

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

**February 1, 2022**



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## EXECUTIVE SUMMARY

The Special Reclamation Fund Advisory Council (the “SRFAC”) 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). According to W.Va. Code § 22-1-17 the SRFAC shall consist of eight members, including the Secretary of the West Virginia Department of Environmental Protection (WVDEP) or his or her designee, the Treasurer of the State of West Virginia or his or her designee, the Director of the National Mine Land Reclamation Center at West Virginia university and five members to be appointed by the governor with the advice and consent of the Senate.

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 Fund is presently funded by a tax of 27.9 cents per ton of clean coal mined in West Virginia. From this revenue, funds based on a tax rate of 15 cents per ton are being paid into the Special Reclamation Water Trust Fund (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 SRWTF was created “for the purpose of assuring a reliable source of capital to construct, operate, and maintain water treatment systems on forfeited sites.” (W.Va. Code § 22-3-11).

The Secretary of the WVDEP is required to conduct formal actuarial studies every two years and conduct informal reviews annually on the Fund and SRWTF. The SRFAC is also required to make a report to the Legislature every year on the financial condition of the Fund. (W.Va. Code § 22-1-17). The report is to include: “A recommendation as to whether or not any adjustments to the special reclamation tax should be made considering the cost, timeliness and adequacy of bond forfeiture reclamation, including water treatment [and] a discussion of the SRFAC 's required study issues.”

In accordance with the statutory requirements, the SRFAC submits the following:

**1. Recommendation:**

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

The SRFAC 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 remain at 15 cents per ton. It was previously established by the Council that the Fund would cover all costs for both land reclamation and water treatment through June 2018. Then starting in July 2018, the SRWTF would begin covering the cost for water treatment—both water capital costs and ongoing water treatment costs. Following reviews of the financial status and investment earnings of both funds it was the consensus of the Council to continue paying for all reclamation costs out of the Fund to allow the SRWTF to continue building assets while earning higher yields. It was also agreed that fund transfers from the SRWTF to the Fund would occur, as needed, to maintain a fund balance of \$10,000,000.

The SRFAC further recommends that the State Legislature form a panel to examine the elements of our State code that result in uncontrolled liabilities, and 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 SRFAC 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 SRFAC 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 whether the statute and regulations creating the Fund and SRWTF in West Virginia have inappropriately interpreted SMCRA to require long-term CWA liabilities. The SRFAC 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 SRFAC 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.

**2021 Study issues:**

- Review of the current investment strategy
- Continue review of DMR database and improvement of functionality. A priority addition is to include a data field that indicates whether an active permit is treating AMD, or other water pollutants, as part of the effort to compile water management and treatment costs on active sites.
- Integrate more detailed inspection data with the DMR permit data used by the SRF. Currently, the database only specifies a broad inspection status on the date of last inspection. Information about permit violations, including number, date, and types of violations, is needed to evaluate risk of forfeiture. DMR is working to connect two databases to make this happen.
- Continue to improve upon the active mine pollutant inventory.
- Determination of controlling entities
- Consensus Coal Forecast
- Actuarial Study

**2021 Notable Projects:**

- Rare Earth Elements Extraction Plant combined with new Acid Mine Drainage Treatment
- Cost comparison of the watershed approach treatment vs at source treatment within Muddy Creek (results are not yet final)
- Consensus Coal Forecast
- Southwestern Energy (SWN) partnership for Operation & Maintenance extended for two sites

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

Mike Sheehan served as Deputy Director for Division of Land Restoration until his retirement on October 29, 2021. Since then, David McCoy P.E.- Chief Engineer is temporarily serving as the member representing the Cabinet Secretary of the WVDEP. Lindsay Marchio 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. Christine Risch, Marshall University, Center for Business and Economic Research, serves as the Actuary/Economist member. Bill Raney served as the member representing the interests of the coal industry until August 5, 2021. Jason Bostic was appointed to replace Mr.

Raney in that position. John Morgan serves as the member representing the interest of environmental advocates. Ronald Pauley serves as the member representing the interests of coal miners. Christopher Pence serves as the member representing the interests of the general public.

#### **BACKGROUND ON THE SPECIAL RECLAMATION FUND**

In 2001 the legislation establishing the SRFAC 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 SRFAC found that the failure to extend the Temporary Tax again would result in insolvency of 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 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 Analysis performed by Pinnacle Actuarial Resources, Inc. the Fund was found to be sufficiently funded under the existing 12.9 cent tax. However, the SRFAC 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 were 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.

Based upon projections under the 2013 Actuarial Analysis performed by Pinnacle Actuarial Resources, Inc. the Fund was projected to be over 100 percent funded using a 20-year cash flow basis and 95.7 percent funded

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using a 35-year cash flow basis. The SRWTF was (and is today) accumulating 15 cents per ton coal tax revenue and interest and was 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.

Based on the 2015 Actuarial Analysis conducted by Taylor & Mulder, the Fund was projected to fall to a low of \$51.5 million in 2018. This was due to paying for all reclamation cost for both land and water as well as operation and maintenance cost associated with water treatment. The Fund was projected to then slowly recover to \$187.5 million by the end of the twenty-year study period, at which point an \$8.2 million liability would remain. The SRWTF was expected to accumulate approximately \$120 million by 2018 before beginning to support water reclamation costs in 2019 (*However, it should be noted that as of December 31, 2017 the balance in the SRWTF had only reached \$104 million*). Afterwards, the SRWTF was projected to show gains, reaching \$289.8 million by the end of the twenty-year study period with a \$110.5 million liability remaining. Both funds combined were projected to total approximately \$477.3 million at the end of the twenty-year study period with a total remaining liability of \$118.7 million.

The results of the 2017 Actuarial Analysis conducted by Pinnacle Actuarial Resources, Inc. indicated that on a present value basis the Fund was 97.3% funded over a twenty-year projection and 93.6% funded over a thirty five-year projection period but indicated that the Fund would go into a negative balance in 2021. The SRWTF was 162.6% funded over a twenty-year projection, 151.4% funded over a thirty five-year projection period and is fully funded throughout the entire projection period. Combined, the two funds were 123.4% and 115.8% funded over twenty and thirty five-year projections respectively, and fully funded throughout the entire projection period. Pinnacle determined that a transfer of \$38 million in assets from the SRWTF to the Fund would keep the Fund in a positive balance position throughout the projection period without causing the SRWTF to move into a negative balance.

Beginning in 2019, it was decided that only twenty years of projections would be performed for the biennial actuarial reports. This decision was made to reduce inaccuracy associated with very long-term forecasting.



Taylor and Mulder 2019 projections of revenues and expenses to the Funds imply that the Funds will be solvent on a cash basis through 2039.



Taylor and Mulder 2021 projections of revenues and expenses to the Funds imply that the Funds will be solvent on a cash basis through 2039. Note that these projections assume that money will be transferred from the Water Trust Fund to the Special Reclamation Fund to maintain a minimum fund balance of \$10,000,000.

The chart below (Figure 1) shows a simplified cash flow projection for the SRF and WTF combined over the next 20 years.

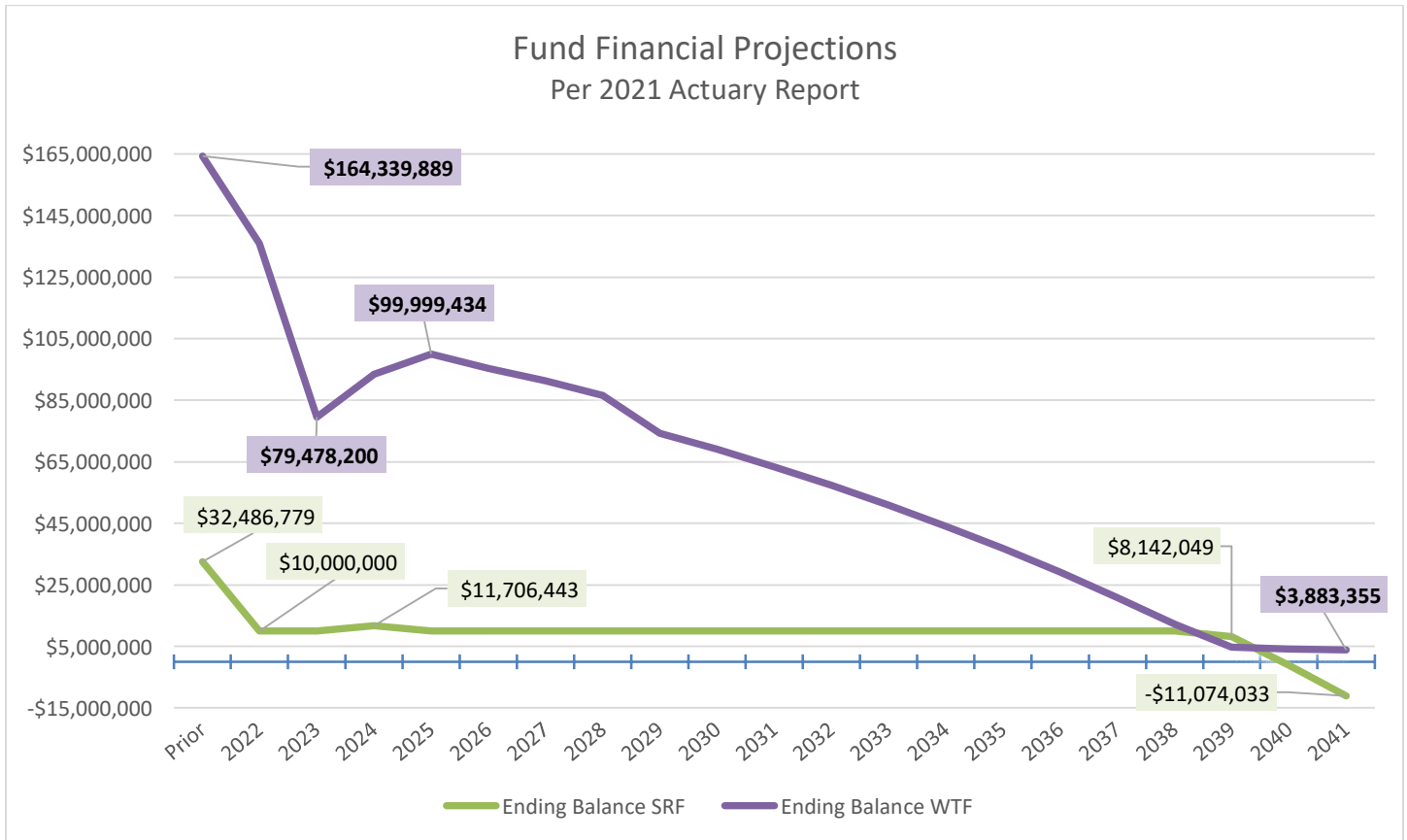


Figure 1

**Recommendations from 2021 Actuary Report**

**Coal Production Risks:** There has been some instability in coal production forecasts and the coal market in general over the preceding decade as a result of different regulatory regimes, alternative energy adoption rates, economic events, and, most recently, the COVID-19 pandemic. Future studies may benefit from considering alternative coal production scenarios.

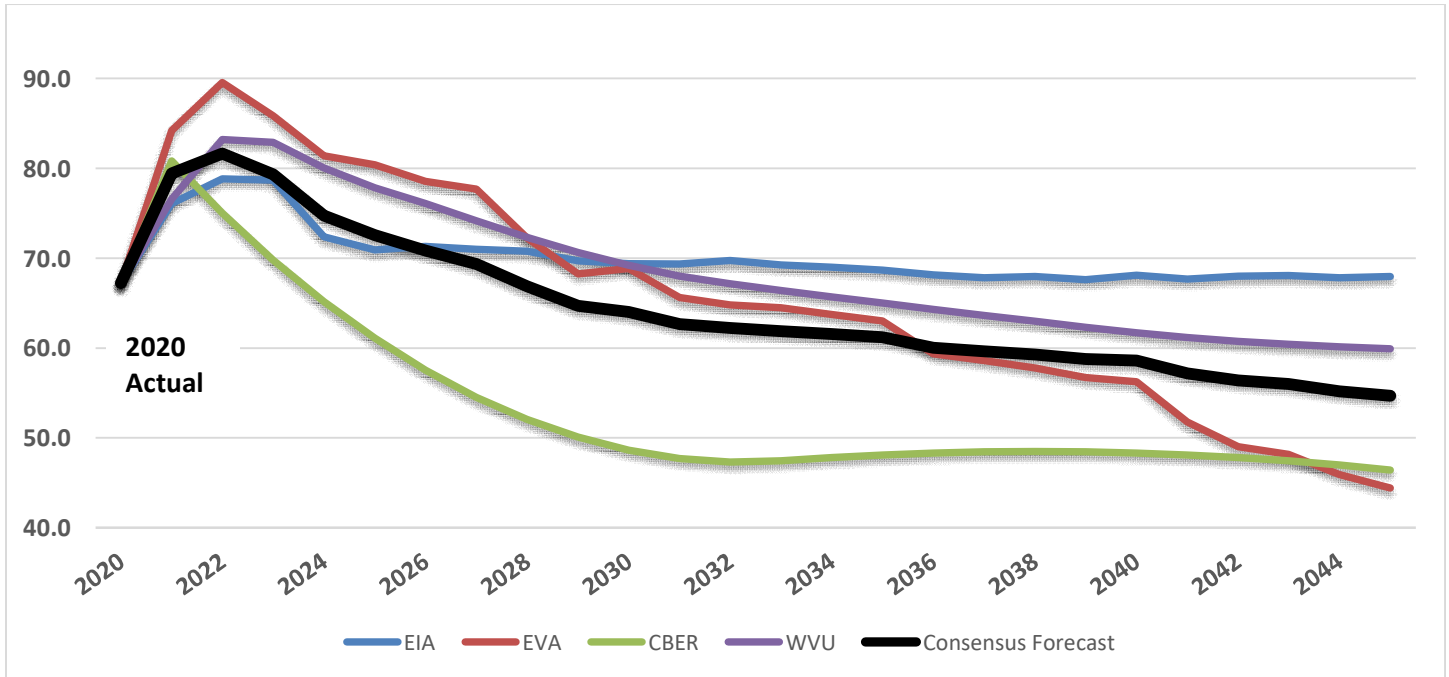


**Permit Status History:** Permit databases were evaluated as of a specific date. The study includes a non-empirical forfeiture rate. Further study including determination of factors that contribute to forfeitures is recommended.

**Coal Consensus Forecast by Marshall University-Center for Business & Economic Research**

**Consensus Forecast:** The four long-term forecasts produced by EIA, EVA, CBER and BBER are combined to create the 2021 Consensus Forecast for West Virginia Coal Production. For simplicity, a simple average was used to calculate the consensus forecast<sup>4</sup> (Figure 2 and Table 2). Coal production in West Virginia is projected to initially rebound from 67.3 million tons in 2020 to 81.6 million tons in 2022, followed by a steady decline to about 55 million tons in 2045.

**Figure 2:** Consensus and Component Forecasts 2021 (million tons)



Source: EIA, EVA, WVU BBER and Marshall.

**Summary:** The four component models incorporate a range of possible of West Virginia coal production levels over the next 24 years, with varying forecasts that illustrate the impact of primary supply and demand variables and uncertainty over the continuation of recent trends. The consensus reduces uncertainty by combining the forecasts into one aggregate projection. Despite an expected short-term recovery in coal production, the consensus forecast projects that West Virginia will experience a steady decline in coal production through 2045.

### **SRFAC Recommendation**

The SRFAC 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 remain at 15 cents per ton. It was previously established by the Council that the Fund would cover all costs for both land reclamation and water treatment through June 2018. Then starting in July 2018, the SRWTF would begin covering the cost for water treatment—both water capital costs and ongoing water treatment costs. Following reviews of the financial status and investment earnings of both funds it was the consensus of the Council, this year, to continue paying for all reclamation costs out of the Fund to allow the SRWTF to continue building assets while earning higher yields. It was also agreed that fund transfers from the SRWTF to the Fund would occur, as needed, to maintain a fund balance of \$10,000,000.

### **FINANCES OF THE SPECIAL RECLAMATION FUND & THE SRWTF**

This section of the Report to the Legislature outlines the financial status of the Fund and the SRWTF for calendar year 2021 and provides comments regarding the future financial position of both. 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.

The WVDEP acknowledges that future forfeitures and any water management costs associated with them could affect funding needs of the Fund and the SRWTF. WVDEP is currently working to compile water management and treatment costs on active (still permitted) sites in order to better inform the actuaries and policy makers in prediction of future water management and treatment costs associated with revoked sites. Additionally, the SRFAC is continuously looking for ways to predict future forfeitures, which will continue to be a focal point of the SRFAC through 2022. The Office of Surface Mining Reclamation and Enforcement (OSMRE) supports WVDEP's efforts to improve the active mine pollutant inventory to ensure the accuracy of future forfeiture cost projections and has formed a team with WVDEP to develop a work plan for obtaining additional data.

To summarize the data and analysis that follow, it should be noted that the Fund will continue to pay for all costs for both land reclamation and water treatment. Money transfers from the SRWTF to the Fund will occur as needed in order to maintain the Fund balance of \$10,000,000.

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As of December 31, 2021, the Fund had accumulated assets of \$19.3 million, a 50% decrease compared to 2020 SRWTF values, while the SRWTF had accumulated \$169.9 million in assets, a 17.2% increase over 2020 SRWTF values. Increased revenues for the SRWTF are attributed to the tax increase in 2012 as well as the improved investment strategy which was initiated in 2013 as described below.

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

The first recommendation was in two parts:

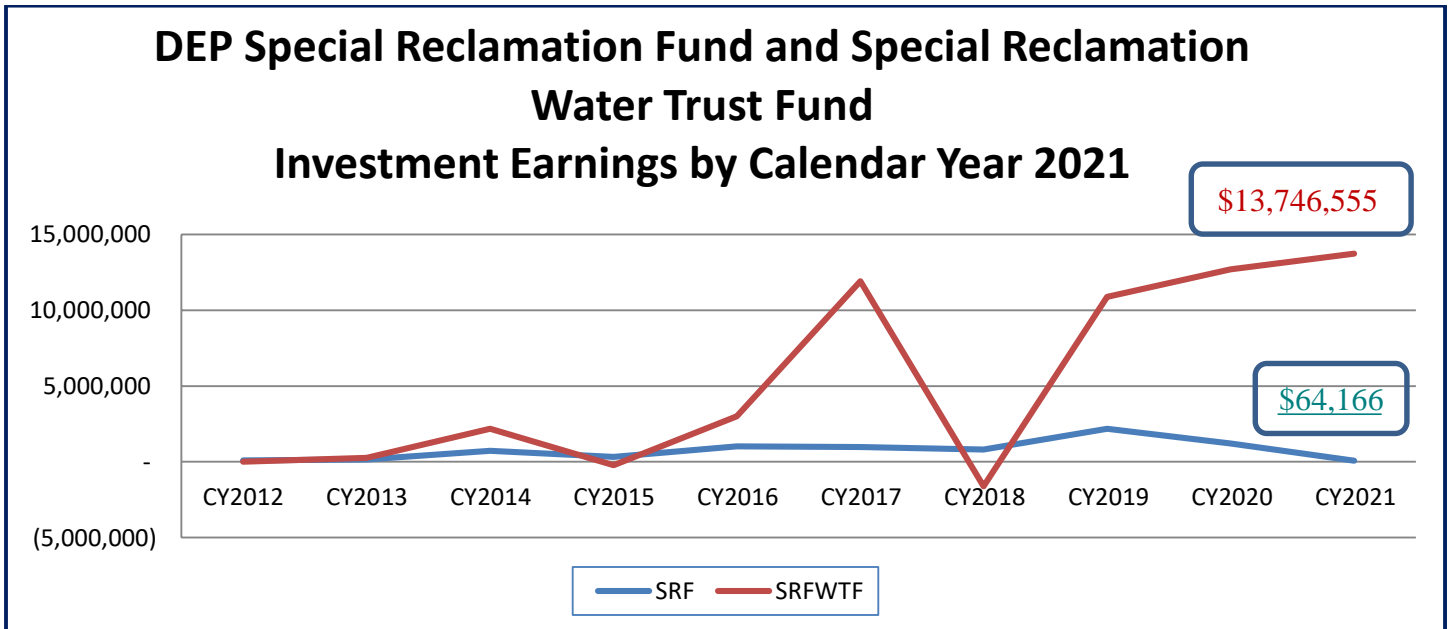
1. That the current balance of the Special Reclamation Water Trust Fund (SRWTF) and all additional revenue of the SRWTF through Fiscal Year 2018 be invested in the Investment Management Board (IMB) Fixed Income Pool until FY 2019.
2. That WVDEP develops plans to maximize the return on investment for future SRWTF revenue.

The second recommendation was also in two parts:

1. That the current balance of the Special Reclamation Fund be invested in the Board of Treasury Investments West Virginia Short Term Bond Pool except for \$5 million, which should remain in the West Virginia Money Market Pool.
2. That WVDEP develops 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.

In June of 2013, except for \$5 million, the balance of the Fund was transferred to the West Virginia Short Term Bond Pool. The following chart (Figure 3) depicts the investment earnings for the previous ten years prior to the new investment strategies and results of the new strategy leading up to the current year.



**Figure 3**

Since 2001, despite a very aggressive reclamation schedule, the Fund has 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 122 requiring water treatment. Since passage of that legislation, an additional 209 permits have been forfeited as well, bringing the total to 601 permits requiring reclamation. Of those, work has been completed on 515 permits. Regarding water treatment, the Fund is treating water at 183 sites and has an additional 21 sites under review or construction. As of December 31, 2021, the Fund had accumulated cash and investments totaling \$19.3 million, while the SRWTF had accumulated \$169.9 million.

A complete inventory of all bond forfeiture sites is in Appendix E, along with bond forfeiture sites that have mine drainage related problems, and a prioritized order in which they will be addressed.

Graphic summaries of the status of the Funds are outlined in the following figures.

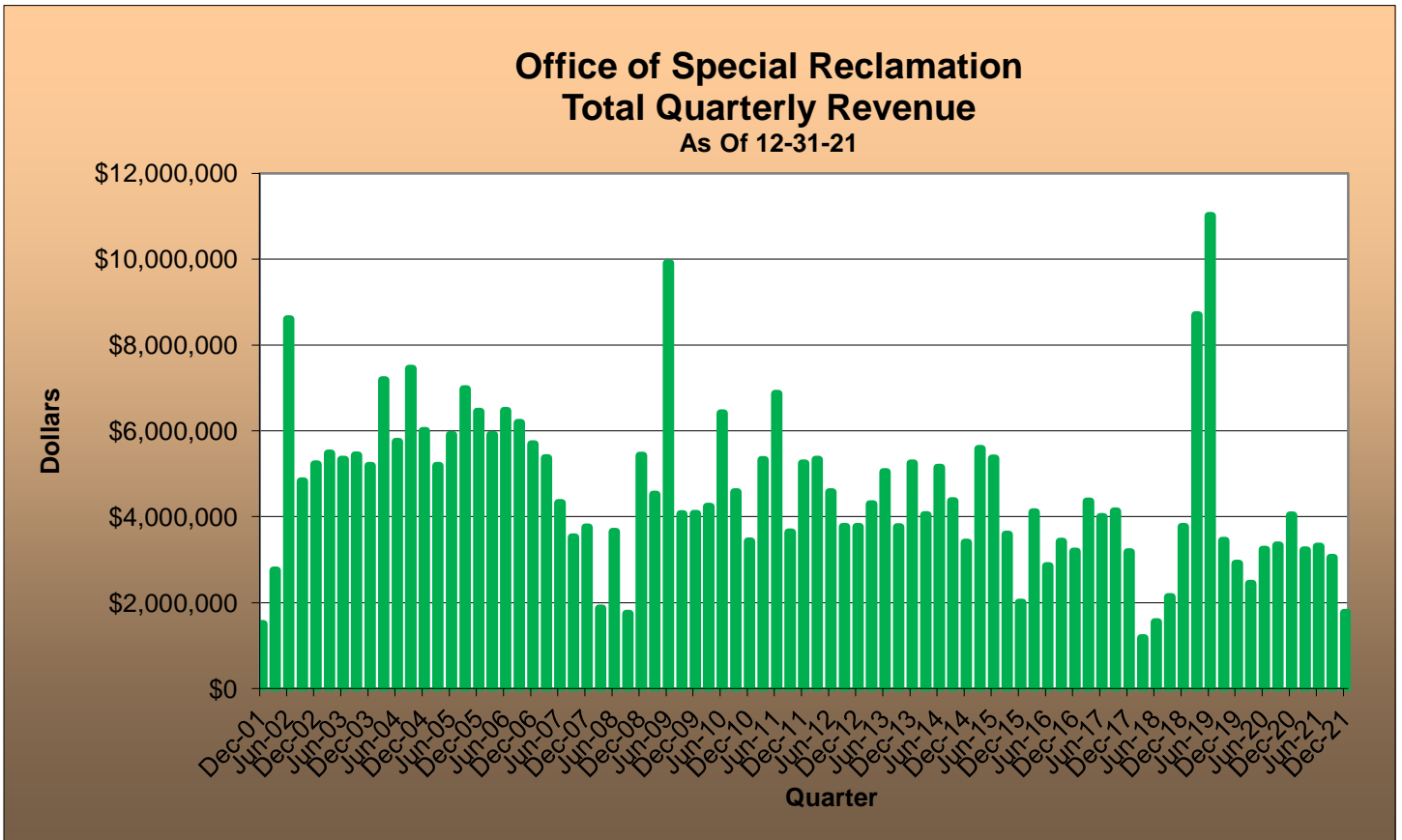


Figure 4

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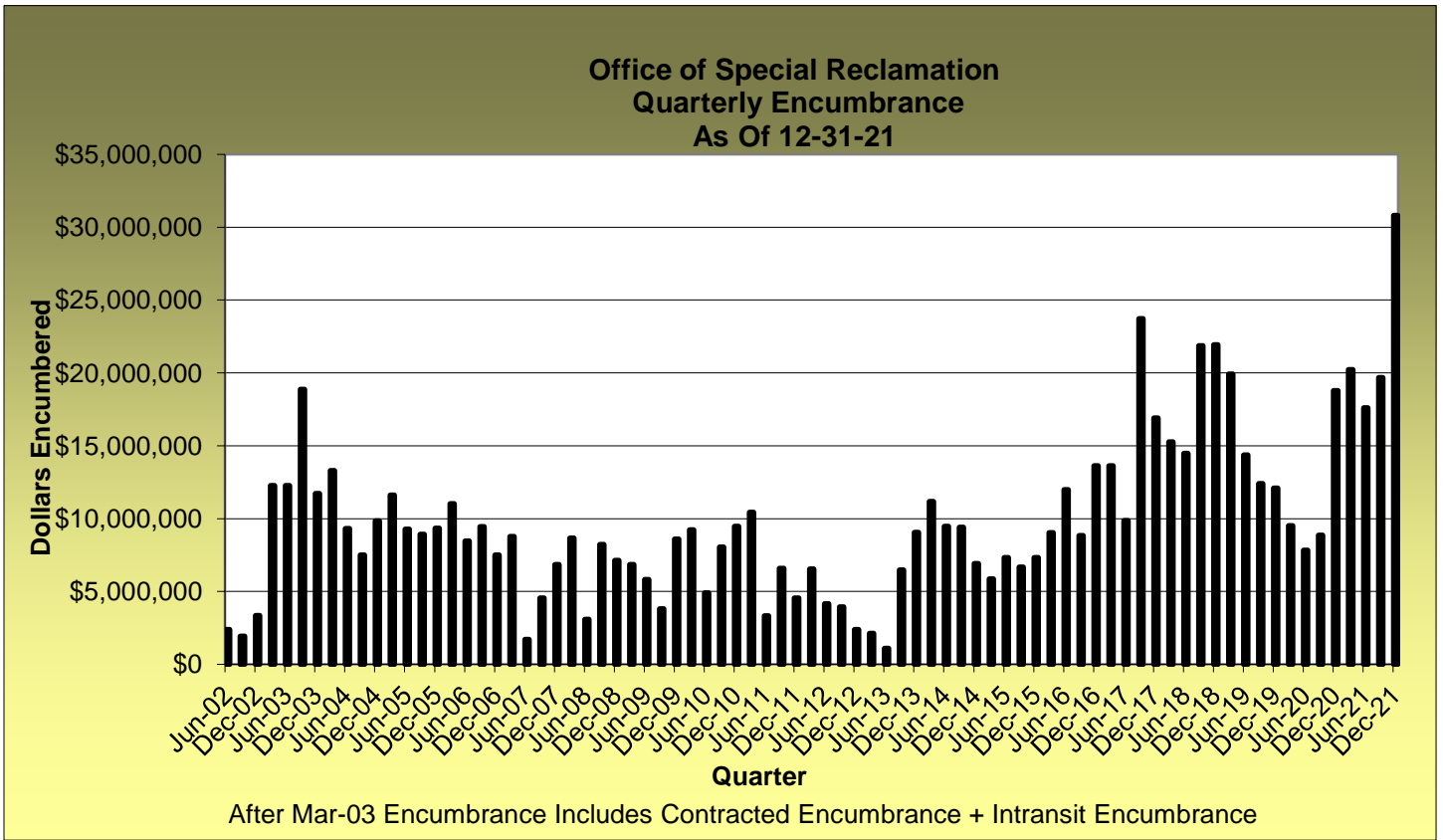
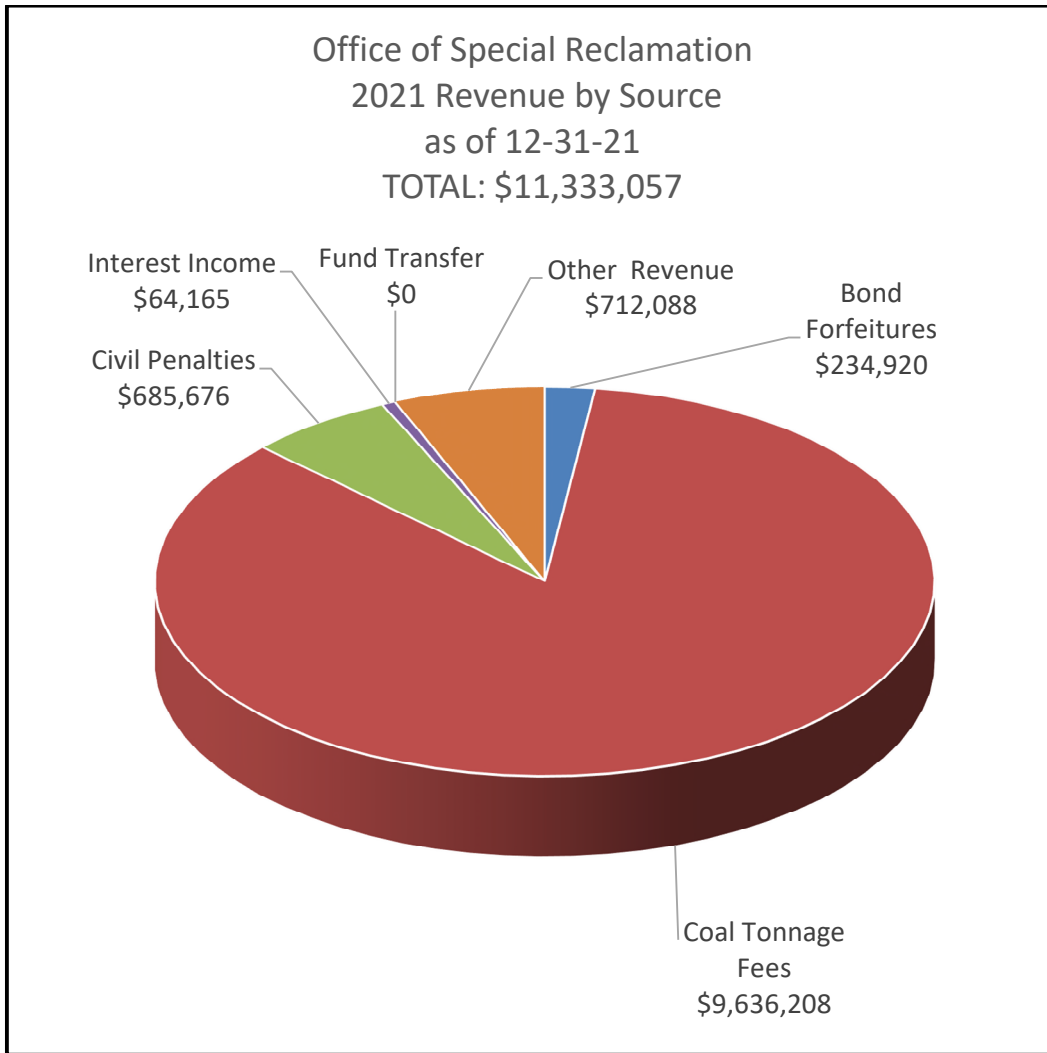


Figure 5



**Figure 6**

### **Water Treatment Funding**

A complete inventory of bond forfeiture sites that are producing mine drainage that violate effluent limitations or applicable water quality standards for long-term treatment of these sites are in Appendix E.

The current main funding mechanism for bond-forfeited sites is the 27.9 cent tax per ton of clean coal mined, of which fifteen cents is dedicated to the SRWTF.

In 2008, the Legislature authorized, but did not separately fund, the 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.

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The average yearly revenue, fees and investment earnings for the past four years have exceeded twenty two million dollars (\$22 M/year). The current balance in the SRWTF is \$169,908,092 as of December 31, 2021. The SRFAC is continuing to look at alternatives for water treatment funding.

Increased water capital cost and water treatment cost are the result of two identical lawsuits filed against the WVDEP. In 2011 and 2012 the WVDEP entered into separate consent decrees with the northern and southern district courts respectively. As will be discussed later in this report, the WVDEP was 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, for a total of 192 sites.

WVDEP has fulfilled the requirements of the Consent Decree by obtaining all NPDES permits.

### **Additional Charges to the Fund Due to NPDES Requirements**

Due to NPDES requirements, the WVDEP has been faced with charging more expenditures to the Fund. These include:

- Realty – Land and/or easement purchases have been necessary to expand existing or new water treatment sites outside permit boundaries. Surveying and appraisal costs are included in these purchases.

Increased staff – As a result of having to apply for and obtain NPDES permits at all bond forfeiture sites now and into the future, the WVDEP has found it necessary to incorporate an NPDES permitting section into the Office of Special Reclamation (OSR - The office responsible for reclamation of land and waters for bond forfeited sites). Five new staff members consisting of one (1) Program Manager and four (4) Environmental Resource Specialists have been added to fulfill the NPDES requirements for the WVDEP. Additionally, to reduce surveying costs associated with reality needs and design, a licensed surveyor was hired.

Also, two (2) land agents were hired in 2018 to address realty needs, although the responsibilities and salaries are split between OSR and the Office of Abandoned Mine Lands.

- NPDES permitting fees:
  - Application fees - \$1,000/application
  - Modification fees - \$500/mod.
  - Annual fees - \$1000/permit.
- Additional water sampling related to permit applications.



- The WVDEP entered into a grant agreement with the West Virginia Land Stewardship Corporation (WVLSC) to provide contractual services in the areas of design, construction, and project oversight. The purpose of the agreement was to enhance the capacity of WVDEP professional staff to meet reclamation deadlines. It is estimated that project costs increase by 10 to 15% for contractual services and another 1% for indirect cost associated with managing the grant.

The WVLSC was created by state legislation in 2013 to lessen the burdens of government when government identifies a need for WVLSC to assist with land stewardship and the remediation of properties with known environmental issues, including former mining sites.

A pilot grant agreement, known as the LaRosa Fuels site (Permit Number S-1051-86), was approved in 2016 to evaluate the efficiency and benefits of a work-sharing partnership.

WVDEP approved a grant amendment in 2017 and provided additional funds, as well as additional permits to be reclaimed. The grant was structured as an up-front payment to provide the WVLSC with the funds needed to cover the level of liability inherent in multiple reclamation projects, which requires engaging multiple engineering and construction firms simultaneously. Having the resources to cover at least the original liability estimates provided by WVDEP gave the WVLSC Board the level of certainty it needed to take on the project.

The WVLSC invested the grant funds so that they could earn interest that could be used on the project. In 2018, when it was identified that WVDEP investments were gaining a higher rate of return, the grant funds were returned to the WVDEP to maximize investment earnings. The WVLSC invoices the WVDEP when expenditures regularly occur. WVLSC had one design project in 2021 to fulfill the grant agreement, which was completed before the end of the year.

### **WVDEP Policy Relevant to the Fund**

Effective May 21, 2014 the WVDEP has implemented a new policy establishing a standard procedure the WVDEP will follow to terminate the State's jurisdiction over bond-forfeited former mining sites (Special Reclamation Sites). With a decision that the Special Reclamation Site has satisfied the applicable performance standards, WVDEP will terminate jurisdiction over the subject Special Reclamation Site. The policy limits the vulnerability of the State, and consequently the Fund, by reducing the possibility of lawsuits pertaining to damages unrelated to former mining practices or reclamation practices, i.e. due to recreation, timbering, oil & gas, etc., as well as any changes to environmental laws taking effect after reclamation of the subject Special Reclamation Site.

The WVDEP will retain jurisdiction of Special Reclamation Sites, or portions thereof, that are necessary for the effective treatment of mine discharges emanating from the subject Site.

## **Litigation**

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 WVDEP, 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 (WVDEP) 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 WVDEP 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 WVDEP 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. WVDEP 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 WVDEP was “in violation of the National Pollutant Discharge Elimination System permitting requirements of the Clean Water Act.” The Southern District Court ordered the Secretary to “apply for, and obtain, NPDES permits for all sites at issue in this action,” and the parties subsequently submitted a joint stipulation agreeing to the same injunctive relief and timeframes for compliance set forth in the Northern District litigation. The Southern District Court entered final judgment August 31, 2010.

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On January 11, 2010, the same Plaintiffs (West Virginia Highlands Conservancy and West Virginia Rivers Coalition) and the Sierra Club submitted a letter giving WVDEP notice of their intent to sue WVDEP 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, WVDEP 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. As required by the Consent Decree on July 2, 2012 WVDEP submitted a Final Treatment Cost Report to Plaintiffs and SRFAC, in which WVDEP 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 WVDEP estimated that these costs will amount to \$35.5 million for one-time capital construction costs and over \$6 million in annual operations and maintenance costs.

The Consent Decree resolves all four suits filed by the Plaintiffs regarding bond forfeited sites. The Consent Decree required WVDEP to obtain WV/NPDES permits for all 21 bond forfeiture sites cited in the initial litigation by September 1, 2011. Thereafter, WVDEP issued draft WV/NPDES permits for 50 additional sites by the end of each calendar year, beginning in 2012. By December 31, 2015 the Consent Decree required WVDEP to issue draft WV/NPDES permits for all bond forfeited sites listed in Attachment A of the Consent Decree and for sites that were in existence on the date the Decree was executed. Thereafter, the WVDEP shall exercise its best judgment on the timing of issuance of draft permits for sites forfeited after the execution of the consent decree.

*Note: The final draft permit was issued December 10, 2015.*

2. 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 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 SRFAC 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

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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 SRFAC recommendations are issued, whereas the Defendants recommended that it was premature for the court to reopen this matter prior to the close of the 2012 legislative session.

On March 30, 2012, a status conference call was conducted by the Court. In light of the enactment of Senate Bill 579 that increased the special reclamation tax from 14.4 cents to 27.9 cents per ton of clean coal mined, the Plaintiff acknowledged that it would move to withdraw its Second Motion to reopen and refile it to address the changed circumstances that have occurred since the filing of its motion to reopen.

On April 2, 2012, the WVHC filed its Motion to withdraw its Second Motion to reopen this case with the Court. On August 5, 2012, the Court issued an Order granting the Plaintiff's Motion to withdraw its Second Motion. In addition, the Court granted the WVHC leave to file an additional motion to explain deficiencies that remain, notwithstanding the recent revenue increase in the Special Reclamation Fund.

This case remains open, so the District Court can address any issue that may arise regarding the State's ABS (alternative bonding system).

3. On or about April 20, 2016, the West Virginia Highlands Conservancy, West Virginia Rivers Coalition, and Sierra Club sued the West Virginia Department of Environmental Protection's (WVDEP) Special Reclamation Program alleging it was in violation of seven West Virginia National Pollution Discharge Elimination System (WVNPDES) permits issued for sites controlled by the Special Reclamation Program, four in the United States District Court for the Northern District of West Virginia<sup>1</sup> and three in the Southern District<sup>2</sup>. The lawsuits allege that the WVDEP had discharged and continued to discharge quantities of aluminum, iron, nitrogen ammonia, and suspended solids in excess of the effluent limitations in those permits. The lawsuits further allege discharges of effluent with pH outside of the permit range. On December 12, 2016, the parties met at WVDEP's headquarters in Charleston. The WVDEP explained to the Plaintiffs that a timetable for achieving compliance had already been established and were included in a corrective action plan required under the enforcement actions being carried out by the WVDEP's Division of Mining and Reclamation. On July 10, 2017,

## 2021 SRF Advisory Council Annual Report

the parties filed a consent decree in the Northern District action. On April 25, 2018, the parties filed a consent decree in the Southern District. The compliance requirements found in these consent decrees are based on the schedule that the WVDEP had prepared for inclusion in the corrective action plan; no new or different requirements were added as a result of the litigation.

4. On June 29, 2021, Appalachian Mountain Advocates, on behalf of Sierra Club, West Virginia Highlands Conservancy, and West Virginia Rivers Coalition, delivered to the West Virginia Department of Environmental Protection ("WVDEP") a Notice of Intent ("NOI") to sue for violations of the Clean Water Act regarding WV/NPDES Permit No. WV1027301, which is associated with the Greendale bond forfeiture site operated by the WVDEP Office of Special Reclamation. Discussions between the parties resulted in no further legal action being taken by either party to date.

5. *Living Lands, LLC and D.C. Chapman Ventures, Inc. v. Jack Cline, Brady Cline Coal Co., Spruce Run Coal Co., Harold Ward, Secretary, West Virginia Department of Environmental Protection, Civil Action No. 3:20-cv-00275*, revolves around three primary claims. The first of which being that unlined treatment ponds, unlined AMD sludge drying pits for treated sludge, and unlined conveyance ditches allow for infiltration and pollution of groundwater; therefore, point sources requiring individual NPDES permits. The second being that the material in the treatment ponds and the treated sludge in the sludge drying pits are hazardous wastes and/or solid wastes under RCRA, therefore triggering the relevant waste handling and disposal requirements. The third being that the material in the unlined treatment ponds, unlined sludge drying pits, and unlined conveyance ditches is AMD contaminated mining waste under CERCLA, therefore triggering financial responsibility requirements for potential responsible parties, including but not limited to the DEP.

The implications of the DEP losing on the first issue would be that similarly situated ponds across the state of West Virginia could be required to install liners and obtain NPDES permits, at a huge cost. A loss on the second issue would completely upend how the DEP, and all other entities who generate, store, or dispose of AMD sludge currently operate. A loss on the third issue would expose the DEP, as well as any other potential responsible parties in the handling history of the material, to massive financial liability for the cleanup and remediation of this site, and very likely many others. A loss on any of these claims is likely to impact similar operations in other states, as a precedent would allow for similar challenges in courts across the nation.

The case is currently set for trial in the United States District Court for the Southern District of West Virginia, before Judge Robert C. Chambers, on November 1, 2022.

1. *West Virginia Highlands Conservancy, et al. v. Austin Caperton, Secretary, West Virginia Department of Environmental Protection,*

United States District Court for the Northern District of West Virginia, Civil Action No. 1:16-cv-70

2. *West Virginia Highlands Conservancy, et al. v. Austin Caperton, Secretary, West Virginia Department of Environmental Protection,*

United States District Court for the Southern District of West Virginia, Civil Action No. 2:16-cv-03769

## **2022 SRFAC Study Issues**

- Review of the current investment strategy
- Continue review of DMR database and improvement to functionality. A priority addition is to include a data field that indicates whether an active permit is treating AMD, or other water pollutants, as part of the effort to compile water management and treatment costs on active sites.
- Integrate more detailed inspection data with the DMR permit data used by the SRF. Currently, the database only specifies a broad inspection status on the date of last inspection. Information about permit violations, including number, date, and types of violations, is needed to evaluate risk of forfeiture. DMR is working to connect two databases to make this happen.
- Continue to improve upon the active mine pollutant inventory.
- Determination of controlling entities
- Actuarial Modeling Improvements for 2023 Study

The SRFAC is continuously looking for ways to improve the ability to project future forfeitures. Although limited in its current form the DMR database of open permits is the primary source of information used for the biennial actuarial analysis of the SRF and SRWTF. The analysis also relies heavily on information obtained from forfeited permits and applied to current permits to project future forfeitures.

The SRFAC would like to explore options to increase the linkages of data from past forfeitures to open permits, to improve the predictive power of historical data. Some pieces of data that may be available in the permit databases that have not been previously utilized include:

- length of time a permit had a particular status
- number of times a permit changed status
- groupings with other permits (proximity or use), including Parent Company level of existing permits

## 2021 SRF Advisory Council Annual Report

- Number of permits that are controlled by a Parent Company with no coal production
- annual coal production associated with a permit or group of permits

The SRFAC recognizes that not all these pieces of data are available, even in open permits, and may no longer be available for permits that forfeited many years ago but would like to explore the ability to enhance the information available that can help quantify risk. The database will need to be cleaned and augmented prior to future in depth study.

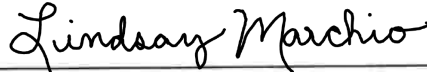
***The SRFAC would like to recognize the WVDEP for their conscientious management of the Fund and the SRWTF and their efforts in minimizing the impacts of bankruptcies to the Funds.***

2021 SRF Advisory Council Annual Report

**Special Reclamation Fund Advisory Council  
Annual Report to the Legislature  
February 3, 2022**



Harold Ward, Secretary WVDEP  
Ex Officio  
Designee: David McCoy  
WVDEP Chief Engineer  
Div. of Land Restoration  
601 57<sup>th</sup> Street  
Charleston, WV 25304



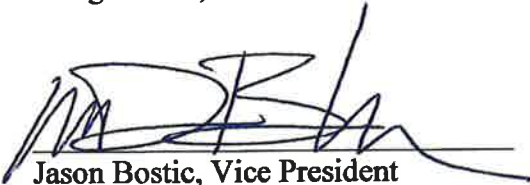
Riley Moore, Treasurer  
Designee: Lindsay Marchio  
Associate General Counsel  
WV State Treasurer's Office  
1900 Kanawha Blvd  
Capital Complex Bldg. 1, Room E-145  
Charleston, WV 25305



Paul Ziemkiewicz, PhD, Director  
National Mine Land Reclamation Center  
WVU – NRCCE Building  
P.O. Box 6064  
Morgantown, WV 26506



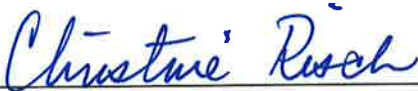
John S. L. Morgan  
Morgan Worldwide  
343 North Limestone Street  
Lexington, Ky. 40508



Jason Bostic, Vice President  
West Virginia Coal Association  
Northgate Business Park  
P.O. Box 3923  
Charleston, WV 25339



Ronald Pauley  
50 Sunset Drive  
Sumerco, WV 25567



Christine M. Risch  
Director of Resource & Energy Economics  
Marshall University  
Center for Business & Economic Research  
One John Marshall Drive  
Huntington, WV 25755-0003



Chris Pence  
10 Hale Street 4<sup>th</sup> Floor  
Charleston, WV 25301



Appendices for 2021 SRFAC Annual Report  
(All Appendices as of 12-31-21)

**A. WVDEP Graphs:**

Land and Water Permits Scheduled by Quarter and Projects Completed

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 Collected by Source: Bonds, Civil Penalties, Tax

**B. Rare Earth Elements**

**C. Coal Consensus Forecast**

**D. Actuarial Study**

**E. Bond Forfeiture Inventories**

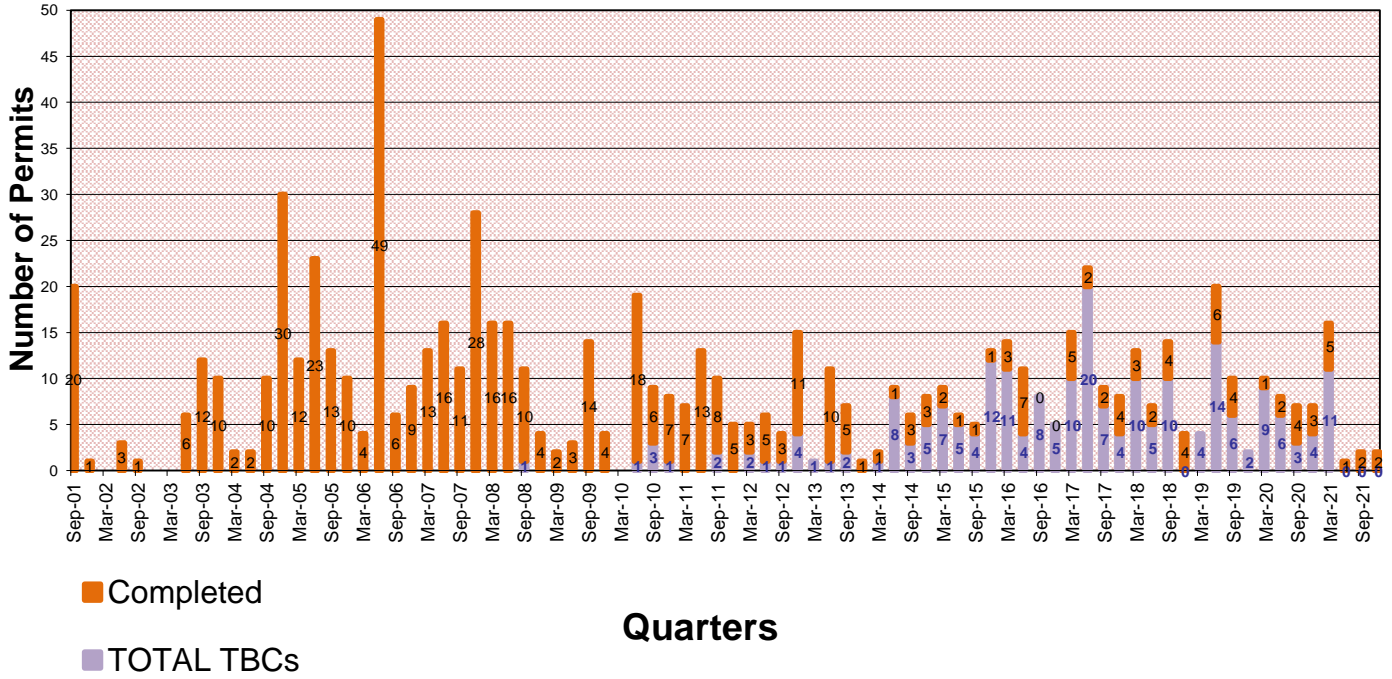
a. **Total Forfeiture Inventory**

b. **Acid Mine Drainage Inventory**

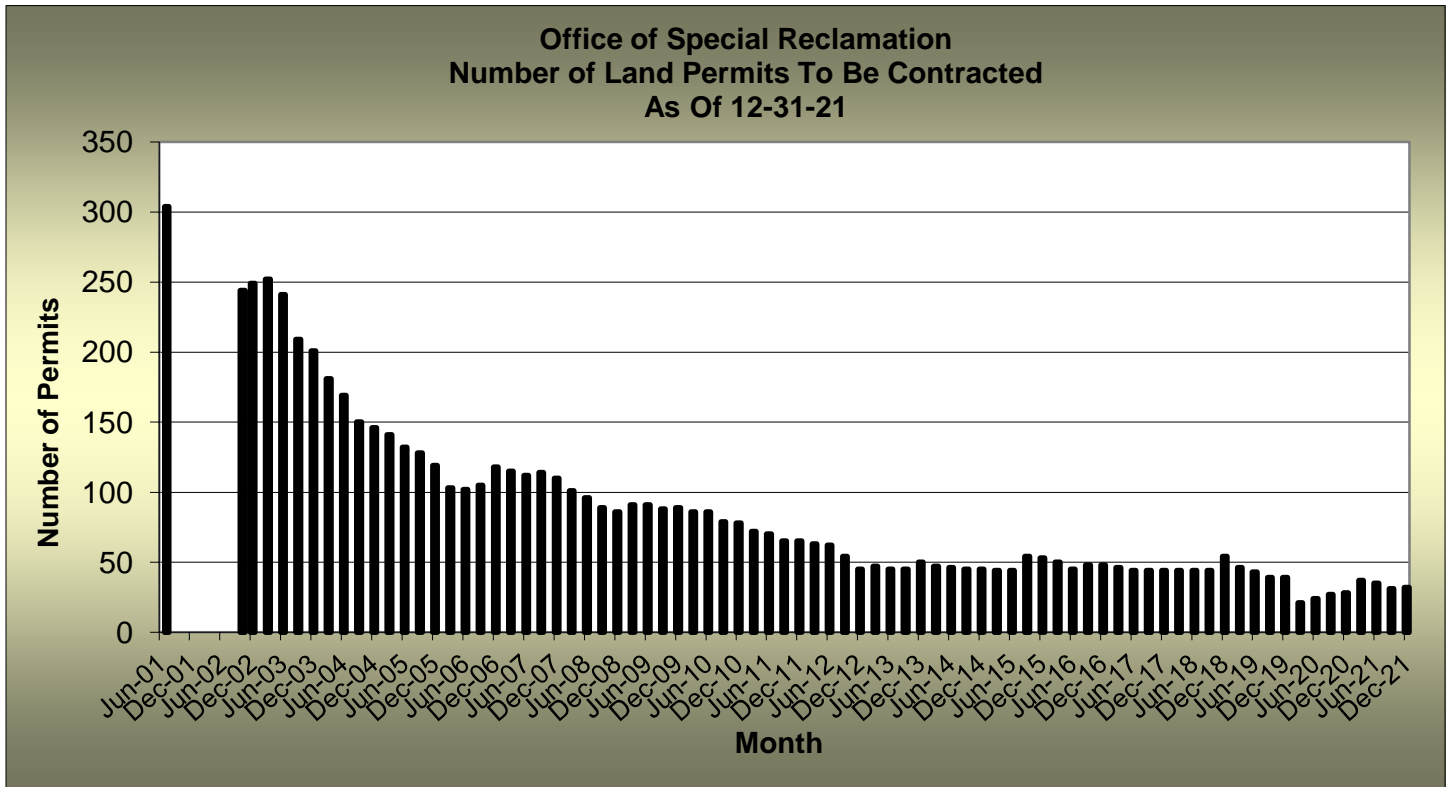
c. **Mine Drainage Treatment Prioritization**

## **Appendix A**

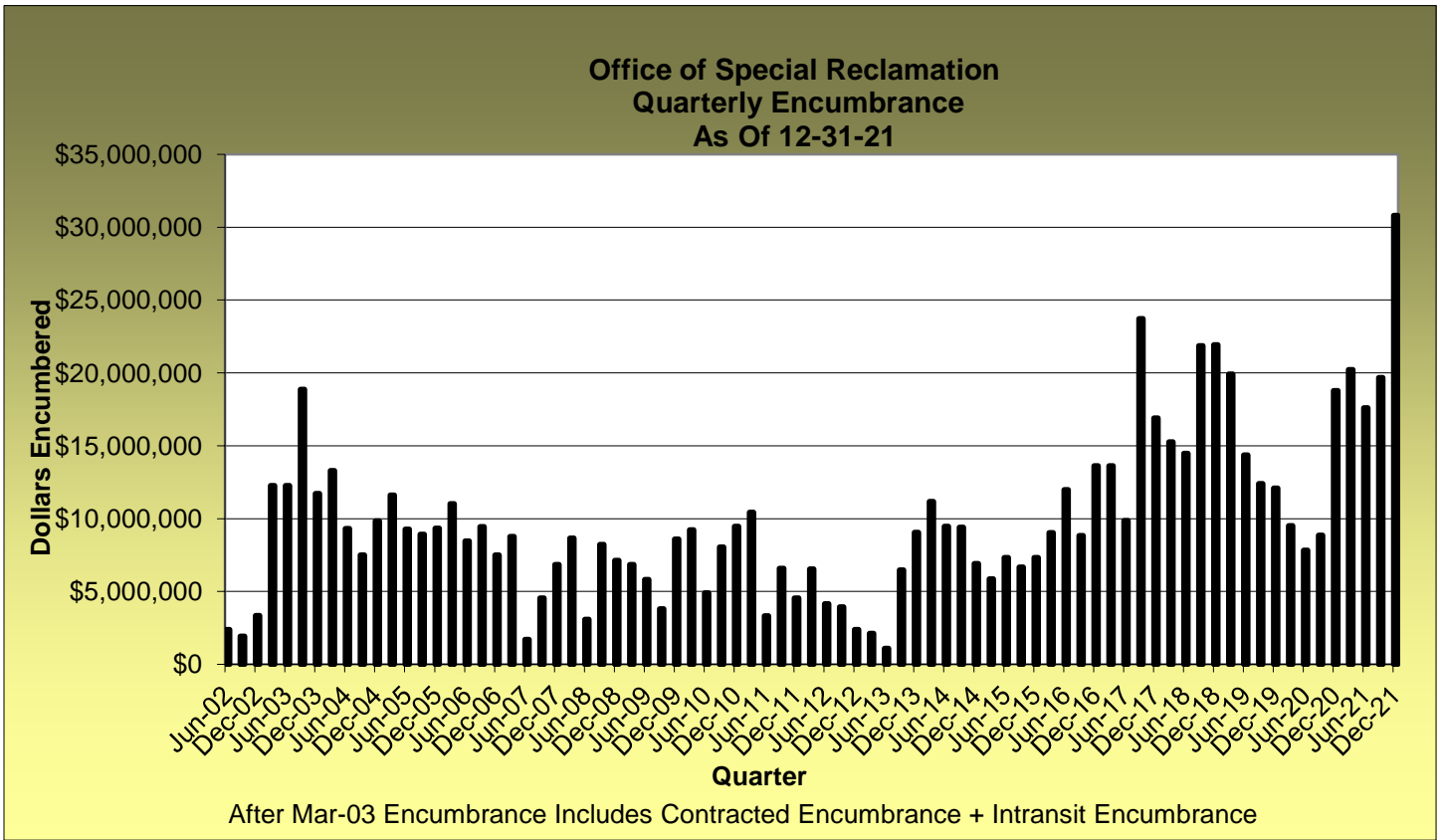
**Land and Water Permits  
TBC -Scheduled by Quarter  
and Projects Completed  
As Of December 31, 2021**

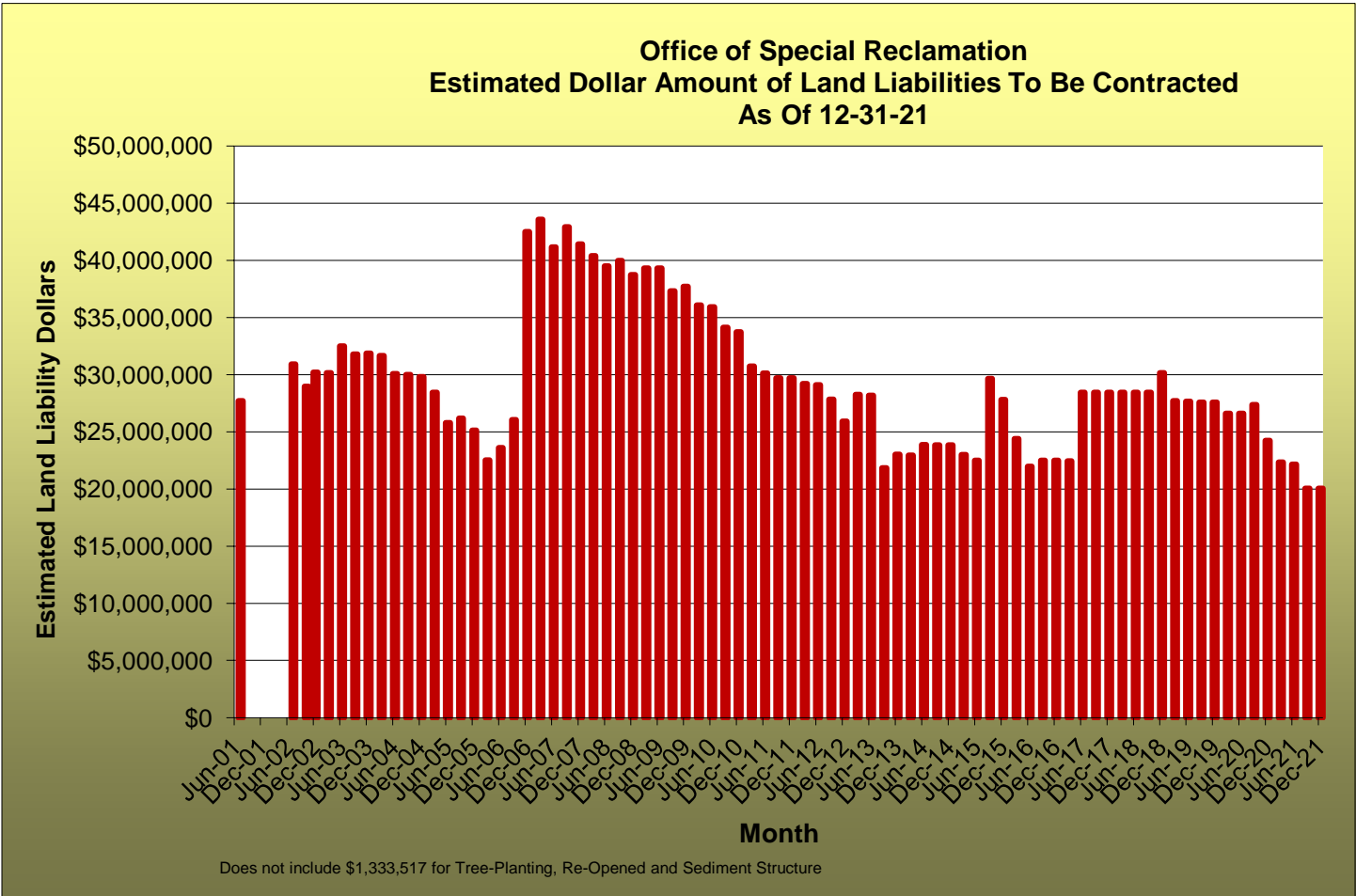


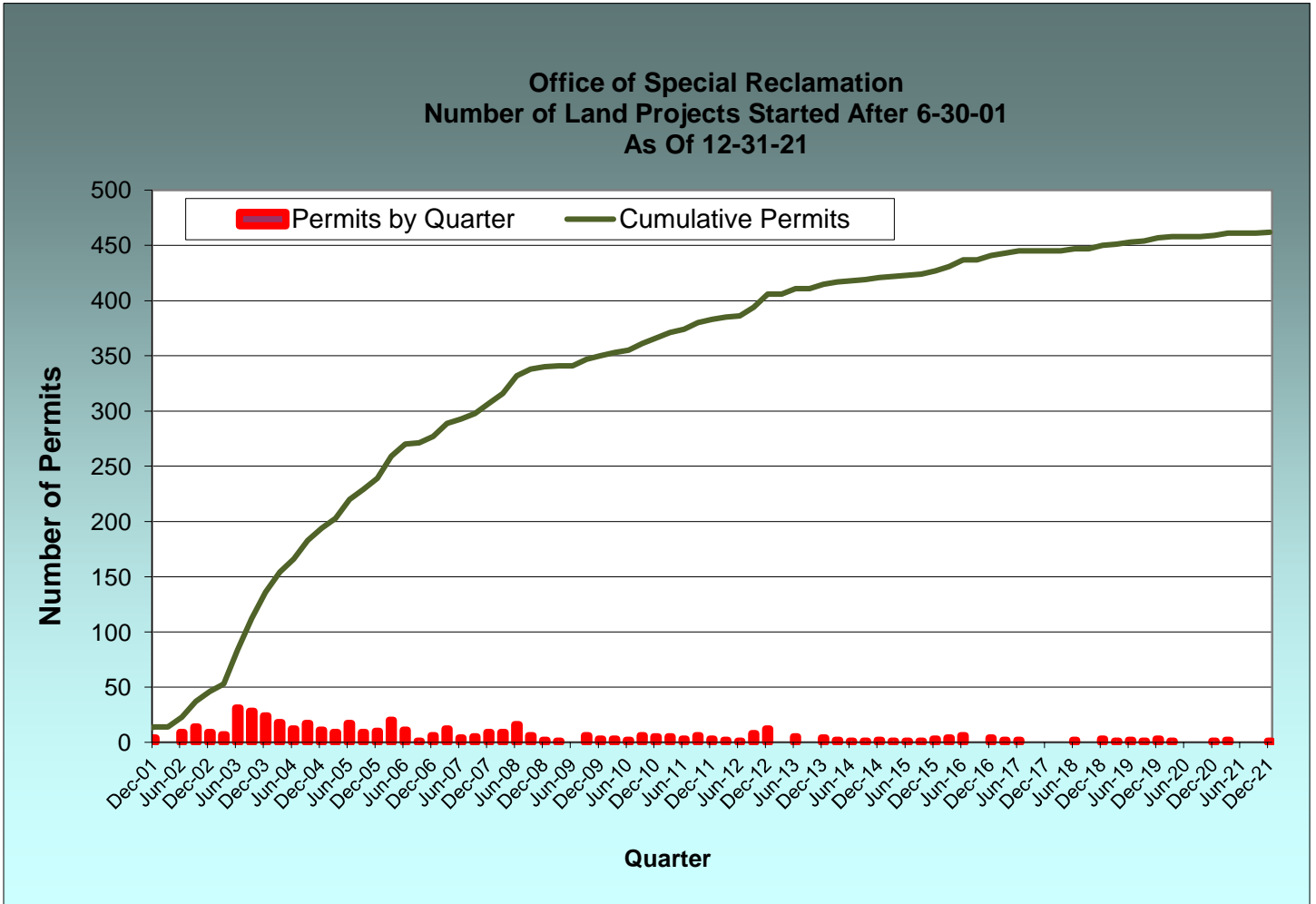
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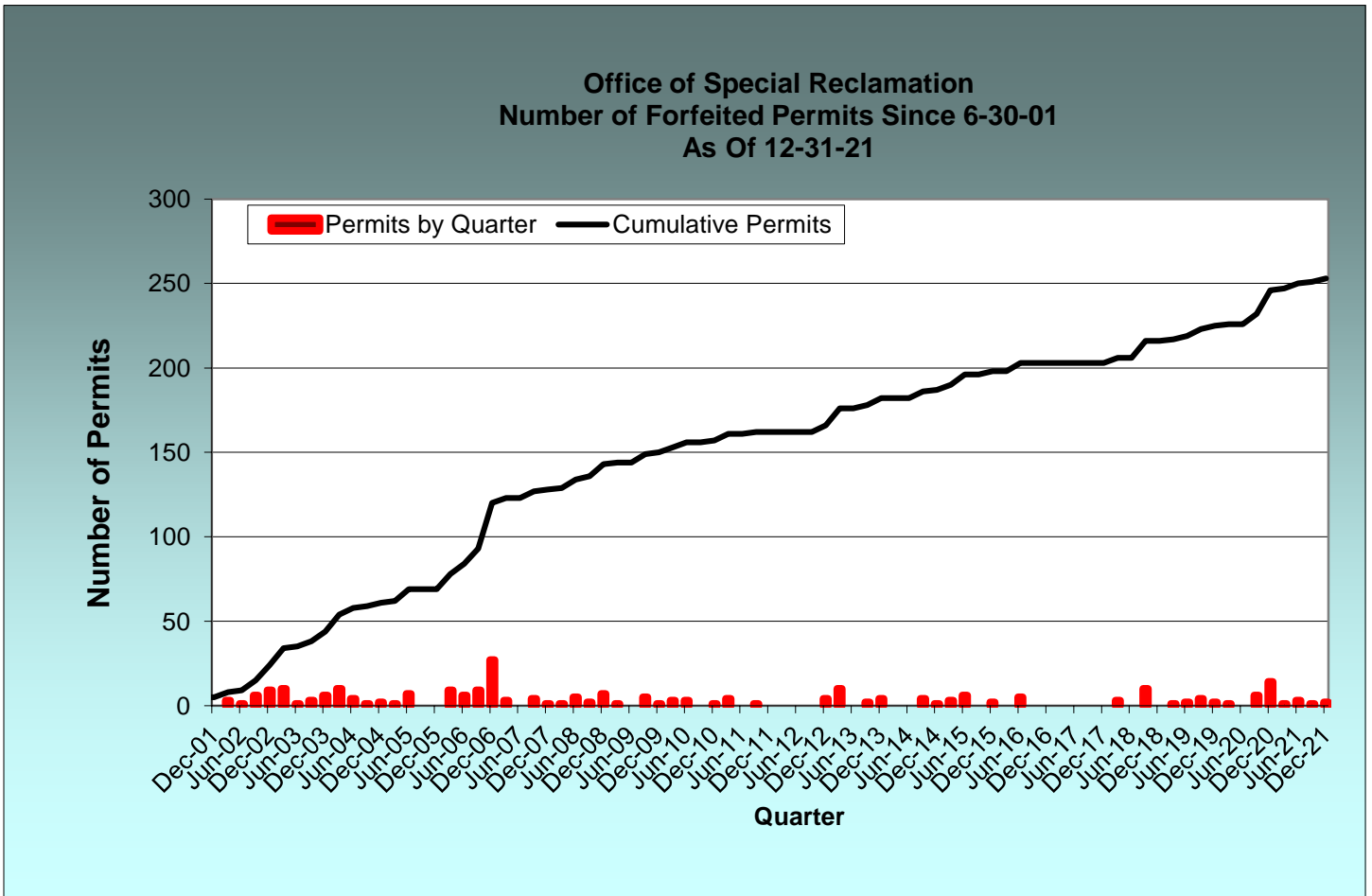


2021 SRF Advisory Council Annual Report



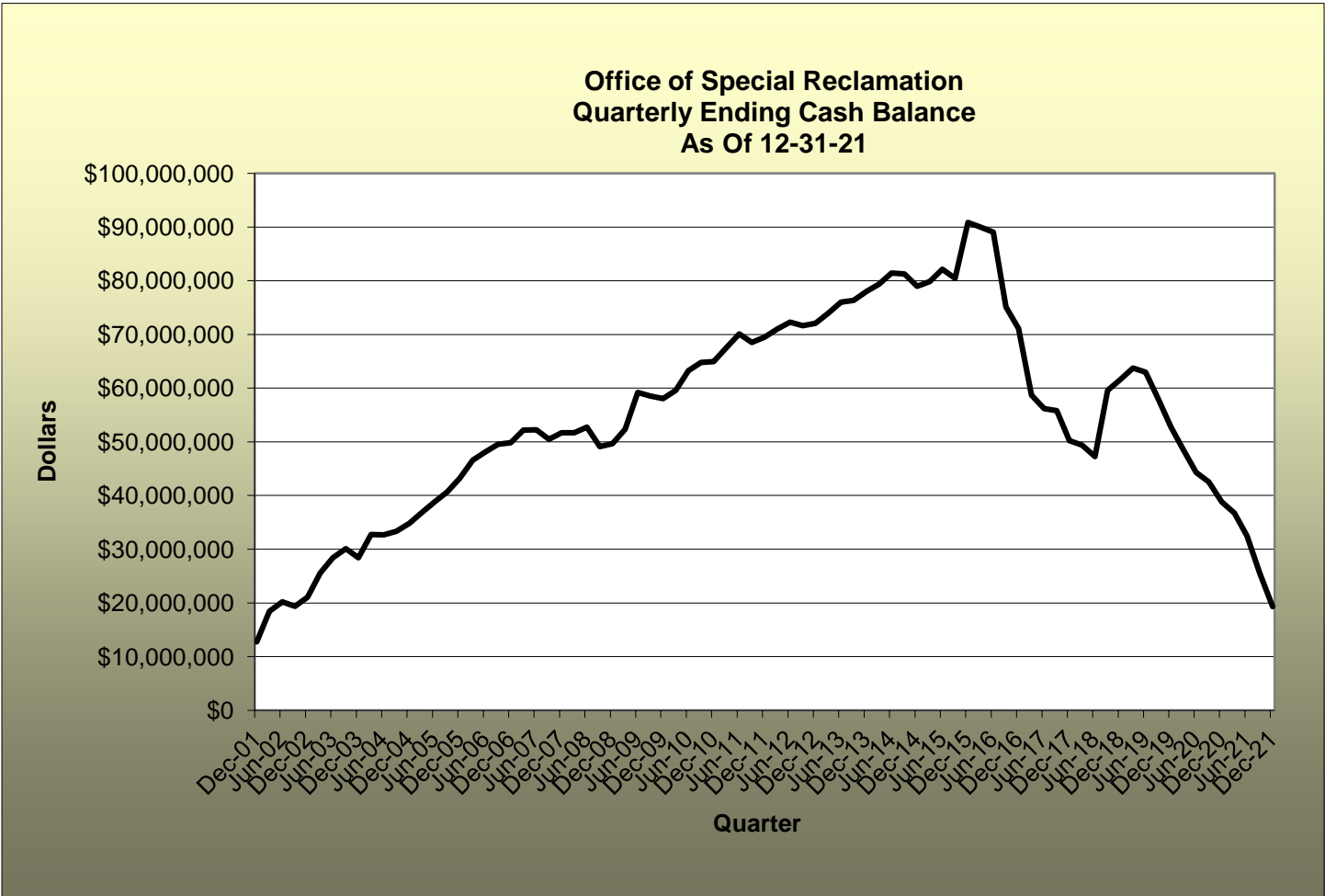


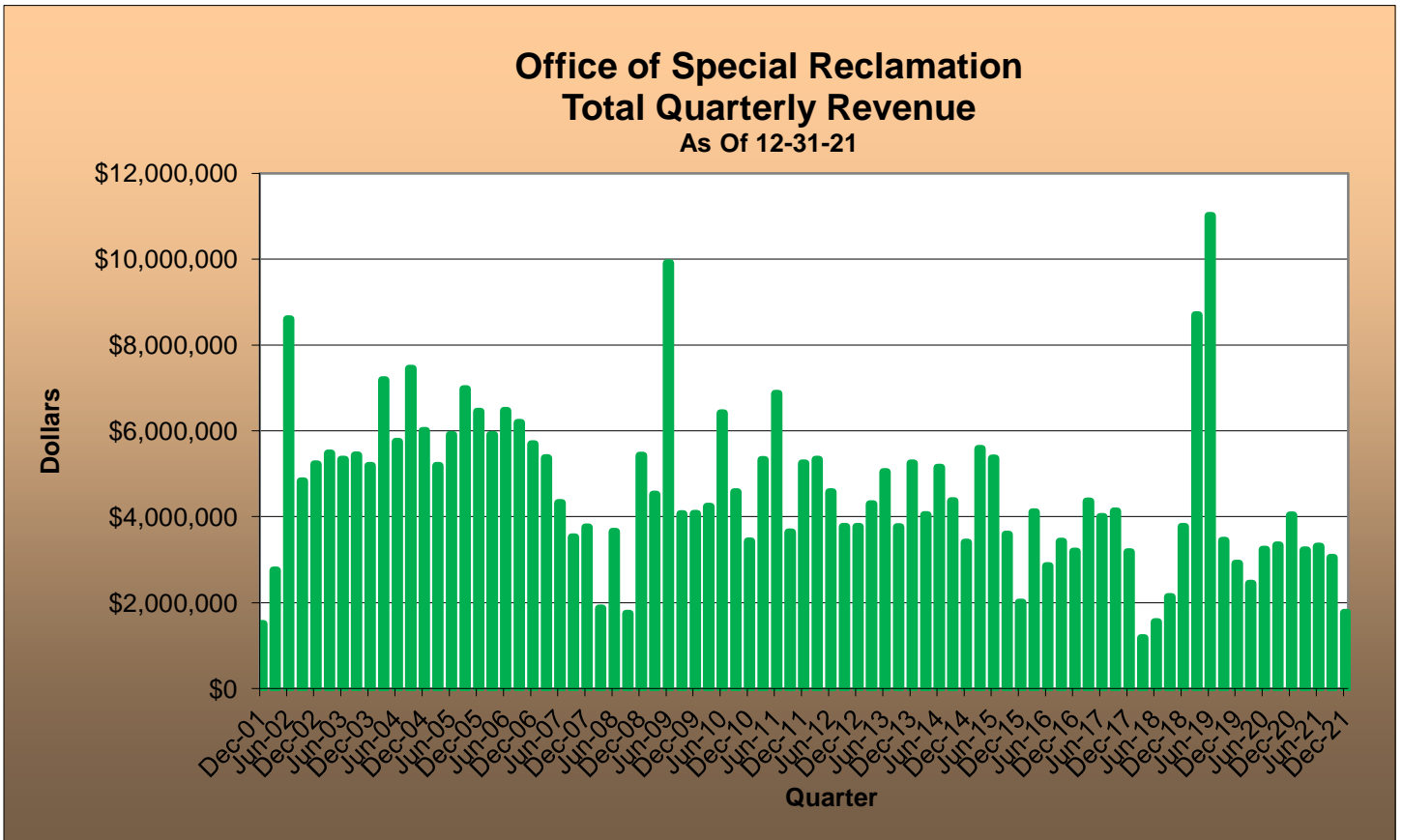




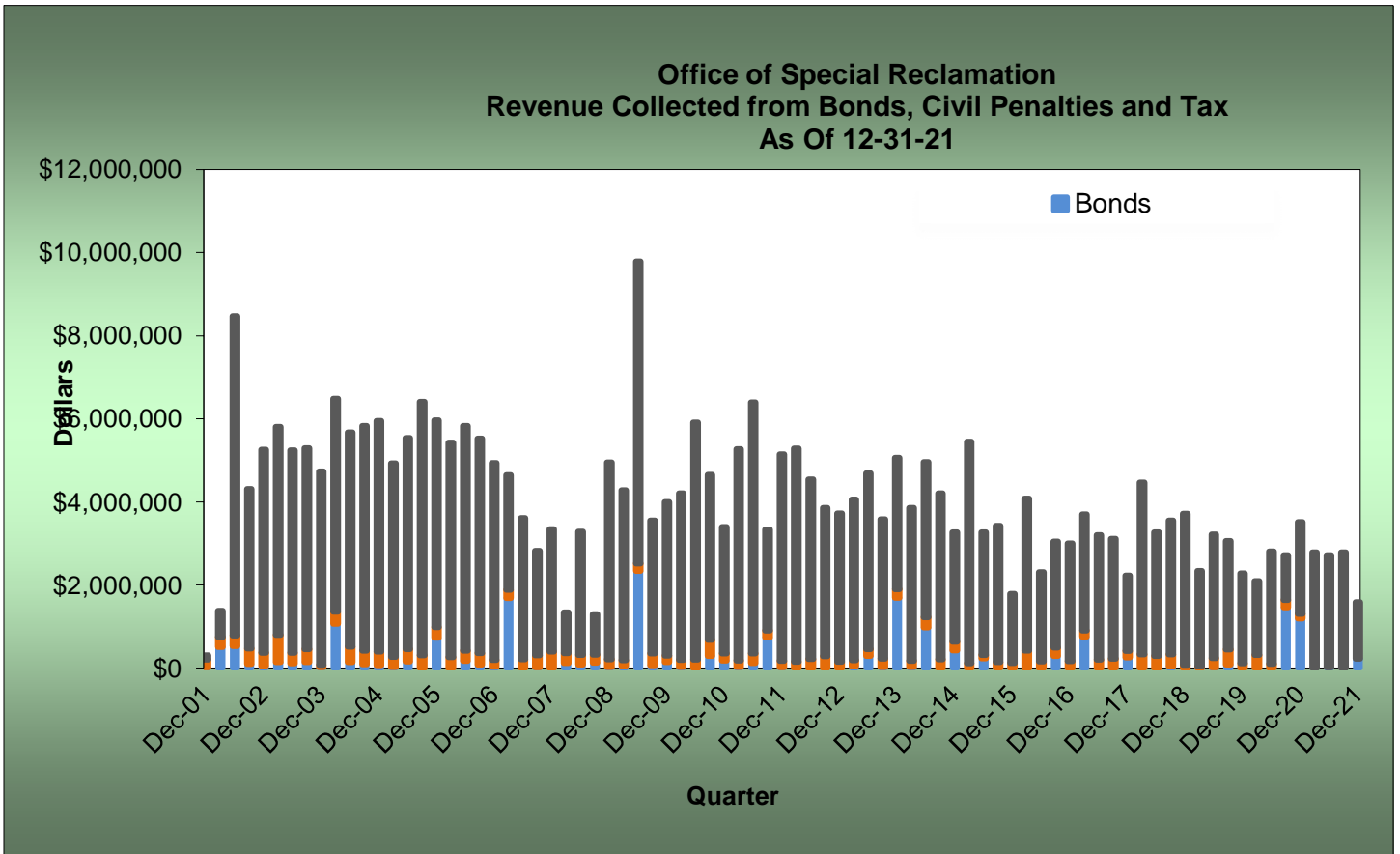


2021 SRF Advisory Council Annual Report

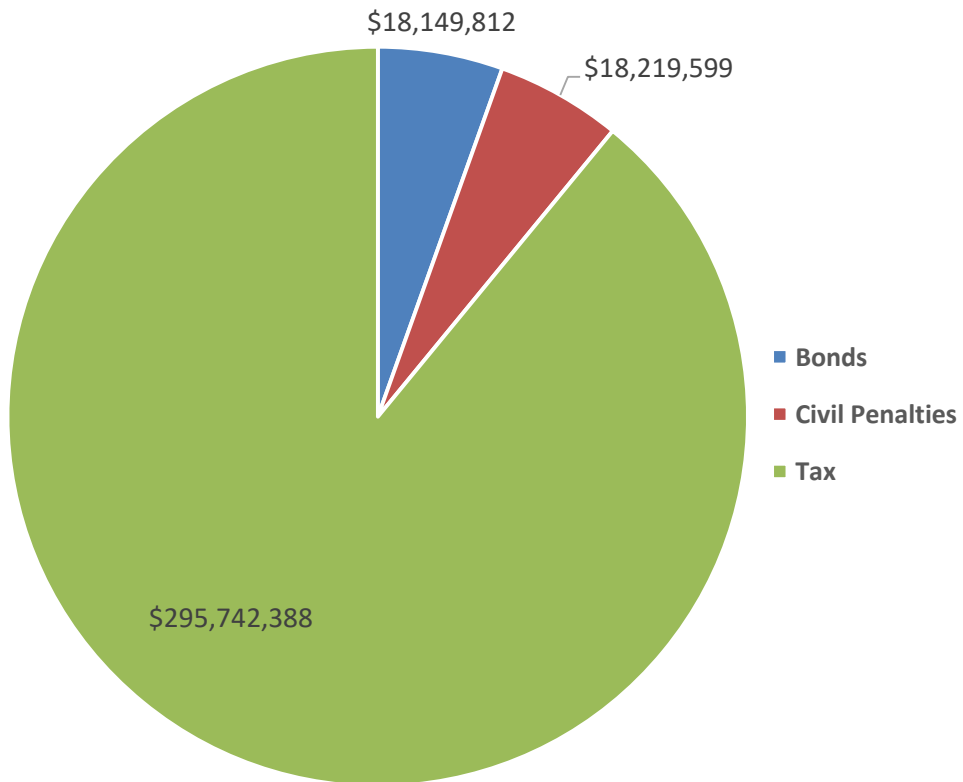




2021 SRF Advisory Council Annual Report



**Office of Special Reclamation  
Cumulative Revenue Collected from Bonds, Civil Penalties and Tax  
As of 12-31-21**



## **Appendix B**

## Project Summary

Applicant: West Virginia University  
Principle Investigator: Paul F. Ziemkiewicz, PhD  
Project Title: At-source Recovery of Rare Earth and Critical Minerals from Acid Coal Mine Drainage ETD67  
Project Objective: Develop and test a continuous process for efficiently producing an enriched rare earth element/critical mineral (RECM) concentrate from acid mine drainage (AMD) at the site of production, upstream of conventional AMD treatment.

- Sub-objective 1. Evaluate a process for purifying that concentrate at a central acid leaching/solvent extraction (ALSX) facility.
- Sub-objective 2. Achieve a target RECM oxide purity in excess of 90%.
- Sub-objective 3. Demonstrate that the final process will achieve its purity goal at commercially attractive efficiencies.

Project Description: RECM can be extracted from many waste products and ores. However, few such sources are economically attractive. We have identified that AMD is an attractive source since it relies on natural processes to create a concentrated, easily extracted source of RECM (REE+Co). Further, we have demonstrated that this process is environmentally beneficial since it would incentivize treatment of AMD and produces insignificant NORM or other noxious wastes.

Across the northern and central Appalachian Coal Basins, water pollution caused by acid mine drainage (AMD) is the single greatest cause of stream impairment. Our recent research has shown that AMD is enriched in rare earth elements (REE) and the critical mineral cobalt. AMD has an average total REE concentration of about 287 µg/L (0.287 ppm), ranging from negligible to 2,000 µg/L. Five of those REEs are classified as CM: Y, Nd, Eu, Tb, Dy while the critical mineral cobalt (Co) alone is present at about 75% of the TREE concentration in a given sample. Operators of AMD producing coal mines and tailings facilities are obliged to treat AMD to neutralize acidity and remove regulated metals (e.g., iron (Fe), aluminum (Al), and manganese (Mn)) prior to discharge. These metals precipitate as hydroxides during AMD treatment, leaving a solid residue that contains the RECMs.

We have created a concentrate of 80% REE derived from AMD treatment precipitates (DE FE 0026927). Ongoing research (DE FE 0031524) indicates that significant gains in efficiency can be made by semi-selective precipitation of RECM upstream of compliance AMD treatment when most of the gangue metals are still in solution. The strategy of using raw AMD as the feedstock to our acid leaching/solvent extraction (ALSX) refining process was recently demonstrated at the bench scale and also in the field where a mobile field unit was deployed at a conventional AMD treatment plant operated by WVDEP. Early work has produced solid feedstock with RECM ranging from 3.6% in the laboratory to 0.2% in an initial, continuous, field extraction trial. Of that amount, 0.14% are mixed REE oxides (MREO), including the five REEs that are also CM (0.07%) and the Critical Mineral cobalt (0.06%).

By focusing on raw AMD The proposed strategy 1) creates an enriched, homogenized REE feedstock, 2) reduces transportation costs to a REE refinery, 3) reduces acid consumption in the acid leaching step, and 4) reduces the volume of waste produced during REE refining. All of these factors would significantly reduce the capital and operating costs of an RECM extraction enterprise. For example, we have already identified transportation, waste handling and acid consumption during the leaching stage as major opX cost centers. Cost reductions resulting from at-source production of a RECM concentrate are obvious. Perhaps as important, extraction of a concentrate prior to AMD treatment dramatically reduces the mass of unreacted lime, an artifact of conventional AMD treatment, in the solid phase that would consume acid during the ALSX stage.

Major Participants: Virginia Tech University-ALSX technical support, TEA. West Virginia Department of Environmental Protection-will collaborate by jointly constructing and operating a field scale coupled

AMD treatment/RECM extraction plant. Rockwell Automation, Inc., will provide system controls, sensors and automation. InnoH2O, Inc., will provide their proprietary treatment system for recycling raffinate during ALSX.

## **Appendix C**



# **Consensus Coal Production Forecast for West Virginia: 2021**

**Prepared for:**

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

**Date:**

**June 2021**



**Center for Business and  
Economic Research**

## **Consensus Coal Production Forecast for West Virginia: 2021**

Christine Risch

Director of Resource and Energy Economics, Center for Business and Economic Research

Mark Burton, PhD

Director, Center for Business and Economic Research

William Sheils, MBA

Research Associate, Center for Business and Economic Research

Marshall University

One John Marshall Dr.

Huntington, West Virginia 25701

Phone: (304) 696-5747

### **Disclaimer:**

The contents of this report reflect the views of the authors who are responsible for the accuracy of the data presented herein. The views expressed in this report are those of the authors and do not reflect the official policy or position of Marshall University or its governing bodies. The use of trade names, if applicable, does not signify endorsement.

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## Consensus Coal Production Forecast for West Virginia: 2021

### Introduction

The West Virginia Consensus Coal Production Forecast is a combined production forecast comprised of four component forecasts. A consensus approach to forecasting seeks the wisdom of the crowd in producing an expectation for output from the coal industry. The Consensus Forecast is used to provide the best expectation of tax revenues to be collected for mandatory reclamation activities conducted through the Special Reclamation Fund and the Special Reclamation Water Trust Fund.

This report describes recent historical coal production trends for the State of West Virginia including the individual industries that comprise the major segments of demand for coal produced in West Virginia. Each of the component forecasts used to form the Consensus Forecast is described, with information about assumptions and resulting projected levels of production for West Virginia. The process used to produce the Consensus is also described, including the weightings applied to each of the component forecasts. The West Virginia Consensus Coal Production Forecast is calculated for the years 2021 through 2045.

### Overview of West Virginia Coal Production

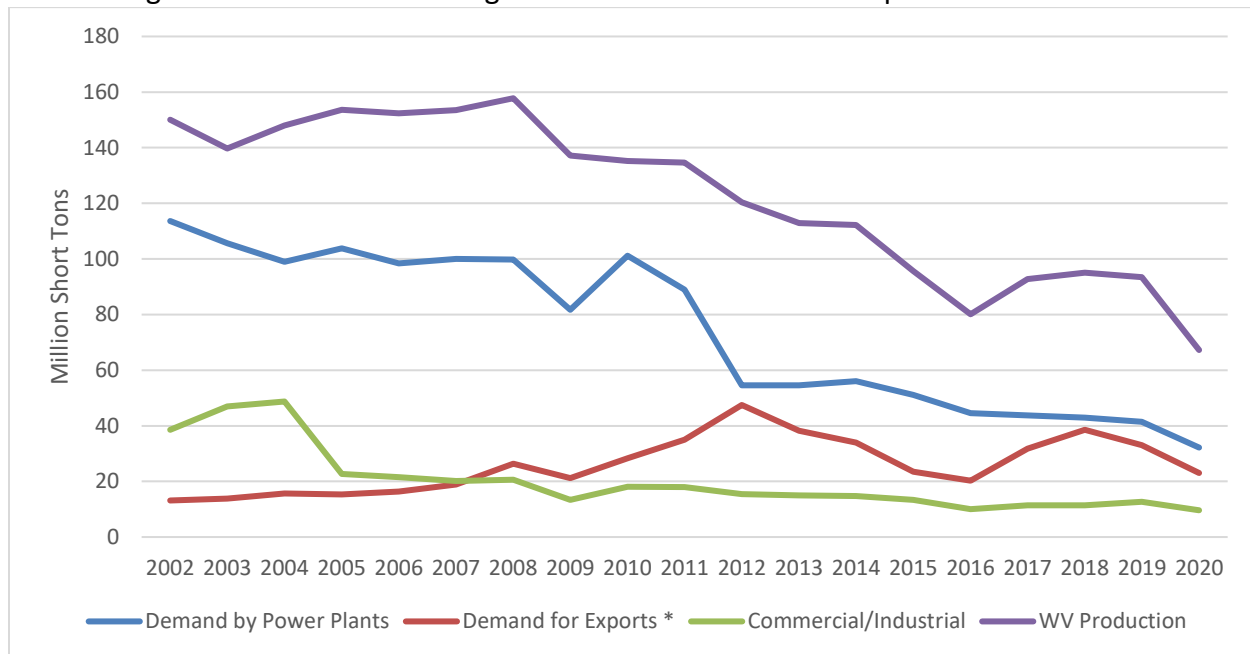
West Virginia coal production for 2020 was 67.3 million tons (EIA 2021),<sup>1</sup> a decrease from the 93.3 million tons produced in 2019. This decrease reflects various trends and events within the coal industry's primary markets: power generation, exports, and industrial demand, all compounded by the effects of the COVID-19 pandemic. Demand for West Virginia coal decreased by about 28 percent from 2019 levels, led by a decrease in demand for exports.

Future demand for West Virginia coal depends on several variables. These include the pace of economic recovery from the pandemic, the capacity of gas-fired electrical generators in the region and the price paid for gas by those generators, the lifespan and generation levels of the coal-fired power plants that will continue to burn coal from the State, the extent of new renewable generation, exchange rates and the rate of economic growth of countries that import West Virginia coal, and the nature of compliance with environmental regulations. Recent demand trends with preliminary and estimated data for 2020 are shown in Figure 1.

---

<sup>1</sup> 67.3 million tons is the Energy Information Administration's revised 2020 production value based on the final 2020 value published by MSHA (clean coal production reported on MSHA Form 7000-2). The West Virginia Office of Miner's Health, Safety and Training (WVOMHST) reports 2020 production of 73 million tons, but this may not be exclusively clean coal, which is the final production volume.

Figure 1. Historical West Virginia Coal Production and Components of Demand



Source: EIA. Asterisk (\*) 2020 volumes estimated by MU CBER. Other 2020 figures are preliminary by EIA.

### The Electricity Sector

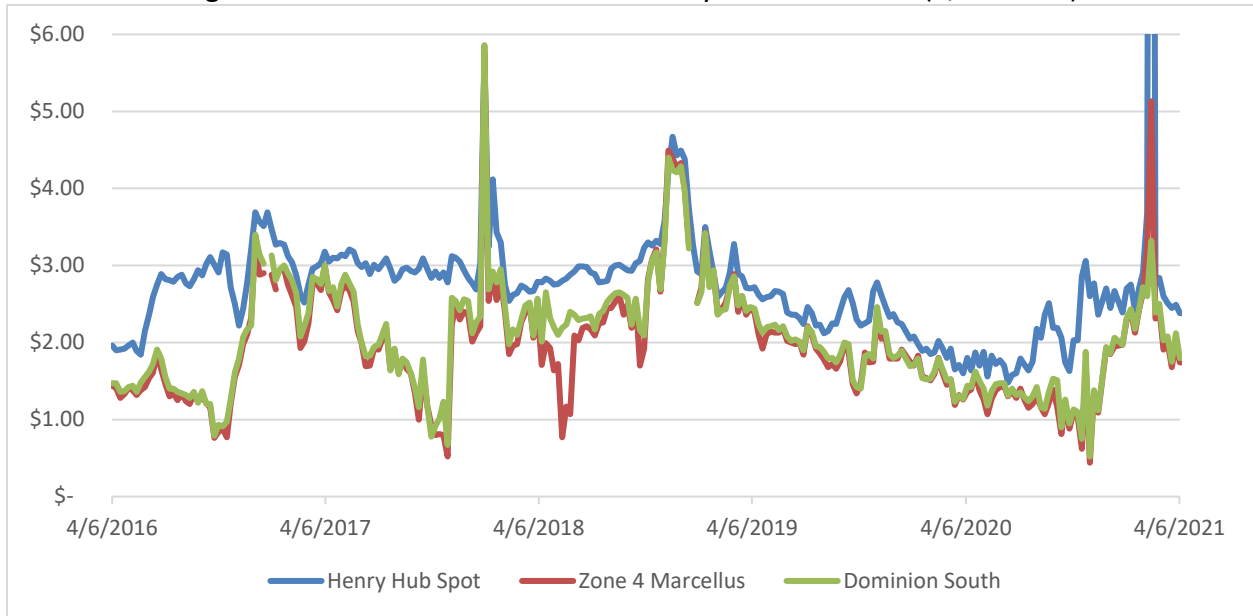
Preliminary coal distribution data for 2020, published by the U.S. Energy Information Administration (EIA), indicate that demand for West Virginia-produced coal by the electricity sector fell sharply in 2020, to about 32.2 million tons, compared to 41.4 million tons in 2019 (EIA 2021). This was a decline of 22.4 percent between 2019 and 2020, while total coal distribution to the electric power industry also fell by about 22.4 percent during the same time (EIA 2021).

### Natural Gas Prices

In previous years, a large contributor to reduced coal demand was the price of natural gas. From 2019 to 2020, the average U.S. price of gas delivered to the electric power sector decreased sharply, averaging \$2.99/mcf in 2019 (nominal dollars) and \$2.48/mcf in 2020 (EIA 2020). Coal has been somewhat less competitive than in 2018, when delivered gas prices averaged \$3.68/mcf.

For several years, abundant gas production from the Marcellus play, combined with relatively low takeaway capacity, has resulted in especially low gas prices in a primary region in which West Virginia coal competes. That differential has diminished but still persists at times, as shown in the following chart of weekly prices at the two primary Marcellus area price hubs vs. the Henry Hub (Figure 2).

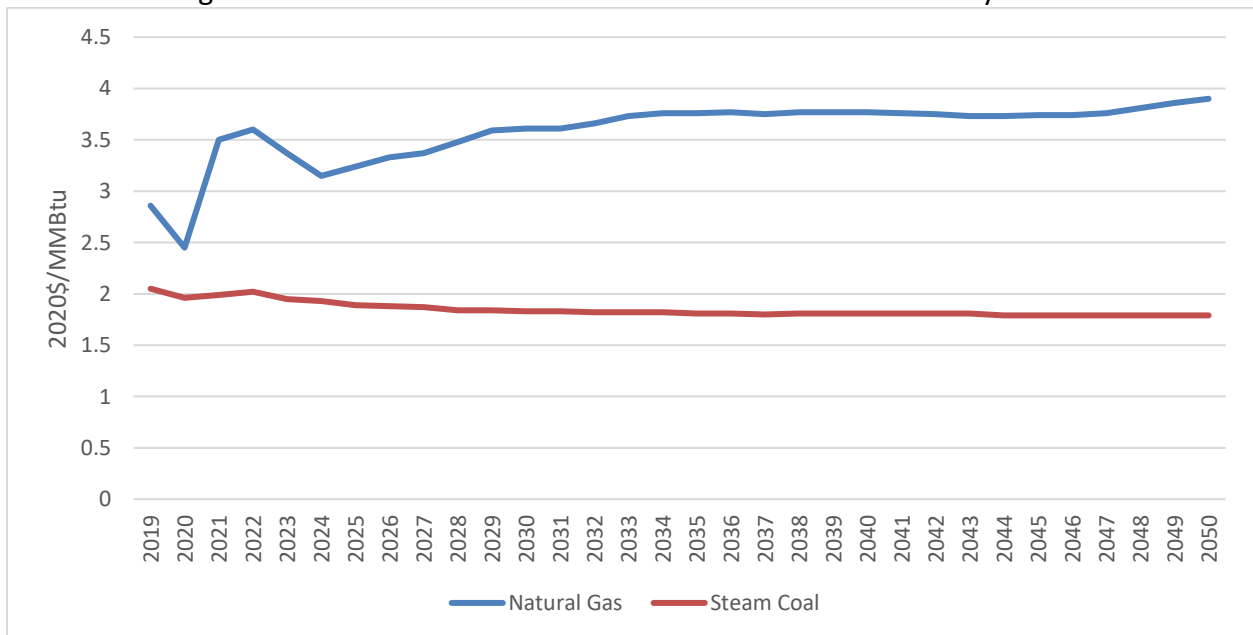
Figure 2. Select Marcellus Area Vs. Henry Hub Gas Prices (\$/MMBTU)



Source: EIA, Natural Gas Weekly.

In its Annual Energy Outlook (AEO) 2021 Reference Case analysis, the EIA continues to project real natural gas prices delivered to the power generation sector to increase while coal prices decline at a gradual rate through 2050 (Figure 3) (EIA 2021).

Figure 3. EIA Forecasted Natural Gas & Coal Prices to Electricity Sector



Source: EIA, AEO 2021.

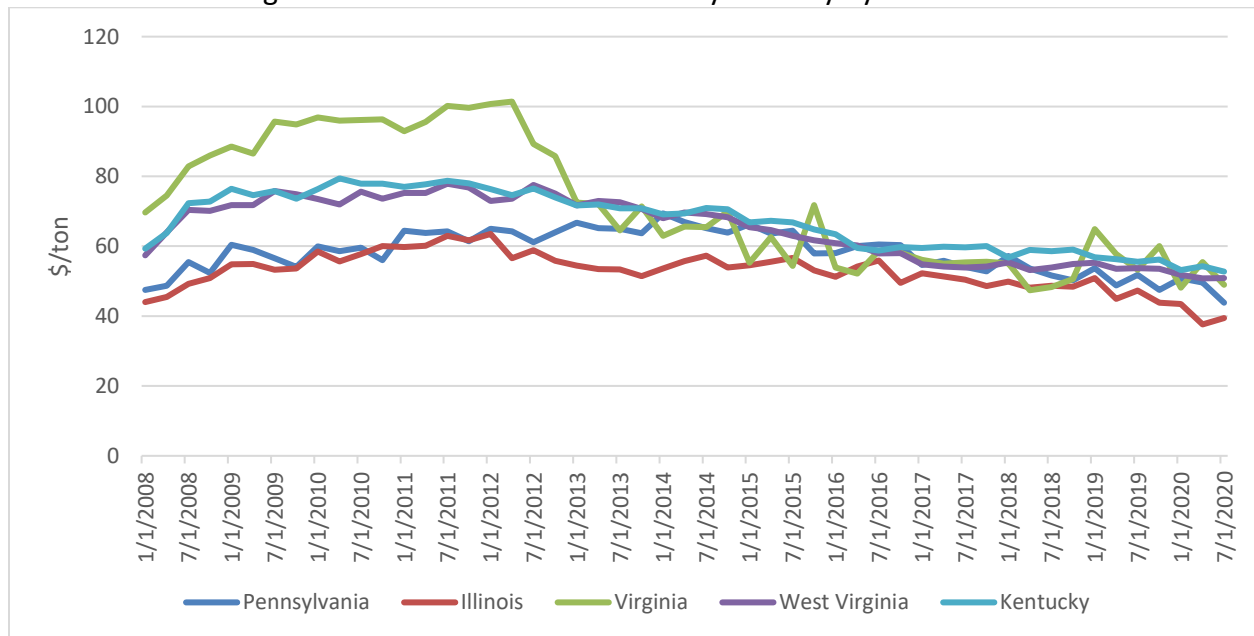
*Coal-Fired Power Plant Retirements*

In 2019 and 2020, several coal-fired power plants retired that were consumers of West Virginia coal. One of these plants, the 69 MW Morgantown Energy Facility, was located in West Virginia. Other significant closures included two other independent power producers, the 655 MW Somerset plant in New York, and the 588 MW Dickerson plant in Maryland. In 2019, Virginia Electric & Power closed smaller coal units at three plants that used West Virginia coal - Chesterfield, Mecklenburg, and Yorktown (EIA 2020).

*Prices of Coal Delivered to the Electricity Industry*

The price of West Virginia-produced coal delivered to power plants has been falling since around 2012. Average prices for regional coal producing states are much closer than in previous decades. Prior to 2013 West Virginia, Virginia and Kentucky producers commanded a premium over coal produced from Pennsylvania and Illinois. Prior to 2019 that premium had largely disappeared, although the gap between Illinois coal grew in 2019 and 2020 (Figure 4).

Figure 4. Coal Prices to the Electricity Industry by Mine State



Source: EIA, Quarterly Coal Report.

*Environmental Regulation*

On March 15, 2021, EPA finalized the Revised Cross-State Air Pollution Rule Update for the 2008 ozone National Ambient Air Quality Standards (NAAQS). Starting in the 2021 ozone season, the rule will require additional emissions reductions of nitrogen oxides (NOX) from power plants in 12 states (Environmental Protection Agency 2021).

The Waters of the United States (WOTUS) law was revised in 2020. The new version of the law is considered to be less stringent than the 2015 version and to provide some clarity for the mining industry (National Mining Association 2020). The rule rejected the “significant nexus” test for navigability from 2015, but may have extended regulation for wetlands, man-made ditches, and ephemeral streams. Per the law man-made ditches are now considered “tributaries” if they pass through wetlands and water flows through them. Ephemeral streams are now only federally regulated if an ephemeral break is part of an otherwise regulated intermittent or perennial tributary, or if they are seasonally inundated by more than a direct response to precipitation, e.g., indirectly by groundwater table elevation or snowpack melts (The National Law Review 2020).

### **The Industrial Sector**

As shown In Figure 1, demand for West Virginia coal by the industrial sector (coke plants and self-generating manufacturers, including coal-fired combined heat and power plants) decreased substantially from 2018 to 2020, with demand down about 15 percent from 2018. This decrease occurred primarily at coke plants, which represented annual demand of almost 8.8 million tons in 2020. From 2018 to 2019, U.S. steel production increased by one percent, to 87.8 million metric tons (mmt), up from 86.8 mmt in 2018, but fell to 72.7 mmt in 2020 (International Trade Administration 2021).

In 2020, the U.S. imported 20 million metric tons of steel, a 21% decrease from 25.4 mmt in 2019. The U.S. steel trade deficit amounted to 13.9 mmt, a 25% decrease from 18.7 mmt in 2019. Imports from Russia (-60%) showed the largest volume decline in 2020, followed by Japan (-35%), Taiwan (-31%), South Korea (-22%) and Mexico (-11%). 2020 imports from Turkey increased by 72% (ITA 2021).

### **Exports**

The nation’s coal exports fell in 2019 and 2020, totaling 93.7 million short tons in 2019 and 69.1 million tons in 2020, down from about 116 million short tons in 2018.<sup>2</sup>

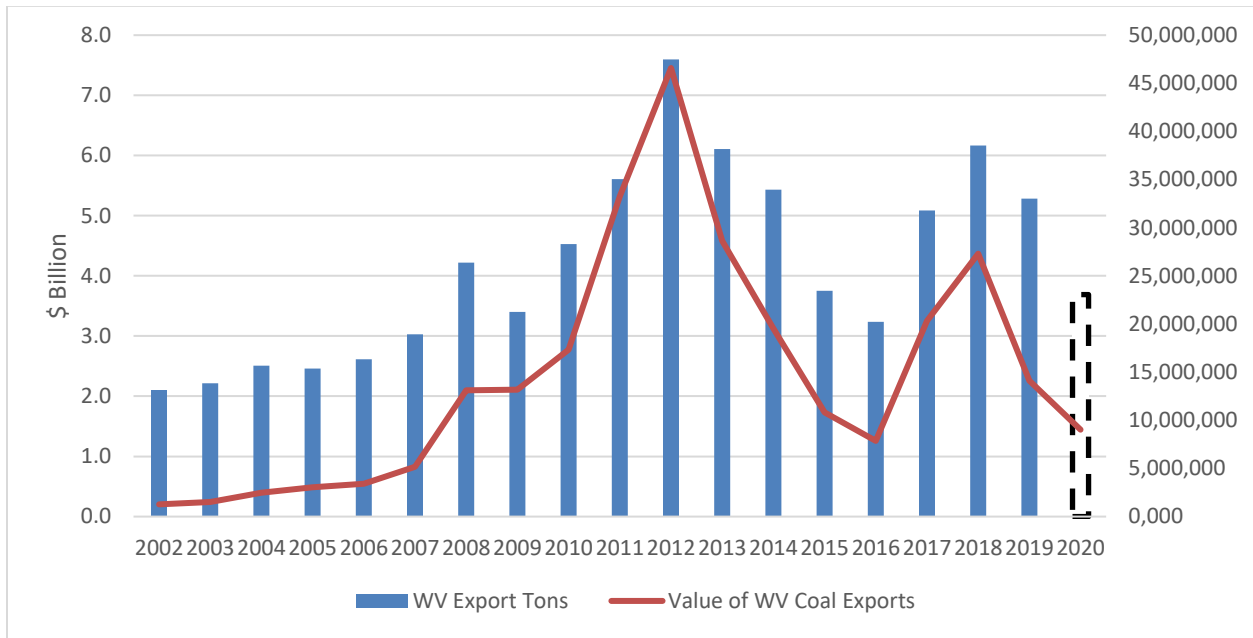
The value of coal exports from West Virginia dropped to \$1.4 billion in 2020, down from \$2.3 billion in 2019. The State maintained exports to many countries in North America, Europe, South America, Africa, and Asia. The top five importing countries by value were India, Ukraine, Brazil, the Netherlands, and Morocco (ITA 2021). Figure 5 shows the value of West Virginia-based coal exports and associated tonnage from 2002 to 2020.

---

<sup>2</sup> 2020 data for coal export tonnage by U.S. state of origin has not yet been released. CBER estimates West Virginia’s exports based on historical shares of total exports and the value of coal exports from the state.



Figure 5. Value and Tonnage of West Virginia Coal Exports, 2002-2020



Source: EIA, ITA; 2020 export tonnage estimated by CBER.

## Component Forecasts

### Energy Information Administration (EIA)

Publication:	Annual Energy Outlook 2021
Date:	January 2021
Forecast Horizon:	2021-2050
Region(s):	Northern Appalachia, Central Appalachia

The EIA provides a forecast of coal production by region in its 2021 Annual Energy Outlook, projecting through 2050. 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. NEMS is a modular system, with modules that represent each of the fuel supply markets, conversion sectors, and end-use consumption sectors of the energy system (EIA 2021).

Only the EIA Reference Case figures are used for the Consensus forecast, which represents EIA's 'best assessment of how U.S. and world energy markets will operate through 2050.' This projection assumes improvement in known energy production, delivery, and consumption technology trends (Energy Information Administration 2021).

The EIA's forecasts for Appalachia are used to create an EIA forecast for West Virginia coal production. The method used is described in Appendix B.

#### *Key Assumptions:*

Macroeconomic Issues: Real GDP growth averages 2.1% per year from 2020 to 2050.

Coal Prices: EIA projects the average mine mouth price for all coals to be about \$31/ton in 2021 (2020\$) and to rise to \$35 by 2050.

Natural Gas Prices: Henry Hub<sup>3</sup> spot prices are expected to be about \$3.10 in 2021 and rise thereafter at an annual rate of 2.0 percent, resulting in an average expected price of \$3.69/MMBtu in 2050.

Electricity: U.S. use of coal for production of electricity is expected to decline by 1.1% annually through 2050. Coal-fired generating capacity is expected to decrease at a rate of 2.5 percent

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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.

per year through 2050. By comparison, combined cycle (natural gas) capacity is projected to increase by 1.6% per year and renewable capacity is projected to increase by 3.2 percent per year.

Industrial/Commercial: Industrial self-generators (CHP plants, power plants with a non-regulatory status, and small on-site generating systems) are expected to see a very slight increase in coal consumption of 0.2 percent per year through 2050. Metallurgical coal use in coke plants is projected to decrease by 0.4 percent per year. The commercial sector is expected to maintain flat coal consumption of one million tons per year.

Exports: U.S. coal exports are projected to rise steadily to 99 million tons in 2024 and to be at least 95 million tons throughout the remaining forecast period.

Environmental: The AEO2021 includes the effects of current legislation, environmental regulations, and international protocols including recent government actions for which implementing regulations were available as of the end of September 2020. This includes the Mercury and Air Toxics Standards (MATS) and the Cross-State Air Pollution Rule (CSAPR). AEO2021 reflects a number of state-level policies that affect its projections of the electricity generation mix. These include the Illinois Future Energy Jobs Act, the New York Clean Energy Standard, and the Maryland Clean Energy Jobs Act. In 2020, only Virginia enacted new legislation for renewable portfolio standards (RPS) programs. At the federal level, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA) jointly issued The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Light Trucks in April 2020 as an amendment to and replacement of the 2012 Corporate Average Fuel Economy (CAFE) standards for light-duty vehicles. The updated standard sets fuel economy and carbon dioxide standards, which increase 1.5% in stringency each year from model years 2021 through 2026 (EIA 2021).

## Energy Ventures Analysis (EVA)

Publication: EVA Long-Term Forecast

Date: June 2021

Forecast Horizon: 2021-2050

Region(s): All states

EVA utilizes the AURORAxmp 24/7 dispatch model (which EVA licenses) to calculate electricity generation by fuel type. The forecast reflects the least cost dispatch solution consistent with the operating parameters of individual units and regulatory requirements. Existing generation, planned generation which is deemed to be likely to be constructed, and announced retirements are reflected. In addition, the model adds and retires capacity in an economic manner and as required by law.

### *Key Assumptions:*

**Macroeconomic Issues:** GDP growth is expected to average 2.8% per year over the forecast period, with strong GDP growth in the next three years and then gradually declining growth to under 2% in the latter part of the forecast period.

**Coal Prices:** Coal prices vary by region, coal quality, and market. Current prices are relatively high due to the strength in the global market and expected economic growth as a result of the recovery from the coronavirus pandemic. After recovery, prices are expected to soften slightly and then start to grow slightly in real terms throughout the forecast period. Pricing is based upon production costs including return on investment. Future pricing also reflects the higher cost of capital related to the reduced access to capital as a result of environmental, social and governance (ESG) concerns.

**Natural Gas Prices:** Henry Hub gas prices are expected to soften from current levels which are above \$3.00 per MMBtu (\$2020) in 2021 and range from \$2.50 to \$3.00 (\$2020) through 2040. Thereafter, prices are expected to increase through 2050 resulting in a price of \$3.56 per MMBtu (2020\$) in 2050.

**Electricity:** Growth in electricity demand is expected to average 1.0% per year. This rate of growth is higher than in prior years due to the expected impact of electric vehicles on demand. Utility demand for coal is expected to decline from 515 million tons in 2021 to less than 100 million tons by 2050. The decline is heavier in the early years as a number of plants are retired in response to CCR and ELG rule. The forecast production reflects which power plants are

assumed to be in operation in each year and their expected coal supply. Therefore, the forecast would change with any changes to the retirement schedules.

**Industrial/Commercial:** Demand from other sectors is also expected to decline. The decline reflects industrial plant conversions from coal to natural gas and reduced metallurgical coal in steelmaking as the industry continues to shift from blast furnace to electric arc furnace production. The non-metallurgical industrial demand affects most coal supply regions. As this demand is tied to specific plants, demand depends upon their continued operation. As industrial plants are retired, the mix of coals is affected. All of the domestic metallurgical coal is expected to originate in Appalachia. Commercial demand is relatively small.

**Exports:** The level of exports is affected by global demand for coal and global supply. U.S. export levels are a function of the competitiveness of U.S. coals in the global market which in turn is affected by the relative strength of the U.S. dollar particularly with respect to the Australian dollar as global coal trade is U.S. dollar denominated and Australia is the largest exporter of bituminous coals. The U.S. exports both steam and metallurgical coals. U.S. metallurgical coal exports exclusively originate in Appalachia. U.S. steam coals originate throughout the U.S. with the origin a function of coal quality, transportation logistics, and cost. Steam and met coal export forecasts are exogenously determined through an analysis of global supply and demand. The resulting price forecast, however, affects domestic pricing and therefore utility coal demand.

Steam coal exports are largely expected from four regions in the future: Northern Appalachia, the Illinois Basin, the Powder River Basin, and the Rockies. Other regions, such as Central Appalachia, are believed to be not economic long-term and therefore unlikely to participate except in unusual circumstance. The exports reflecting the expected shift in the market away from the Atlantic to the Pacific. Both the Powder River Basin and Rockies coal are typically exported through the west coast, primarily terminals in western Canada. Northern Appalachia coals will move through the U.S. East Coast while Illinois Basin coals will move through the U.S. East Coast and the U.S. Gulf. While the U.S. continues to be a swing global supplier, contraction in the global coal industries has created a potentially larger role.

Met coal exports are largely expected from Appalachia. Metallurgical coal production is expected from the Northern, Central, and Southern areas where the highest quality metallurgical coal is produced. While global metallurgical coal demand is expected to decline over time, some continued blast furnace production is expected globally through 2050.

**Environmental:** Coal Combustion Residuals (CCR) and Effluent Limitation Guidelines (ELGs) go into effect according to their regulatory schedule. Plants which are not expected to comply are retired. Federal carbon limitations are not assumed. Compliance is assumed with announced

state/regional plans. Pennsylvania is assumed to join the Regional Greenhouse Gas Initiative (RGGI) effective January 2022. The caps in AB32 (California) are assumed to be extended through 2050. Florida is assumed to put into place a Renewable Performance Standard (RPS) for solar development. The various tax credits (i.e., production tax credits, investment tax credits, and Section 45Q [carbon capture] credits) are generally assumed to continue as they are.

**Market Uncertainty:** There are substantial changes underway in the global energy market as global concerns over carbon emissions are resulting in significant changes in the U.S. and other countries. The changes include efforts to reduce carbon emissions through the expansion of low carbon generation including increased use of renewables including offshore wind, batteries, small modular nuclear reactions, and green hydrogen. With respect to fossil fuels, there are global efforts to expand the use of carbon capture technology. Other technologies of interest include direct air capture. In addition, the transportation sector is moving toward greater use of electrical vehicles which in turn would increase electricity demand growth. The future forecasts of coal production are qualified by these uncertainties.

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

Publication: CBER West Virginia Coal Production Forecast 2021

Date: May 2021

Forecast Horizon: 2021-2050

Region(s): West Virginia

The CBER forecast of West Virginia total coal production is an econometric model based on quarterly coal production from 1984 through 2020. The forecast uses an averaging approach based on two separate long-term forecasts (through 2050). Both models incorporate a mid/short-term forecast (through 2033) based largely on the market for thermal coal produced in the State. One short-term model treats the economic recession in 2009 and subsequent sharp downturns in historical coal production as structural breaks in the market while the other uses the differential between natural gas and coal prices delivered to the power generation sector to explain changes in production. To create the initial short-term forecasts, quarterly changes in total coal production were modeled with a vector autoregression (VAR) approach based on historical demand for West Virginia-sourced coal in regional power generation. For years beyond 2033, the forecast utilizes an autoregressive approach, which estimates future changes in total coal production based on historical patterns.

Because this is a technical model based solely on historical data, CBER does not make any specific assumptions about future micro or macroeconomic variables. The model is heavily influenced by recent downward trends in demand for coal and projects a continued and fairly rapid decline in production over the next few years.

**West Virginia University Bureau for Business and Economic Research (BBER)**

Publication: WVU BBER Coal Production Forecast 2021

Date: June 2021

Forecast Horizon: 2021-2050

Region: Northern West Virginia and Southern West Virginia

The WVU Bureau of Business and Economic Research Coal Production Forecast is an econometric model based upon changes in factors that affect the demand and price for coal sourced from mines in Northern and Southern West Virginia between 1985 and 2020. Historical data on coal prices, production and other energy-related data are obtained from a variety of Energy Information Administration reports. Forecasts for US-level explanatory variables were taken from the IHS March 2021 Long-Term Forecast and the 2021 Annual Energy Outlook from the Energy Information Administration (West Virginia University 2021).



## Consensus Forecast

The four long-term forecasts produced by EIA, EVA, CBER and BBER are combined to create the 2021 Consensus Forecast for West Virginia Coal Production. For simplicity, a simple average was used to calculate the consensus forecast<sup>4</sup> (Figure 6 and Table 2). Coal production in West Virginia is projected to initially rebound from 67.3 million tons in 2020 to 81.6 million tons in 2022, followed by a steady decline to about 55 million tons in 2045.

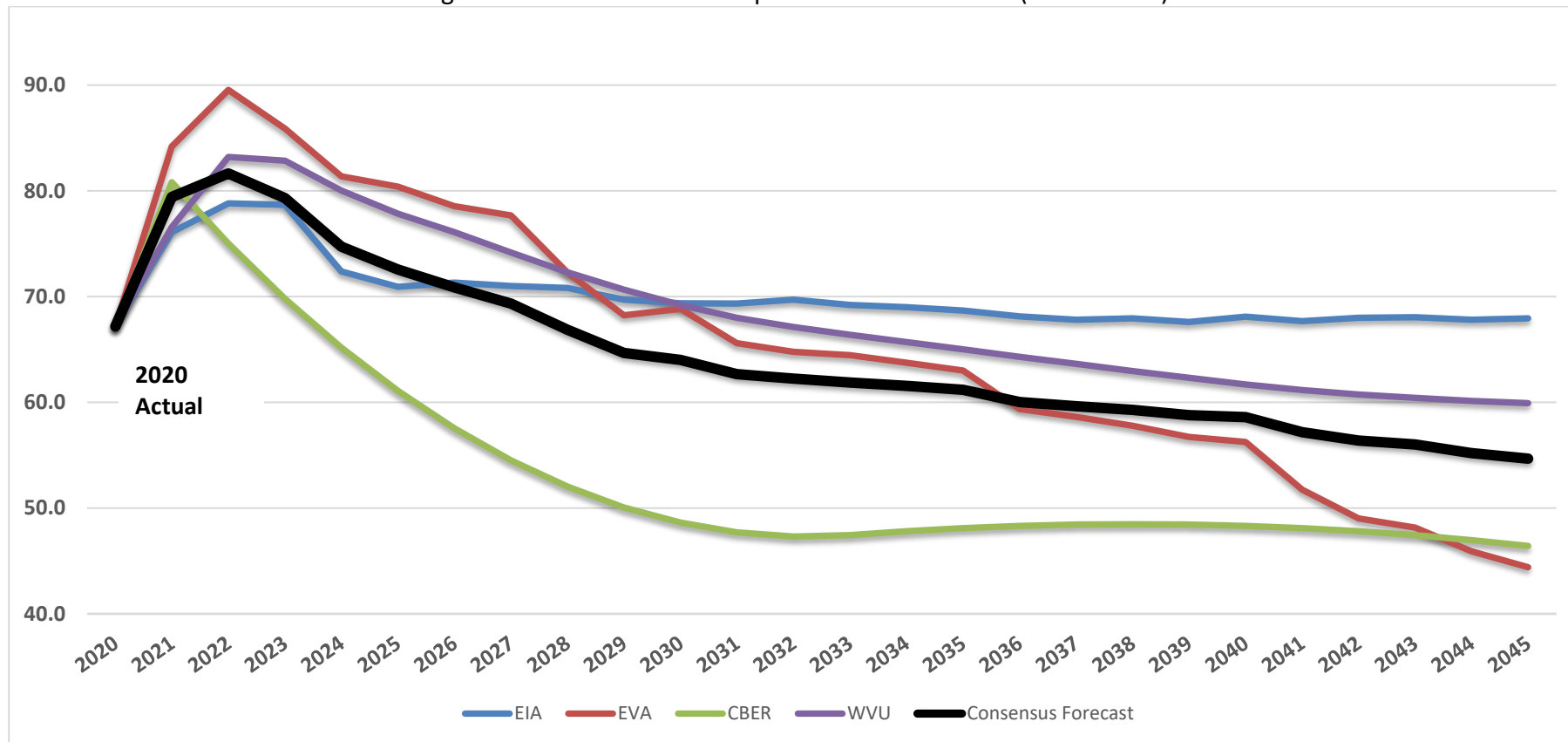
## Summary

The four component models incorporate a range of possible levels of West Virginia coal production over the next 24 years, with varying forecasts that illustrate the impact of primary supply and demand variables and uncertainty over the continuation of recent trends. The consensus reduces uncertainty by combining the forecasts into one aggregate projection. Despite an expected short-term recovery in coal production, the consensus forecast projects that West Virginia will experience a steady decline in coal production through 2045.

---

<sup>4</sup> Due to the subjective nature of weight selection, a simple average approach (with same weight for all four forecasts) would generate a very similar forecast as the weighted average but does not require additional (often unrealistic) assumptions to estimate accuracy rate of historical forecasts.

Figure 6: Consensus and Component Forecasts 2021 (million tons)



Source: EIA, EVA, WVU BBER and authors' calculation.

Table 2: Consensus Forecast for West Virginia Coal Production 2021 (million tons)

Year	Historical	2021 Forecasting Group				2021 Consensus	2019 Consensus	2017 Consensus	2016 Consensus	2015 Consensus
		EIA	EVA	CBER	BBER*					
2015	95.5								107.2	
2016	80.1							79.5	103.4	
2017	92.8						86.8	76.9	101.7	
2018	95.1						83.6	74.7	102.7	
2019	92.4					91.1	84.1	76.7	104.8	
2020	67.2					88.3	87.1	80.1	104.9	
2021		76.1	84.2	80.8	76.6	79.4	84.4	86.1	78.6	104.4
2022		78.8	89.5	75.0	83.2	81.6	84.1	85.9	75.7	103.4
2023		78.7	85.9	69.8	82.9	79.3	83.3	84.7	73.1	102.8
2024		72.4	81.4	65.2	80.0	74.7	82.3	82.8	70.3	102.8
2025		70.9	80.4	61.1	77.8	72.6	81.2	81.5	69.1	102.4
2026		71.3	78.5	57.5	76.1	70.9	80.7	80.2	67.9	102.2
2027		71.0	77.7	54.5	74.2	69.3	80	79.3	66.2	101.7
2028		70.8	72.3	52.0	72.3	66.8	78.8	77.7	64.5	101.2
2029		69.7	68.2	50.1	70.7	64.7	78.7	76.8	63	100.9
2030		69.4	68.8	48.6	69.2	64.0	77.6	76.3	61.7	100.9
2031		69.3	65.6	47.7	68.0	62.7	76.8	76.1	62.1	100.5
2032		69.7	64.8	47.3	67.1	62.2	76.1	76	62.9	100.9
2033		69.2	64.5	47.4	66.4	61.9	75.3	76.6	63.3	99.8
2034		69.0	63.7	47.8	65.7	61.6	74	76.7	63.1	98.3
2035		68.7	63.0	48.1	65.0	61.2	73.5	76.6	62.5	97.3
2036		68.1	59.4	48.3	64.3	60.0	73.4	76.5	62.3	
2037		67.8	58.6	48.4	63.6	59.6	73.1	76.1	60.4	
2038		67.9	57.8	48.5	63.0	59.3	72.6	75.6	59.7	
2039		67.6	56.7	48.4	62.3	58.8	72	75.8	58.6	
2040		68.1	56.3	48.3	61.7	58.6	71.2	75.3	57.1	
2041		67.7	51.7	48.1	61.2	57.2	70.7			
2042		68.0	49.0	47.8	60.7	56.4	70.4			
2043		68.0	48.1	47.4	60.4	56.0	70.3			
2044		67.8	45.9	47.0	60.1	55.2	70.1			
2045		67.9	44.4	46.4	59.9	54.7	69.9			

Source: EIA, EVA, WVU BBER and authors' calculation. All forecasts were produced in 2021.

## REFERENCES

- EIA. 2021. *Archived weekly and monthly coal production*. U.S. Department of Energy.  
<http://www.eia.gov/coal/production/weekly/archive/>.
- . 2021. "Assumptions to AEO2021." *Analysis & Projections*. January.
- EIA. 2020. *Electric Power Monthly*. U.S. Department of Energy.  
<http://www.eia.gov/naturalgas/weekly/>.
- . 2021. "Summary of Legislation and Regulations Included in the AEO 2020." March.
- Energy Information Administration. 2021. "Annual Energy Outlook 2021." January.  
<http://www.eia.gov/forecasts/aeo/>.
- Energy Ventures Analysis. 2021. *West Virginia Coal Production Forecast*.
- Environmental Protection Agency. 2021. "Revised Cross-State Air Pollution Rule Update." EPA, March 15.
- International Trade Administration. 2021. *Global Steel Report*. U.S. Department of Commerce.
- ITA. 2021. "State Export Data, Global Patterns of a State's Exports."
- . 2021. "Steel Imports Report: United States." U.S. Department of Commerce, March.
- National Mining Association. 2020. "WOTUS Rule Provides Much-Needed Certainty and Clarity." January 23.
- The National Law Review. 2020. "The Final "WOTUS" Rule — a Twist or a Tweak?" January 31.
- West Virginia University. 2021. *WVU BBER Coal Production Forecast 2021*. WVU College of Business & Economics.

## Appendix A: EIA Forecasts for Regional Coal Production

EIA forecasts Appalachian coal production to decline gradually through 2037, with greater stability from 2037 to 2050. As shown below (Figure A1), Interior<sup>5</sup> production is projected to challenge Appalachian production throughout the time period. Northern Appalachian<sup>6</sup> production is expected to be 10 million tons above Central Appalachia through 2050.

Figure A1. EIA Forecasted Coal Production by Region

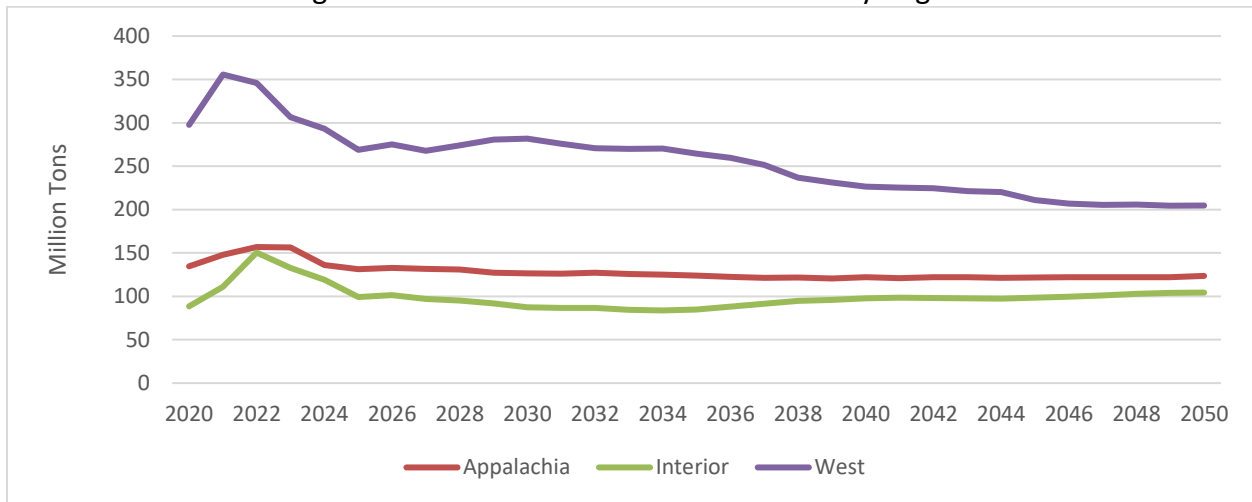
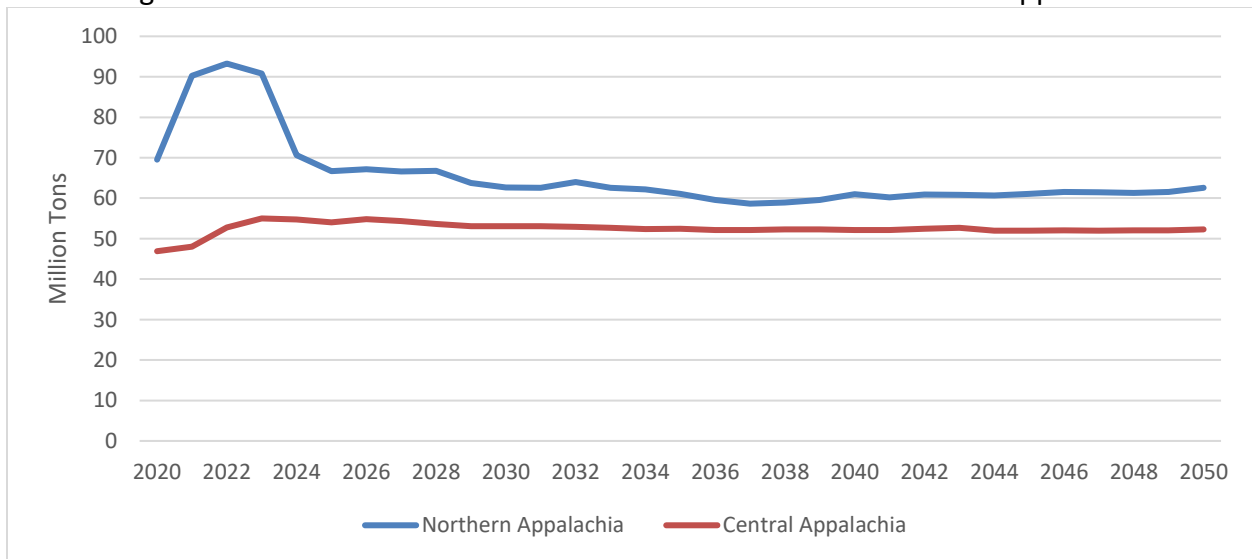


Figure A2. EIA Forecasted Coal Production for Northern and Central Appalachia



Source for Figure A1 and Figure A2: EIA AEO 2021.

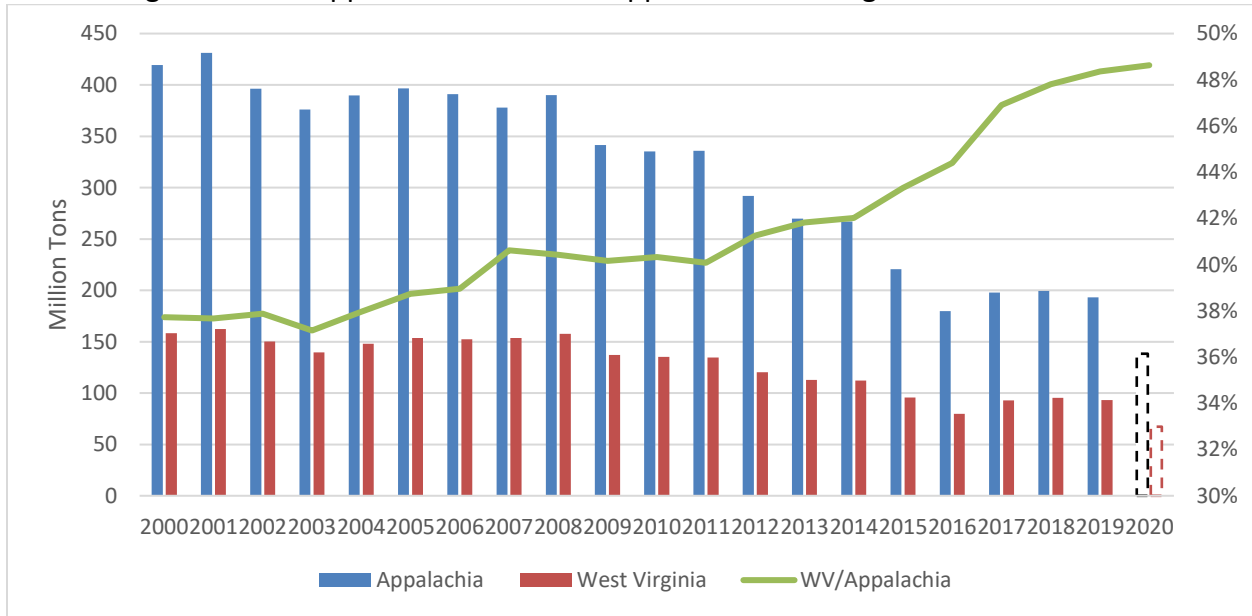
<sup>5</sup> Arkansas, Illinois, Indiana, Iowa, Kansas, W. Kentucky, Louisiana, Mississippi, Missouri, Oklahoma, and Texas.

<sup>6</sup> Northern Appalachia includes Pennsylvania, Maryland, Ohio, and N. West Virginia. Central Appalachia includes Virginia, E. Kentucky, N. Tennessee, and S. West Virginia.

### Appendix B. EIA Forecast for West Virginia

The EIA forecast for WV coal production is derived from EIA’s forecast for the Appalachia region, as the agency does not publish forecasts for individual states. The WV forecast was calculated using year-adjusted WV/Appalachia coal production.

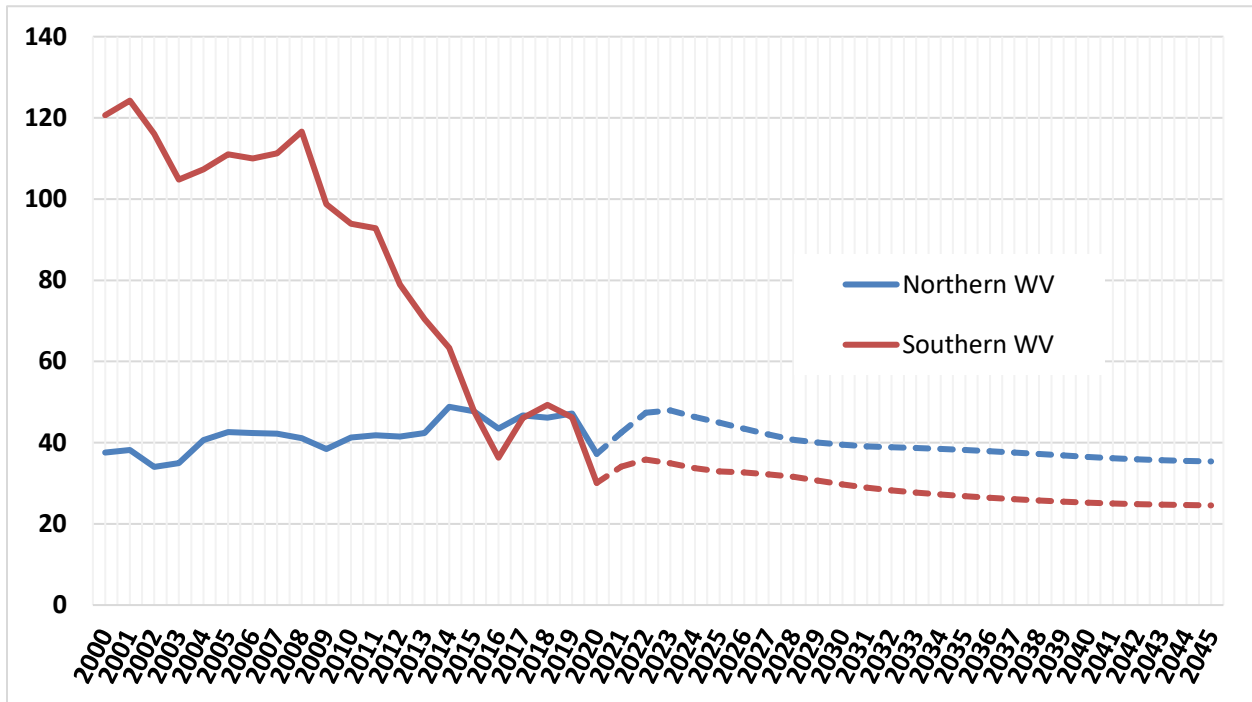
Figure A3. EIA Appalachian Forecasts Applied to West Virginia Coal Production



Source: EIA AEO 2021 and CBER calculations for West Virginia production.

### Appendix C. WVU BBER Forecast of Northern vs. Southern WV Production

Figure A4. WVU BBER Forecast of Northern vs. Southern WV Production



## **Appendix D**





**Taylor & Mulder**  
Property and Casualty Consulting Actuaries

**West Virginia Office of Special Reclamation  
Actuarial Reserve Study as of June 30, 2021**

**November 2021**



**Taylor & Mulder**  
Property and Casualty Consulting Actuaries

10508 Rivers Bend Lane,  
Potomac, MD 20854

t (301) 365-4800 f (301) 365-4882  
e [contact@taylorandmulder.com](mailto:contact@taylorandmulder.com)

w [taylorandmulder.com](http://taylorandmulder.com)

November 16, 2021

Mr. David B. McCoy, PE  
Engineer-Chief  
Division of Land Reclamation  
West Virginia Department of Environmental Protection  
Office of Special Reclamation  
47 School Street Suite 301  
Phillipi, WV 26416  
[David.B.McCoy@wv.gov](mailto:David.B.McCoy@wv.gov)

Dear Mr. McCoy,

Enclosed is the actuarial review of the West Virginia Department of Environmental Protection (“WVDEP”) Special Reclamation Fund and Water Trust Fund (“SRF” and “WTF”, respectively, or collectively “the Funds”) as of June 30, 2021.

The first section in the text of our report is the *Executive Summary*. This section presents our conclusions and recommendations. It also describes the purpose and scope of our report, explains the distribution and use of our report, and provides the conditions and limitations underlying our work. This section of our report also includes the Background section which provides information about the Fund history.

The next section of the text of our report is the *Actuarial Analysis* that describes the sources of data, our overall methodology, the selection of factors and specific methodologies and considerations by line of business. It also describes the selection of ultimate losses. The *Exhibits* section of our report follows the text of the report and includes all of our analyses.

Please feel free to call if you have any questions regarding any aspect of our report.

Sincerely,

Daniel W. Lupton, FCAS, MAAA, CSPA, MBA

Evelyn Toni Mulder, FCAS, MAAA, FCA

Bobby J. Jaegers, ACAS, MAAA, FCA

Enclosures

# West Virginia Office of Special Reclamation

## Actuarial Reserve Study as of June 30, 2021

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## Executive Summary

### Purpose and Scope

Taylor & Mulder, Incorporated (“T&M”) was requested by the West Virginia Department of Environmental Protection (“WVDEP”) to conduct an actuarial review of its loss reserves as of June 30, 2021. This report contains our summary and conclusions along with a description of the analysis underlying our conclusions.

Specifically, T&M was asked by the WVDEP to conduct an actuarial analysis to include within its scope the following tasks:

- A valuation in accordance with applicable actuarial standards of practice promulgated by the Actuarial Standards Board of the American Academy of Actuaries that will determine the Program’s fiscal soundness;
- An evaluation of the present assets and liabilities of the Special Reclamation Program for a minimum of 20 years, including an annual table illustrating those assets and liabilities for underground versus surface mine permits, small versus large permits (based on bond amounts or acreage) and permits for tipples, preparation plants, and impoundments and illustrating land and water liabilities separately;
- An evaluation of the prospective assets and liabilities of the Special Reclamation Program for a minimum of 20 years, including a table illustrating estimates of underground versus surface mine permits, small versus large permits (based on bond amounts or acreage) and permits for tipples, preparation plants, and impoundments and illustrating land and water liabilities separately, including the funded status of the Water Trust Fund (“WTF”) as well as the Special Reclamation Fund (“SRF”);
- A table that combines the findings of the two previous tasks;
- An analysis and discussion of the ability of the Program to support long term and/or perpetual liabilities; and,
- A one-page executive summary of conclusions with references to the body of the report.

*Note: This is a “closed” valuation of the Funds’ liabilities insofar as it considers only liabilities arising from permits that have already been issued. The estimated liabilities account for current*

*known reclamation projects as well as anticipated permit revocations on permits issued prior to June 30, 2021. Anticipated income is also linked to permits issued by June 30, 2021 without regard to future permits issued.*

This report presents the results of those analyses. This report was prepared by:

- Daniel W. Lupton, FCAS, MAAA, CSPA, MBA, Vice President and Consulting Actuary,
- Evelyn Toni Mulder, FCAS, MAAA, FCA, Principal and Consulting Actuary,
- Bobby J. Jaegers, ACAS, MAAA, FCA, Consulting Actuary

In accordance with the requirements of the Actuarial Standards of Practice in making statements of actuarial opinion, I provide the following statement:

*I, Daniel W. Lupton, am Vice President and Consulting Actuary in the firm of Taylor & Mulder, Inc. I am a Fellow of the Casualty Actuarial Society in good standing and qualified to issue a Statement of Actuarial Opinion. I am also a Member of the American Academy of Actuaries.*

## Conclusions

### Overall Fund Liabilities

The following chart shows the projected undiscounted liabilities for land reclamation costs, water capital costs, maintenance and operations costs, and administrative expenses for the next 20 years:

---

**West Virginia Office of Special Reclamation  
Actuarial Reserve Study as of June 30, 2021  
Special Reclamation Fund and Water Trust Fund Combined  
Undiscounted Liabilities**

<b>Expense Category</b>	<b>Current Forfeitures</b>	<b>Prospective Forfeitures</b>	<b>Total Liability</b>
Land Reclamation Costs	21,306,701	78,439,530	99,746,231
Water Capital Costs	131,598,040	93,479,328	225,077,369
O&M Costs*	150,959,602	29,872,179	180,831,780
Administrative Expense			59,166,576
<b>Total Liability</b>	<b>303,864,343</b>	<b>201,791,037</b>	<b>564,821,955</b>

\*O&M Costs are Operation and Maintenance Costs

It should be noted that because this is a “closed” study, the above table does not include anticipated liabilities arising from permits issued after June 30, 2021.

Administrative expenses in the above table include employee benefits, contractual obligations, personnel services, and unclassified expenses other than reclamation costs. The following table shows the estimated total liability from all forfeitures (current and projected) for the next 20 years, as well as a comparison to the same values projected as of the previous study:

---

**West Virginia Office of Special Reclamation  
Actuarial Reserve Study as of June 30, 2021  
Special Reclamation Fund and Water Trust Fund Combined  
Undiscounted Liabilities**

<b>Expense Category</b>	<b>Current Study</b>	<b>Prior Study</b>	<b>Difference</b>
Land Reclamation	99,746,231	88,723,579	11,022,652
Water Capital	225,077,369	180,471,492	44,605,877
Water O&M	180,831,780	168,065,548	12,766,232
Administrative*	59,166,576	59,442,730	(276,154)
<b>Total</b>	<b>564,821,955</b>	<b>496,703,348</b>	<b>68,118,607</b>

Relative to the prior study, the current study anticipates higher land reclamation, water capital, and water O&M expenses.

A detailed breakdown of these liability cash flows is provided in Exhibits E-6 through E-9.

### **Funds' Assets**

In addition to projecting the Funds' liabilities, we also projected the Funds' assets. This was performed in the context of modeling future fiscal year cash flows. The following chart shows anticipated revenues over the next 20 years:

<b>West Virginia Office of Special Reclamation Actuarial Reserve Study as of June 30, 2021 Projected Revenues for SRF and WTF</b>	
<b>Revenue Category</b>	<b>20 Years</b>
Bond Forfeitures	37,998,926
Civil Penalties	9,881,849
SRF Coal Fees	111,105,361
WTF Coal Fees	129,192,280
SRF Investment Yield	2,687,481
WTF Investment Yield	69,938,713
<b>Total</b>	<b>360,804,609</b>

Note that due to the closed nature of the study, the revenues in the table above only reflect projected revenues associated with currently in-force permits. The actual anticipated revenues over that time period are considerably higher. For example, the SRF and WTF coal fees included in the table above represent only 66% of the total anticipated coal production over the next 20 years, as coal production in future years will increasingly come from permits that have not yet been issued as of June 30, 2021.

Relatedly, it should be noted that the actual investment yield will vary based on the rate at which funds must be transferred from the WTF to the SRF to pay for liabilities. Because the WTF earns a higher investment yield than the SRF (projected 5.3% as compared to 1.3%), additional revenues in the SRF (for example, from coal tonnage fees associated with new permits that are outside the scope of our study) will have a significant positive impact on total investment yield over time. This is because less money will need to be transferred from the WTF to the SRF to pay for reclamation activities, and therefore more investment income can be earned.

Technical details regarding how each revenue category was projected are provided in **Appendix A**, below. Revenue projection details are provided in Exhibits E-3 through E-5.

## **Financial Projections**

Our projections of revenues and expenses to the Funds imply that the Funds will be solvent on a cash basis through 2039. The chart on the following page shows a simplified cash flow projection for the SRF and WTF combined over the next 20 years.



West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Financial Projection

Fiscal Year Ending 6/30	Total	Total	Beginning Balance		WTF to SRF	Ending Balance	
	<u>Expenditures</u>	<u>Revenues</u>	<u>SRF</u>	<u>WTF</u>	<u>Transfers</u>	<u>SRF</u>	<u>WTF</u>
Prior						32,486,779	164,339,889
2022	85,202,817	34,289,512	32,486,779	164,339,889	48,800,723	10,000,000	135,913,363
2023	87,243,420	30,808,258	10,000,000	135,913,363	74,433,112	10,000,000	79,478,200
2024	10,011,434	25,605,954	10,000,000	79,478,200	-	11,706,443	93,366,278
2025	20,000,794	24,927,507	11,706,443	93,366,278	7,288,204	10,000,000	99,999,434
2026	28,648,560	23,992,386	10,000,000	99,999,434	18,324,324	10,000,000	95,343,260
2027	26,613,321	22,586,973	10,000,000	95,343,260	16,895,057	10,000,000	91,316,911
2028	25,822,793	21,105,477	10,000,000	91,316,911	16,762,332	10,000,000	86,599,594
2029	32,054,940	19,758,765	10,000,000	86,599,594	23,565,724	10,000,000	74,303,419
2030	23,479,197	18,349,255	10,000,000	74,303,419	15,394,969	10,000,000	69,173,477
2031	22,994,878	17,242,092	10,000,000	69,173,477	15,360,443	10,000,000	63,420,691
2032	22,345,760	16,277,491	10,000,000	63,420,691	15,082,863	10,000,000	57,352,422
2033	21,861,836	15,367,071	10,000,000	57,352,422	14,934,072	10,000,000	50,857,657
2034	21,306,992	14,469,640	10,000,000	50,857,657	14,693,148	10,000,000	44,020,306
2035	20,674,453	13,571,037	10,000,000	44,020,306	14,362,833	10,000,000	36,916,890
2036	20,358,909	12,568,592	10,000,000	36,916,890	14,390,442	10,000,000	29,126,574
2037	19,986,700	11,671,859	10,000,000	29,126,574	14,295,304	10,000,000	20,811,733
2038	19,461,630	10,791,877	10,000,000	20,811,733	14,020,891	10,000,000	12,141,980
2039	19,189,331	9,888,344	10,000,000	12,141,980	12,141,980	8,142,049	4,698,945
2040	18,918,303	9,086,888	8,142,049	4,698,945	4,698,945	(1,132,583)	4,142,162
2041	18,645,888	8,445,631	(1,132,583)	4,142,162	4,142,162	(11,074,033)	3,883,355

Note that these projections assume that the Water Trust Fund transfers money to the Special Reclamation Fund in order to maintain a fund balance of \$10,000,000.

A detailed version of this financial projection is provided in Exhibit E-2, which shows the breakdown by type of undiscounted expenditure and revenue item.

### **Recommendations**

**Coal Production Risks:** There has been some instability in coal production forecasts and the coal market in general over the preceding decade as a result of different regulatory regimes, alternative energy adoption rates, economic events, and, most recently, the COVID-19 pandemic. Future studies may benefit from considering alternative coal production scenarios.

**Permit Status History:** Permit databases were evaluated as of a specific date. However, because this study estimates anticipated changes in permit status over time, it is necessary to make assumptions about how permit statuses change in order to develop forfeiture models. If records exist, it could be possible to produce more accurate models if a full history of each permit (including all status changes over time and dates when status changes occurred) were available.

### **Background**

On August 3, 1977, Congress enacted the Surface Mining Control and Reclamation Act of 1977 (“the SMCRA”) to encourage the reclamation of mined areas and return land and water resources to beneficial use. The SMCRA established a program for the regulation of mining permits and a program for reclaiming bond forfeiture sites. In West Virginia, reclamation of abandoned mine lands is performed by the West Virginia Department of Environmental Protection (“WVDEP”) Office of Special Reclamation.

Funding for the reclamation of mined areas comes from bond forfeitures, coal tonnage fees, civil penalties, and interest income. The largest of these funding sources is coal tonnage fees. Coal tonnage fees of \$0.15 per ton of coal mined are deposited in the Water Trust Fund (“WTF”) and \$0.129 per ton are deposited in the Special Reclamation Fund (“SRF”). Amounts from bond forfeitures go to the SRF.

Currently, all reclamation activities, including water treatment, are paid through the SRF, with amounts being transferred to the SRF from the WTF to fund payment of certain costs. Financial projections assume that funds will be transferred to the SRF to maintain a certain minimum balance of working capital, and that the remaining amounts will be left in the WTF to achieve a higher average investment yield.

### **Report Distribution and Use**

This report has been prepared for internal use by the management of the WVDEP and its board, its accountants, auditors, and attorneys, and the West Virginia legislature. The WVDEP is not authorized to include this report in any marketing or request for proposal solicitations. In addition, it should be understood that T&M consultants are available to respond to any questions by authorized third parties with respect to this report.

### **Conditions and Limitations**

The analyses contained in this report were performed using accepted loss and loss adjustment expense reserving methods adjusted to the special needs of the WVDEP and in conformance with sound actuarial standards and principles. T&M introduced assumptions and judgments that we considered appropriate in the circumstances.

With regard to projections of ultimate values, it should be understood that the emergence and settlement of claims are subject to uncertainty. While we have used our best professional judgment in all instances, projections of future ultimate losses and loss expenses are inherently uncertain because of the random nature of claims occurrences. They are also dependent upon future contingent events and are affected by many additional factors.

WVDEP claim reserving procedures, current and perceived social and economic inflation, current and future court and jury attitudes, legislative changes affecting the WVDEP, improvements in technology, and many other economic, legal, political, legislative and social factors all can have significant effects on ultimate claim costs. Therefore, we cannot warrant that actual developments

will not differ from current projections. Such differences could be upward or downward and could be significant.

In summary, the ultimate loss and loss adjustment expense levels estimated in this report are subject to potential variations in estimation due to:

- (1) the fact that the ultimate liability of WVDEP is subject to the outcome of events yet to occur;
- (2) the unanticipated changes in the legal, economic, legislative or claims adjudication environments;
- (3) statistical fluctuation in losses around the estimated or expected values when all other factors remain constant; and
- (4) the fact that the actual future loss and loss payment and reporting patterns may differ from those applied in the determination of the expected losses or there may be unanticipated changes in the loss and expense loss and expense payment and reporting patterns;

Accordingly, no assurance can be given that future loss emergence will not deviate from the estimated ultimate loss and loss adjustment expenses. However, the ultimate loss and loss adjustment expense estimates were based on a reasonable application of generally accepted actuarial procedures and techniques applied to the information available.

We reviewed the information for overall reasonableness and consistency.

T&M relied without audit or verification on historical loss, loss adjustment expense, exposure data, and other information provided by the WVDEP and its employees. T&M has relied upon the data provided and on the oral and/or written statements made regarding the quality, accuracy, and completeness of the data and information supplied. Any inaccuracies or inconsistencies in the data could have a significant effect on the conclusions drawn.

Should any inaccuracies be found in the data, T&M should be notified immediately so that the analysis can be adjusted accordingly.

With regard to projections of estimated revenues, it should be understood that the revenue streams are subject to uncertainty similar to that experienced in modeling loss projections. While we have used our best professional judgment in all instances, projections of future revenues are inherently uncertain due to potential changes in technology, the implementation of environmental requirements, the introduction of and/or enhanced use of alternative fuels, and changes in the economy among others. While T&M has used its best judgment in selecting values and trends for each category of revenue, actual revenue collected is dependent upon unknown future events and may be affected by additional factors outside of WVDEP control.

This report is limited in scope to the estimate of the level of reserve adequacy at the evaluation date of the report. It also includes projections regarding cash flow of the operations of the WVDEP under certain narrow assumptions and conditions.

This report was prepared for use by persons technically competent in insurance financial matters. Persons receiving this report should be made aware of the availability of T&M personnel to answer questions and/or amplify on any matter addressed therein.

## Appendix A: Actuarial Analysis

### Sources of Data

The data underlying our analysis was compiled from several sources. The following are the primary sources from which data was taken and how each data source was used:

- Special Reclamation Database: This database was provided by David B. McCoy, Engineer-Chief, Division of Land Reclamation. The database includes information pertaining to historical and ongoing reclamation projects in the state, including site characteristics, land use information, anticipated and actual land and water reclamation costs (both individual capital expenditures and ongoing costs), and administrative costs. This database replaced a similar database provided earlier by Michael Sheehan, former Executive Director; however, that database was determined to have errors that rendered it unsuitable for this analysis.
- Permits database: This database was provided by Amy Crouser, Assistant Director for the WVDEP Division of Mining and Reclamation. This database includes data on permits issued between 1961 and June 30, 2021, including the permit status, permit location and type, bond amount, and bonded acres.
- 2021 Consensus Coal Forecast by the Center for Business and Economic Research at Marshall University was used for coal market history and projections.
- Special Reclamation Fund Expenditures: This database was provided by Scott Fairchild, Financial Reporting Specialist (II) for the WVDEP. This database included SRF and WTF expenditures from July 1, 2005 to June 30, 2021.
- Revenues for WTF and SRF were also provided by Scott Fairchild. These databases include all revenues to the Special Reclamation Fund and Water Trust Fund from July 1, 2005 to June 30, 2021.
- Prior Actuarial Reports: These were provided by Mr. Sheehan to provide additional context for our projections.
- Coal Production Decline Rates, including an analysis of anticipated coal production decline rates, was provided by John Morgan, indicating the anticipated rate at which coal production will decline from currently in-force permits.

- SRF and WTF Investment Allocations: These were provided by Mr. Sheehan and were used to project anticipated SRF and WTF investment revenues based on the allocation of funds to money market, short term bonds, and IMB fund.

## **Overall Methodology**

### **Loss Projections**

Losses were projected using two models: a traditional deterministic model and a stochastic generalized linear model, described in greater detail below.

Based on the results of these methods, we selected anticipated payment amounts in each future fiscal year. A three-year delay was added to these payment patterns to account for the delay between a permit revocation and the commencement of reclamation activities at the site.

Current cost estimates on active reclamation activities were adjusted for historical variances between cost estimates and the final costs. These costs were then spread out over time, assuming 50% of costs will be incurred in the year that work is scheduled to commence and 50% of costs will be incurred in the following year for land reclamation and water capital costs. Water operations & maintenance costs were projected to continue each year according to current estimated annual costs subject to an annual attenuation factor of 98% starting in 2031. This is due to the fact that annual O&M costs associated with currently active reclamations are projected to show modest declines after 10 years.

All costs are then adjusted to nominal dollars using an inflation factor of 2.5%.

### ***Deterministic Loss Model***

The traditional deterministic model projects anticipated bond forfeiture and permit release rates based on historical data triangles. Permits are arranged into cohorts by year of permit issuance based on the assumption that permit releases and bond forfeitures vary based on the age of

permit. From these data triangles, overall release and forfeiture rates are selected for each age of permit, then adjusted to reflect anticipated differences in rates for permits based on current status (active, inactive, or phased release). These release and forfeiture rates are applied to currently open permits, separately for surface, underground, and other mine types and separately by permit status types. A final adjustment is made based on bond size, whereby permits backed by smaller bonds (less than \$500,000) are anticipated to be forfeited at a rate that is higher than permits backed by large bonds (greater than \$500,000.)

These adjusted forfeiture and release rates are applied to currently open permits or bonded acres to determine the number of permits and acres expected to be released or forfeited each year in the future. We then apply anticipated average costs per forfeited acre to determine future costs by year for the anticipated land reclamation costs, water capital costs, and water operations & maintenance costs.

### *Stochastic Loss Model*

The stochastic model uses advanced statistical techniques to project future anticipated forfeiture and release rates.

The stochastic model is formally based on a kind of generalized linear model, specifically a multinomial logistic regression model. The model uses historical data about forfeited and released bonds to predict the probability that open permits will experience forfeiture or release each year in the future. In addition, the stochastic model considers the parent companies of each permit and simulates bankruptcies from parent companies. When a parent company experiences bankruptcy, we project that the probability of forfeiture for the company's permits is increased by 30% for the year following. This is based on the understanding that although parent company bankruptcies can lead to forfeitures, the permits are often sold as assets to other companies as a way of preventing further forfeitures.

Technical details of the stochastic model are provided as **Appendix B** of the report.



### *Comparison of Deterministic and Stochastic Models*

The deterministic and stochastic loss models have unique advantages and disadvantages that we considered carefully as part of our projections.

The deterministic model has the advantage that patterns of releases and forfeitures can be easily visualized. As a result, it is possible to make selections of anticipated release and forfeiture rates that explicitly anticipate recent or future changes in rates that could affect loss projections. For example, the most recent ten years have generally experienced lower forfeiture rates than the preceding ten. It is straightforward to account for this change when selecting anticipated future forfeiture rates. By comparison, the stochastic model is less intuitive, and it can be challenging to make manual adjustments to fitted model results.

However, there are several drawbacks to the deterministic model that prompted the development of the stochastic model. First, the method assumes that future forfeitures and releases are roughly statistically independent. This assumption may be incorrect. Recent years have seen increasing consolidation in coal industry. As a result, permits are controlled by a smaller set of companies. For this reason, a single bankruptcy could lead to a large number of simultaneous forfeitures. This key issue was accounted for explicitly in the stochastic model.

Relatedly, the deterministic model makes a simplifying assumption about the number of bonds that will be forfeited or released in a year. For example, for a given age, the deterministic model may project that 0.93% of a particular kind of bond will be forfeited. Realistically, this means that a given bond will be forfeited with probability 0.93% or not forfeited with probability 99.07%. However, the deterministic model projects that 0.93% of all bonds will be forfeited. That is, for a given bond of 100 acres, the deterministic model might project that 0.93 acres will be forfeited in that year, where in actuality either 0 acres or 100 acres will be forfeited. This assumption may result in excessive confidence about the accuracy of the central estimate, particularly with respect to the timing and amount of cash flows. The stochastic model, by comparison, simulates individual permit behavior directly and thereby avoids using this assumption.

A final advantage of the stochastic model is that the use of a statistical framework enables the use of model validation tools that are not generally available for traditional models. This makes it possible to directly assess the extent to which different assumptions impact model predictive performance and deliver a model that is optimized to provide the most accurate predictions possible. In the deterministic model, predictions are assumed to be accurate, and model validation is, at best, implicit in the extent to which forfeiture or release rates are selected to mirror or diverge from historical rates.

### Revenue Projections

Anticipated coal tonnage fees were modeled by considering the anticipated change in Appalachian coal production per year from the consensus coal forecast as well as the effect of the “runoff” of permits. The runoff of permits is comprised of two separate factors:

1. A factor representing the reduction in number of active permits among the current cohort of open permits. This factor was projected as part of the loss models.
2. A factor representing the reduced coal production over time among the permits that remain open. This factor was determined judgmentally based on discussions with the Board and based on analysis provided by John Morgan, as discussed above.

With respect to the second point, we assumed the following rates of decline in coal production:

	Northern Mines	Southern Mines
<b>Underground Mines</b>	2.5%	5.0%
<b>Surface Mines</b>	25.0%	10.0%

Bond forfeitures revenues were determined based on the loss models. The deterministic loss model tracked the anticipated bond dollars forfeited in each period. The stochastic loss model considered the bond dollars forfeited across different simulated scenarios. These projections were combined to select a central estimate of bond forfeiture revenues.

Civil penalties were anticipated to decline in a manner commensurate with the decline in production on the current cohort of permits.

Investment returns were projected based on historical average returns. Both the SRF and WTF experienced historically high investment returns on short-term bonds in 2021. It is anticipated that these short-term bond returns will drift back to historical average returns over the next several years.

### **Administrative Expense Calculations**

Historical administrative expenses were provided to us for the years 2006 through June 30, 2021. Administrative expenses are defined as the sum of employee benefits, contractual obligations, personnel services, and other unclassified expenses.

Administrative expenses associated with the current cohort of permits were projected assuming 3% inflation each year and discounted based on the projected number of remaining permits in force from the cohort of open permits as of June 30, 2021.

## Appendix B: Technical Details of the Stochastic Loss Model

### Data Pre-Processing

The model was fitted on closed permits. However, the permit database only reflects the current status of the permits and the date that this status was set. Therefore, to determine the probability that a permit stays open in a given year, it was necessary to reconstruct historical permit data reflecting the fact that a permit with certain attributes was open in a given year.

For example, if a permit was issued in 1990 and released in 2000, the permit database reflects a single entry of “released” with a status year of 2000. However, inherent in that entry is an implied 10 years in which the permit had “open” status (during 1990, 1991, ... 1999).

### Model Form

The stochastic loss model is a multinomial logistic model with four outcomes: “Open,” “Forfeited,” “Release,” and “Terminated.” It predicts, based on a linear predictor, the log-odds of each outcome. The model was fitted using a neural network as part of the “nnet” package in R.

The linear predictor of the model is of the following form:

$$\begin{aligned} & \textit{Permit Type} \times \textit{NS} \times \textit{Permits} \times \textit{Permit Years} + \textit{Spline}(\textit{Log}(\textit{Cohort Acres}),3) \\ & + \textit{Spline}(\textit{Issue Year},5) + \textit{Spline}(\textit{Age}^*,3) + \textit{Poly}(\textit{Age},2) \end{aligned}$$

Where the variables used are described as follows:

Variable	Description
Permit Type	Notes whether a permit is a surface mine, underground mine, prospect, or other
NS	Notes whether a mine is in a northern or southern county
Permits	Counts the number of permits held by the permittee
Permit Years	Counts the sum of the ages of all permits held by permittee
Cohort Acres	Sum of acres held by all permits issued in the same year as a given permit
Age	The length of time that a permit has been in force
Age*	Age, subject to a maximum value of 3
Issue Year	The year that a permit was issued

<b>Spline(Variable, N)</b>	A “beta spline” function of a given variable with N-1 knots. This is a piecewise function of 3 <sup>rd</sup> degree polynomials with N different “pieces.”
<b>Poly(Variable, N)</b>	An N-degree polynomial function of the variable

Beta splines were used after initial testing revealed that high-order polynomials produced superior fit (as measured by the AIC and by cross entropy error, discussed below) but failed to provide useful results when extrapolating beyond the training dataset. We determined that this was due to the inherent instability of high-order polynomials. We determined that spline functions produced similarly good fit over the training data and test set but generalized more robustly over the set of open permits.

### **Variable Selection and Model Validation**

The closed permits were split randomly into 80% training data and 20% test data. After the model form was determined, the model was re-fit on the entire dataset. Model predictions were carried out on the set of open permits.

Variables tested included size of bonds, specific county, permit status, specific permit type, and bonded acres. These variables were generally rejected either because of missing data or because they resulted in over-fitting the model. The same is true of many variable interactions that were tested.

Variables were selected based on the extent to which they improved the Akaike Information Criterion (AIC) of the model over the full training data or the extent to which they improved the cross-entropy error in the test dataset. This is a measure of the degree to which the model properly categorizes permits as being open, forfeited, released, or terminated.

The model was additionally validated using plots of actual and fitted permit forfeitures and by reviewing model statistics such as t-statistics.

Initial tests of the model included the “Status Year” variable, indicating the latest year when the status of the permit was updated. This variable significantly improves the AIC and cross-entropy

error when using a random sample of data, but out-of-time samples perform very poorly. This seems to be the result of the historical patterns in permit forfeiture, which causes the Status Year variable to generate significant over-fitting. For this reason, Status Year was excluded as a variable in this study.

## **Simulation**

The final simulation was carried out in two steps. First, the baseline “status probabilities” (i.e., the probability that a permit remains open, is forfeited, etc.) were determined for each open permit for each of the 20 years in the future. Then, for each of 5,000 simulations, we carried out the following procedure:

1. Simulate whether each of the ultimate parent companies goes bankrupt in a given year using a Bernoulli probability distribution with probability 0.5%. This probability is based on default probability for high-grade credit ratings from major credit rating agencies.
2. Augment the baseline status probabilities with the simulated bankruptcies by adding 30% to the unnormalized log-odds of a permit being forfeited. This means that if a permit previously had a 10% probability of being forfeited, following the bankruptcy it would have a  $(10\% + 30\%) / 130\% = 30.8\%$  probability of being forfeited. The 30% probability was based on discussion with the Board and judgment.
3. For each year in the future, the status of each permit was simulated until the permit status was no longer “open.”
4. The results of this simulation were stored, and then the process was repeated for the next simulation, starting at step 1.

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Executive Summary

	(1)	(2)	(3)	(4)	(5)
<u>Expense Category</u>	<u>Undiscounted Liabilities Arising From...</u>		<u>Total Liability</u>	<u>Previous Study</u>	<u>Difference</u>
	<u>Current Forfeitures</u>	<u>Future Forfeitures</u>			
Land Capital	21,306,701	78,439,530	<b>99,746,231</b>	88,723,579	11,022,652
Water Capital	131,598,040	93,479,328	<b>225,077,369</b>	180,471,492	44,605,877
Ongoing Water Treatment Administration	150,959,602	29,872,179	<b>180,831,780</b>	168,065,548	12,766,232
			<b>59,166,576</b>	59,442,730	(276,154)
<b>Total</b>	<b>303,864,343</b>	<b>201,791,037</b>	<b>564,821,955</b>	496,703,348	68,118,607

Notes:

- Col (1) - (2) from Exhibits E-6 to E-8, Cols (6) and (7)
- Col (3) Administration Expense from Exhibit E-9, Col (3)
- Col (4) from Prior Study
- Col (5) = (3) - (4)

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Financial Projection

Fiscal Year Ending 6/30	Expenditures					Revenues						Beginning Balance		WTF to SRF Transfers	Ending Balance		
	Land	Water Capital	Water Op/Maint	Admin	Total	SRF Coal Fees	WTF Coal Fees	Bond Forfeitures	Civil Penalties	SRF Investments	WTF Investments	SRF	WTF		SRF	WTF	
Prior																	
2022	10,421,876	64,986,687	6,220,885	3,573,369	85,202,817	10,005,152	11,633,898	2,675,265	889,871	345,027	8,740,299	32,486,779	164,339,889	48,800,723	10,000,000	164,339,889	135,913,363
2023	10,782,374	66,611,354	6,376,407	3,473,285	87,243,420	9,252,553	10,758,782	2,604,576	822,934	130,246	7,239,167	10,000,000	135,913,363	74,433,112	10,000,000	79,478,200	79,478,200
2024	102,450	-	6,535,817	3,373,166	10,011,434	8,303,147	9,654,823	2,545,991	738,492	130,246	4,233,255	10,000,000	79,478,200	-	11,706,443	93,366,278	93,366,278
2025	4,421,876	5,458,547	6,836,689	3,283,682	20,000,794	7,695,609	8,948,383	2,473,609	684,457	152,472	4,972,978	11,706,443	93,366,278	7,288,204	10,000,000	99,999,434	99,999,434
2026	8,159,603	10,026,211	7,259,618	3,203,128	28,648,560	7,174,007	8,341,869	2,381,918	638,065	130,246	5,326,280	10,000,000	99,999,434	18,324,324	10,000,000	95,343,260	95,343,260
2027	7,126,493	8,695,438	7,659,050	3,132,340	26,613,321	6,699,770	7,790,430	2,292,362	595,886	130,246	5,078,278	10,000,000	95,343,260	16,895,057	10,000,000	91,316,911	91,316,911
2028	6,634,679	8,068,464	8,052,546	3,067,104	25,822,793	6,175,826	7,181,193	2,205,105	549,286	130,246	4,863,822	10,000,000	91,316,911	16,762,332	10,000,000	86,599,594	86,599,594
2029	9,065,571	10,976,194	9,006,775	3,006,399	32,054,940	5,725,009	6,656,987	2,124,771	509,189	130,246	4,612,563	10,000,000	86,599,594	23,565,724	10,000,000	74,303,419	74,303,419
2030	5,279,421	6,346,677	8,899,873	2,953,226	23,479,197	5,424,361	6,307,396	2,047,172	482,449	130,246	3,957,631	10,000,000	74,303,419	15,394,969	10,000,000	69,173,477	69,173,477
2031	4,924,371	5,896,950	9,269,352	2,904,205	22,994,878	5,094,006	5,923,263	1,957,115	453,067	130,246	3,684,394	10,000,000	69,173,477	15,360,443	10,000,000	63,420,691	63,420,691
2032	4,498,579	5,353,682	9,634,253	2,859,245	22,345,760	4,847,485	5,636,611	1,854,024	431,141	130,246	3,377,983	10,000,000	63,420,691	15,082,863	10,000,000	57,352,422	57,352,422
2033	4,214,982	4,993,242	9,835,894	2,817,718	21,861,836	4,630,704	5,384,539	1,754,954	411,861	130,246	3,054,768	10,000,000	57,352,422	14,934,072	10,000,000	50,857,657	50,857,657
2034	3,901,456	4,593,520	10,031,688	2,780,328	21,306,992	4,426,385	5,146,960	1,663,524	393,688	130,246	2,708,837	10,000,000	50,857,657	14,693,148	10,000,000	44,020,306	44,020,306
2035	3,555,834	4,151,052	10,219,218	2,748,348	20,674,453	4,226,693	4,914,760	1,578,753	375,927	130,246	2,344,658	10,000,000	44,020,306	14,362,833	10,000,000	36,916,890	36,916,890
2036	3,349,477	3,888,774	10,402,914	2,717,744	20,358,909	3,985,083	4,633,817	1,498,700	354,438	130,246	1,966,308	10,000,000	36,916,890	14,390,442	10,000,000	29,126,574	29,126,574
2037	3,118,811	3,593,822	10,581,821	2,692,246	19,986,700	3,809,019	4,429,091	1,413,353	338,779	130,246	1,551,372	10,000,000	29,126,574	14,295,304	10,000,000	20,811,733	20,811,733
2038	2,823,585	3,214,442	10,753,638	2,669,965	19,461,630	3,648,671	4,242,641	1,337,305	324,517	130,246	1,108,497	10,000,000	20,811,733	14,020,891	10,000,000	12,141,980	12,141,980
2039	2,639,242	2,977,905	10,921,855	2,650,328	19,189,331	3,484,914	4,052,225	1,264,288	309,953	130,246	646,720	10,000,000	12,141,980	12,141,980	8,142,049	4,698,945	4,698,945
2040	2,454,919	2,740,904	11,086,377	2,636,103	18,918,303	3,347,018	3,891,882	1,193,973	297,688	106,047	250,280	8,142,049	4,698,945	(1,132,583)	4,698,945	4,142,162	4,142,162
2041	2,270,632	2,503,504	11,247,108	2,624,643	18,645,888	3,149,948	3,662,730	1,132,168	280,160	-	220,624	(1,132,583)	4,142,162	4,142,162	(11,074,033)	3,883,355	3,883,355



West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Coal Tonnage Fees and Civil Penalties Projections

Fiscal Year Ending 6/30	(1) - (5) Coal Production in Million Tons					(6) - (9) % Coal Production From In-Force Permits				(10) Total In-Force Production	(11) - (13) Coal Tonnage Fees from In-Force Permits			(14) Civil Penalties
	Northern		Southern		Total	Northern		Southern			SRF	WTF	Total	
	Surface	Underground	Surface	Underground		Surface	Underground	Surface	Underground					
2008	7.0	34.1	62.4	54.3	157.8	100%	100%	100%	100%	157.8	9,415,063	-	9,415,063	855,750
2009	5.2	33.1	51.0	47.7	137.1	100%	100%	100%	100%	137.1	17,098,738	1,850,648	18,949,386	1,151,628
2010	4.0	37.3	46.7	47.2	135.2	100%	100%	100%	100%	135.2	16,639,204	1,924,569	18,563,773	688,062
2011	3.3	38.6	48.0	44.8	134.7	100%	100%	100%	100%	134.7	18,168,515	2,100,436	20,268,951	805,018
2012	2.0	39.4	37.9	41.0	120.4	100%	100%	100%	100%	120.4	16,876,736	1,963,409	18,840,145	940,571
2013	1.5	40.9	32.4	37.9	112.8	100%	100%	100%	100%	112.8	15,277,933	14,605,229	29,883,163	677,771
2014	1.3	47.4	29.1	34.0	111.9	100%	100%	100%	100%	111.9	13,949,645	16,210,221	30,159,866	734,975
2015	0.9	46.9	19.4	28.4	95.6	100%	100%	100%	100%	95.6	14,936,957	17,369,799	32,306,756	2,551,755
2016	0.2	43.3	15.5	20.8	79.8	100%	100%	100%	100%	79.8	10,774,387	12,530,157	23,304,544	612,182
2017	0.1	46.6	20.1	25.9	92.8	100%	100%	100%	100%	92.8	11,174,041	12,994,938	24,168,979	822,617
2018	0.6	45.5	22.5	26.7	95.4	100%	100%	100%	100%	95.4	11,831,011	13,758,966	25,589,977	716,346
2019	0.7	46.3	22.3	23.9	93.3	100%	100%	100%	100%	93.3	12,138,331	14,116,367	26,254,698	976,343
2020	0.3	33.8	15.0	18.1	67.2	100%	100%	100%	100%	67.2	9,269,937	10,780,545	20,050,482	612,870
2021	0.4	39.9	17.7	21.4	79.4	100%	100%	100%	100%	79.4	8,771,920	10,166,395	18,938,315	877,641
2022	0.4	41.1	18.2	22.0	81.6	75%	98%	90%	95%	77.6	10,005,152	11,633,898	21,639,051	889,871
2023	0.4	39.9	17.7	21.4	79.3	56%	95%	81%	90%	71.7	9,252,553	10,758,782	20,011,335	822,934
2024	0.4	37.6	16.6	20.1	74.7	42%	93%	73%	86%	64.4	8,303,147	9,654,823	17,957,970	738,492
2025	0.3	36.5	16.2	19.6	72.6	32%	90%	66%	81%	59.7	7,695,609	8,948,383	16,643,992	684,457
2026	0.3	35.7	15.8	19.1	70.9	24%	88%	59%	77%	55.6	7,174,007	8,341,869	15,515,877	638,065
2027	0.3	34.9	15.4	18.7	69.3	18%	86%	53%	74%	51.9	6,699,770	7,790,430	14,490,201	595,886
2028	0.3	33.6	14.9	18.0	66.8	13%	84%	48%	70%	47.9	6,175,826	7,181,193	13,357,018	549,286
2029	0.3	32.6	14.4	17.4	64.7	10%	82%	43%	66%	44.4	5,725,009	6,656,987	12,381,996	509,189
2030	0.3	32.2	14.3	17.2	64.0	8%	80%	39%	63%	42.0	5,424,361	6,307,396	11,731,757	482,449
2031	0.3	31.5	14.0	16.9	62.7	6%	78%	35%	60%	39.5	5,094,006	5,923,263	11,017,269	453,067
2032	0.3	31.3	13.8	16.8	62.2	4%	76%	31%	57%	37.6	4,847,485	5,636,611	10,484,097	431,141
2033	0.3	31.1	13.8	16.7	61.9	3%	74%	28%	54%	35.9	4,630,704	5,384,539	10,015,243	411,861
2034	0.3	31.0	13.7	16.6	61.6	2%	72%	25%	51%	34.3	4,426,385	5,146,960	9,573,345	393,688
2035	0.3	30.8	13.6	16.5	61.2	2%	70%	23%	49%	32.8	4,226,693	4,914,760	9,141,453	375,927
2036	0.3	30.2	13.4	16.2	60.0	1%	68%	21%	46%	30.9	3,985,083	4,633,817	8,618,900	354,438
2037	0.3	30.0	13.3	16.1	59.6	1%	67%	19%	44%	29.5	3,809,019	4,429,091	8,238,110	338,779
2038	0.3	29.8	13.2	16.0	59.3	1%	65%	17%	42%	28.3	3,648,671	4,242,641	7,891,311	324,517
2039	0.3	29.6	13.1	15.8	58.8	1%	63%	15%	40%	27.0	3,484,914	4,052,225	7,537,139	309,953
2040	0.3	29.5	13.0	15.8	58.6	0%	62%	14%	38%	25.9	3,347,018	3,891,882	7,238,900	297,688
2041	0.3	28.8	12.7	15.4	57.2	0%	60%	12%	36%	24.4	3,149,948	3,662,730	6,812,678	280,160

Notes: Cols (1) - (4) for 2008 - 2019 from USEIA; 2020-2041 based on Col (5) allocated out by mine and location type  
 Col (5) for 2008 - 2019 from USEIA; 2020 - 2041 from 2021 Consensus Coal Forecast  
 Col (6) - (7) from Exhibit E-70, Cols (6) and (7)  
 Cols (6) through (9) based on decline rates of 25%, 2.5%, 10%, and 5%, respectively; based on analysis provided by John Morgan  
 Col (10) = Sum Product of Cols (1) - (4) and Cols (6) - (9)  
 Col (11) = (10) × 1,000,000 × \$0.129  
 Col (12) = (10) × 1,000,000 × \$0.150  
 Col (13) = (11) + (12)  
 Col (14) from client data for 2021 and prior; 2022 and subsequent = average of 2008-2021 trended out based on Col (13)

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Coal Tonnage Fees Detail

Fiscal Year Ending 6/30	(1) Coal Tonnage Fees from Permits In Force As of June 30, 2021			(2) Total Coal Tonnage Fees			(3) Coal Tonnage Fees from New Permits			(4) Total Civil Penalties	(5) New Permit Civil Penalties
	SRF	WTF	Total	SRF	WTF	Total	SRF	WTF	Total		
2008	9,415,063	-	9,415,063	9,415,063	-	9,415,063				855,750	
2009	17,098,738	1,850,648	18,949,386	17,098,738	1,850,648	18,949,386				1,151,628	
2010	16,639,204	1,924,569	18,563,773	16,639,204	1,924,569	18,563,773				688,062	
2011	18,168,515	2,100,436	20,268,951	18,168,515	2,100,436	20,268,951				805,018	
2012	16,876,736	1,963,409	18,840,145	16,876,736	1,963,409	18,840,145				940,571	
2013	15,277,933	14,605,229	29,883,163	15,277,933	14,605,229	29,883,163				677,771	
2014	13,949,645	16,210,221	30,159,866	13,949,645	16,210,221	30,159,866				734,975	
2015	14,936,957	17,369,799	32,306,756	14,936,957	17,369,799	32,306,756				2,551,755	
2016	10,774,387	12,530,157	23,304,544	10,774,387	12,530,157	23,304,544				612,182	
2017	11,174,041	12,994,938	24,168,979	11,174,041	12,994,938	24,168,979				822,617	
2018	11,831,011	13,758,966	25,589,977	11,831,011	13,758,966	25,589,977				716,346	
2019	12,138,331	14,116,367	26,254,698	12,138,331	14,116,367	26,254,698				976,343	
2020	9,269,937	10,780,545	20,050,482	9,269,937	10,780,545	20,050,482				612,870	
2021	8,771,920	10,166,395	18,938,315	8,771,920	10,166,395	18,938,315				877,641	
2022	10,005,152	11,633,898	21,639,051	10,526,400	12,240,000	22,766,400	521,248	606,102	1,127,349	936,231	46,360
2023	9,252,553	10,758,782	20,011,335	10,229,700	11,895,000	22,124,700	977,147	1,136,218	2,113,365	909,842	86,909
2024	8,303,147	9,654,823	17,957,970	9,636,300	11,205,000	20,841,300	1,333,153	1,550,177	2,883,330	857,065	118,572
2025	7,695,609	8,948,383	16,643,992	9,365,400	10,890,000	20,255,400	1,669,791	1,941,617	3,611,408	832,970	148,513
2026	7,174,007	8,341,869	15,515,877	9,146,100	10,635,000	19,781,100	1,972,093	2,293,131	4,265,223	813,466	175,400
2027	6,699,770	7,790,430	14,490,201	8,939,700	10,395,000	19,334,700	2,239,930	2,604,570	4,844,499	795,108	199,222
2028	6,175,826	7,181,193	13,357,018	8,617,200	10,020,000	18,637,200	2,441,374	2,838,807	5,280,182	766,425	217,139
2029	5,725,009	6,656,987	12,381,996	8,346,300	9,705,000	18,051,300	2,621,291	3,048,013	5,669,304	742,330	233,141
2030	5,424,361	6,307,396	11,731,757	8,256,000	9,600,000	17,856,000	2,831,639	3,292,604	6,124,243	734,299	251,850
2031	5,094,006	5,923,263	11,017,269	8,088,300	9,405,000	17,493,300	2,994,294	3,481,737	6,476,031	719,383	266,316
2032	4,847,485	5,636,611	10,484,097	8,023,800	9,330,000	17,353,800	3,176,315	3,693,389	6,869,703	713,647	282,505
2033	4,630,704	5,384,539	10,015,243	7,985,100	9,285,000	17,270,100	3,354,396	3,900,461	7,254,857	710,205	298,344
2034	4,426,385	5,146,960	9,573,345	7,946,400	9,240,000	17,186,400	3,520,015	4,093,040	7,613,055	706,763	313,074
2035	4,226,693	4,914,760	9,141,453	7,894,800	9,180,000	17,074,800	3,668,107	4,265,240	7,933,347	702,173	326,246
2036	3,985,083	4,633,817	8,618,900	7,740,000	9,000,000	16,740,000	3,754,917	4,366,183	8,121,100	688,405	333,967
2037	3,809,019	4,429,091	8,238,110	7,688,400	8,940,000	16,628,400	3,879,381	4,510,909	8,390,290	683,816	345,037
2038	3,648,671	4,242,641	7,891,311	7,649,700	8,895,000	16,544,700	4,001,029	4,652,359	8,653,389	680,374	355,857
2039	3,484,914	4,052,225	7,537,139	7,585,200	8,820,000	16,405,200	4,100,286	4,767,775	8,868,061	674,637	364,685
2040	3,347,018	3,891,882	7,238,900	7,559,400	8,790,000	16,349,400	4,212,382	4,898,118	9,110,500	672,342	374,654
2041	3,149,948	3,662,730	6,812,678	7,378,800	8,580,000	15,958,800	4,228,852	4,917,270	9,146,122	656,280	376,119

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Investment Return Calculations

Fiscal Year <u>Ending 6/30</u>	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Investment Rates					Discount Factor for	
	<u>Money</u> <u>Market</u>	<u>Short Term</u> <u>Bond</u>	<u>SRF</u> <u>Blend</u>	<u>IMB</u> <u>Yield</u>	<u>SRWTF</u> <u>Selection</u>	<u>SRF</u>	<u>WTF</u>
2021	0.5%	1.4%	1.1%	5.5%	5.3%	98.9%	95.0%
2022	0.5%	1.8%	1.3%	5.5%	5.3%	97.7%	90.1%
2023	0.5%	1.8%	1.3%	5.5%	5.3%	96.4%	85.6%
2024	0.5%	1.8%	1.3%	5.5%	5.3%	95.2%	81.3%
2025	0.5%	1.8%	1.3%	5.5%	5.3%	94.0%	77.2%
2026	0.5%	1.8%	1.3%	5.5%	5.3%	92.7%	73.3%
2027	0.5%	1.8%	1.3%	5.5%	5.3%	91.6%	69.5%
2028	0.5%	1.8%	1.3%	5.5%	5.3%	90.4%	66.0%
2029	0.5%	1.8%	1.3%	5.5%	5.3%	89.2%	62.7%
2030	0.5%	1.8%	1.3%	5.5%	5.3%	88.1%	59.5%
2031	0.5%	1.8%	1.3%	5.5%	5.3%	86.9%	56.5%
2032	0.5%	1.8%	1.3%	5.5%	5.3%	85.8%	53.7%
2033	0.5%	1.8%	1.3%	5.5%	5.3%	84.7%	50.9%
2034	0.5%	1.8%	1.3%	5.5%	5.3%	83.6%	48.4%
2035	0.5%	1.8%	1.3%	5.5%	5.3%	82.6%	45.9%
2036	0.5%	1.8%	1.3%	5.5%	5.3%	81.5%	43.6%
2037	0.5%	1.8%	1.3%	5.5%	5.3%	80.4%	41.4%
2038	0.5%	1.8%	1.3%	5.5%	5.3%	79.4%	39.3%
2039	0.5%	1.8%	1.3%	5.5%	5.3%	78.4%	37.3%
2040	0.5%	1.8%	1.3%	5.5%	5.3%	77.4%	35.4%
2041	0.5%	1.8%	1.3%	5.5%	5.3%	76.4%	33.6%

Notes:

- Col (1) Based on average annual money market returns
- Col (2) based on average annual change in returns, returning to long-run average over time
- Col (3) = Col (1) × 39% + Col (2) × 61%; percents based on current allocations
- Col (4) from West Virginia Investment Management Board 2020 Report, Returns Capped at 5.5%
- Col (5) = Col (1) × 2% + Col (2) × 2% + Col (4) × 96%; percents based on current allocations
- Col (6) = 1.0 / [1 + (3)] × Prior Year Discount
- Col (7) = 1.0 / [1 + (5)] × Prior Year Discount

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Special Reclamation Fund  
 Payout of Land Liabilities

Fiscal Year Ending 6/30	(1)	(2)	(3) Unadjusted Costs			(6) Inflated Cost at 2.50% Annual Inflation		
	Curr. Scheduled Liabilities	Payout Pattern	Proj. Payout of Current Liabilities	Proj. Payout of Future Liabilities	Total	Proj. Payout of Current Liabilities	Proj. Payout of Future Liabilities	Total
Prior	17,050,200							
2022	1,601,504	50%	9,325,852	-	9,325,852	10,421,876	-	10,421,876
2023	174,516	50%	9,413,110	-	9,413,110	10,782,374	-	10,782,374
2024	-		87,258	-	87,258	102,450	-	102,450
2025	-		-	3,674,325	3,674,325	-	4,421,876	4,421,876
2026	-		-	6,614,792	6,614,792	-	8,159,603	8,159,603
2027	-		-	5,636,365	5,636,365	-	7,126,493	7,126,493
2028	-		-	5,119,403	5,119,403	-	6,634,679	6,634,679
2029	-		-	6,824,498	6,824,498	-	9,065,571	9,065,571
2030				3,877,377	3,877,377		5,279,421	5,279,421
2031				3,528,406	3,528,406		4,924,371	4,924,371
2032				3,144,701	3,144,701		4,498,579	4,498,579
2033				2,874,589	2,874,589		4,214,982	4,214,982
2034				2,595,870	2,595,870		3,901,456	3,901,456
2035				2,308,202	2,308,202		3,555,834	3,555,834
2036				2,121,219	2,121,219		3,349,477	3,349,477
2037				1,926,964	1,926,964		3,118,811	3,118,811
2038				1,702,008	1,702,008		2,823,585	2,823,585
2039				1,552,087	1,552,087		2,639,242	2,639,242
2040				1,408,478	1,408,478		2,454,919	2,454,919
2041				1,270,972	1,270,972		2,270,632	2,270,632
<b>Total</b>	<b>18,826,221</b>		<b>18,826,221</b>	<b>56,180,256</b>	<b>75,006,477</b>	<b>21,306,701</b>	<b>78,439,530</b>	<b>99,746,231</b>

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water Trust Fund  
 Payout of Water Capital Liabilities

Fiscal Year Ending 6/30	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unadjusted Costs			Inflated Cost at 2.50% Annual Inflation				
	Curr. Scheduled Liabilities	Payout Pattern	Proj. Payout of Current Liabilities	Proj. Payout of Future Liabilities	Total	Proj. Payout of Current Liabilities	Proj. Payout of Future Liabilities	Total
Prior	110,821,281							
2022	5,483,347	50%	58,152,314	-	58,152,314	64,986,687	-	64,986,687
2023	-	50%	58,152,314	-	58,152,314	66,611,354	-	66,611,354
2024	-		-	-	-	-	-	-
2025	-		-	4,535,739	4,535,739	-	5,458,547	5,458,547
2026	-		-	8,128,006	8,128,006	-	10,026,211	10,026,211
2027	-		-	6,877,249	6,877,249	-	8,695,438	8,695,438
2028	-		-	6,225,730	6,225,730	-	8,068,464	8,068,464
2029				8,262,802	8,262,802	-	10,976,194	10,976,194
2030				4,661,203	4,661,203	-	6,346,677	6,346,677
2031				4,225,278	4,225,278	-	5,896,950	5,896,950
2032				3,742,454	3,742,454	-	5,353,682	5,353,682
2033				3,405,358	3,405,358	-	4,993,242	4,993,242
2034				3,056,341	3,056,341	-	4,593,520	4,593,520
2035				2,694,576	2,694,576	-	4,151,052	4,151,052
2036				2,462,755	2,462,755	-	3,888,774	3,888,774
2037				2,220,451	2,220,451	-	3,593,822	3,593,822
2038				1,937,610	1,937,610	-	3,214,442	3,214,442
2039				1,751,248	1,751,248	-	2,977,905	2,977,905
2040				1,572,559	1,572,559	-	2,740,904	2,740,904
2041				1,401,320	1,401,320	-	2,503,504	2,503,504
<b>Total</b>	<b>116,304,628</b>		<b>116,304,628</b>	<b>67,160,680</b>	<b>183,465,307</b>	<b>131,598,040</b>	<b>93,479,328</b>	<b>225,077,369</b>

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water Trust Fund  
 Payout of Water Operations & Maintenance Liabilities

Fiscal Year Ending 6/30	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Curr. Scheduled Liabilities	Payout Pattern	Unadjusted Costs Proj. Payout of Current Liabilities	Proj. Payout of Future Liabilities	Total	Inflated Cost at 2.50% Annual Inflation		
						Proj. Payout of Current Liabilities	Proj. Payout of Future Liabilities	Total
Prior	5,441,358							
2022	5,566,661	n/a	5,566,661	-	5,566,661	6,220,885	-	6,220,885
2023	5,566,661		5,566,661	-	5,566,661	6,376,407	-	6,376,407
2024	5,566,661		5,566,661	-	5,566,661	6,535,817	-	6,535,817
2025	5,566,661		5,566,661	114,235	5,680,896	6,699,213	137,476	6,836,689
2026	5,566,661		5,566,661	318,535	5,885,196	6,866,693	392,925	7,259,618
2027	5,566,661		5,566,661	490,906	6,057,567	7,038,360	620,690	7,659,050
2028	5,566,661		5,566,661	646,786	6,213,447	7,214,319	838,227	8,052,546
2029	5,566,661		5,566,661	1,213,575	6,780,237	7,394,677	1,612,097	9,006,775
2030	5,566,661		5,566,661	969,692	6,536,353	7,579,544	1,320,329	8,899,873
2031	5,566,661		5,566,661	1,075,007	6,641,669	7,769,033	1,500,319	9,269,352
2032	5,566,661		5,566,661	1,168,097	6,734,758	7,963,259	1,670,994	9,634,253
2033	5,455,328		5,455,328	1,252,685	6,708,013	7,999,093	1,836,800	9,835,894
2034	5,346,221		5,346,221	1,328,456	6,674,677	8,035,089	1,996,599	10,031,688
2035	5,239,297		5,239,297	1,394,314	6,633,611	8,071,247	2,147,971	10,219,218
2036	5,134,511		5,134,511	1,453,640	6,588,150	8,107,568	2,295,346	10,402,914
2037	5,031,821		5,031,821	1,506,181	6,538,002	8,144,052	2,437,769	10,581,821
2038	4,931,184		4,931,184	1,550,922	6,482,107	8,180,700	2,572,938	10,753,638
2039	4,832,561		4,832,561	1,590,371	6,422,932	8,217,513	2,704,342	10,921,855
2040	4,735,909		4,735,909	1,624,758	6,360,667	8,254,492	2,831,885	11,086,377
2041	4,641,191		4,641,191	1,654,306	6,295,497	8,291,637	2,955,471	11,247,108
<b>Total</b>	<b>112,022,653</b>		<b>106,581,295</b>	<b>19,352,467</b>	<b>125,933,762</b>	<b>150,959,602</b>	<b>29,872,179</b>	<b>180,831,780</b>

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Administrative Expense Projection

Fiscal Year <u>Ending 6/30</u>	(1) Total Admin <u>Expense</u>	(2) Remaining <u>Permits</u>	(3) Admin Expense <u>On In-Force Permits</u>
2022	3,786,261	94%	3,573,369
2023	3,899,849	89%	3,473,285
2024	4,016,844	84%	3,373,166
2025	4,137,349	79%	3,283,682
2026	4,261,470	75%	3,203,128
2027	4,389,314	71%	3,132,340
2028	4,520,993	68%	3,067,104
2029	4,656,623	65%	3,006,399
2030	4,796,322	62%	2,953,226
2031	4,940,212	59%	2,904,205
2032	5,088,418	56%	2,859,245
2033	5,241,071	54%	2,817,718
2034	5,398,303	52%	2,780,328
2035	5,560,252	49%	2,748,348
2036	5,727,059	47%	2,717,744
2037	5,898,871	46%	2,692,246
2038	6,075,837	44%	2,669,965
2039	6,258,112	42%	2,650,328
2040	6,445,856	41%	2,636,103
2041	6,639,231	40%	2,624,643
<b>Total</b>	<b>101,738,247</b>		<b>59,166,576</b>

Notes: Col (1) from client data, trended at 3% per year.  
 Col (2) from Exhibit E-17, Col (5)  
 Col (3) = (1) × (2)

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Average Reclamation Expenses - Land

	<u>Surface</u>	<u>Underground</u>	<u>Other</u>
(1) Total reclamation expenditure in 2021 dollars (i.e., inflated)	142,676,375	61,814,683	49,768,338
(2) Total disturbed acreage	37,176	3,910	4,501
(3) Average cost per disturbed acre in 2021 dollars	3,838	15,808	11,058
(4) Percent of permitted acreage that is disturbed	70.01%	73.44%	79.46%
(5) Cost per permitted acre in 2021 dollars	2,687	11,609	8,787
(6) Selected cost per acre	2,685	11,610	8,785
Previous Selection	2,765	10,880	8,095



West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Average Reclamation Expenses - Water Capital

	<u>Surface</u>	<u>Underground</u>	<u>Other</u>
(1) Total expenditure in 2021 Dollars (i.e., inflated)	185,121,050	29,300,748	46,410,461
(2) Total disturbed acreage under permits with water issues	11,702	614	1,317
(3) Average cost per disturbed acre in 2021 dollars	15,820	47,726	35,238
(4) Percent of permitted acreage that is disturbed under permits with water	70.34%	87.67%	81.66%
(5) Cost Per Permitted Acre in 2021 dollars	11,128	41,839	28,775
(6) Percent of forfeited acres with water issues	31.33%	13.15%	28.48%
(7) Cost Per Disturbed Acre in 2021 dollars with water issues	4,956	6,277	10,034
(8) Cost Per Permitted Acre in 2021 dollars with water issues	3,486	5,503	8,194
(9) Selected Cost Per Acre with water issues	3,490	5,595	8,145
Previous Selection	3,490	5,690	8,095

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Average Reclamation Expenses - Water O&M

	<u>Surface</u>	<u>Underground</u>	<u>Other</u>
(1) Total Annual Expenditure in Actual Dollars for Water Forfeited Permits	4,054,151	697,530	712,356
(2) Total disturbed acreage under permits with water issues	11,702	614	1,317
(3) Total cost per disturbed acre for water issue sites	346	1,136	541
(4) Percent of permitted acreage that is disturbed under permits with water	70.34%	87.67%	81.66%
(5) Valuation Cost Per Permitted Acre	244	996	442
(6) Percent of forfeited acres with water issues	31.33%	13.15%	28.48%
(7) Valuation Cost Per Disturbed Acre with water issues	109	149	154
(8) Valuation Cost Per Permitted Acre with water issues	76	131	126
(9) Selected Valuation Cost Per Acre with water issues	90	140	135
Previous Selection	100	145	140

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Bond Size Adjustment Factor Calculation

<u>Bond Category</u>	<u>Bond Value</u>	(1) Previous Selected Factor	(2) 2015 Active + Inactive Permits	(3) 2015-21 Revoked Permits	(4) Forfeiture Probability	(5) Relativity	(6) 2021 Selected Factor
Small	Less than \$100,000	1.50	982	16	1.63%	1.05	1.25
Medium	Between \$100,000 and \$500,000	0.50	447	4	0.89%	0.57	0.55
Large	Above \$500,000	0.50	431	9	2.09%	1.34	0.90
<b>Total</b>			<b>1,860</b>	<b>29</b>	<b>1.56%</b>	<b>1.00</b>	

Notes: Col (1) from previous analysis  
 Cols (2) and (3) from client data  
 Col (4) = (3) / (2)  
 Col (5) = (4) / (4 Total)  
 Col (6) selected based on previous and current relativities

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Release and Forfeiture Probability Relativities by Status

	(1)	(2)	(3)	(4)	(5)	(6)
<u>Status</u>	<u>Total Permits 2015</u>	<u>Total Forfeitures 2015-21</u>	<u>Probability</u>	<u>Relativity</u>	<u>2019 Selection</u>	<u>Selected</u>
Active	1,338	14	1.05%	0.67	0.50	0.60
Inactive	264	8	3.03%	1.94	0.75	1.35
Phased Release	258	7	2.71%	1.74	3.00	2.35
Overall	1,860	29	1.56%			

	(1)	(2)	(3)	(4)	(5)	(6)
<u>Status</u>	<u>Total Permits 2015</u>	<u>Total Releases 2015-21</u>	<u>Probability</u>	<u>Relativity</u>	<u>2019 Selection</u>	<u>Selected</u>
Active	1,338	142	10.61%	0.84	0.80	0.80
Inactive	264	16	6.06%	0.48	0.55	0.50
Phased Release	258	76	29.46%	2.34	2.50	2.40
Overall	1,860	234	12.58%			

Notes:  
 Cols (1) and (2) from client data  
 Col (3) = (2) / (1)  
 Col (4) = (3) / (3 Total)  
 Col (5) from previous analysis  
 Col (6) selected based on previous and current relativities

**Triangle Data on Number of Permits, Forfeitures, Releases, and Terminations  
By Permit Type and Issue Year**

Surface  
Total Permits

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
1965	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	10	9	9	9	9	9	9	9	9	8	8	8	8	8	8	7	7	7	5	5
1969	11	11	11	10	10	10	10	10	10	10	10	10	10	9	8	7	7	7	5	5
1970	13	13	12	12	12	12	12	12	12	12	12	12	12	12	10	10	8	7	5	5
1971	20	20	19	19	19	19	19	18	18	18	18	18	18	18	14	13	11	7	7	7
1972	22	22	22	21	21	21	21	21	21	21	21	21	19	11	7	4	1	1	1	1
1973	22	22	22	22	22	22	22	22	22	22	22	19	16	11	10	10	8	7	6	6
1974	41	41	41	41	41	41	41	41	39	39	37	26	22	20	16	14	12	12	12	12
1975	103	103	103	103	103	101	100	98	95	89	67	47	38	30	25	24	22	20	16	16
1976	92	92	90	90	85	84	83	81	74	55	40	35	30	27	26	20	18	18	17	17
1977	118	116	114	107	106	105	104	96	76	54	45	35	32	27	25	22	21	18	17	17
1978	166	164	162	158	155	152	142	114	86	77	62	49	47	44	39	38	33	30	27	27
1979	81	81	80	78	77	73	63	52	44	42	40	36	36	31	29	24	19	17	15	15
1980	115	115	115	113	110	102	97	92	85	79	73	64	55	45	42	37	31	30	29	29
1981	165	165	162	153	146	139	130	126	118	111	107	100	91	85	76	72	59	53	47	47
1982	93	93	89	81	72	69	65	59	56	51	43	33	26	20	15	14	10	8	6	6
1983	190	188	180	157	147	133	125	113	105	93	72	63	54	49	43	40	34	28	24	24
1984	107	106	101	92	90	86	81	76	64	54	46	37	33	26	23	19	16	15	14	14
1985	133	128	121	120	118	116	112	104	93	81	68	60	46	38	31	27	25	25	24	24
1986	128	119	114	109	106	104	99	90	78	64	60	54	49	43	38	32	29	26	24	24
1987	140	138	131	127	124	115	103	92	81	69	58	53	45	35	29	22	20	19	19	19
1988	115	113	109	107	99	91	88	78	69	59	48	44	40	32	29	28	27	27	27	27
1989	134	125	123	120	115	110	103	97	86	74	62	52	47	40	37	35	33	31	28	28
1990	92	92	86	81	74	71	67	59	57	47	39	34	33	32	31	31	30	28	27	27
1991	74	72	69	67	66	65	64	56	50	42	35	31	31	29	27	25	23	19	19	19
1992	52	51	48	47	44	43	41	39	31	22	20	16	16	14	13	11	10	9	9	9
1993	59	58	52	49	49	48	45	42	37	32	29	27	26	24	20	19	16	16	16	16
1994	42	41	39	39	38	34	30	28	28	24	23	21	21	18	18	15	14	14	14	14
1995	40	40	40	39	39	37	34	30	28	26	25	24	23	23	22	22	21	21	20	20
1996	29	29	29	29	29	29	29	29	27	26	26	26	25	24	22	22	22	21	19	19
1997	47	45	44	44	42	42	42	40	38	37	36	36	34	31	30	29	28	27	27	27
1998	36	36	35	35	35	34	33	33	31	30	30	28	28	27	27	27	27	26	26	26
1999	17	17	14	14	14	12	12	11	11	10	10	9	8	7	7	7	7	7	7	7
2000	19	19	19	19	17	16	14	13	12	12	12	11	11	11	9	9	8	8	7	7
2001	26	26	26	26	26	26	26	25	25	25	25	25	25	25	24	24	24	24	24	24
2002	23	23	22	22	22	22	22	21	21	21	20	20	20	19	19	19	19	19	19	19
2003	29	29	29	28	28	27	25	24	24	23	22	22	22	22	22	22	22	22	22	22
2004	33	33	32	32	32	31	31	31	31	31	31	31	31	31	31	30	28	26	26	26
2005	19	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
2006	16	16	16	15	15	15	15	15	15	14	13	13	13	13	13	12				
2007	31	31	31	31	30	30	30	30	28	26	26	26	25	25	24					
2008	23	23	23	23	23	23	23	23	22	21	20	20	17	16						
2009	25	25	25	25	25	25	25	24	24	24	23	22	21							
2010	14	14	14	14	14	13	13	13	13	13	13	13	13							
2011	20	20	20	20	20	20	20	20	20	20	20	19								
2012	26	26	26	25	24	24	24	24	24	24	24	24								
2013	25	25	24	23	23	23	23	23	23	23										
2014	21	21	21	21	21	21	21	21	21	21										
2015	16	16	15	15	15	15	15													
2016	11	11	11	11	11	11														
2017	6	6	6	6	6															
2018	9	9	9	9																
2019	9	9	9																	
2020	11	11																		
2021	7																			

Surface  
Total Permits

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	3	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
1969	4	4	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	4	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	6	4	4	4	3	3	3	3	3	2	1	1	1	1	1	1	1	1	1	0
1972	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1973	5	5	3	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
1974	12	10	10	10	7	5	4	3	3	2	2	2	2	2	2	2	2	2	2	2
1975	15	11	9	8	6	6	5	4	4	4	4	4	4	4	4	4	3	2	2	2
1976	15	15	14	14	13	11	10	10	10	10	10	10	10	10	9	9	8	8	8	7
1977	14	14	13	12	12	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
1978	22	19	17	17	16	15	13	13	11	11	11	11	9	8	8	8	8	8	8	8
1979	13	11	11	11	10	8	8	7	6	6	5	5	5	5	5	5	5	5	4	4
1980	28	24	19	18	15	14	12	12	11	11	7	7	7	7	7	7	7	6	6	6
1981	43	39	38	36	34	32	30	29	29	27	26	24	23	23	22	21	21	20	19	19
1982	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	2
1983	22	20	16	16	15	15	14	13	12	11	11	11	9	9	9	9	9	9	8	7
1984	14	13	12	12	11	11	10	9	8	8	8	8	7	7	7	6	6	5	4	
1985	18	16	16	16	13	10	10	10	10	8	8	8	7	7	7	7	7	7	7	
1986	23	22	22	21	18	17	17	15	15	15	14	14	14	14	14	14	13			
1987	19	18	18	16	13	12	12	12	12	12	12	11	10	9	9	9				
1988	26	24	23	20	18	16	15	15	15	15	15	15	14	14	14					
1989	25	22	21	21	20	19	17	17	17	15	15	15	15	15						
1990	27	26	24	22	21	19	19	19	18	17	17	17	16							
1991	19	16	15	15	15	15	14	14	14	14	14	14	14							
1992	9	9	9	9	9	8	8	7	7	6	6									
1993	16	14	13	13	13	13	13	13	13	13	13									
1994	14	14	14	13	13	13	13	13	13											
1995	20	20	19	19	19	19	19	19												
1996	19	19	18	18	18	18	17													
1997	27	26	26	26	26	26														
1998	25	24	23	23	23															
1999	7	7	7	6																
2000	7	7	7																	
2001	24	23																		
2002	18																			
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2017																				
2018																				
2019																				
2020																				
2021																				

Surface  
Total Permits

Issue Yr	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1975	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1976	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1977	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
1978	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1979	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1980	6	5	3																	
1981	19	19																		
1982	2																			
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2019																				
2020																				
2021																				



Surface  
Total Releases

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2	2	0
1969	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0
1970	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	2	1	2	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	2	2	2	0
1972	0	0	0	1	0	0	0	0	0	0	0	0	1	8	4	3	3	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	3	3	5	1	0	2	0	1	0
1974	0	0	0	0	0	0	0	0	0	1	11	4	2	4	2	1	0	2	0	0
1975	0	0	0	0	0	0	0	1	0	4	22	17	8	7	4	1	2	2	2	4
1976	0	0	0	0	0	0	0	1	6	18	13	5	4	2	1	6	1	0	1	1
1977	0	0	0	1	0	0	0	8	20	20	8	10	3	3	2	3	1	2	1	2
1978	0	0	0	0	0	0	6	23	22	7	14	12	1	2	3	1	4	2	2	2
1979	0	0	0	0	0	3	9	9	7	2	2	3	0	4	2	3	3	1	2	2
1980	0	0	0	0	3	6	4	5	7	6	5	6	5	8	2	3	6	1	1	1
1981	0	0	0	7	4	6	9	4	6	6	4	5	7	4	6	1	11	6	6	6
1982	0	0	3	6	7	3	3	6	3	5	4	7	5	6	4	0	4	2	1	1
1983	0	1	6	18	7	13	4	10	8	8	14	4	7	2	4	3	6	4	4	1
1984	0	1	0	4	1	3	3	5	9	5	7	8	4	7	2	4	0	1	1	1
1985	0	4	4	1	0	1	3	4	8	9	11	7	10	8	7	4	2	0	1	1
1986	1	7	2	2	0	1	3	3	6	9	4	5	4	4	3	5	3	2	2	2
1987	1	2	3	2	1	2	7	5	6	11	10	5	7	6	5	7	2	0	0	0
1988	1	2	0	1	3	3	0	6	8	7	9	4	4	7	2	0	0	1	0	0
1989	0	3	1	1	1	1	3	5	11	8	12	5	4	7	3	1	2	2	3	3
1990	0	0	0	0	4	1	3	6	2	10	7	3	1	1	0	0	1	2	1	1
1991	0	0	1	0	0	0	1	8	5	8	7	4	0	2	1	2	1	3	0	0
1992	0	0	0	0	3	1	1	1	8	7	2	4	0	2	1	2	1	0	0	0
1993	0	1	1	2	0	1	1	3	5	4	3	1	1	2	4	0	1	0	0	0
1994	0	1	1	0	0	4	1	1	0	4	1	2	0	3	0	0	3	1	0	0
1995	0	0	0	1	0	1	3	4	2	0	2	1	1	0	0	1	0	1	1	1
1996	0	0	0	0	0	0	0	0	2	1	0	0	1	0	2	0	0	1	1	1
1997	0	2	1	0	2	0	0	2	2	1	1	0	1	2	1	1	1	0	0	0
1998	0	0	0	0	0	0	1	0	2	1	0	2	0	1	0	0	0	0	0	0
1999	0	0	3	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0
2000	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	1	1
2001	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2003	0	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0
2004	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0
2005	0	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	1	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	1	0	1	1
2008	0	0	0	0	0	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	0	1	1	1	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	0
2011	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Surface  
Total Releases

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	1	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	1	2	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	1	0	2	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1974	0	2	0	0	3	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0
1975	1	4	2	1	2	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0
1976	2	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1
1977	3	0	1	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	5	3	2	0	1	1	2	0	1	0	0	0	1	1	0	0	0	0	0	0
1979	2	2	0	0	1	2	0	1	1	0	1	0	0	0	0	0	0	0	1	0
1980	1	4	3	1	3	1	2	0	1	0	1	0	0	0	0	0	0	1	0	0
1981	3	2	1	2	2	2	2	1	0	0	1	1	1	0	1	1	0	1	1	0
1982	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
1983	1	2	3	0	1	0	1	1	1	1	0	0	2	0	0	0	0	0	0	1
1984	0	1	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	1	1	0
1985	4	2	0	0	3	1	0	0	0	2	0	0	1	0	0	0	0	0	0	0
1986	1	0	0	1	0	1	0	2	0	0	1	0	0	0	0	0	0	0	0	0
1987	0	1	0	1	2	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0
1988	1	1	0	3	1	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0
1989	2	2	1	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0
1990	0	1	2	2	1	2	0	0	1	1	0	0	1	0	0	0	0	0	0	0
1991	0	3	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
1993	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	1	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	0
1996	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	1	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	0
2001	0	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	0
2003	0	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	0
2005	0	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	0
2007	0	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	0
2009	0	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	0
2011	0	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	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Surface  
Total Releases

Issue Yr	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	1	0	0	1	0															
1979	0	0	0	0																
1980	0	1	2																	
1981	0	0																		
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2021																				

Surface  
Total Forfeitures

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	2	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1974	0	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	1	0	0
1975	0	0	0	0	0	2	1	1	3	2	0	3	1	1	1	0	0	0	0
1976	0	0	2	0	5	1	1	1	1	2	0	1	1	1	0	0	1	0	0
1977	0	2	2	6	1	1	1	0	0	2	1	0	0	2	0	0	0	1	0
1978	0	2	2	4	3	3	4	5	6	2	1	1	1	1	2	0	1	1	1
1979	0	0	1	2	1	1	1	2	1	0	0	1	0	1	0	2	2	1	0
1980	0	0	0	2	0	2	1	0	0	0	1	3	4	2	1	2	0	0	0
1981	0	0	3	2	3	1	0	0	2	1	0	2	2	2	3	3	2	0	0
1982	0	0	1	2	2	0	1	0	0	0	4	3	2	0	1	1	0	0	1
1983	0	1	2	5	3	1	4	2	0	4	7	5	2	3	2	0	0	2	3
1984	0	0	5	5	1	1	2	0	3	5	1	1	0	0	1	0	3	0	0
1985	0	1	3	0	2	1	1	4	3	3	2	1	4	0	0	0	0	0	0
1986	0	2	3	3	3	1	2	6	6	5	0	1	1	2	2	1	0	1	0
1987	0	0	4	2	2	7	5	6	5	1	1	0	1	4	1	0	0	1	0
1988	0	0	4	1	5	5	3	4	1	3	2	0	0	1	1	0	1	0	0
1989	0	6	1	2	4	4	4	1	0	4	0	5	1	0	0	1	0	0	0
1990	0	0	6	5	3	2	1	2	0	0	1	2	0	0	1	0	0	0	0
1991	0	2	2	2	1	1	0	0	1	0	0	0	0	0	1	0	1	1	0
1992	0	1	3	1	0	0	1	1	0	2	0	0	0	0	0	0	0	1	0
1993	0	0	5	1	0	0	2	0	0	1	0	1	0	0	0	1	2	0	0
1994	0	0	1	0	1	0	3	1	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
1997	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0
1998	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
1999	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	1	1	2	0	1	0	0	0	0	0	1	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	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
2003	0	0	0	1	0	0	2	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	1	2	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	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0
2007	0	0	0	0	1	0	0	0	1	1	0	0	0	1	1	0	0	0	0
2008	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
2009	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	1	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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Surface  
Total Forfeitures

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1977	0	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	1	0	0	0	1	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	0
1980	0	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
1981	1	2	0	0	0	0	0	0	2	0	1	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	0
1983	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
1985	2	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1987	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	1	1	0	0	1	1	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	0
1991	0	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	0
1993	0	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	0
1995	0	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	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	0
1998	0	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	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2003																				
2004																				
2005																				
2006																				
2007																				
2008																				
2009																				
2010																				
2011																				
2012																				
2013																				
2014																				
2015																				
2016																				
2017																				
2018																				
2019																				
2020																				
2021																				



Surface  
Misc Terminations

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0







Surface  
Percent Forfeited

Issue Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	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%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%	0.00%	18.18%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.88%	0.00%	2.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	1.94%	0.99%	1.00%	3.06%	2.11%	0.00%	4.48%	2.13%	2.63%	3.33%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	2.17%	0.00%	5.56%	1.18%	1.19%	1.20%	1.23%	1.35%	3.64%	0.00%	2.86%	3.33%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%
1977	0.00%	1.69%	1.72%	5.26%	0.93%	0.94%	0.95%	0.00%	0.00%	2.63%	1.85%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	0.00%	4.76%	0.00%
1978	0.00%	1.20%	1.22%	2.47%	1.90%	1.94%	2.63%	3.52%	5.26%	2.33%	1.30%	1.61%	2.04%	2.13%	4.55%	0.00%	2.63%	3.03%	3.33%	0.00%
1979	0.00%	0.00%	1.23%	2.50%	1.28%	1.30%	1.37%	1.17%	1.92%	0.00%	0.00%	3.81%	7.53%	6.94%	3.17%	5.56%	4.08%	0.00%	5.88%	10.71%
1980	0.00%	0.00%	0.00%	1.74%	0.00%	1.82%	0.98%	0.00%	0.00%	0.00%	1.27%	4.11%	6.25%	3.64%	2.22%	4.76%	0.00%	0.00%	0.00%	0.00%
1981	0.00%	0.00%	1.82%	1.23%	1.96%	0.68%	0.00%	0.00%	1.59%	0.85%	0.00%	1.87%	2.00%	2.20%	3.53%	3.95%	2.78%	0.00%	0.00%	0.00%
1982	0.00%	0.00%	1.08%	2.25%	2.47%	0.00%	1.45%	0.00%	0.00%	0.00%	7.84%	6.98%	6.06%	0.00%	5.00%	6.67%	0.00%	0.00%	12.50%	0.00%
1983	0.00%	0.53%	1.06%	2.78%	1.91%	0.68%	3.01%	1.60%	0.00%	3.81%	7.53%	6.94%	3.17%	5.56%	4.08%	0.00%	0.00%	5.88%	10.71%	0.00%
1984	0.00%	0.00%	4.72%	4.95%	1.09%	1.11%	2.33%	0.00%	3.95%	7.81%	1.85%	2.17%	0.00%	0.00%	3.85%	0.00%	15.79%	0.00%	0.00%	0.00%
1985	0.00%	0.75%	2.34%	0.00%	1.67%	0.85%	0.86%	3.57%	2.88%	3.23%	2.47%	1.47%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1986	0.00%	1.56%	2.52%	2.63%	2.75%	0.94%	1.92%	6.06%	6.67%	6.41%	0.00%	1.67%	1.85%	4.08%	4.65%	2.63%	0.00%	3.45%	0.00%	0.00%
1987	0.00%	0.00%	2.90%	1.53%	1.57%	5.65%	4.35%	5.83%	5.43%	1.23%	1.45%	0.00%	1.89%	8.89%	2.86%	0.00%	0.00%	5.00%	0.00%	0.00%
1988	0.00%	0.00%	3.54%	0.92%	4.67%	5.05%	3.30%	4.55%	1.28%	4.35%	3.99%	0.00%	0.00%	2.50%	3.13%	0.00%	3.45%	0.00%	0.00%	0.00%
1989	0.00%	4.48%	0.80%	1.63%	3.33%	3.48%	3.64%	0.97%	0.00%	4.65%	0.00%	8.06%	1.92%	0.00%	0.00%	2.70%	0.00%	0.00%	0.00%	0.00%
1990	0.00%	0.00%	6.52%	5.81%	3.70%	2.70%	1.41%	2.99%	0.00%	0.00%	2.13%	5.13%	0.00%	0.00%	3.13%	0.00%	0.00%	0.00%	0.00%	0.00%
1991	0.00%	2.70%	2.78%	2.90%	1.49%	1.52%	0.00%	0.00%	1.79%	0.00%	0.00%	0.00%	0.00%	0.00%	3.45%	0.00%	4.00%	4.35%	0.00%	0.00%
1992	0.00%	1.92%	5.88%	2.08%	0.00%	0.00%	2.33%	2.44%	0.00%	6.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	0.00%
1993	0.00%	0.00%	8.62%	1.92%	0.00%	0.00%	4.17%	0.00%	0.00%	2.70%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%	10.53%	0.00%	0.00%	0.00%
1994	0.00%	0.00%	2.44%	0.00%	2.56%	0.00%	8.82%	3.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1995	0.00%	0.00%	0.00%	0.00%	0.00%	2.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.17%	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%	4.00%	0.00%	0.00%	0.00%	0.00%	4.76%	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%	2.78%	2.94%	0.00%	0.00%	0.00%	0.00%	3.57%	0.00%
1998	0.00%	0.00%	2.78%	0.00%	0.00%	2.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.70%	0.00%	0.00%
1999	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	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%
2000	0.00%	0.00%	0.00%	0.00%	5.26%	5.88%	12.50%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%	9.09%	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%	0.00%
2002	0.00%	0.00%	4.35%	0.00%	0.00%	0.00%	0.00%	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	3.45%	0.00%	0.00%	7.41%	0.00%	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%	3.33%	7.14%	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%	0.00%
2006	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.14%	0.00%	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	0.00%
2007	0.00%	0.00%	0.00%	0.00%	3.23%	0.00%	0.00%	0.00%	3.33%	3.57%	0.00%	0.00%	0.00%	0.00%	4.00%	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%	4.35%	0.00%	0.00%	0.00%	0.00%	5.88%	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%	4.00%	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%	7.14%	0.00%	0.00%	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%	0.00%
2012	0.00%	0.00%	0.00%	3.85%	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%	0.00%
2013	0.00%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2014	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2015	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2016	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2021	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wtd Avg																				
5 Yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.96%	0.92%	0.97%	0.88%	1.98%	0.00%	0.00%
10 Yr	0.00%	0.00%	0.65%	0.58%	0.00%	0.49%	0.00%	0.47%	0.90%	0.46%	0.47%	0.00%	0.00%	1.05%	1.01%	0.50%	0.48%	1.93%	0.53%	0.00%
15 Yr	0.00%	0.00%	0.37%	0.68%	0.32%	0.31%	0.60%	0.61%	0.95%	0.31%	0.31%	0.00%	0.30%	1.55%	0.63%	0.68%	1.32%	1.99%		

Surface  
Percent Forfeited

Issue Year	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	33.33%	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%	0.00%	0.00%	0.00%
1969	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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	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%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	15.38%	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%
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%	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%	7.69%	0.00%	0.00%	0.00%	9.09%	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%	0.00%	0.00%
1980	0.00%	0.00%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	27.27%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1981	2.13%	4.65%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.90%	0.00%	3.85%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1983	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1984	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	9.09%	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%
1985	8.33%	0.00%	0.00%	0.00%	0.00%	15.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1986	0.00%	4.35%	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%	7.14%				
1987	0.00%	0.00%	0.00%	5.56%	6.25%	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%	3.85%	4.17%	0.00%	5.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%					
1989	3.57%	4.00%	0.00%	0.00%	4.76%	5.00%	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%							
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%							
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%							
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%							
1994	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%											
1996	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%													
1998	0.00%	0.00%	0.00%	0.00%	0.00%															
1999	0.00%	0.00%	0.00%	0.00%																
2000	0.00%	0.00%	0.00%																	
2001	0.00%	4.17%																		
2002	5.26%																			
2003																				
2004																				
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2015																				
2016																				
2017																				
2018																				
2019																				
2020																				
2021																				
Wtd Avg																				
5 Yr	1.20%	1.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.17%	2.56%	0.00%	0.00%	0.00%	0.00%
10 Yr	0.56%	0.60%	0.64%	0.00%	0.56%	0.58%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.10%	1.14%	0.00%	0.00%	0.00%	0.00%
15 Yr	0.69%	1.06%	0.75%	0.37%	2.27%	1.24%	0.48%	0.00%	0.00%	1.04%	1.67%	0.57%	0.60%	0.00%	0.77%	0.88%	0.96%	0.00%	0.00%	0.00%
All Yr	0.99%	1.27%	1.24%	0.22%	1.42%	1.36%	0.32%	0.35%	0.40%	1.29%	1.45%	0.52%	0.57%	0.00%	0.76%	0.86%	0.95%	0.00%	0.00%	0.00%
All Avg Rolling	1.10%	0.77%	0.84%	0.60%	0.62%	0.67%	0.69%	0.36%	0.13%	0.26%	0.49%	0.55%	0.45%	0.19%	0.22%	0.54%	1.01%	0.89%	0.47%	0.00%
Linear Smoothed	0.86%	0.83%	0.80%	0.77%	0.75%	0.72%	0.69%	0.66%	0.64%	0.61%	0.58%	0.55%	0.53%	0.50%	0.47%	0.45%	0.42%	0.39%	0.36%	0.34%
Prior Sel	0.63%	0.62%	0.60%	0.58%	0.57%	0.55%	0.53%	0.52%	0.50%	0.48%	0.47%	0.45%	0.43%	0.42%	0.40%	0.39%	0.37%	0.35%	0.34%	0.32%
Selected	0.86%	0.83%	0.80%	0.77%	0.75%	0.72%	0.69%	0.66%	0.64%	0.61%	0.58%	0.55%	0.53%	0.50%	0.47%	0.45%	0.42%	0.39%	0.36%	0.34%
Active	0.51%	0.50%	0.48%	0.46%	0.45%	0.43%	0.41%	0.40%	0.38%	0.37%	0.35%	0.33%	0.32%	0.30%	0.28%	0.27%	0.25%	0.23%	0.22%	0.20%
Inactive	1.15%	1.12%	1.08%	1.04%	1.01%	0.97%	0.93%	0.90%	0.86%	0.82%	0.79%	0.75%	0.71%	0.68%	0.64%	0.60%	0.56%	0.53%	0.49%	0.45%
Phased Release	2.01%	1.95%	1.88%	1.82%	1.75%	1.69%	1.62%	1.56%	1.50%	1.43%	1.37%	1.30%	1.24%	1.18%	1.11%	1.05%	0.98%	0.92%	0.85%	0.79%



Surface  
Percent Released

Issue Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%	28.57%	0.00%
1969	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%	28.57%	0.00%
1970	0.00%	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%	16.67%	0.00%	20.00%	12.50%	28.57%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	22.22%	0.00%	15.38%	18.18%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.76%	42.11%	36.36%	42.86%	75.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	13.64%	15.79%	31.25%	9.09%	0.00%	20.00%	0.00%	14.29%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.56%	29.73%	15.38%	9.09%	20.00%	12.50%	7.14%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.00%	0.00%	4.21%	24.72%	25.37%	17.02%	18.42%	13.33%	4.00%	8.33%	9.09%	20.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	1.20%	7.41%	24.32%	23.64%	12.50%	11.43%	6.67%	3.70%	23.08%	5.00%	0.00%	5.56%	0.00%	0.00%
1977	0.00%	0.00%	0.00%	0.88%	0.00%	0.00%	7.69%	20.83%	26.32%	14.81%	22.22%	8.57%	9.38%	7.41%	12.00%	4.55%	9.52%	5.56%	0.00%
1978	0.00%	0.00%	0.00%	0.00%	0.00%	3.95%	16.20%	19.30%	8.14%	18.18%	19.35%	2.04%	4.26%	6.82%	2.56%	10.53%	6.06%	6.67%	0.00%
1979	0.00%	0.00%	0.00%	0.00%	3.90%	12.33%	14.29%	13.46%	4.55%	4.76%	7.50%	0.00%	11.11%	6.45%	10.34%	12.50%	5.26%	11.76%	0.00%
1980	0.00%	0.00%	0.00%	0.00%	2.65%	5.45%	3.92%	5.15%	7.61%	7.06%	6.33%	8.22%	7.81%	14.55%	4.44%	7.14%	16.22%	3.23%	3.33%
1981	0.00%	0.00%	0.00%	4.32%	2.61%	4.11%	6.47%	3.08%	4.76%	5.08%	3.60%	4.67%	7.00%	4.40%	7.06%	1.32%	15.28%	10.17%	11.32%
1982	0.00%	0.00%	3.23%	6.74%	8.64%	4.17%	4.35%	3.23%	5.08%	8.93%	7.84%	16.28%	15.15%	23.08%	20.00%	0.00%	28.57%	20.00%	12.50%
1983	0.00%	0.53%	3.19%	10.00%	4.46%	8.84%	3.01%	8.00%	7.08%	7.62%	15.05%	5.56%	11.11%	3.70%	8.16%	6.98%	15.00%	11.76%	3.57%
1984	0.00%	0.93%	0.00%	3.96%	1.09%	3.33%	3.49%	6.17%	11.84%	7.81%	12.96%	17.39%	10.81%	21.21%	7.69%	17.39%	0.00%	6.25%	6.67%
1985	0.00%	3.01%	3.13%	0.83%	0.00%	0.85%	2.59%	3.57%	7.69%	9.68%	13.58%	10.29%	16.67%	17.39%	18.42%	12.90%	7.41%	0.00%	4.00%
1986	0.78%	5.47%	1.68%	1.75%	0.00%	0.94%	2.88%	3.03%	6.67%	11.54%	6.25%	8.33%	7.41%	8.16%	6.98%	13.16%	9.38%	6.90%	7.69%
1987	0.71%	1.43%	2.17%	1.53%	0.79%	1.61%	6.09%	4.85%	6.52%	13.58%	14.49%	8.62%	13.21%	13.33%	14.29%	24.14%	9.09%	0.00%	0.00%
1988	0.87%	1.74%	0.00%	0.92%	2.80%	3.03%	0.00%	6.82%	10.26%	10.14%	15.25%	8.33%	9.09%	17.50%	6.25%	0.00%	0.00%	3.57%	0.00%
1989	0.00%	2.24%	0.80%	0.81%	0.83%	0.87%	2.73%	4.85%	11.34%	9.30%	16.22%	8.06%	7.69%	14.89%	7.50%	2.70%	5.71%	6.06%	9.68%
1990	0.00%	0.00%	0.00%	0.00%	4.94%	1.35%	4.23%	8.96%	3.39%	17.54%	14.89%	7.69%	3.03%	0.00%	0.00%	3.23%	6.67%	3.57%	0.00%
1991	0.00%	0.00%	1.39%	0.00%	0.00%	0.00%	1.54%	12.50%	8.93%	16.00%	16.67%	11.43%	0.00%	6.45%	3.45%	7.41%	4.00%	13.04%	0.00%
1992	0.00%	0.00%	0.00%	0.00%	6.38%	2.27%	2.33%	2.44%	20.51%	22.58%	9.09%	20.00%	0.00%	12.50%	7.14%	15.38%	9.09%	0.00%	0.00%
1993	0.00%	1.69%	1.72%	3.85%	0.00%	2.04%	2.08%	6.67%	11.90%	10.81%	9.38%	3.45%	3.70%	7.69%	16.67%	0.00%	5.26%	0.00%	0.00%
1994	0.00%	2.38%	2.44%	0.00%	0.00%	10.53%	2.94%	3.33%	0.00%	14.29%	4.17%	8.70%	0.00%	14.29%	0.00%	0.00%	16.67%	6.67%	0.00%
1995	0.00%	0.00%	0.00%	2.50%	0.00%	2.56%	8.11%	11.76%	6.67%	0.00%	7.14%	3.85%	4.00%	0.00%	4.35%	0.00%	4.55%	4.76%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.90%	3.70%	0.00%	3.85%	0.00%	8.33%	0.00%	0.00%	4.55%	4.76%	0.00%
1997	0.00%	4.26%	2.22%	0.00%	4.55%	0.00%	0.00%	4.76%	5.00%	2.63%	2.70%	0.00%	2.78%	5.88%	3.23%	3.33%	3.45%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	6.06%	3.23%	0.00%	6.67%	0.00%	3.57%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	0.00%	0.00%	17.65%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	10.00%	11.11%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%
2000	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	7.14%	0.00%	0.00%	0.00%	8.33%	0.00%	9.09%	0.00%	11.11%	0.00%	12.50%	0.00%
2001	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%	4.00%	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%	4.76%	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%	3.57%	0.00%	4.00%	0.00%	4.17%	4.35%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2004	0.00%	0.00%	3.03%	0.00%	0.00%	3.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.23%	3.33%	0.00%	0.00%
2005	0.00%	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%
2006	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%	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%	3.33%	3.57%	0.00%	0.00%	3.85%	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%	4.55%	4.76%	0.00%	15.00%	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%	4.17%	4.35%	4.55%	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%	5.00%	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%	4.00%	0.00%	0.00%	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%	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%	0.00%
2014	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2015	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%	0.00%
2016	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2021	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wtd Avg																			
5 Yr	0.00%	0.00%	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.97%	2.88%	1.05%	5.05%	0.00%	0.00%	0.97%	0.88%	0.00%	1.25%
10 Yr	0.00%	0.00%	0.65%	0.58%	0.55%	0.00%	0.00%	0.00%	0.45%	1.83%	2.37%	0.47%	2.40%	0.53%	1.01%	1.00%	1.45%	0.97%	1.59%
15 Yr	0.00%	0.00%	0.37%	0.34%	0.65%	0.62%	0.00%	0.91%	0.32%	1.88%	1.85%	1.54%	2.71%	2.17%	2.83%	1.69%	2.98%	2.66%	2.40%
All Yr	0.10%	0.88%	1.04%	1.77%	1.46%	2.01%	2.62%	5.22%	7.18%	8.53%	9.71%	9.03%	6.87%	8.80%	7.20%	5.99%	7.85%	5.57%	4.93%
All Avg Rolling	0.10%	0.12%	0.42%	0.63%	0.78%	0.67%	0.66%	0.95%	1.39%	2.27%	3.16%	3.51%	3.83%	3.39%	3.30%	2.68%	2.82%	2.67%	2.71%
Linear Smoothed	0.10%	0.12%	0.24%	0.36%	0.69%	1.03%													

Surface  
Percent Released

Issue Year	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	40.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	20.00%	50.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	14.29%	33.33%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	16.67%	0.00%	40.00%	66.67%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	16.67%	0.00%	0.00%	30.00%	28.57%	20.00%	25.00%	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	6.25%	26.67%	18.18%	11.11%	25.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	33.33%	0.00%	0.00%	0.00%
1976	11.76%	0.00%	6.67%	0.00%	7.14%	0.00%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	12.50%
1977	17.65%	0.00%	7.14%	7.69%	0.00%	33.33%	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%
1978	18.52%	13.64%	10.53%	0.00%	5.88%	6.25%	13.33%	0.00%	7.69%	0.00%	0.00%	9.09%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	13.33%	15.38%	0.00%	0.00%	9.09%	20.00%	0.00%	12.50%	14.29%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%
1980	3.45%	14.29%	12.50%	5.26%	16.67%	6.67%	14.29%	0.00%	8.33%	0.00%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%
1981	6.38%	4.65%	2.56%	5.26%	5.56%	5.88%	6.25%	3.33%	0.00%	0.00%	3.70%	3.85%	4.17%	0.00%	4.35%	4.55%	0.00%	4.76%	5.00%	0.00%
1982	16.67%	0.00%	0.00%	20.00%	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%	33.33%
1983	4.17%	9.09%	15.00%	0.00%	6.25%	0.00%	6.67%	7.14%	7.69%	8.33%	0.00%	0.00%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	12.50%
1984	0.00%	7.14%	0.00%	0.00%	8.33%	0.00%	0.00%	10.00%	0.00%	11.11%	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	20.00%
1985	16.67%	11.11%	0.00%	0.00%	18.75%	7.69%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1986	4.17%	0.00%	0.00%	4.55%	0.00%	5.56%	0.00%	11.76%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1987	0.00%	5.26%	0.00%	5.56%	12.50%	7.69%	0.00%	0.00%	0.00%	0.00%	8.33%	9.09%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1988	3.70%	3.85%	0.00%	13.04%	5.00%	11.11%	6.25%	0.00%	0.00%	0.00%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1989	7.14%	8.00%	4.55%	0.00%	0.00%	0.00%	10.53%	0.00%	0.00%	11.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1990	0.00%	3.70%	7.69%	8.33%	4.55%	9.52%	0.00%	0.00%	0.00%	5.26%	5.56%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1991	0.00%	15.79%	6.25%	0.00%	0.00%	0.00%	6.67%	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%
1992	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	11.11%	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%
1993	0.00%	12.50%	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	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%	7.14%	0.00%	0.00%	0.00%	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%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	5.26%	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%	0.00%	0.00%	0.00%
1997	0.00%	3.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1998	3.85%	4.00%	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%	0.00%	0.00%	0.00%
1999	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%	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%	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%	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%	0.00%
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5 Yr	1.20%	2.22%	2.41%	1.08%	0.00%	0.00%	1.41%	1.49%	1.52%	5.80%	0.00%	1.37%	4.17%	1.67%	0.00%	0.00%	0.00%	4.35%	6.98%	5.00%
10 Yr	0.56%	2.38%	2.56%	2.38%	0.56%	2.91%	3.29%	2.04%	0.74%	5.38%	0.83%	0.85%	5.56%	1.82%	1.02%	1.10%	0.00%	3.66%	5.41%	4.41%
15 Yr	1.38%	4.23%	2.61%	3.36%	3.03%	3.31%	2.87%	2.79%	1.49%	4.17%	2.78%	1.15%	4.79%	2.05%	0.77%	0.88%	1.92%	4.49%	6.41%	4.35%
All Yr	5.42%	6.90%	4.97%	3.81%	5.92%	5.43%	5.36%	3.19%	2.37%	4.29%	2.90%	1.04%	4.57%	2.00%	0.76%	0.86%	1.90%	4.49%	6.41%	4.35%
All Avg Rolling	2.33%	2.87%	3.07%	3.24%	2.72%	2.65%	2.84%	2.84%	2.38%	2.94%	2.69%	2.55%	2.50%	2.59%	2.43%	1.08%	0.77%	1.97%	3.84%	5.03%
Linear Smoothed	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%
Prior Sel	3.26%	3.21%	3.15%	3.09%	3.03%	2.97%	2.91%	2.85%	2.80%	2.74%	2.68%	2.62%	2.56%	2.50%	2.45%	2.39%	2.33%	2.27%	2.21%	2.15%
Selected	2.94%	2.88%	2.82%	2.76%	2.71%	2.66%	2.60%	2.55%	2.50%	2.45%	2.40%	2.35%	2.30%	2.26%	2.21%	2.17%	2.13%	2.08%	2.04%	2.00%
Active	2.35%	2.30%	2.26%	2.21%	2.17%	2.12%	2.08%	2.04%	2.00%	1.96%	1.92%	1.88%	1.84%	1.81%	1.77%	1.74%	1.70%	1.67%	1.63%	1.60%
Inactive	1.47%	1.44%	1.41%	1.38%	1.35%	1.33%	1.30%	1.27%	1.25%	1.22%	1.20%	1.18%	1.15%	1.13%	1.11%	1.08%	1.06%	1.04%	1.02%	1.00%
Phased Release	7.05%	6.91%	6.77%	6.63%	6.50%	6.37%	6.24%	6.12%	6.00%	5.88%	5.76%	5.64%	5.53%	5.42%	5.31%	5.21%	5.10%	5.00%	4.90%	4.80%

Surface  
Percent Released

Issue Year	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	12.50%	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%	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%	0.00%	0.00%
1980	0.00%	16.67%	40.00%	0.00%	0.00%	0.00%	0.00%	0.00%	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%	0.00%	0.00%	0.00%	0.00%	0.00%	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	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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Wtd Avg																				
5 Yr	2.56%	2.27%	9.68%	3.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10 Yr	1.72%	1.79%	8.33%	3.33%	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%	0.00%
15 Yr	1.69%	1.79%	8.33%	3.33%	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%	0.00%
All Yr	1.69%	1.79%	8.33%	3.33%	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%	0.00%
All Avg Rolling	4.25%	2.78%	4.17%	4.67%	4.03%	1.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Linear Smoothed	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%	2.87%
Prior Sel	2.09%	2.04%	1.98%	1.92%	1.86%	1.80%	1.74%	1.69%	1.63%	1.57%	1.51%	1.45%	1.39%	1.34%	1.28%	1.22%	1.16%	1.10%		
Selected	1.96%	1.92%	1.88%	1.85%	1.81%	1.77%	1.74%	1.70%	1.67%	1.63%	1.60%	1.57%	1.54%	1.51%	1.48%	1.45%	1.42%	1.39%	1.36%	1.34%
Active	1.57%	1.54%	1.51%	1.48%	1.45%	1.42%	1.39%	1.36%	1.33%	1.31%	1.28%	1.26%	1.23%	1.21%	1.18%	1.16%	1.14%	1.11%	1.09%	1.07%
Inactive	0.98%	0.96%	0.94%	0.92%	0.90%	0.89%	0.87%	0.85%	0.83%	0.82%	0.80%	0.79%	0.77%	0.75%	0.74%	0.72%	0.71%	0.70%	0.68%	0.67%
Phased Release	4.71%	4.61%	4.52%	4.43%	4.34%	4.25%	4.17%	4.09%	4.00%	3.92%	3.85%	3.77%	3.69%	3.62%	3.55%	3.48%	3.41%	3.34%	3.27%	3.21%

Underground  
Total Permits

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1
1977	36	36	35	33	32	30	28	28	19	16	14	14	11	11	9	9	8	8	8
1978	103	102	99	94	91	86	75	55	49	41	38	35	32	32	29	28	26	24	24
1979	71	70	65	64	63	58	47	40	36	36	35	35	35	34	34	33	32	29	29
1980	107	107	107	106	92	78	72	67	65	61	60	60	59	57	56	53	46	45	42
1981	178	178	177	172	157	149	148	142	138	136	133	131	129	127	124	113	99	90	83
1982	102	102	100	97	93	90	86	84	83	82	78	77	74	69	54	44	36	34	29
1983	306	303	286	276	256	232	219	214	204	185	172	163	150	134	126	118	108	95	84
1984	191	187	181	171	152	131	124	119	112	106	99	90	88	77	73	58	55	46	46
1985	90	87	83	78	72	66	61	60	58	57	49	42	34	34	32	28	25	23	19
1986	96	95	90	87	84	81	78	76	74	69	57	49	44	38	30	24	24	22	20
1987	107	104	101	96	94	89	88	84	76	71	65	61	56	41	36	33	29	28	28
1988	175	170	163	156	139	126	115	97	87	83	71	65	52	44	38	33	31	28	28
1989	130	128	124	112	105	92	86	77	69	65	56	47	42	39	32	32	31	28	25
1990	52	50	48	47	43	41	39	38	32	31	27	25	24	22	18	17	16	15	15
1991	47	43	41	41	37	37	31	31	31	28	25	25	21	20	19	19	19	19	18
1992	49	49	49	45	45	44	43	42	41	35	32	31	31	28	28	26	25	24	22
1993	56	53	46	45	42	40	39	39	37	37	35	32	30	30	29	26	25	25	24
1994	56	55	54	54	51	48	47	45	45	44	43	39	38	36	34	33	31	30	29
1995	43	43	41	40	38	36	35	33	33	32	32	30	28	25	24	24	21	21	21
1996	45	44	44	44	40	37	37	36	36	34	34	31	30	29	29	28	27	27	25
1997	43	42	42	42	41	41	38	37	37	37	33	32	31	31	29	29	29	29	29
1998	37	37	37	37	34	32	30	29	29	28	25	24	24	23	23	22	19	19	19
1999	35	35	34	34	33	31	31	31	31	31	30	29	29	29	29	28	27	24	23
2000	31	31	31	31	30	30	30	27	27	27	26	25	25	24	24	24	23	20	19
2001	20	20	20	20	20	20	18	18	18	17	17	16	16	16	16	16	12	12	12
2002	25	25	25	25	25	23	23	23	21	21	19	19	18	18	17	15	15	14	12
2003	31	31	30	30	29	28	28	28	26	26	25	24	24	23	23	22	22	22	20
2004	23	22	21	21	19	19	19	18	18	16	15	15	15	15	13	13	12	12	12
2005	18	18	18	18	18	17	17	17	16	15	15	15	15	14	14	14	14	14	14
2006	20	20	20	19	19	19	18	18	18	18	18	17	17	16	16	15	15	15	15
2007	21	21	21	21	20	20	20	20	20	19	19	15	15	15	15	15	15	15	15
2008	21	21	18	18	17	16	16	16	16	15	15	15	15	13	13	13	13	13	13
2009	19	19	19	19	19	19	19	19	19	17	17	17	17	17	17	17	17	17	17
2010	26	26	26	24	24	24	22	20	20	20	20	20	20	20	20	20	20	20	20
2011	17	17	16	16	16	16	15	15	15	15	15	14	14	14	14	14	14	14	14
2012	17	17	15	14	13	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2013	19	18	18	17	17	17	17	17	17	16	16	16	16	16	16	16	16	16	16
2014	29	29	29	24	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
2015	9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
2016	7	7	7	7	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2017	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
2018	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2019	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
2020	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
2021	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7



Underground  
Total Permits

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1977	7	6	5	5	4	4	4	4	4	4	4	3	2	2	2	2	2	2	2	2
1978	21	20	19	15	14	12	11	11	11	10	9	9	8	8	7	7	7	7	7	7
1979	28	25	25	21	21	19	19	18	18	17	16	14	14	13	11	10	10	10	10	10
1980	40	36	34	30	26	25	18	15	14	14	14	12	12	11	11	11	10	10	10	10
1981	79	66	61	55	50	45	45	42	38	38	36	36	35	35	31	31	30	30	30	30
1982	24	23	23	21	18	16	16	15	15	14	13	12	12	11	10	10	10	10	9	8
1983	79	75	73	68	63	59	52	51	51	49	49	44	44	44	44	44	44	43	42	41
1984	41	41	41	38	34	32	31	30	28	27	24	24	23	22	22	20	20	19	19	
1985	19	19	17	15	13	11	11	11	11	10	10	10	10	9	8	8	7	7		
1986	19	15	15	14	12	10	10	9	9	9	9	9	9	9	9	9	9			
1987	26	22	20	16	16	16	15	15	15	15	13	12	11	11	10	10				
1988	26	25	25	24	23	22	20	19	18	18	18	17	17	16	16					
1989	25	23	21	21	20	19	19	19	19	19	18	18	18	17						
1990	13	13	12	12	11	11	10	10	10	10	10	10	10							
1991	17	16	14	14	14	14	14	13	12	11	11									
1992	22	22	21	21	19	18	17	16	16	15	15									
1993	23	19	19	19	19	18	18	18	18											
1994	27	26	25	24	24	17	17	17												
1995	20	20	20	20	19	18	18	17												
1996	23	23	20	18	18	18	16													
1997	29	28	27	26	26	25														
1998	18	17	16	16	16															
1999	23	21	20	20																
2000	19	19	18																	
2001	11	11																		
2002	10																			
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2020																				
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Underground  
Total Permits

Issue Yr	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1977	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1978	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
1979	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1980	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
1981	30	29																		
1982	8																			
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2019																				
2020																				
2021																				

Underground  
Total Releases

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	1	0	0	6	2	2	0	3	0	1	0	1	0	0
1978	0	0	0	0	0	0	8	15	3	7	3	0	2	2	0	1	0	1	1
1979	0	1	0	0	0	3	8	3	4	0	0	0	0	0	1	0	1	1	2
1980	0	0	0	0	7	7	3	3	2	4	1	0	1	1	1	2	6	1	2
1981	0	0	0	3	10	4	1	6	4	1	3	1	1	1	0	9	11	8	6
1982	0	0	2	2	3	3	4	2	1	1	4	1	1	3	11	9	7	2	4
1983	0	1	16	6	16	21	12	3	9	13	11	3	8	11	6	8	8	10	10
1984	0	1	3	6	10	18	2	4	6	3	5	5	1	8	2	15	3	8	0
1985	0	3	1	5	3	2	3	0	0	1	5	6	5	0	2	2	2	2	3
1986	0	1	2	2	2	2	2	1	1	1	9	6	5	6	7	5	0	1	2
1987	1	2	1	3	2	4	1	1	5	3	5	2	5	12	3	3	3	1	0
1988	4	4	3	5	15	5	8	7	7	3	6	5	9	7	6	3	1	2	0
1989	0	0	4	9	3	9	4	9	5	3	7	7	3	2	4	0	1	2	3
1990	0	1	1	0	3	2	0	0	5	1	3	2	0	2	4	1	1	0	1
1991	0	1	1	0	2	0	2	0	0	3	3	0	4	1	1	0	0	0	1
1992	0	0	0	1	0	0	1	0	1	6	2	0	0	3	0	2	1	1	2
1993	0	3	1	1	1	1	1	0	1	0	1	3	2	0	1	3	1	0	1
1994	0	0	0	0	2	3	1	2	0	1	1	4	1	2	2	1	2	1	1
1995	1	0	1	1	1	2	0	2	0	1	0	2	2	3	0	0	3	0	0
1996	0	1	0	0	2	3	0	1	0	2	0	2	1	1	0	1	1	0	1
1997	0	1	0	0	1	0	2	1	0	0	4	1	1	0	2	0	0	0	0
1998	0	0	0	0	3	1	2	1	0	1	3	0	0	1	0	1	3	0	0
1999	0	0	1	0	0	2	0	0	0	0	1	1	0	0	0	1	1	3	1
2000	0	0	0	0	1	0	0	3	0	0	1	1	0	1	0	0	1	3	1
2001	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	4	0	0	0
2002	0	0	0	0	0	2	0	0	2	0	2	0	1	0	1	2	0	1	2
2003	0	0	0	0	1	1	0	0	2	0	1	1	0	1	0	1	0	0	2
2004	0	1	1	0	2	0	0	1	0	2	1	0	0	0	2	0	1	0	0
2005	0	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0
2006	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0
2007	0	0	0	0	1	0	0	0	1	0	4	0	0	0	0	0	0	0	0
2008	0	0	3	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0
2009	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
2010	0	0	0	2	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0
2011	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0
2012	0	0	2	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0
2013	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2014	0	0	0	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Underground  
Total Releases

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	1	1	1	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
1978	3	1	1	4	1	2	0	0	0	1	0	1	0	1	0	0	0	0	0	0
1979	0	1	0	4	0	2	0	1	0	1	1	1	0	1	2	1	0	0	0	0
1980	2	4	2	4	4	1	7	3	1	0	0	2	0	0	0	0	0	1	0	0
1981	4	12	5	5	5	5	0	3	4	0	2	0	1	0	4	0	1	0	0	0
1982	5	1	0	1	3	2	0	1	0	0	1	1	0	1	1	0	0	0	1	1
1983	2	3	2	4	5	3	7	0	0	2	0	2	0	0	0	0	0	1	1	1
1984	4	0	0	2	4	2	1	0	2	1	3	0	1	1	0	2	0	1	0	0
1985	0	0	1	2	2	2	0	0	0	0	0	0	0	1	1	0	1	0	0	0
1986	1	1	0	1	2	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1987	1	4	2	3	0	0	1	0	0	0	2	1	1	0	0	0	0	0	0	0
1988	2	1	0	0	1	1	2	1	0	0	0	1	0	1	0	1	0	0	0	0
1989	0	2	2	0	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0
1990	2	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	1	2	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0
1992	0	0	1	0	1	1	1	1	0	1	0	1	0	0	0	0	0	0	0	0
1993	1	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	2	1	1	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1996	2	0	3	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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2021																				



Underground  
Total Forfeitures

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	1	2	1	1	2	0	3	1	0	0	0	0	1	0	0	0	0
1978	0	1	3	5	3	5	3	5	3	1	0	0	1	1	0	2	1	1	1
1979	0	0	5	1	1	2	3	4	0	0	1	0	0	0	0	0	0	0	1
1980	0	0	0	1	7	7	3	2	0	0	0	0	0	1	0	1	1	0	1
1981	0	0	1	2	5	4	0	0	0	1	0	1	1	1	3	2	3	1	1
1982	0	0	0	1	1	0	0	0	0	0	0	0	2	2	4	1	1	0	1
1983	0	2	1	4	4	3	1	2	1	6	2	6	5	5	2	0	2	3	1
1984	0	3	3	4	9	3	5	1	1	3	2	4	1	3	2	0	0	1	0
1985	0	0	3	0	3	4	2	1	2	0	3	1	3	0	0	2	1	0	1
1986	0	0	3	1	1	1	1	1	1	4	3	2	0	0	1	1	0	1	0
1987	0	1	2	2	0	1	0	3	3	2	1	2	0	3	2	0	1	0	0
1988	0	1	4	2	2	8	3	11	3	1	6	1	4	1	0	2	1	1	0
1989	0	2	0	3	4	4	2	0	3	1	2	2	2	1	3	0	0	1	0
1990	0	1	1	1	1	0	2	1	1	0	1	0	1	0	0	0	0	0	0
1991	0	3	1	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	3	0	1	0	1	0	0	1	1	0	0	0	0	0	0	0
1993	0	0	6	0	1	1	0	0	1	0	1	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	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0
1996	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1997	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
1999	0	0	0	0	1	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	1	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	1	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	1	0	0	0	0	0	0	0	0	0	0	0	1	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	1	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
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Underground  
Total Forfeitures

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	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	1	0	0	1	0	0	0	0	0	0	0	0	0	0
1979	1	2	0	0	0	0	0	0	0	0	0	1	0	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	0	0
1981	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1983	2	1	0	1	0	1	0	1	0	0	0	3	0	0	0	0	0	0	0	0
1984	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
1986	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0				
1988	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0				
1989	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				
1991	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0				
1992	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				
1994	0	0	0	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	0	0	0	0				
1996	0	0	0	0	0	0	1	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				
1998	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				
2000	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				
2002	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				
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Underground  
Total Forfeitures

Issue Yr	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	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	0
1979	0	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	0
1981	0	1																		
1982	0																			
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Underground  
Misc Terminations

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0





Underground  
Percent Forfeited

Issue Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1977	0.00%	0.00%	2.78%	5.71%	3.03%	3.13%	6.67%	0.00%	10.71%	5.26%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	0.97%	2.94%	5.05%	3.19%	5.49%	3.49%	6.67%	5.45%	2.04%	0.00%	0.00%	2.63%	2.86%	0.00%	6.25%	3.45%	3.57%	3.85%
1979	0.00%	0.00%	7.14%	1.54%	1.56%	3.17%	5.17%	8.51%	0.00%	0.00%	2.78%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	3.13%
1980	0.00%	0.00%	0.00%	0.93%	6.60%	7.61%	3.85%	2.78%	0.00%	0.00%	0.00%	0.00%	1.69%	0.00%	1.79%	1.89%	0.00%	2.22%	0.00%
1981	0.00%	0.00%	0.56%	1.13%	2.91%	2.55%	0.00%	0.00%	0.00%	0.72%	0.00%	0.75%	0.76%	0.78%	2.36%	1.61%	2.65%	1.01%	1.11%
1982	0.00%	0.00%	0.00%	1.00%	1.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.60%	2.70%	5.80%	1.85%	2.27%	0.00%	2.94%
1983	0.00%	0.65%	0.33%	1.40%	1.45%	1.17%	0.43%	0.91%	0.47%	2.94%	1.08%	3.49%	3.07%	3.33%	1.49%	0.00%	1.69%	2.78%	1.05%
1984	0.00%	1.57%	1.60%	2.21%	5.26%	1.97%	3.82%	0.81%	0.84%	2.68%	1.89%	4.04%	1.11%	3.41%	2.60%	0.00%	0.00%	1.82%	0.00%
1985	0.00%	0.00%	3.45%	0.00%	3.85%	5.56%	3.03%	1.64%	3.33%	0.00%	5.26%	2.04%	7.14%	0.00%	0.00%	6.25%	3.57%	0.00%	4.35%
1986	0.00%	0.00%	3.16%	1.11%	1.15%	1.19%	1.23%	1.28%	1.32%	5.41%	4.35%	3.51%	0.00%	0.00%	2.63%	3.33%	0.00%	4.17%	0.00%
1987	0.00%	0.93%	1.92%	1.98%	0.00%	1.06%	0.00%	3.41%	3.57%	2.63%	1.41%	3.08%	0.00%	5.36%	4.88%	0.00%	3.03%	0.00%	0.00%
1988	0.00%	0.57%	2.35%	1.23%	1.28%	5.76%	2.38%	9.57%	3.09%	1.15%	7.23%	1.41%	6.15%	1.92%	0.00%	5.26%	3.03%	3.23%	0.00%
1989	0.00%	1.54%	0.00%	2.42%	3.57%	3.81%	2.17%	0.00%	3.90%	1.45%	3.08%	3.57%	4.26%	2.38%	7.69%	0.00%	0.00%	3.23%	0.00%
1990	0.00%	1.92%	2.00%	2.08%	2.13%	0.00%	4.88%	2.56%	2.63%	0.00%	3.23%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1991	0.00%	6.38%	2.33%	0.00%	4.88%	0.00%	10.81%	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%	6.12%	0.00%	2.22%	0.00%	2.33%	0.00%	0.00%	2.86%	3.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1993	0.00%	0.00%	11.32%	0.00%	2.22%	2.38%	0.00%	0.00%	2.56%	0.00%	2.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1994	0.00%	1.79%	1.82%	0.00%	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%
1995	0.00%	0.00%	2.33%	0.00%	2.50%	0.00%	2.78%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%
1996	0.00%	0.00%	0.00%	0.00%	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	0.00%	0.00%	0.00%	0.00%	3.70%	0.00%
1997	0.00%	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%
1998	0.00%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	0.00%	0.00%	0.00%	0.00%	4.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1999	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%	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%	5.56%	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%	3.23%	0.00%	0.00%	0.00%	0.00%	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%	5.00%	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%	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%	6.67%	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%	0.33%	0.00%	0.62%	0.00%	0.29%	0.29%	0.29%	0.00%	0.00%	0.30%
2011	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.32%	1.46%	1.52%	1.48%	1.51%	1.65%	1.13%	1.14%	1.03%	0.99%
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%
2014	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2015	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2016	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2021	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wtd Avg																			
5 Yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.30%	0.00%	1.20%	0.00%	0.00%	0.00%	0.00%
10 Yr	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.53%	0.00%	0.49%	0.00%	0.00%	0.46%	0.46%
15 Yr	0.00%	0.00%	0.00%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.33%	0.00%	0.62%	0.00%	0.29%	0.29%	0.29%	0.00%	0.00%	0.30%
All Yr	0.00%	0.59%	1.54%	1.37%	2.16%	2.13%	1.64%	1.69%	1.24%	1.32%	1.46%	1.52%	1.48%	1.51%	1.65%	1.13%	1.14%	1.03%	0.99%
All Avg Rolling	0.00%	0.07%	0.18%	0.33%	0.46%	0.51%	0.49%	0.45%	0.38%	0.38%	0.36%	0.44%	0.42%	0.60%	0.59%	0.72%	0.52%	0.44%	0.33%
Linear Smoothed	0.00%	0.15%	0.22%	0.29%	0.36%	0.42%	0.49%	0.41%	0.41%	0.41%	0.41%	0.40%	0.40%	0.40%	0.39%	0.39%	0.39%	0.38%	0.38%



Underground  
Percent Forfeited

Issue Year	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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%	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%	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%	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%	0.00%	0.00%
1981	0.00%	3.33%																		
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5 Yr	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%	0.00%	0.00%	0.00%	0.00%
10 Yr	0.00%	1.69%	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%	0.00%
15 Yr	0.00%	1.69%	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%	0.00%
All Yr	0.00%	1.69%	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%	0.00%
All Avg Rolling	0.00%	0.57%	0.57%	0.57%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Linear Smoothed	0.31%	0.31%	0.31%	0.30%	0.30%	0.30%	0.29%	0.29%	0.28%	0.28%	0.28%	0.28%	0.27%	0.27%	0.27%	0.26%	0.26%	0.26%	0.25%	
Prior Sel	0.24%	0.23%	0.23%	0.22%	0.22%	0.21%	0.21%	0.20%	0.19%	0.19%	0.18%	0.18%	0.17%	0.16%	0.16%	0.15%	0.15%	0.14%		
Selected	0.31%	0.31%	0.31%	0.30%	0.30%	0.30%	0.29%	0.29%	0.28%	0.28%	0.28%	0.28%	0.27%	0.27%	0.27%	0.26%	0.26%	0.26%	0.25%	
Active	0.19%	0.19%	0.18%	0.18%	0.18%	0.18%	0.17%	0.17%	0.17%	0.17%	0.17%	0.17%	0.16%	0.16%	0.16%	0.16%	0.16%	0.15%	0.15%	
Inactive	0.42%	0.42%	0.41%	0.41%	0.41%	0.40%	0.39%	0.39%	0.38%	0.38%	0.38%	0.38%	0.37%	0.37%	0.36%	0.36%	0.35%	0.35%	0.34%	
Phased Release	0.74%	0.73%	0.72%	0.71%	0.71%	0.70%	0.69%	0.68%	0.68%	0.67%	0.66%	0.65%	0.65%	0.64%	0.63%	0.62%	0.62%	0.61%	0.60%	0.59%

Underground  
Percent Released

Issue Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1977	0.00%	0.00%	0.00%	0.00%	0.00%	3.13%	0.00%	0.00%	21.43%	10.53%	12.50%	0.00%	21.43%	0.00%	9.09%	0.00%	11.11%	0.00%	0.00%
1978	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.30%	0.00%	0.00%	14.29%	7.32%	0.00%	5.26%	5.71%	0.00%	3.13%	0.00%	3.57%	3.85%
1979	0.00%	1.41%	0.00%	0.00%	0.00%	4.76%	13.79%	6.38%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.86%	0.00%	2.94%	3.03%	6.25%
1980	0.00%	0.00%	0.00%	0.00%	6.60%	7.61%	3.85%	4.17%	2.99%	6.15%	1.64%	0.00%	1.67%	1.69%	1.75%	3.57%	11.32%	2.17%	4.44%
1981	0.00%	0.00%	0.00%	1.69%	5.81%	2.55%	0.67%	4.05%	2.82%	0.72%	2.21%	0.75%	0.76%	0.78%	0.00%	7.26%	9.73%	8.08%	6.67%
1982	0.00%	0.00%	1.96%	2.00%	3.09%	3.23%	4.44%	2.33%	1.19%	1.20%	4.88%	1.28%	1.30%	4.05%	15.94%	16.67%	15.91%	5.56%	11.76%
1983	0.00%	0.33%	5.28%	2.10%	5.80%	8.20%	5.17%	1.37%	4.21%	6.37%	5.95%	1.74%	4.91%	7.33%	4.48%	6.35%	6.78%	9.26%	10.53%
1984	0.00%	0.52%	1.60%	3.31%	5.85%	11.84%	1.53%	3.23%	5.04%	2.68%	4.72%	5.05%	1.11%	9.09%	2.60%	20.55%	5.17%	14.55%	0.00%
1985	0.00%	3.33%	1.15%	6.02%	3.85%	2.78%	4.55%	0.00%	0.00%	1.72%	8.77%	12.24%	11.90%	0.00%	5.88%	6.25%	7.14%	8.00%	13.04%
1986	0.00%	1.04%	2.11%	2.22%	2.30%	2.38%	2.47%	1.28%	1.32%	1.35%	13.04%	10.53%	10.20%	13.64%	18.42%	16.67%	0.00%	4.17%	9.09%
1987	0.93%	1.87%	0.96%	2.97%	2.08%	4.26%	1.12%	1.14%	5.95%	3.95%	7.04%	3.08%	8.20%	21.43%	7.32%	8.33%	9.09%	3.45%	0.00%
1988	2.29%	2.29%	1.76%	3.07%	9.62%	3.60%	6.35%	6.09%	7.22%	3.45%	7.23%	7.04%	13.85%	13.46%	13.64%	7.89%	3.03%	6.45%	0.00%
1989	0.00%	0.00%	3.13%	7.26%	2.68%	8.57%	4.35%	10.47%	6.49%	4.35%	10.77%	12.50%	6.38%	4.76%	10.26%	0.00%	3.13%	6.45%	10.71%
1990	0.00%	1.92%	2.00%	0.00%	6.38%	4.65%	0.00%	0.00%	13.16%	3.13%	9.68%	7.41%	0.00%	8.33%	18.18%	5.56%	5.88%	0.00%	6.25%
1991	0.00%	2.13%	2.33%	0.00%	4.88%	0.00%	5.41%	0.00%	0.00%	9.68%	10.71%	0.00%	16.00%	4.76%	5.00%	0.00%	0.00%	0.00%	5.26%
1992	0.00%	0.00%	0.00%	2.04%	0.00%	0.00%	2.27%	0.00%	2.38%	14.63%	5.71%	0.00%	0.00%	9.68%	0.00%	7.14%	3.85%	4.00%	8.33%
1993	0.00%	5.36%	1.89%	2.17%	2.22%	2.38%	2.50%	0.00%	2.56%	0.00%	2.70%	8.57%	6.25%	0.00%	3.33%	10.34%	3.85%	0.00%	4.00%
1994	0.00%	0.00%	0.00%	0.00%	3.70%	5.88%	2.08%	4.26%	0.00%	2.22%	2.27%	9.30%	2.56%	5.26%	5.56%	2.94%	6.06%	3.23%	3.33%
1995	2.33%	0.00%	2.33%	2.44%	2.50%	5.26%	0.00%	5.71%	0.00%	3.03%	0.00%	6.25%	6.67%	10.71%	0.00%	0.00%	12.50%	0.00%	0.00%
1996	0.00%	2.22%	0.00%	0.00%	4.55%	7.50%	0.00%	2.70%	0.00%	5.56%	0.00%	5.88%	3.23%	3.33%	0.00%	3.45%	3.57%	3.00%	3.70%
1997	0.00%	2.33%	0.00%	0.00%	2.38%	0.00%	4.88%	2.63%	0.00%	0.00%	10.81%	3.03%	3.13%	0.00%	6.45%	0.00%	0.00%	0.00%	0.00%
1998	0.00%	0.00%	0.00%	0.00%	8.11%	2.94%	6.25%	3.33%	0.00%	3.45%	10.71%	0.00%	0.00%	4.17%	0.00%	4.35%	13.64%	0.00%	0.00%
1999	0.00%	0.00%	2.86%	0.00%	0.00%	6.06%	0.00%	0.00%	0.00%	0.00%	3.23%	3.33%	0.00%	0.00%	0.00%	3.45%	3.57%	11.11%	4.17%
2000	0.00%	0.00%	0.00%	0.00%	3.23%	0.00%	0.00%	10.00%	0.00%	0.00%	3.70%	3.85%	0.00%	4.00%	0.00%	4.17%	13.04%	5.00%	0.00%
2001	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%
2002	0.00%	0.00%	0.00%	0.00%	0.00%	8.00%	0.00%	0.00%	8.70%	0.00%	9.52%	0.00%	5.26%	0.00%	5.56%	11.76%	0.00%	6.67%	14.29%
2003	0.00%	0.00%	0.00%	0.00%	3.33%	3.45%	0.00%	0.00%	7.14%	0.00%	3.85%	4.00%	0.00%	4.17%	0.00%	4.35%	0.00%	0.00%	9.09%
2004	0.00%	4.35%	4.55%	0.00%	9.52%	0.00%	0.00%	5.26%	0.00%	11.11%	6.25%	0.00%	0.00%	0.00%	13.33%	0.00%	7.69%	0.00%	0.00%
2005	0.00%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	5.88%	6.25%	0.00%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%
2006	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%
2007	0.00%	0.00%	0.00%	0.00%	4.76%	0.00%	0.00%	0.00%	5.00%	0.00%	21.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2008	0.00%	0.00%	14.29%	0.00%	5.56%	5.88%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	6.67%	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%	10.53%	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%	7.69%	0.00%	0.00%	8.33%	9.09%	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%	5.88%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2012	0.00%	0.00%	11.76%	6.67%	7.14%	23.08%	0.00%	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%	5.26%	0.00%	5.56%	0.00%	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%
2014	0.00%	0.00%	0.00%	17.24%	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%
2015	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%	0.00%	0.00%	0.00%	0.00%	0.00%
2016	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%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2021	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wtd Avg																			
5 Yr	0.00%	0.00%	0.00%	8.93%	1.59%	5.88%	1.35%	2.30%	3.70%	1.28%	5.81%	1.18%	0.00%	3.90%	2.41%	3.61%	6.25%	4.76%	6.52%
10 Yr	0.00%	1.65%	2.22%	6.00%	1.95%	3.05%	2.33%	1.13%	2.94%	2.29%	4.95%	1.70%	0.56%	2.65%	1.55%	2.45%	5.21%	3.38%	3.67%
15 Yr	0.00%	0.88%	2.60%	3.63%	2.66%	3.28%	2.15%	2.03%	3.03%	1.66%	5.59%	2.47%	1.54%	3.53%	2.33%	3.45%	5.31%	2.79%	4.85%
All Yr	0.24%	0.91%	1.83%	2.20%	4.06%	4.72%	3.53%	3.53%	3.89%	3.66%	5.71%	3.80%	4.15%	5.64%	4.94%	6.67%	6.52%	5.47%	5.69%
All Avg Rolling	0.24%	0.46%	0.86%	2.57%	3.14%	4.00%	3.05%	2.94%	2.66%	2.62%	3.71%	3.34%	3.12%	2.59%	2.77%	3.59%	4.23%	4.66%	5.03%
Linear Smoothed	1.39%	1.55%	1.72%	1.89%	2.05%	2.22%	2.39%	2.56%	2.72%	2.89%	3.06%	3.23%	3.39%						

Underground  
Percent Released

Issue Year	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1977	12.50%	14.29%	16.67%	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	12.50%	4.76%	5.00%	21.05%	6.67%	14.29%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	11.11%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%
1979	0.00%	3.57%	0.00%	16.00%	0.00%	9.52%	0.00%	5.26%	0.00%	5.66%	5.88%	6.25%	0.00%	7.14%	15.38%	9.09%	0.00%	0.00%	0.00%	0.00%
1980	4.76%	10.00%	5.56%	11.76%	13.33%	3.85%	28.00%	16.67%	6.67%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%
1981	4.82%	15.19%	7.58%	8.20%	9.09%	10.00%	0.00%	6.67%	9.52%	0.00%	5.26%	0.00%	2.78%	0.00%	11.43%	0.00%	3.23%	0.00%	0.00%	0.00%
1982	17.24%	4.17%	0.00%	4.35%	14.29%	11.11%	0.00%	6.25%	0.00%	0.00%	7.14%	7.69%	0.00%	8.33%	9.09%	0.00%	0.00%	0.00%	10.00%	11.11%
1983	2.38%	3.80%	2.67%	5.48%	7.35%	4.76%	11.86%	0.00%	0.00%	3.92%	0.00%	4.08%	0.00%	0.00%	0.00%	0.00%	0.00%	2.27%	2.33%	2.38%
1984	8.70%	0.00%	0.00%	4.88%	10.53%	5.88%	3.13%	0.00%	6.67%	3.57%	11.11%	0.00%	4.17%	4.35%	0.00%	9.09%	0.00%	5.00%	0.00%	0.00%
1985	0.00%	0.00%	5.26%	11.76%	13.33%	15.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	11.11%	0.00%	12.50%	0.00%	0.00%	0.00%
1986	5.00%	5.26%	0.00%	6.67%	14.29%	16.67%	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%
1987	3.57%	15.38%	9.09%	15.00%	0.00%	0.00%	6.25%	0.00%	0.00%	0.00%	13.33%	7.69%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1988	7.14%	3.85%	0.00%	0.00%	4.17%	4.35%	9.09%	5.00%	0.00%	0.00%	0.00%	5.56%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1989	0.00%	8.00%	8.70%	0.00%	4.76%	5.00%	0.00%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1990	13.33%	0.00%	7.69%	0.00%	8.33%	0.00%	9.09%	0.00%	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	0.00%	5.88%	12.50%	0.00%	0.00%	0.00%	0.00%	7.14%	7.69%	0.00%	0.00%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1992	0.00%	0.00%	4.55%	0.00%	4.76%	5.26%	5.65%	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%
1993	4.17%	17.39%	0.00%	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%
1994	6.90%	3.70%	3.85%	0.00%	0.00%	29.17%	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%
1995	4.76%	0.00%	0.00%	0.00%	5.00%	5.26%	0.00%	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%
1996	8.00%	0.00%	13.04%	10.00%	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%	0.00%	0.00%	0.00%
1997	0.00%	3.45%	3.57%	3.70%	0.00%	3.85%	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%
1998	5.26%	5.56%	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%	0.00%	0.00%
1999	0.00%	8.70%	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%	0.00%	0.00%
2000	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%	0.00%	0.00%	0.00%
2001	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%	0.00%	0.00%	0.00%	0.00%
2002	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%	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%	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%	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%	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%	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%	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%	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%	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%	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%	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%	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%	0.00%
2014	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2015	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2016	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2021	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wtd Avg																				
5 Yr	4.71%	4.00%	6.48%	2.91%	0.96%	8.49%	3.33%	3.57%	1.35%	1.33%	1.37%	5.71%	1.52%	4.62%	1.49%	2.15%	1.10%	1.80%	1.79%	1.98%
10 Yr	4.69%	4.19%	5.21%	1.55%	2.09%	6.22%	4.07%	3.16%	0.68%	1.28%	3.28%	4.00%	1.56%	2.62%	4.40%	1.84%	1.32%	2.11%	1.52%	1.80%
15 Yr	4.36%	5.28%	5.18%	3.08%	4.36%	6.34%	5.00%	2.88%	2.67%	1.71%	3.99%	4.33%								



Underground  
Percent Released

Issue Year	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1977	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	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	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	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%	0.00%	0.00%
1981	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	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	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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2021																				
Wtd Avg																				
5 Yr	1.54%	0.00%	3.45%	0.00%	0.00%	0.00%	0.00%	0.00%	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 Yr	1.47%	0.00%	3.45%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
15 Yr	1.47%	0.00%	3.45%	0.00%	0.00%	0.00%	0.00%	0.00%	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 Yr	1.47%	0.00%	3.45%	0.00%	0.00%	0.00%	0.00%	0.00%	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 Avg Rolling	1.64%	1.11%	1.65%	1.15%	1.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Linear Smoothed	1.55%	1.38%	1.20%	1.03%	0.85%	0.68%	0.50%	0.33%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Prior Sel	2.26%	2.15%	2.03%	1.91%	1.79%	1.67%	1.55%	1.43%	1.31%	1.19%	1.07%	0.95%	0.83%	0.72%	0.60%	0.48%	0.36%	0.24%		
Selected	1.55%	1.38%	1.20%	1.03%	0.85%	0.68%	0.50%	0.33%	0.15%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Active	1.24%	1.10%	0.96%	0.82%	0.68%	0.54%	0.40%	0.26%	0.12%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Inactive	0.78%	0.69%	0.60%	0.51%	0.43%	0.34%	0.25%	0.16%	0.08%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Phased Release	3.72%	3.30%	2.88%	2.46%	2.04%	1.62%	1.20%	0.78%	0.36%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Other  
Total Permits

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1969	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1970	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1971	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3
1972	7	7	7	7	7	7	7	6	6	6	6	6	5	4	4	4	4	4	4
1973	7	7	7	7	7	7	7	7	7	7	7	6	5	5	5	5	5	4	4
1974	16	16	16	14	14	14	13	13	13	13	11	8	7	7	6	5	5	5	4
1975	26	26	25	24	24	24	23	23	23	19	13	12	6	5	4	4	4	4	4
1976	23	23	22	22	22	22	21	19	14	11	9	9	7	7	7	7	7	7	7
1977	23	23	21	20	20	19	19	16	15	11	11	11	11	11	11	11	11	10	10
1978	25	23	22	17	17	17	16	12	11	10	10	10	10	10	10	10	9	9	9
1979	21	21	20	19	19	17	15	13	12	12	11	11	11	11	11	11	11	8	7
1980	38	37	35	34	33	31	27	24	23	23	23	22	22	22	21	19	19	19	19
1981	122	122	122	120	116	115	113	112	112	109	109	105	104	101	98	95	91	90	90
1982	70	69	65	62	61	57	56	53	50	46	45	41	39	34	31	29	28	23	23
1983	220	215	208	198	181	167	161	159	156	144	136	119	113	110	101	97	96	89	83
1984	133	131	124	117	112	104	101	99	95	90	79	77	74	69	65	64	58	57	53
1985	78	77	71	67	65	62	62	57	49	46	38	37	33	32	31	27	26	24	24
1986	80	73	67	64	62	60	51	44	37	33	31	28	21	21	21	21	21	21	21
1987	89	83	78	71	67	54	44	38	31	26	21	19	18	16	16	16	16	16	16
1988	124	117	111	108	95	74	60	43	35	35	29	24	22	20	18	16	16	15	15
1989	137	130	127	103	79	61	45	31	29	27	24	20	19	17	14	14	14	14	14
1990	148	143	102	66	40	20	13	12	11	11	11	10	10	10	10	9	9	8	8
1991	199	159	104	67	41	24	23	19	17	17	17	16	16	15	14	14	11	11	11
1992	170	131	98	57	38	33	25	25	22	22	21	20	20	20	19	19	17	17	17
1993	169	146	91	49	39	34	29	27	27	24	23	23	21	20	19	19	19	17	16
1994	114	83	48	33	27	23	22	22	21	20	20	20	19	18	18	18	16	16	16
1995	150	118	65	38	22	15	15	13	13	13	13	12	11	11	11	10	10	10	10
1996	130	86	53	27	17	9	9	8	8	6	6	6	5	5	5	4	4	4	4
1997	162	129	82	50	34	31	30	25	20	19	19	19	18	18	16	15	15	15	15
1998	161	111	58	32	18	16	11	10	7	7	6	6	6	6	6	6	6	5	5
1999	140	110	68	45	33	19	14	8	7	7	7	7	7	7	7	7	7	6	6
2000	117	94	66	38	23	15	11	9	7	5	5	5	4	3	3	3	3	3	3
2001	125	91	66	35	23	17	13	9	8	7	7	7	7	7	7	7	6	6	6
2002	110	96	57	37	24	20	14	12	11	11	10	9	9	9	9	8	8	8	8
2003	80	65	47	24	18	10	9	9	9	8	8	8	7	7	7	6	6	5	5
2004	126	98	75	35	19	13	13	11	11	11	11	11	11	11	8	8	8	8	8
2005	128	115	69	30	19	13	10	8	5	5	5	4	3	3	3	3	3	3	3
2006	198	166	86	30	22	19	12	10	10	9	9	8	7	7	7	7	7	7	7
2007	183	139	80	41	28	18	13	9	9	9	9	7	6	6	5	5	5	5	5
2008	191	161	102	49	27	17	14	13	12	11	11	10	10	10	10	10	10	10	10
2009	176	140	79	41	20	12	11	10	9	8	7	7	6	6	6	6	6	6	6
2010	143	124	63	32	23	20	16	13	13	11	9	9	9	9	9	9	9	9	9
2011	170	156	95	44	31	17	13	7	4	3	3	3	3	3	3	3	3	3	3
2012	162	141	75	46	31	26	17	13	8	8	8	8	8	8	8	8	8	8	8
2013	132	107	72	40	32	22	21	20	18	18	18	18	18	18	18	18	18	18	18
2014	84	67	34	23	14	10	8	8	8	8	8	8	8	8	8	8	8	8	8
2015	67	52	33	17	11	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2016	30	24	14	9	8	6	6	6	6	6	6	6	6	6	6	6	6	6	6
2017	43	37	17	9	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
2018	57	42	19	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
2019	62	47	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
2020	58	40	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
2021	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35

Other  
Total Permits

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1969	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
1971	3	3	3	3	3	3	3	2	2	2	2	2	2	2	0	0	0	0	0	0
1972	4	4	4	4	4	4	3	2	2	1	1	1	1	1	1	1	1	1	1	1
1973	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1974	4	4	4	4	3	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1
1975	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2
1976	7	7	7	6	6	6	6	6	6	5	5	5	5	4	4	4	4	4	4	4
1977	9	9	7	6	6	6	5	4	4	4	4	4	4	4	4	4	4	4	4	4
1978	8	6	6	6	4	4	3	3	3	3	3	3	3	3	3	3	3	2	2	2
1979	7	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
1980	19	19	19	18	17	17	16	16	16	16	16	15	15	15	12	11	11	11	11	11
1981	87	82	80	76	74	71	68	68	67	67	65	64	64	62	61	60	59	58	58	57
1982	21	20	20	20	19	19	18	17	17	17	17	16	15	15	14	11	11	11	10	9
1983	80	76	74	73	69	67	63	61	59	58	57	56	56	55	55	53	51	50	48	46
1984	52	51	50	50	49	49	49	49	48	48	47	47	46	44	44	44	44	44	43	
1985	23	23	23	22	22	22	22	21	21	20	20	19	19	19	19	18	18	18		
1986	20	20	18	18	18	18	18	18	18	17	17	17	16	14	14	13	13			
1987	16	15	15	14	13	13	13	13	13	12	12	12	12	11	10	9				
1988	15	14	14	14	13	13	11	11	11	11	11	11	11	11	11	10				
1989	14	14	14	14	14	14	14	14	14	14	14	14	14	14						
1990	8	8	8	8	8	8	8	8	8	8	8	8	8	8						
1991	10	10	9	9	9	8	8	8	8	8	7	7								
1992	16	16	16	16	16	16	16	16	16	15	14	14								
1993	16	15	15	15	14	14	14	14	14	14										
1994	16	16	16	16	16	16	16	16	16	15	14									
1995	10	10	10	10	10	10	10	10	16											
1996	4	4	4	4	4	4	4													
1997	15	14	14	14	14	14														
1998	5	5	5	5	5															
1999	6	6	6	6																
2000	3	3	3																	
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2021																				

Other  
Total Permits

Issue Yr	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1973	3	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1974	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1975	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1976	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1977	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
1978	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1979	5	5	5	4																
1980	11	10	9																	
1981	53	51																		
1982	9																			
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2019																				
2020																				
2021																				

Other  
Total Releases

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0
1974	0	0	0	0	0	0	0	0	0	2	3	1	0	1	1	0	0	0	1	0
1975	0	0	0	0	0	0	0	0	4	5	1	5	1	1	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	1	5	3	2	0	2	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	1	1	3	0	0	0	0	0	0	0	0	1	0	0
1978	0	0	0	0	0	1	4	1	1	0	0	0	0	0	0	0	1	0	0	0
1979	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	3	1	0
1980	0	0	0	0	1	2	2	3	0	0	0	1	0	0	1	2	0	0	0	0
1981	0	0	0	2	1	1	2	1	0	3	0	4	0	1	1	3	4	1	1	0
1982	0	0	1	0	1	2	1	1	2	0	4	0	1	2	3	3	1	1	3	0
1983	0	4	4	8	12	12	4	1	2	9	5	13	3	1	9	3	1	4	4	0
1984	0	2	2	5	5	7	2	1	4	4	7	2	2	2	3	1	4	1	4	0
1985	0	0	3	2	2	2	0	5	5	3	6	1	4	0	1	2	0	2	0	0
1986	0	2	2	2	0	2	7	5	5	3	2	2	5	0	0	0	0	0	0	0
1987	0	2	5	4	3	11	7	6	6	4	4	2	1	1	0	0	0	0	0	0
1988	2	5	4	3	12	19	9	17	7	0	5	5	1	1	2	1	0	1	0	0
1989	0	1	0	24	24	16	13	12	2	2	3	1	1	2	1	0	0	0	0	0
1990	0	2	40	33	23	19	7	1	0	0	1	0	0	0	1	0	1	0	1	0
1991	0	40	55	36	25	15	1	4	1	0	0	1	0	0	1	1	0	0	0	0
1992	2	39	33	37	18	4	8	0	3	0	1	1	0	0	1	0	2	0	0	0
1993	2	23	49	41	10	5	5	1	0	3	1	0	2	1	1	0	0	2	1	0
1994	3	31	35	14	6	4	1	0	1	0	0	1	1	0	0	0	1	0	0	0
1995	6	32	52	27	16	7	0	2	0	0	0	1	1	0	0	0	1	0	0	0
1996	4	44	33	25	10	8	0	0	0	2	0	0	0	0	0	0	1	0	0	0
1997	6	33	47	31	16	3	1	5	5	0	1	0	0	1	0	1	1	0	0	1
1998	12	50	53	25	13	2	3	1	3	0	1	0	0	0	0	0	0	0	0	1
1999	15	30	42	23	12	13	5	6	0	1	0	0	0	0	0	0	0	0	0	1
2000	4	23	28	27	15	8	4	2	1	2	0	0	0	0	0	0	0	0	0	0
2001	6	34	25	31	11	4	4	4	1	0	0	0	0	0	0	0	0	1	0	0
2002	6	14	38	20	13	4	6	2	1	0	1	1	0	0	0	0	0	0	0	0
2003	3	15	18	23	6	8	0	0	0	0	1	0	0	0	0	0	1	0	0	0
2004	9	28	23	40	16	6	0	2	0	0	0	0	0	0	0	2	0	0	0	0
2005	6	13	45	39	11	6	3	2	3	0	0	1	1	0	0	0	0	0	0	0
2006	6	32	80	55	8	3	7	2	0	1	0	1	1	0	0	0	0	0	0	0
2007	8	44	59	39	13	10	4	3	0	0	0	2	0	0	0	0	0	0	0	0
2008	4	29	59	52	22	9	3	1	1	1	0	0	0	0	0	0	0	0	0	0
2009	5	36	61	38	20	8	0	1	1	0	0	0	1	0	0	0	0	0	0	0
2010	4	19	61	31	9	3	4	3	0	1	2	0	0	0	0	0	0	0	0	0
2011	1	14	61	51	13	14	4	6	1	1	0	0	0	0	0	0	0	0	0	0
2012	0	21	66	29	15	5	9	2	4	0	0	0	0	0	0	0	0	0	0	0
2013	3	25	35	32	8	10	1	0	2	0	0	0	0	0	0	0	0	0	0	0
2014	3	17	33	11	9	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	3	15	19	16	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	2	6	10	5	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	3	6	20	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	1	15	23	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	4	15	29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Other  
Total Releases

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
1969	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1975	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
1976	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
1977	1	0	2	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	1	2	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
1979	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	1	1	0	1	0	0	0	0	1	0	0	3	1	0	0	0	0
1981	2	4	2	4	1	1	3	0	1	0	2	1	0	1	1	1	1	1	0	1
1982	2	1	0	0	1	0	1	1	0	0	0	1	0	0	1	3	0	0	1	1
1983	3	4	2	1	4	2	4	2	0	1	1	1	0	1	0	2	2	1	1	2
1984	1	0	1	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	1	0
1986	1	0	2	0	0	0	0	0	0	1	0	0	1	2	0	1	0	0	0	0
1987	0	1	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
1988	0	1	0	0	1	0	2	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	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	1	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
1992	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
1993	0	1	0	0	1	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	0
1995	0	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	0
1997	0	1	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	0
1999	0	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	0
2001	0	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	0
2003	0	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	0
2005	0	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	0
2007	0	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	0
2009	0	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	0
2011	0	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	0
2013	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Other  
Total Forfeitures

Issue Yr	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	1	1	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0
1976	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
1977	0	0	2	1	0	1	0	2	0	1	0	0	0	0	0	0	0	0	0
1978	0	2	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	1	1	0	1	1	1	0	1	0	0	0	0	0	0	0	0	0
1980	0	1	2	1	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	3	0	0	0	0	0	0	0	0	1	2	2	0	0	0
1982	0	1	3	3	0	2	0	2	1	0	0	1	3	0	2	0	1	0	2
1983	0	1	3	2	5	2	2	1	1	3	3	4	3	2	0	1	0	3	2
1984	0	0	5	2	0	1	1	1	0	1	4	0	1	3	1	0	2	0	0
1985	0	1	3	2	0	1	0	0	3	0	2	0	0	1	0	2	1	0	0
1986	1	5	4	1	2	0	2	2	2	1	0	1	2	0	0	0	0	0	0
1987	0	4	0	3	1	2	3	0	1	1	1	0	0	1	0	0	0	0	0
1988	1	2	2	0	1	2	5	0	1	0	1	0	1	1	0	1	0	0	0
1989	1	6	3	0	0	2	3	2	0	0	0	3	0	0	2	0	0	0	0
1990	0	3	1	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	1	1	2	0	0	1	0	0	0	0	0	0	0	0	3	0
1992	0	0	0	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	6	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
1995	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	1	0	0	0	0	1	0	0	0	0	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	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0
2001	0	0	0	0	1	2	0	0	0	1	0	0	0	0	0	0	0	0	0
2002	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
2003	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
2004	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
2005	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2006	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2007	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0
2008	0	1	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
2009	0	0	0	0	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0
2010	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0
2013	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2021	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Other  
Total Forfeitures

Issue Yr	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	1	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	0
1979	0	0	1	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	0
1981	1	1	0	0	1	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0
1984	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0
1985	1	0	0	1	0	0	0	0	0	1	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	0
1987	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1				
1988	0	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	1					
1990	0	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	0
1992	0	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	0
1994	0	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	0
1996	0	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	0
1998	0	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	0
2000	0	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	0
2002	0	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	0
2004																				
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2020																				
2021																				

Other  
Total Forfeitures

Issue Yr	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	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	0
1979	0	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	0
1981	1	2																		
1982	0																			
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2021																				







Other  
Percent Forfeited

Issue Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	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%	0.00%	0.00%	0.00%	0.00%
1972	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%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	12.50%	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%	0.00%
1975	0.00%	0.00%	3.85%	4.00%	0.00%	0.00%	4.17%	0.00%	0.00%	0.00%	5.26%	0.00%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	4.35%	0.00%	0.00%	0.00%	0.00%	4.55%	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1977	0.00%	0.00%	8.70%	4.76%	0.00%	5.00%	0.00%	10.53%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1978	0.00%	8.00%	4.35%	22.73%	0.00%	0.00%	0.00%	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%	4.76%	5.00%	0.00%	5.26%	5.88%	6.67%	0.00%	0.00%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1980	0.00%	2.63%	5.41%	2.86%	0.00%	0.00%	6.45%	0.00%	4.17%	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%	0.00%	2.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.95%	1.92%	1.98%	0.00%	0.00%	0.00%
1982	0.00%	1.43%	4.35%	4.62%	0.00%	3.28%	0.00%	3.57%	1.89%	0.00%	0.00%	2.17%	6.67%	0.00%	5.13%	0.00%	3.23%	0.00%	7.14%
1983	0.00%	0.45%	1.40%	0.96%	2.53%	1.10%	1.20%	0.62%	0.63%	1.92%	2.08%	2.94%	2.52%	1.77%	0.00%	0.99%	0.00%	3.13%	2.25%
1984	0.00%	0.00%	3.82%	1.61%	0.00%	0.89%	0.96%	0.99%	0.00%	1.05%	4.44%	0.00%	1.30%	4.05%	1.45%	0.00%	3.13%	0.00%	0.00%
1985	0.00%	1.28%	3.90%	2.82%	0.00%	1.54%	0.00%	0.00%	5.26%	0.00%	4.35%	0.00%	0.00%	3.03%	0.00%	6.45%	3.70%	0.00%	0.00%
1986	1.25%	6.25%	5.48%	1.49%	3.13%	0.00%	3.33%	3.92%	4.55%	2.70%	0.00%	3.23%	7.14%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1987	0.00%	4.49%	0.00%	3.85%	1.41%	2.99%	5.56%	0.00%	2.63%	3.23%	3.85%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%
1988	0.81%	1.61%	1.71%	0.00%	0.93%	2.11%	6.76%	0.00%	2.33%	0.00%	2.86%	0.00%	4.17%	4.55%	0.00%	5.56%	0.00%	0.00%	0.00%
1989	0.73%	4.38%	2.31%	0.00%	0.00%	2.53%	4.92%	4.44%	0.00%	0.00%	0.00%	12.50%	0.00%	0.00%	11.76%	0.00%	0.00%	0.00%	0.00%
1990	0.00%	2.03%	0.70%	2.94%	4.55%	2.50%	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%
1991	0.00%	0.00%	0.00%	0.96%	1.49%	4.88%	0.00%	0.00%	5.26%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	21.43%	0.00%
1992	0.00%	0.00%	0.00%	4.08%	1.75%	2.63%	0.00%	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%	4.11%	1.10%	0.00%	0.00%	0.00%	3.45%	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%	2.08%	0.00%	0.00%	0.00%	0.00%	0.00%	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%
1995	0.00%	0.00%	0.85%	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%	0.00%
1996	0.00%	0.00%	0.00%	1.89%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%
1997	0.00%	0.00%	0.00%	1.22%	0.00%	0.00%	0.00%	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%	1.72%	3.13%	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%
1999	0.00%	0.00%	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%
2000	0.00%	0.00%	0.00%	1.52%	0.00%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	20.00%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2001	0.00%	0.00%	0.00%	0.00%	2.86%	8.70%	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%
2002	0.00%	0.00%	1.04%	0.00%	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%	0.00%	0.00%
2003	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%
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%	9.09%	0.00%	0.00%	0.00%
2005	0.00%	0.00%	0.87%	0.00%	0.00%	0.00%	0.00%	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%	1.16%	0.00%	0.00%	0.00%	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%	5.56%	7.69%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%
2008	0.00%	0.52%	0.00%	0.98%	0.00%	3.70%	0.00%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2009	0.00%	0.00%	0.00%	0.00%	2.44%	0.00%	8.33%	0.00%	0.00%	11.11%	12.50%	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%	7.69%	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%	28.57%	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%	11.76%	7.69%	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%	4.76%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2014	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2015	0.00%	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%
2016	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2017	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2018	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2019	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2020	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2021	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Wtd Avg																			
5 Yr	0.00%	0.00%	0.00%	0.00%	1.02%	0.00%	0.00%	4.00%	4.76%	4.35%	2.38%	2.22%	2.78%	0.00%	2.94%	2.70%	2.94%	0.00%	3.33%
10 Yr	0.00%	0.00%	0.00%	0.00%	0.65%	0.44%	1.17%	2.96%	2.63%	2.22%	1.15%	1.16%	2.63%	1.39%	2.99%	1.28%	1.41%	0.00%	1.23%
15 Yr	0.00%	0.06%	0.12%	0.22%	0.43%	0.31%	1.23%	2.05%	2.48%	2.29%	0.75%	0.78%	1.59%	1.50%	1.44%	0.67%	1.32%	2.01%	0.68%
All Yr	0.06%	0.52%	1.33%	1.30%	0.99%	1.30%	1.85%	1.54%	1.55%	1.10%	1.50%	1.17%	1.64%	1.49%	1.28%	1.06%	0.95%	1.00%	0.88%
All Avg Rolling	0.06%	0.08%	0.17%	0.29%	0.50%	0.55%	0.78%	1.40%	2.19%	2.66%	2.26%	1.76%	1.65%	1.53%	1.81%	1.56%	1.75%	1.28%	1.31%
Linear Smoothed	0.00%	0.00%	0.02%	0.33%	0.65%	0.96%	1.27%	1.59%	1.90%	2.22%	2.11%	1.98%	1.86%	1.73%	1.60%	1.48%	1.35%		



Other  
Percent Forfeited

Issue Year	480	492	504	516	528	540	552	564	576	588	600	612	624	636	648	660	672	684	696	708
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
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%	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%	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%	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%	0.00%	0.00%
1981	1.75%	3.77%																		
1982	0.00%																			
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2018																				
2019																				
2020																				
2021																				
Wtd Avg																				
5 Yr	1.19%	2.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10 Yr	1.02%	2.33%	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%	0.00%	0.00%	0.00%
15 Yr	1.01%	2.33%	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%	0.00%	0.00%	0.00%
All Yr	1.01%	2.33%	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%	0.00%	0.00%	0.00%
All Avg Rolling	0.53%	1.16%	1.16%	0.80%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Linear Smoothed	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%
Prior Sel	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%	0.31%
Selected	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%	0.35%
Active	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%	0.21%
Inactive	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%	0.47%
Phased Release	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%	0.81%



Other  
Percent Released

Issue Year	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1969	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1972	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%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1973	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	16.67%	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	
1974	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	15.38%	27.27%	12.50%	0.00%	14.29%	16.67%	0.00%	0.00%	0.00%	20.00%	
1975	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	17.39%	26.32%	7.69%	41.67%	16.67%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1976	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.76%	26.32%	21.43%	18.18%	0.00%	22.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1977	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.26%	6.25%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.09%	0.00%	
1978	0.00%	0.00%	0.00%	0.00%	0.00%	5.88%	25.00%	8.33%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	10.00%	0.00%	0.00%	
1979	0.00%	0.00%	0.00%	0.00%	5.26%	5.88%	6.67%	7.69%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	27.27%	12.50%	
1980	0.00%	0.00%	0.00%	2.94%	6.06%	6.45%	11.11%	0.00%	0.00%	0.00%	0.00%	4.35%	0.00%	0.00%	4.55%	9.52%	0.00%	0.00%	0.00%	
1981	0.00%	0.00%	1.64%	0.83%	0.86%	1.74%	0.88%	0.00%	0.00%	2.68%	0.00%	3.67%	0.00%	0.96%	0.99%	3.06%	4.21%	1.10%	0.00%	
1982	0.00%	0.00%	1.45%	1.61%	3.28%	1.75%	1.79%	3.77%	0.00%	8.00%	0.00%	2.22%	4.88%	7.69%	8.82%	3.23%	3.45%	10.71%	0.00%	
1983	0.00%	1.82%	1.86%	3.85%	6.06%	6.63%	2.40%	0.62%	1.26%	5.77%	3.47%	9.56%	2.52%	0.88%	8.18%	2.97%	1.03%	4.17%	4.49%	
1984	0.00%	1.50%	1.53%	4.03%	4.27%	6.25%	1.92%	0.99%	4.04%	4.21%	7.78%	2.53%	2.60%	2.70%	4.35%	1.54%	6.25%	1.72%	7.02%	
1985	0.00%	0.00%	3.90%	2.82%	2.99%	3.08%	0.00%	8.06%	8.77%	6.12%	13.04%	2.63%	10.81%	0.00%	3.13%	6.45%	0.00%	7.69%	0.00%	
1986	0.00%	2.50%	2.74%	2.99%	0.00%	3.23%	11.67%	9.80%	11.36%	8.11%	6.06%	6.45%	17.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
1987	0.00%	2.25%	6.02%	5.13%	4.23%	16.42%	12.96%	13.64%	15.79%	12.90%	15.38%	9.52%	5.26%	5.56%	0.00%	0.00%	0.00%	0.00%	0.00%	
1988	1.61%	4.03%	3.42%	2.70%	11.11%	20.00%	12.16%	28.33%	16.28%	0.00%	14.29%	17.24%	4.17%	4.55%	10.00%	5.56%	0.00%	6.25%	0.00%	
1989	0.00%	0.73%	0.00%	18.90%	23.30%	20.25%	21.31%	26.67%	6.45%	6.90%	11.11%	4.17%	5.00%	10.53%	5.88%	0.00%	0.00%	0.00%	0.00%	
1990	0.00%	1.35%	27.97%	32.35%	34.85%	47.50%	35.00%	7.69%	8.33%	0.00%	0.00%	9.09%	0.00%	0.00%	10.00%	0.00%	11.11%	0.00%	0.00%	
1991	0.00%	20.10%	34.59%	34.62%	37.31%	36.59%	4.17%	17.39%	5.26%	0.00%	0.00%	5.88%	0.00%	6.25%	6.67%	0.00%	0.00%	0.00%	0.00%	
1992	1.18%	22.94%	25.19%	37.76%	31.58%	10.53%	24.24%	0.00%	12.00%	0.00%	4.55%	4.76%	0.00%	5.00%	0.00%	10.53%	0.00%	0.00%	0.00%	
1993	1.18%	13.61%	33.56%	45.05%	20.41%	12.82%	14.71%	3.45%	0.00%	11.11%	4.17%	0.00%	8.70%	4.76%	5.00%	0.00%	0.00%	10.53%	5.88%	
1994	2.63%	27.19%	42.17%	29.17%	18.18%	14.81%	4.35%	0.00%	4.55%	0.00%	0.00%	5.00%	5.26%	0.00%	0.00%	5.56%	0.00%	0.00%	0.00%	
1995	4.00%	21.33%	44.07%	41.54%	42.11%	31.82%	0.00%	13.33%	0.00%	0.00%	0.00%	7.69%	8.33%	0.00%	0.00%	0.00%	9.09%	0.00%	0.00%	
1996	3.08%	33.85%	38.37%	47.17%	37.04%	47.06%	0.00%	0.00%	0.00%	0.00%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	
1997	3.70%	20.37%	36.43%	37.80%	32.00%	8.82%	3.23%	16.67%	20.00%	0.00%	5.00%	0.00%	0.00%	5.26%	0.00%	5.56%	6.25%	0.00%	0.00%	
1998	7.45%	31.06%	47.75%	43.10%	40.63%	11.11%	18.75%	9.09%	30.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	
1999	10.71%	21.43%	38.18%	33.82%	26.67%	39.39%	26.32%	42.86%	0.00%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	
2000	3.42%	19.66%	29.79%	40.91%	39.47%	34.78%	26.67%	18.18%	11.11%	28.57%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2001	4.80%	27.20%	27.47%	46.97%	31.43%	17.39%	23.53%	30.77%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	
2002	5.45%	12.73%	39.58%	35.09%	35.14%	16.67%	30.00%	14.29%	8.33%	0.00%	9.09%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2003	3.75%	18.75%	27.69%	48.94%	25.00%	44.44%	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	
2004	7.14%	22.22%	23.47%	53.33%	45.71%	31.58%	0.00%	15.38%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	18.18%	0.00%	0.00%	0.00%	
2005	4.69%	10.16%	39.13%	56.52%	36.67%	31.58%	23.08%	20.00%	37.50%	0.00%	0.00%	20.00%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2006	3.03%	16.16%	48.19%	63.95%	26.67%	13.64%	36.84%	16.67%	0.00%	10.00%	0.00%	11.11%	12.50%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2007	4.37%	24.04%	42.45%	48.75%	31.71%	35.71%	22.22%	23.08%	0.00%	0.00%	0.00%	22.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2008	2.09%	15.18%	36.65%	50.98%	44.90%	33.33%	17.65%	7.14%	7.69%	8.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2009	2.84%	20.45%	43.57%	48.10%	48.78%	40.00%	0.00%	9.09%	10.00%	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2010	2.80%	13.29%	49.19%	49.21%	28.13%	13.04%	20.00%	18.75%	0.00%	7.69%	18.18%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2011	0.59%	8.24%	39.10%	53.68%	29.55%	45.16%	23.53%	46.15%	14.29%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2012	0.00%	12.96%	46.81%	38.67%	32.61%	16.13%	34.62%	11.76%	30.77%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2013	2.27%	18.94%	32.71%	44.44%	20.00%	31.25%	4.55%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2014	3.57%	20.24%	49.25%	32.35%	39.13%	28.57%	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%	
2015	4.48%	22.39%	36.54%	48.48%	29.41%	9.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2016	6.67%	20.00%	41.67%	35.71%	11.11%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2017	6.98%	13.95%	54.05%	47.06%	22.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2018	1.75%	26.32%	54.76%	73.68%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2019	6.45%	24.19%	61.70%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
2020	0.00%	31.03%	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%	0.00%	0.00%	
2021	5.71%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Wtd Avg																				
5 Yr	3.92%	24.00%	100.00%	46.15%	25.51%	22.92%	18.82%	14.67%	12.70%	6.52%	4.76%	6.67%	8.33%	0.00%	0.00%	5.41%	2.94%	3.13%	3.33%	
10 Yr	2.88%	17.57%	81.14%	46.91%	33.55%	29.33%	19.88%	14.81%	10.53%	4.44%	4.60%	5.81%	3.95%	0.00%	3.85%	4.23%	1.35%	2.47%	0.00%	
15 Yr	2.70%	17.77%	77.22%	50.38%	33.62%	28.44%	19.26%	15.38%	9.32%	5.34%	4.51%	3.88%	3.17%	1.50%	0.72%	2.00%	4.61%	2.68%	2.03%	
All Yr	2.56%	14.89%	40.54%	29.38%	19.15%	15.38%	9.34%	8.74%	6.00%	4.80%	6.33%	4.91%	4.78%	2.17%	3.57%	2.72%	3.02%	3.66%	3.01%	
All Avg Rolling	2.56%	10.79%	32.10%	45.50%	48.63%	31.73%	22.93%	1												

Other  
Percent Released

Issue Year	240	252	264	276	288	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468
1963	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1964	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1965	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1966	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1967	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1968	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%
1969	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1970	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	100.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1971	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1972	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	25.00%	33.33%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1973	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%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1974	0.00%	0.00%	0.00%	0.00%	25.00%	33.33%	0.00%	0.00%	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1975	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%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%
1976	0.00%	0.00%	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1977	10.00%	0.00%	22.22%	14.29%	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%	0.00%
1978	11.11%	25.00%	0.00%	0.00%	33.33%	0.00%	25.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	33.33%	0.00%	0.00%
1979	0.00%	14.29%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	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%	5.26%	5.66%	0.00%	5.88%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%	0.00%	20.00%	8.33%	0.00%	0.00%	0.00%	0.00%
1981	2.22%	4.60%	2.44%	5.00%	1.32%	1.35%	4.23%	0.00%	1.47%	0.00%	2.99%	1.54%	0.00%	1.56%	1.61%	1.64%	1.67%	1.69%	0.00%	1.72%
1982	8.70%	4.76%	0.00%	0.00%	5.00%	0.00%	5.26%	5.66%	0.00%	0.00%	0.00%	5.88%	0.00%	0.00%	6.67%	21.43%	0.00%	0.00%	9.09%	10.00%
1983	3.61%	5.00%	2.63%	1.35%	5.48%	2.90%	5.97%	3.17%	0.00%	1.69%	1.72%	1.75%	0.00%	1.79%	0.00%	3.64%	3.77%	1.96%	2.00%	4.17%
1984	1.89%	0.00%	1.96%	0.00%	2.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	2.13%	2.17%	0.00%	0.00%	0.00%	0.00%	2.27%	
1985	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.55%	0.00%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	5.26%	0.00%	0.00%		
1986	4.76%	0.00%	10.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.56%	0.00%	0.00%	5.88%	12.50%	0.00%	7.14%	0.00%			
1987	0.00%	6.25%	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	8.33%	9.09%	0.00%				
1988	0.00%	6.67%	0.00%	0.00%	7.14%	0.00%	15.38%	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%						
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%						
1991	9.09%	0.00%	10.00%	0.00%	0.00%	11.11%	0.00%	0.00%	0.00%	0.00%	12.50%	0.00%								
1992	5.88%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	6.25%	0.00%									
1993	0.00%	6.25%	0.00%	0.00%	6.67%	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%										
1995	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%													
1997	0.00%	6.67%	0.00%	0.00%	0.00%	0.00%														
1998	0.00%	0.00%	0.00%	0.00%	0.00%															
1999	0.00%	0.00%	0.00%	0.00%																
2000	0.00%	0.00%	0.00%																	
2001	0.00%	0.00%																		
2002	0.00%																			
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2020																				
2021																				
Wtd Avg																				
5 Yr	0.00%	2.86%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.61%	1.69%	1.82%	0.00%	1.61%	4.17%	1.01%	2.82%	1.44%	1.09%	1.72%	3.03%
10 Yr	0.00%	2.06%	1.01%	0.00%	0.90%	0.85%	1.72%	0.00%	0.72%	1.18%	0.95%	1.43%	0.76%	2.24%	2.39%	3.80%	1.35%	1.43%	1.57%	2.76%
15 Yr	1.30%	2.50%	1.76%	0.53%	1.31%	1.04%	2.41%	1.15%	0.57%	0.90%	1.26%	1.65%	0.68%	2.43%	2.26%	3.57%	1.28%	1.83%	1.53%	2.68%
All Yr	2.42%	3.11%	2.04%	2.10%	2.83%	1.59%	3.36%	1.50%	0.79%	1.39%	1.18%	1.56%	0.97%	2.36%	2.21%	3.94%	1.28%	1.83%	1.53%	2.68%
All Avg Rolling	2.11%	2.09%	1.59%	1.50%	1.04%	0.93%	1.33%	1.13%	1.15%	0.96%	1.17%	1.25%	1.16%	1.66%	1.92%	2.77%	2.28%	2.14%	1.49%	1.98%
Linear Smoothed	2.57%	2.33%	2.10%	1.86%	1.62%	1.39%	1.15%	0.91%	0.68%	0.44%	2.04%	2.07%	2.10%	2.13%	2.15%	2.18%	2.21%	2.24%	2.27%	2.30%
Prior Sel	2.45%	2.27%	2.09%	1.91%	1.73%	1.55%	1.37%	1.19%	1.01%	0.83%	1.50%	1.61%	1.72%	1.83%	1.93%	2.04%	2.15%	2.26%	2.36%	2.47%
Selected	2.57%	2.33%	2.10%	1.86%	1.62%	1.39%	1.15%	0.91%	0.68%	0.44%	2.04%	2.07%	2.10%	2.13%	2.15%	2.18%	2.21%	2.24%	2.27%	2.30%
Active	2.06%	1.87%	1.68%	1.49%	1.30%	1.11%	0.92%	0.73%	0.54%	0.35%	1.63%	1.65%	1.68%	1.70%	1.72%	1.75%	1.77%	1.79%	1.81%	1.84%
Inactive	1.29%	1.17%	1.05%	0.93%	0.81%	0.69%	0.57%	0.46%	0.34%	0.22%	1.02%	1.03%	1.05%	1.06%	1.08%	1.09%	1.11%	1.12%	1.13%	1.15%
Phased Release	6.17%	5.60%	5.03%	4.46%	3.90%	3.33%	2.76%	2.19%	1.62%	1.05%	4.90%	4.96%	5.03%	5.10%	5.17%	5.24%	5.31%	5.37%	5.44%	5.51%



West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Remaining Acres Projections  
 All Mine Types

Fiscal Year Ending 6/30	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Deterministic Model	Stochastic Mean	Stochastic Median	Selected	% Remaining In Force		
					Total	Surface	Underground
2021	329,024	329,024	329,024	329,024	100%	100%	100%
2022	319,817	301,101	301,230	310,523	94%	95%	95%
2023	311,287	274,725	274,783	293,035	89%	90%	89%
2024	303,242	249,270	249,356	276,299	84%	84%	84%
2025	295,595	226,484	226,676	261,136	79%	80%	80%
2026	288,342	206,173	206,278	247,310	75%	76%	76%
2027	281,415	187,976	188,186	234,801	71%	72%	73%
2028	274,765	171,456	171,663	223,214	68%	68%	69%
2029	268,382	156,432	156,465	212,423	65%	65%	66%
2030	262,261	142,832	142,917	202,589	62%	62%	64%
2031	256,394	130,312	130,453	193,423	59%	59%	61%
2032	250,772	118,867	118,993	184,882	56%	56%	59%
2033	245,385	108,306	108,396	176,891	54%	54%	57%
2034	240,224	98,662	98,694	169,459	52%	51%	55%
2035	235,298	89,809	89,964	162,631	49%	49%	53%
2036	230,587	81,689	81,685	156,136	47%	47%	52%
2037	226,084	74,232	74,249	150,166	46%	45%	50%
2038	221,777	67,351	67,396	144,586	44%	44%	49%
2039	217,656	61,030	61,029	139,342	42%	42%	48%
2040	213,707	55,343	55,409	134,558	41%	41%	47%
2041	209,921	50,253	50,221	130,071	40%	39%	46%

Notes: Col (1) from Exhibit E-86, Col (20), (35), (50), etc.  
 Col (2) from Exhibit E-139, Col (16)  
 Col (3) from Exhibit E-139, Col (14)  
 Col (5) = Col (4) / [Col (4) 2019 Total]  
 Col (6) and (7) based on Col (5), Distributed according to Exhibit E-86

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Bond Forfeiture Projections  
 All Mine Types

Fiscal Year Ending 6/30	(1)	(2)	(3)	(4)
	Bond Forfeiture Recoveries			
	Deterministic Model	Stochastic Mean	Stochastic Median	Selected
2022	2,675,265	11,077,445	9,572,696	2,675,265
2023	2,604,576	7,564,943	5,994,468	2,604,576
2024	2,545,991	6,914,358	5,545,980	2,545,991
2025	2,473,609	6,397,015	4,930,476	2,473,609
2026	2,381,918	5,926,918	4,481,824	2,381,918
2027	2,292,362	5,311,966	3,684,996	2,292,362
2028	2,205,105	4,879,956	3,261,230	2,205,105
2029	2,124,771	4,337,187	2,741,080	2,124,771
2030	2,047,172	3,975,465	2,360,382	2,047,172
2031	1,957,115	3,650,182	1,918,350	1,957,115
2032	1,854,024	3,127,389	1,588,323	1,854,024
2033	1,754,954	2,847,424	1,385,637	1,754,954
2034	1,663,524	2,535,582	1,108,968	1,663,524
2035	1,578,753	2,110,219	756,290	1,578,753
2036	1,498,700	1,929,457	556,340	1,498,700
2037	1,413,353	1,675,308	429,440	1,413,353
2038	1,337,305	1,473,916	299,040	1,337,305
2039	1,264,288	1,241,337	192,000	1,264,288
2040	1,193,973	1,096,928	123,000	1,193,973
2041	1,132,168	928,606	75,000	1,132,168
<b>Total</b>	<b>37,998,926</b>	<b>79,001,605</b>	<b>51,005,520</b>	<b>37,998,926</b>

Notes: Col (1) from Exhibit E-77, Col (17), (32), etc.  
 Col (2) from Exhibit E-139, Col (8)  
 Col (3) from Exhibit E-139, Col (6)

West Virginia Department of Environmental Protection Office of Special Reclamation  
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 Cost Projections  
 All Mine Types

Fiscal Year Ending 6/30	(1) (2) (3) (4) (5) Land Reclamation Costs					(6) (7) (8) (9) (10) Water Capital Costs					(11) (12) (13) (14) (15) Water O&M Costs				
	Deterministic	Stochastic	Stochastic	Three-Year		Deterministic	Stochastic	Stochastic	Three-Year		Deterministic	Stochastic	Stochastic	Three-Year	
	Model	Mean	Median	Selected	Delay	Model	Mean	Median	Selected	Delay	Model	Mean	Median	Selected	Delay
2022	4,935,566	8,985,560	8,124,823	7,348,650	0	4,974,121	11,679,555	10,560,757	9,071,478	0	111,877	301,192	272,340	228,470	0
2023	4,739,829	6,814,520	6,088,452	5,880,934	0	4,782,140	8,857,607	7,913,854	7,184,533	0	219,766	529,612	476,423	408,600	0
2024	4,549,421	6,165,041	5,460,928	5,391,797	0	4,598,301	8,013,406	7,098,189	6,569,965	0	323,902	736,261	659,470	573,211	0
2025	4,370,070	5,462,624	4,708,335	4,847,010	3,674,325	4,424,133	7,100,394	6,119,959	5,881,495	4,535,739	424,427	919,366	817,292	720,361	114,235
2026	4,176,519	4,838,465	4,187,996	4,400,993	6,614,792	4,233,444	6,289,104	5,443,615	5,322,054	8,128,006	520,964	1,081,549	957,672	853,395	318,535
2027	3,977,372	4,242,458	3,412,299	3,877,377	5,636,365	4,033,851	5,514,406	4,435,354	4,661,203	6,877,249	613,272	1,223,754	1,072,050	969,692	490,906
2028	3,794,250	3,798,764	2,992,204	3,528,406	5,119,403	3,848,839	4,937,686	3,889,308	4,225,278	6,225,730	701,587	1,351,087	1,172,348	1,075,007	646,786
2029	3,619,996	3,298,423	2,515,684	3,144,701	6,824,498	3,670,107	4,287,335	3,269,921	3,742,454	8,262,802	785,970	1,461,649	1,256,672	1,168,097	1,213,575
2030	3,466,633	2,975,639	2,181,495	2,874,589	3,877,377	3,512,759	3,867,776	2,835,538	3,405,358	4,661,203	866,870	1,561,391	1,329,795	1,252,685	969,692
2031	3,300,470	2,672,241	1,814,899	2,595,870	3,528,406	3,336,578	3,473,415	2,359,031	3,056,341	4,225,278	943,774	1,650,963	1,390,630	1,328,456	1,075,007
2032	3,134,833	2,292,108	1,497,666	2,308,202	3,144,701	3,157,728	2,979,314	1,946,687	2,694,576	3,742,454	1,014,319	1,727,794	1,440,831	1,394,314	1,168,097
2033	2,970,864	2,073,074	1,319,718	2,121,219	2,874,589	2,978,267	2,694,610	1,715,387	2,462,755	3,405,358	1,078,569	1,797,282	1,485,067	1,453,640	1,252,685
2034	2,824,859	1,815,553	1,140,481	1,926,964	2,595,870	2,819,060	2,359,881	1,482,412	2,220,451	3,056,341	1,137,109	1,858,139	1,523,295	1,506,181	1,328,456
2035	2,686,143	1,522,662	897,220	1,702,008	2,308,202	2,667,435	1,979,176	1,166,218	1,937,610	2,694,576	1,190,219	1,909,178	1,553,370	1,550,922	1,394,314
2036	2,560,973	1,376,541	718,748	1,552,087	2,121,219	2,530,260	1,789,248	934,238	1,751,248	2,462,755	1,238,333	1,955,319	1,577,462	1,590,371	1,453,640
2037	2,432,578	1,190,718	602,138	1,408,478	1,926,964	2,387,296	1,547,712	782,667	1,572,559	2,220,451	1,281,397	1,995,231	1,597,645	1,624,758	1,506,181
2038	2,303,607	1,062,176	447,133	1,270,972	1,702,008	2,242,140	1,380,631	581,190	1,401,320	1,937,610	1,319,451	2,030,835	1,612,633	1,654,306	1,550,922
2039	2,188,878	884,047	309,446	1,127,457	1,552,087	2,111,804	1,149,097	402,223	1,221,041	1,751,248	1,352,915	2,060,468	1,623,006	1,678,796	1,590,371
2040	2,076,780	798,118	216,411	1,030,436	1,408,478	1,983,766	1,037,404	281,294	1,100,822	1,572,559	1,381,936	2,087,220	1,630,260	1,699,805	1,624,758
2041	1,981,002	684,302	135,243	933,516	1,270,972	1,875,101	889,466	175,791	980,119	1,401,320	1,407,094	2,110,158	1,634,793	1,717,348	1,654,306
Total	66,090,642	62,953,034	48,771,320	59,271,665	56,180,256	66,167,129	81,827,221	63,393,634	70,462,661	67,160,680	17,913,752	30,348,445	25,083,053	24,448,417	19,352,467

Notes: Col (1) from Exhibit E-73, Col (4)  
 Col (2) from Exhibit E-142, Col (16)  
 Col (3) from Exhibit E-142, Col (14)  
 Col (6) from Exhibit E-95, Col (4)  
 Col (7) from Exhibit E-143, Col (16)  
 Col (8) from Exhibit E-143, Col (14)  
 Col (11) from Exhibit E-117, Col (12)  
 Col (12) from Exhibit E-144, Col (16)  
 Col (13) from Exhibit E-144, Col (14)  
 Col (5), (10), and (15) based on (4), (9), and (14), respectively, with a three-year delay on payments

West Virginia Department of Environmental Protection Office of Special Reclamation  
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 Land Reclamation Cost Projection - Deterministic Model  
 Land Total - All Mine Types

Fiscal Year Ending 6/30	(1) Gross Liability				(2) Gross Liability - Three Year Delay				(3) Net Liability				(4) Net Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	3,793,805	1,141,761	0	4,935,566	0	0	0	0	1,639,987	620,313	0	2,260,301	0	0	0	0
2023	3,647,879	1,091,950	0	4,739,829	0	0	0	0	1,548,019	587,235	0	2,135,253	0	0	0	0
2024	3,492,015	1,057,406	0	4,549,421	0	0	0	0	1,440,354	563,076	0	2,003,431	0	0	0	0
2025	3,346,404	1,023,665	0	4,370,070	1,896,902	570,881	0	2,467,783	1,355,343	541,118	0	1,896,461	819,994	310,157	0	1,130,150
2026	3,187,331	989,189	0	4,176,519	3,720,842	1,116,855	0	4,837,697	1,277,437	517,165	0	1,794,601	1,594,003	603,774	0	2,197,777
2027	3,023,626	953,746	0	3,977,372	3,569,947	1,074,678	0	4,644,625	1,190,482	494,527	0	1,685,010	1,494,186	575,156	0	2,069,342
2028	2,870,528	923,722	0	3,794,250	3,419,210	1,040,536	0	4,459,745	1,112,380	476,765	0	1,589,145	1,397,849	552,097	0	1,949,946
2029	2,721,882	898,114	0	3,619,996	4,860,533	1,501,021	0	6,361,554	1,034,604	460,620	0	1,495,224	1,955,108	787,724	0	2,742,832
2030	2,594,780	871,853	0	3,466,633	3,023,626	953,746	0	3,977,372	973,405	446,056	0	1,419,462	1,190,482	494,527	0	1,685,010
2031	2,454,359	846,111	0	3,300,470	2,870,528	923,722	0	3,794,250	910,457	432,897	0	1,343,354	1,112,380	476,765	0	1,589,145
2032	2,311,989	822,844	0	3,134,833	2,721,882	898,114	0	3,619,996	860,647	420,162	0	1,280,809	1,034,604	460,620	0	1,495,224
2033	2,188,459	782,405	0	2,970,864	2,594,780	871,853	0	3,466,633	814,323	401,587	0	1,215,910	973,405	446,056	0	1,419,462
2034	2,071,275	753,585	0	2,824,859	2,454,359	846,111	0	3,300,470	773,564	387,771	0	1,161,335	910,457	432,897	0	1,343,354
2035	1,960,350	725,793	0	2,686,143	2,311,989	822,844	0	3,134,833	734,328	373,063	0	1,107,390	860,647	420,162	0	1,280,809
2036	1,860,562	700,411	0	2,560,973	2,188,459	782,405	0	2,970,864	701,842	360,431	0	1,062,273	814,323	401,587	0	1,215,910
2037	1,758,195	674,383	0	2,432,578	2,071,275	753,585	0	2,824,859	672,338	346,887	0	1,019,225	773,564	387,771	0	1,161,335
2038	1,657,713	645,894	0	2,303,607	1,960,350	725,793	0	2,686,143	635,937	330,365	0	966,302	734,328	373,063	0	1,107,390
2039	1,566,173	622,705	0	2,188,878	1,860,562	700,411	0	2,560,973	606,043	318,547	0	924,590	701,842	360,431	0	1,062,273
2040	1,476,049	600,731	0	2,076,780	1,758,195	674,383	0	2,432,578	575,507	307,300	0	882,807	672,338	346,887	0	1,019,225
2041	1,401,175	579,827	0	1,981,002	1,657,713	645,894	0	2,303,607	552,144	296,690	0	848,834	635,937	330,365	0	966,302

Notes: Col (1) - (3) from Exhibit E-77, Col (15), (30), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (9) - (11) from Exhibit E-77, Col (18), (33), etc.  
 Col (12) = (9) + (10) + (11)  
 Col (5) - (8) and (13) - (16) based on (1) - (4) and (9) - (12), with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
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Land Reclamation Cost Projection - Deterministic Model  
Surface Mines

Fiscal Year Ending 6/30	(1) Gross Liability				(2) Gross Liability - Three Year Delay				(3) Net Liability				(4) Net Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	1,737,930	412,007	0	2,149,937	0	0	0	0	160,143	126,008	0	286,151	0	0	0	0
2023	1,700,108	391,235	0	2,091,343	0	0	0	0	171,789	116,773	0	288,562	0	0	0	0
2024	1,656,592	384,510	0	2,041,102	0	0	0	0	172,301	114,955	0	287,256	0	0	0	0
2025	1,612,422	376,868	0	1,989,290	868,965	206,004	0	1,074,969	171,693	113,761	0	285,455	80,072	63,004	0	143,075
2026	1,560,704	368,171	0	1,928,874	1,719,019	401,621	0	2,120,640	169,319	111,045	0	280,363	165,966	121,390	0	287,356
2027	1,505,258	354,859	0	1,860,117	1,678,350	387,872	0	2,066,222	163,883	106,438	0	270,321	172,045	115,864	0	287,909
2028	1,447,775	343,095	0	1,790,869	1,634,507	380,689	0	2,015,196	160,269	104,031	0	264,300	171,997	114,358	0	286,355
2029	1,383,754	333,820	0	1,717,574	2,366,914	556,605	0	2,923,519	149,054	101,626	0	250,680	255,165	167,925	0	423,091
2030	1,329,485	322,231	0	1,651,715	1,505,258	354,859	0	1,860,117	143,720	99,203	0	242,923	163,883	106,438	0	270,321
2031	1,258,897	309,697	0	1,568,594	1,447,775	343,095	0	1,790,869	133,467	96,761	0	230,228	160,269	104,031	0	264,300
2032	1,179,231	299,135	0	1,478,366	1,383,754	333,820	0	1,717,574	130,206	94,289	0	224,495	149,054	101,626	0	250,680
2033	1,112,632	270,960	0	1,383,592	1,329,485	322,231	0	1,651,715	126,693	85,586	0	212,280	143,720	99,203	0	242,923
2034	1,045,582	253,904	0	1,299,486	1,258,897	309,697	0	1,568,594	123,033	81,209	0	204,243	133,467	96,761	0	230,228
2035	981,163	237,471	0	1,218,633	1,179,231	299,135	0	1,478,366	119,069	75,577	0	194,646	130,206	94,289	0	224,495
2036	920,819	223,045	0	1,143,863	1,112,632	270,960	0	1,383,592	115,644	71,667	0	187,311	126,693	85,586	0	212,280
2037	854,911	207,606	0	1,062,516	1,045,582	253,904	0	1,299,486	112,730	66,516	0	179,246	123,033	81,209	0	204,243
2038	788,564	189,053	0	977,617	981,163	237,471	0	1,218,633	101,724	57,940	0	159,664	119,069	75,577	0	194,646
2039	723,163	174,946	0	898,109	920,819	223,045	0	1,143,863	90,070	53,333	0	143,402	115,644	71,667	0	187,311
2040	657,274	161,781	0	819,055	854,911	207,606	0	1,062,516	76,932	49,012	0	125,944	112,730	66,516	0	179,246
2041	603,087	149,362	0	752,449	788,564	189,053	0	977,617	70,314	44,968	0	115,282	101,724	57,940	0	159,664

Notes: Col (1) - (3) from Exhibit E-77, Col (15), (30), etc.  
Col (4) = (1) + (2) + (3)  
Col (9) - (11) from Exhibit E-77, Col (18), (33), etc.  
Col (12) = (9) + (10) + (11)  
Col (5) - (8) and (13) - (16) based on (1) - (4) and (9) - (12), with a three-year delay



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 Land Reclamation Cost Projection - Deterministic Model  
 Underground Mines

Fiscal Year Ending 6/30	(1) Gross Liability				(2) Gross Liability - Three Year Delay				(3) Net Liability				(4) Net Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	607,019	298,317	0	905,336	0	0	0	0	399,652	220,821	0	620,473	0	0	0	0
2023	590,280	289,605	0	879,885	0	0	0	0	385,343	213,464	0	598,806	0	0	0	0
2024	572,811	281,424	0	854,235	0	0	0	0	370,633	206,593	0	577,225	0	0	0	0
2025	555,046	273,525	0	828,571	303,509	149,159	0	452,668	355,552	199,961	0	555,513	199,826	110,411	0	310,237
2026	538,867	264,378	0	803,246	598,649	293,961	0	892,610	342,023	192,221	0	534,244	392,497	217,143	0	609,640
2027	522,897	256,385	0	779,282	581,545	285,514	0	867,060	328,709	185,500	0	514,209	377,988	210,028	0	588,016
2028	506,808	248,720	0	755,528	563,928	277,475	0	841,403	315,313	179,068	0	494,381	363,092	203,277	0	566,369
2029	491,376	241,373	0	732,749	816,390	401,141	0	1,217,531	302,600	172,918	0	475,519	519,799	292,202	0	812,001
2030	477,367	234,304	0	711,671	522,897	256,385	0	779,282	291,182	167,011	0	458,193	328,709	185,500	0	514,209
2031	464,210	227,575	0	691,785	506,808	248,720	0	755,528	280,571	161,410	0	441,982	315,313	179,068	0	494,381
2032	451,854	221,188	0	673,042	491,376	241,373	0	732,749	270,721	156,120	0	426,840	302,600	172,918	0	475,519
2033	440,205	215,137	0	655,342	477,367	234,304	0	711,671	261,581	151,134	0	412,715	291,182	167,011	0	458,193
2034	429,080	209,408	0	638,488	464,210	227,575	0	691,785	252,978	146,441	0	399,419	280,571	161,410	0	441,982
2035	418,523	203,980	0	622,502	451,854	221,188	0	673,042	244,899	142,020	0	386,919	270,721	156,120	0	426,840
2036	408,504	198,861	0	607,365	440,205	215,137	0	655,342	237,315	137,875	0	375,190	261,581	151,134	0	412,715
2037	398,997	194,009	0	593,006	429,080	209,408	0	638,488	230,201	133,971	0	364,172	252,978	146,441	0	399,419
2038	389,999	189,400	0	579,400	418,523	203,980	0	622,502	223,556	130,286	0	353,842	244,899	142,020	0	386,919
2039	381,649	185,030	0	566,678	408,504	198,861	0	607,365	217,419	126,819	0	344,238	237,315	137,875	0	375,190
2040	373,771	180,879	0	554,650	398,997	194,009	0	593,006	211,712	123,555	0	335,267	230,201	133,971	0	364,172
2041	366,515	177,002	0	543,517	389,999	189,400	0	579,400	206,475	120,541	0	327,017	223,556	130,286	0	353,842

Notes: Col (1) - (3) from Exhibit E-77, Col (15), (30), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (9) - (11) from Exhibit E-77, Col (18), (33), etc.  
 Col (12) = (9) + (10) + (11)  
 Col (5) - (8) and (13) - (16) based on (1) - (4) and (9) - (12), with a three-year delay

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 Land Reclamation Cost Projection - Deterministic Model  
 Other

Fiscal Year Ending 6/30	(1) Gross Liability				(2) Gross Liability - Three Year Delay				(3) Net Liability				(4) Net Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	1,448,856	431,436	0	1,880,292	0	0	0	0	1,080,192	273,484	0	1,353,677	0	0	0	0
2023	1,357,491	411,110	0	1,768,601	0	0	0	0	990,887	256,998	0	1,247,885	0	0	0	0
2024	1,262,613	391,472	0	1,654,085	0	0	0	0	897,421	241,529	0	1,138,949	0	0	0	0
2025	1,178,937	373,272	0	1,552,209	724,428	215,718	0	940,146	828,097	227,395	0	1,055,492	540,096	136,742	0	676,838
2026	1,087,760	356,640	0	1,444,400	1,403,174	421,273	0	1,824,447	766,095	213,899	0	979,994	1,035,540	265,241	0	1,300,781
2027	995,472	342,501	0	1,337,973	1,310,052	401,291	0	1,711,343	697,890	202,589	0	900,479	944,154	249,263	0	1,193,417
2028	915,945	331,908	0	1,247,853	1,220,775	382,372	0	1,603,147	636,797	193,666	0	830,463	862,759	234,462	0	1,097,221
2029	846,752	322,921	0	1,169,673	1,677,228	543,276	0	2,220,504	582,951	186,075	0	769,026	1,180,143	327,597	0	1,507,740
2030	787,928	315,319	0	1,103,247	995,472	342,501	0	1,337,973	538,503	179,842	0	718,345	697,890	202,589	0	900,479
2031	731,252	308,838	0	1,040,091	915,945	331,908	0	1,247,853	496,418	174,727	0	671,145	636,797	193,666	0	830,463
2032	680,904	302,520	0	983,424	846,752	322,921	0	1,169,673	459,720	169,753	0	629,473	582,951	186,075	0	769,026
2033	635,622	296,308	0	931,931	787,928	315,319	0	1,103,247	426,049	164,867	0	590,915	538,503	179,842	0	718,345
2034	596,613	290,273	0	886,886	731,252	308,838	0	1,040,091	397,553	160,121	0	557,674	496,418	174,727	0	671,145
2035	560,665	284,343	0	845,008	680,904	302,520	0	983,424	370,360	155,465	0	525,825	459,720	169,753	0	629,473
2036	531,239	278,506	0	809,745	635,622	296,308	0	931,931	348,883	150,889	0	499,772	426,049	164,867	0	590,915
2037	504,287	272,768	0	777,055	596,613	290,273	0	886,886	329,406	146,400	0	475,806	397,553	160,121	0	557,674
2038	479,149	267,441	0	746,590	560,665	284,343	0	845,008	310,657	142,140	0	452,797	370,360	155,465	0	525,825
2039	461,361	262,730	0	724,091	531,239	278,506	0	809,745	298,555	138,395	0	436,950	348,883	150,889	0	499,772
2040	445,005	258,070	0	703,075	504,287	272,768	0	777,055	286,864	134,733	0	421,596	329,406	146,400	0	475,806
2041	431,572	253,463	0	685,036	479,149	267,441	0	746,590	275,354	131,181	0	406,535	310,657	142,140	0	452,797

Notes: Col (1) - (3) from Exhibit E-77, Col (15), (30), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (9) - (11) from Exhibit E-77, Col (18), (33), etc.  
 Col (12) = (9) + (10) + (11)  
 Col (5) - (8) and (13) - (16) based on (1) - (4) and (9) - (12), with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
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Permit Issue Year	Mine Type	Mine Status	2022								Avg Recl Cost per Acre	2022				Net Cost	
			Permit Count	Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Permit Count	Released Permit Count	Forfeited Acres		Released Acres	Gross Cost	Current Security Amount	Forfeited Security Amount		
1963	Surface	Active	-	-	0.000%	0.00	1.069%	-	-	-	-	2,685.00	1.00	-	-	-	-
1964	Surface	Active	-	-	0.000%	0.00	1.090%	-	-	-	-	2,685.00	1.00	-	-	-	-
1965	Surface	Active	-	-	0.000%	0.00	1.113%	-	-	-	-	2,685.00	1.00	-	-	-	-
1966	Surface	Active	-	-	0.000%	0.00	1.135%	-	-	-	-	2,685.00	1.00	-	-	-	-
1967	Surface	Active	-	-	0.000%	0.00	1.159%	-	-	-	-	2,685.00	1.00	-	-	-	-
1968	Surface	Active	-	-	0.000%	0.00	1.182%	-	-	-	-	2,685.00	1.00	-	-	-	-
1969	Surface	Active	-	-	0.000%	0.00	1.206%	-	-	-	-	2,685.00	1.00	-	-	-	-
1970	Surface	Active	-	-	0.000%	0.00	1.231%	-	-	-	-	2,685.00	1.00	-	-	-	-
1971	Surface	Active	-	-	0.005%	0.00	1.256%	-	-	-	-	2,685.00	1.00	-	-	-	-
1972	Surface	Active	1	400.00	0.021%	1.50	1.282%	0.00	0.01	0.13	5.13	2,685.00	1.00	344.94	32,250.00	10.36	334.58
1973	Surface	Active	-	-	0.038%	0.00	1.308%	-	-	-	-	2,685.00	1.00	-	-	-	-
1974	Surface	Active	-	-	0.054%	0.00	1.335%	-	-	-	-	2,685.00	1.00	-	-	-	-
1975	Surface	Active	-	-	0.071%	0.00	1.362%	-	-	-	-	2,685.00	1.00	-	-	-	-
1976	Surface	Active	-	-	0.087%	0.00	1.390%	-	-	-	-	2,685.00	1.00	-	-	-	-
1977	Surface	Active	6	1,933.27	0.103%	0.67	1.418%	0.01	0.09	1.33	27.41	2,685.00	1.00	3,577.04	4,954,814.00	3,414.40	162.64
1978	Surface	Active	4	2,280.93	0.120%	0.50	1.447%	0.00	0.06	1.37	33.00	2,685.00	1.00	3,667.14	3,663,488.00	2,193.64	1,473.50
1979	Surface	Active	2	180.00	0.136%	1.00	1.476%	0.00	0.03	0.25	2.66	2,685.00	1.00	658.00	1,800,000.00	245.07	412.94
1980	Surface	Active	1	455.76	0.153%	0.50	1.507%	0.00	0.02	0.35	6.87	2,685.00	1.00	933.32	5,032,494.00	3,838.25	-
1981	Surface	Active	9	1,661.03	0.169%	1.06	1.537%	0.02	0.14	2.96	25.54	2,685.00	1.00	7,952.60	4,659,920.00	8,309.33	-
1982	Surface	Active	2	620.00	0.185%	1.00	1.569%	0.00	0.03	1.15	9.73	2,685.00	1.00	3,085.03	2,605,934.00	4,829.34	-
1983	Surface	Active	2	1,704.33	0.202%	0.50	1.601%	0.00	0.03	1.72	27.28	2,685.00	1.00	4,615.29	7,445,894.00	7,509.62	-
1984	Surface	Active	-	-	0.218%	0.00	1.633%	-	-	-	-	2,685.00	1.00	-	3,108,294.00	-	-
1985	Surface	Active	5	2,405.91	0.234%	0.70	1.667%	0.01	0.08	3.95	40.10	2,685.00	1.00	10,603.58	6,463,272.00	10,609.17	-
1986	Surface	Active	7	2,331.92	0.251%	1.07	1.701%	0.02	0.12	6.27	39.66	2,685.00	1.00	16,830.42	4,528,320.00	17,172.34	4,658.08
1987	Surface	Active	3	1,371.12	0.267%	0.83	1.736%	0.01	0.05	3.05	23.80	2,685.00	1.00	8,199.69	4,025,040.00	8,964.95	-
1988	Surface	Active	8	1,898.10	0.284%	0.88	1.771%	0.02	0.14	4.71	33.61	2,685.00	1.00	12,649.67	2,064,680.00	5,124.70	7,524.97
1989	Surface	Active	7	2,959.93	0.300%	0.64	1.807%	0.02	0.13	5.71	53.49	2,685.00	1.00	15,330.08	5,897,004.00	11,374.96	3,955.11
1990	Surface	Active	12	2,801.20	0.316%	0.75	1.844%	0.04	0.22	6.65	51.65	2,685.00	1.00	17,850.58	5,059,180.00	12,007.26	5,843.32
1991	Surface	Active	9	2,094.19	0.333%	0.94	1.882%	0.03	0.17	6.58	39.40	2,685.00	1.00	17,675.48	10,240,611.00	32,191.16	-
1992	Surface	Active	6	4,639.40	0.349%	0.50	1.920%	0.02	0.12	8.10	89.08	2,685.00	1.00	21,751.43	19,515,400.00	34,076.82	-
1993	Surface	Active	12	4,377.78	0.366%	0.83	1.959%	0.04	0.24	13.34	85.77	2,685.00	1.00	35,813.61	11,329,722.00	34,519.87	1,293.74
1994	Surface	Active	7	2,054.59	0.382%	0.50	1.999%	0.03	0.14	3.92	41.07	2,685.00	1.00	10,536.99	7,896,575.00	15,082.93	-
1995	Surface	Active	12	6,620.84	0.398%	0.92	2.040%	0.05	0.24	24.18	135.06	2,685.00	1.00	64,921.91	25,580,598.88	93,421.02	-
1996	Surface	Active	12	6,830.47	0.415%	0.83	2.082%	0.05	0.25	23.61	142.18	2,685.00	1.00	63,393.67	18,396,480.00	63,589.55	-
1997	Surface	Active	24	13,199.94	0.431%	0.79	2.124%	0.10	0.51	45.06	280.37	2,685.00	1.00	120,982.34	56,796,023.00	193,882.65	-
1998	Surface	Active	19	11,029.10	0.448%	0.66	2.167%	0.09	0.41	32.48	239.04	2,685.00	1.00	87,198.14	45,372,480.00	133,602.74	-
1999	Surface	Active	4	2,072.61	0.464%	0.50	2.212%	0.02	0.09	4.81	45.84	2,685.00	1.00	12,909.77	7,201,000.00	16,705.12	-
2000	Surface	Active	6	4,526.19	0.480%	0.50	2.257%	0.03	0.14	10.87	102.15	2,685.00	1.00	29,188.49	19,207,060.00	46,131.28	-
2001	Surface	Active	19	6,826.55	0.497%	0.87	2.303%	0.09	0.44	29.45	157.20	2,685.00	1.00	79,070.13	32,109,664.48	138,516.86	-
2002	Surface	Active	15	6,499.09	0.513%	0.63	2.350%	0.08	0.35	21.12	152.72	2,685.00	1.00	56,710.64	25,567,500.00	83,091.38	-
2003	Surface	Active	16	6,916.12	0.530%	0.81	2.398%	0.08	0.38	29.76	165.83	2,685.00	1.00	79,895.26	40,397,928.00	173,809.41	-
2004	Surface	Active	21	11,573.91	0.574%	0.79	2.447%	0.14	0.51	61.25	283.18	2,685.00	1.00	164,468.84	49,951,983.00	264,369.89	-
2005	Surface	Active	15	5,236.53	0.642%	1.03	2.497%	0.10	0.37	34.74	130.74	2,685.00	1.00	93,281.54	14,496,391.33	96,176.22	-
2006	Surface	Active	10	4,862.21	0.611%	0.90	2.548%	0.06	0.25	26.72	123.87	2,685.00	1.00	71,731.73	17,744,470.00	97,498.14	-
2007	Surface	Active	22	6,382.38	0.579%	0.82	2.600%	0.13	0.57	30.23	165.92	2,685.00	1.00	81,176.49	17,696,714.00	83,829.32	-
2008	Surface	Active	12	8,631.88	0.547%	0.58	2.653%	0.07	0.32	27.56	228.97	2,685.00	1.00	74,010.25	18,544,344.00	59,217.99	14,792.26
2009	Surface	Active	16	6,181.98	0.516%	0.75	2.707%	0.08	0.43	23.92	167.33	2,685.00	1.00	64,222.38	20,632,776.50	79,831.11	-
2010	Surface	Active	12	6,203.98	0.484%	0.92	2.438%	0.06	0.29	27.54	151.23	2,685.00	1.00	73,957.25	9,213,726.00	40,907.35	33,049.90
2011	Surface	Active	17	2,986.04	0.453%	0.74	2.168%	0.08	0.37	9.94	64.75	2,685.00	1.00	26,693.86	6,759,620.00	22,505.77	4,188.10
2012	Surface	Active	22	7,650.01	0.421%	0.86	1.899%	0.09	0.42	27.83	145.29	2,685.00	1.00	74,729.33	11,505,876.51	41,860.51	32,868.82
2013	Surface	Active	22	8,508.13	0.390%	0.95	1.630%	0.09	0.36	31.65	138.69	2,685.00	1.00	84,982.80	18,838,560.00	70,081.00	14,901.79
2014	Surface	Active	16	4,153.44	0.358%	0.75	1.361%	0.06	0.22	11.16	56.52	2,685.00	1.00	29,958.34	14,762,600.00	39,657.77	-
2015	Surface	Active	13	4,371.03	0.327%	0.73	1.092%	0.04	0.14	10.43	47.72	2,685.00	1.00	28,014.32	10,767,800.00	25,702.71	2,311.61
2016	Surface	Active	10	3,389.17	0.295%	0.70	0.823%	0.03	0.08	7.00	27.88	2,685.00	1.00	18,797.78	6,702,080.00	13,844.54	4,953.24
2017	Surface	Active	6	1,324.50	0.264%	1.00	0.553%	0.02	0.03	3.49	7.33	2,685.00	1.00	9,372.96	3,369,999.35	8,881.99	490.97
2018	Surface	Active	8	3,466.31	0.232%	1.00	0.284%	0.02	0.02	8.04	9.85	2,685.00	1.00	21,594.19	9,065,440.00	21,033.63	560.57
2019	Surface	Active	8	4,158.88	0.200%	0.88	0.190%	0.02	0.02	7.30	7.90	2,685.00	1.00	19,588.37	2,559,920.00	4,490.60	15,097.78
2020	Surface	Active	11	3,830.10	0.169%	0.86	0.096%	0.02	0.01	5.59	3.67	2,685.00	1.00	15,004.26	2,559,920.00	3,734.97	11,269.29
2021	Surface	Active	7	3,770.84	0.000%	0.93	0.082%	-	0.01	-	3.09	2,685.00	1.00	-	2,559,920.00	-	-

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Permit Issue Year	Mine Type	Mine Status	Current		Adjustment Factor				Adjustment				Avg Recl Cost per Acre	Gross Cost	Current Security Amount	Forfeited Security Amount	Net Cost
			Permit Count	Bonded Acres	Forfeiture Rate	Permit Bond Size	Release Rate	Forfeited Permit Count	Released Permit Count	Forfeited Acres	Released Acres						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
1963	Surface	Inactive	-	-	0.000%	0.00	0.668%	-	-	-	-	2,685.00	1.00	-	-	-	-
1964	Surface	Inactive	-	-	0.000%	0.00	0.682%	-	-	-	-	2,685.00	1.00	-	-	-	-
1965	Surface	Inactive	-	-	0.000%	0.00	0.695%	-	-	-	-	2,685.00	1.00	-	-	-	-
1966	Surface	Inactive	-	-	0.000%	0.00	0.710%	-	-	-	-	2,685.00	1.00	-	-	-	-
1967	Surface	Inactive	-	-	0.000%	0.00	0.724%	-	-	-	-	2,685.00	1.00	-	-	-	-
1968	Surface	Inactive	-	-	0.000%	0.00	0.739%	-	-	-	-	2,685.00	1.00	-	-	-	-
1969	Surface	Inactive	-	-	0.000%	0.00	0.754%	-	-	-	-	2,685.00	1.00	-	-	-	-
1970	Surface	Inactive	-	-	0.000%	0.00	0.769%	-	-	-	-	2,685.00	1.00	-	-	-	-
1971	Surface	Inactive	-	-	0.011%	0.00	0.785%	-	-	-	-	2,685.00	1.00	-	-	-	-
1972	Surface	Inactive	-	-	0.048%	0.00	0.801%	-	-	-	-	2,685.00	1.00	-	-	-	-
1973	Surface	Inactive	-	-	0.085%	0.00	0.817%	-	-	-	-	2,685.00	1.00	-	-	-	-
1974	Surface	Inactive	-	-	0.122%	0.00	0.834%	-	-	-	-	2,685.00	1.00	-	-	-	-
1975	Surface	Inactive	-	-	0.159%	0.00	0.851%	-	-	-	-	2,685.00	1.00	-	-	-	-
1976	Surface	Inactive	1	438.80	0.196%	0.50	0.869%	0.00	0.01	0.43	3.81	2,685.00	1.00	1,152.81	442,000.00	432.48	720.33
1977	Surface	Inactive	-	-	0.233%	0.00	0.886%	-	-	-	-	2,685.00	1.00	-	-	-	-
1978	Surface	Inactive	-	-	0.269%	0.00	0.904%	-	-	-	-	2,685.00	1.00	-	-	-	-
1979	Surface	Inactive	-	-	0.305%	0.00	0.923%	-	-	-	-	2,685.00	1.00	-	-	-	-
1980	Surface	Inactive	-	-	0.343%	0.00	0.942%	-	-	-	-	2,685.00	1.00	-	-	-	-
1981	Surface	Inactive	1	4.47	0.380%	0.50	0.961%	0.00	0.01	0.01	0.04	2,685.00	1.00	22.81	-	-	22.81
1982	Surface	Inactive	-	-	0.417%	0.00	0.980%	-	-	-	-	2,685.00	1.00	-	-	-	-
1983	Surface	Inactive	-	-	0.454%	0.00	1.000%	-	-	-	-	2,685.00	1.00	-	-	-	-
1984	Surface	Inactive	-	-	0.491%	0.00	1.021%	-	-	-	-	2,685.00	1.00	-	-	-	-
1985	Surface	Inactive	-	-	0.528%	0.00	1.042%	-	-	-	-	2,685.00	1.00	-	-	-	-
1986	Surface	Inactive	1	411.07	0.564%	0.50	1.063%	0.01	0.01	1.16	4.37	2,685.00	1.00	3,115.20	759,360.00	2,143.26	971.95
1987	Surface	Inactive	2	415.61	0.601%	1.00	1.085%	0.01	0.02	2.50	4.51	2,685.00	1.00	6,710.76	1,218,200.00	7,325.88	-
1988	Surface	Inactive	1	1,304.38	0.638%	0.50	1.107%	0.01	0.01	4.16	14.44	2,685.00	1.00	11,176.57	3,589,760.00	11,455.81	-
1989	Surface	Inactive	2	273.00	0.675%	1.00	1.129%	0.01	0.02	1.84	3.08	2,685.00	1.00	4,948.73	577,400.00	3,898.19	1,050.53
1990	Surface	Inactive	1	81.70	0.712%	0.50	1.152%	0.01	0.01	0.29	0.94	2,685.00	1.00	780.95	474,203.73	1,688.19	-
1991	Surface	Inactive	-	-	0.749%	0.00	1.176%	-	-	-	-	2,685.00	1.00	-	-	-	-
1992	Surface	Inactive	-	-	0.786%	0.00	1.200%	-	-	-	-	2,685.00	1.00	-	-	-	-
1993	Surface	Inactive	-	-	0.823%	0.00	1.224%	-	-	-	-	2,685.00	1.00	-	-	-	-
1994	Surface	Inactive	-	-	0.860%	0.00	1.249%	-	-	-	-	2,685.00	1.00	-	2,316,000.00	-	-
1995	Surface	Inactive	3	3,503.18	0.896%	0.50	1.275%	0.03	0.04	15.70	44.66	2,685.00	1.00	42,158.17	7,211,120.00	32,320.47	9,837.69
1996	Surface	Inactive	1	193.90	0.933%	0.50	1.301%	0.01	0.01	0.90	2.52	2,685.00	1.00	2,429.44	5,826,934.00	27,190.98	-
1997	Surface	Inactive	-	-	0.970%	0.00	1.328%	-	-	-	-	2,685.00	1.00	-	-	-	-
1998	Surface	Inactive	1	846.89	1.007%	0.50	1.355%	0.01	0.01	4.26	11.47	2,685.00	1.00	11,449.60	4,109,160.00	20,690.55	-
1999	Surface	Inactive	1	2,264.80	1.044%	0.50	1.382%	0.01	0.01	11.82	31.31	2,685.00	1.00	31,740.47	2,605,000.00	13,597.12	18,143.35
2000	Surface	Inactive	-	-	1.081%	0.00	1.410%	-	-	-	-	2,685.00	1.00	-	-	-	-
2001	Surface	Inactive	1	596.67	1.118%	0.50	1.439%	0.01	0.01	3.33	8.59	2,685.00	1.00	8,952.98	1,955,000.00	10,925.36	-
2002	Surface	Inactive	2	765.87	1.155%	0.50	1.469%	0.02	0.03	4.42	11.25	2,685.00	1.00	11,871.00	7,564,320.00	43,667.44	-
2003	Surface	Inactive	4	4,249.33	1.191%	0.50	1.499%	0.05	0.06	25.31	63.68	2,685.00	1.00	67,988.55	11,163,242.00	66,501.94	1,466.72
2004	Surface	Inactive	3	3,700.97	1.516%	0.50	1.529%	0.05	0.05	28.05	56.59	2,685.00	1.00	75,302.08	4,993,320.00	37,838.73	37,463.35
2005	Surface	Inactive	1	25.99	1.445%	1.50	1.560%	0.01	0.02	0.56	0.41	2,685.00	1.00	1,512.14	26,000.00	563.40	948.74
2006	Surface	Inactive	1	244.59	1.374%	0.50	1.592%	0.01	0.02	1.68	3.89	2,685.00	1.00	4,510.52	823,360.00	5,655.01	-
2007	Surface	Inactive	2	399.20	1.303%	0.50	1.625%	0.03	0.03	2.60	6.49	2,685.00	1.00	6,981.37	298,320.00	1,943.07	5,038.30
2008	Surface	Inactive	4	864.07	1.232%	0.75	1.658%	0.05	0.07	7.98	14.33	2,685.00	1.00	21,431.99	1,122,068.69	10,365.46	11,066.52
2009	Surface	Inactive	3	680.43	1.161%	0.50	1.692%	0.03	0.05	3.95	11.51	2,685.00	1.00	10,603.12	1,762,440.00	10,228.69	374.42
2010	Surface	Inactive	1	5.11	1.090%	1.50	1.523%	0.01	0.02	0.08	0.08	2,685.00	1.00	224.28	11,040.00	180.47	43.81
2011	Surface	Inactive	1	560.86	1.019%	0.50	1.355%	0.01	0.01	2.86	7.60	2,685.00	1.00	7,671.17	5,008,760.00	25,514.86	-
2012	Surface	Inactive	2	676.78	0.948%	0.50	1.187%	0.02	0.02	3.21	8.03	2,685.00	1.00	8,611.89	1,705,920.00	8,084.72	527.16
2013	Surface	Inactive	1	93.44	0.877%	0.50	1.019%	0.01	0.01	0.41	0.95	2,685.00	1.00	1,099.98	1,057,160.00	4,634.99	-
2014	Surface	Inactive	4	2,929.61	0.806%	0.75	0.851%	0.03	0.03	17.71	24.92	2,685.00	1.00	47,544.70	4,406,040.00	26,693.55	20,913.15
2015	Surface	Inactive	2	704.80	0.735%	0.50	0.682%	0.01	0.01	2.59	4.81	2,685.00	1.00	6,954.00	1,230,000.00	4,519.91	2,434.09
2016	Surface	Inactive	1	494.54	0.664%	0.50	0.514%	0.01	0.01	1.64	2.54	2,685.00	1.00	4,408.28	29,400.00	97.60	4,310.67
2017	Surface	Inactive	-	-	0.593%	0.00	0.346%	-	-	-	-	2,685.00	1.00	-	-	-	-
2018	Surface	Inactive	1	351.08	0.522%	0.50	0.178%	0.01	0.00	0.92	0.62	2,685.00	1.00	2,460.53	-	-	2,460.53
2019	Surface	Inactive	1	452.10	0.451%	1.50	0.119%	0.00	0.00	3.06	0.54	2,685.00	1.00	8,213.39	-	-	8,213.39
2020	Surface	Inactive	-	-	0.380%	0.00	0.060%	-	-	-	-	2,685.00	1.00	-	-	-	-
2021	Surface	Inactive	-	-	0.000%	0.00	0.051%	-	-	-	-	2,685.00	1.00	-	-	-	-

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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Forfeiture Rate (6)	Adjustment						Avg Recl Cost per Acre (13)	Adjustment Factor Permit Status (14)	Gross Cost (15)	Current Security Amount (16)	Forfeited Security Amount (17)	Net Cost (18)
						Permit Bond Size (7)	Release Rate (8)	Forfeited Permit Count (9)	Released Permit Count (10)	Forfeited Acres (11)	Released Acres (12)						
1963	Surface	Phased Released	-	-	0.000%	0.00	3.206%	-	-	-	-	2,685.00	0.50	-	-	-	-
1964	Surface	Phased Released	-	-	0.000%	0.00	3.271%	-	-	-	-	2,685.00	0.50	-	-	-	-
1965	Surface	Phased Released	-	-	0.000%	0.00	3.338%	-	-	-	-	2,685.00	0.50	-	-	-	-
1966	Surface	Phased Released	-	-	0.000%	0.00	3.406%	-	-	-	-	2,685.00	0.50	-	-	-	-
1967	Surface	Phased Released	-	-	0.000%	0.00	3.476%	-	-	-	-	2,685.00	0.50	-	-	-	-
1968	Surface	Phased Released	-	-	0.000%	0.00	3.547%	-	-	-	-	2,685.00	0.50	-	-	-	-
1969	Surface	Phased Released	-	-	0.000%	0.00	3.619%	-	-	-	-	2,685.00	0.50	-	-	-	-
1970	Surface	Phased Released	-	-	0.000%	0.00	3.693%	-	-	-	-	2,685.00	0.50	-	-	-	-
1971	Surface	Phased Released	-	-	0.020%	0.00	3.768%	-	-	-	-	2,685.00	0.50	-	-	-	-
1972	Surface	Phased Released	-	-	0.084%	0.00	3.845%	-	-	-	-	2,685.00	0.50	-	-	-	-
1973	Surface	Phased Released	-	-	0.148%	0.00	3.924%	-	-	-	-	2,685.00	0.50	-	-	-	-
1974	Surface	Phased Released	2	189.60	0.212%	0.00	4.004%	0.00	0.08	-	7.59	2,685.00	0.50	-	98,250.00	-	-
1975	Surface	Phased Released	2	8.30	0.276%	0.00	4.086%	0.01	0.08	-	0.34	2,685.00	0.50	-	30,600.00	-	-
1976	Surface	Phased Released	5	626.17	0.341%	0.00	4.169%	0.02	0.21	-	26.11	2,685.00	0.50	-	112,250.00	-	-
1977	Surface	Phased Released	2	48.00	0.405%	0.00	4.254%	0.01	0.09	-	2.04	2,685.00	0.50	-	14,750.00	-	-
1978	Surface	Phased Released	2	158.81	0.469%	0.00	4.341%	0.01	0.09	-	6.89	2,685.00	0.50	-	115,400.00	-	-
1979	Surface	Phased Released	2	358.00	0.533%	0.00	4.429%	0.01	0.09	-	15.86	2,685.00	0.50	-	122,400.00	-	-
1980	Surface	Phased Released	2	621.75	0.597%	0.00	4.520%	0.01	0.09	-	28.10	2,685.00	0.50	-	401,500.00	-	-
1981	Surface	Phased Released	9	1,821.81	0.662%	0.00	4.612%	0.06	0.42	-	84.02	2,685.00	0.50	-	1,675,720.00	-	-
1982	Surface	Phased Released	-	-	0.726%	0.00	4.706%	-	-	-	-	2,685.00	0.50	-	-	-	-
1983	Surface	Phased Released	5	302.61	0.790%	0.00	4.802%	0.04	0.24	-	14.53	2,685.00	0.50	-	179,802.37	-	-
1984	Surface	Phased Released	4	2,603.39	0.854%	0.00	4.900%	0.03	0.20	-	127.57	2,685.00	0.50	-	2,263,360.00	-	-
1985	Surface	Phased Released	2	1,270.29	0.918%	0.00	5.000%	0.02	0.10	-	63.52	2,685.00	0.50	-	80,750.00	-	-
1986	Surface	Phased Released	5	1,212.46	0.983%	0.00	5.102%	0.05	0.26	-	61.86	2,685.00	0.50	-	639,708.00	-	-
1987	Surface	Phased Released	4	760.81	1.047%	0.00	5.207%	0.04	0.21	-	39.61	2,685.00	0.50	-	442,636.00	-	-
1988	Surface	Phased Released	5	478.00	1.111%	0.00	5.313%	0.06	0.27	-	25.39	2,685.00	0.50	-	111,000.00	-	-
1989	Surface	Phased Released	6	1,688.64	1.175%	0.00	5.421%	0.07	0.33	-	91.54	2,685.00	0.50	-	386,550.00	-	-
1990	Surface	Phased Released	3	662.34	1.239%	0.00	5.532%	0.04	0.17	-	36.64	2,685.00	0.50	-	506,608.00	-	-
1991	Surface	Phased Released	5	1,006.45	1.304%	0.00	5.645%	0.07	0.28	-	56.81	2,685.00	0.50	-	537,148.00	-	-
1992	Surface	Phased Released	-	-	1.368%	0.00	5.760%	-	-	-	-	2,685.00	0.50	-	29,800.00	-	-
1993	Surface	Phased Released	1	562.59	1.432%	0.00	5.877%	0.01	0.06	-	33.07	2,685.00	0.50	-	37,838.98	-	-
1994	Surface	Phased Released	6	2,470.42	1.496%	0.00	5.997%	0.09	0.36	-	148.16	2,685.00	0.50	-	1,520,619.00	-	-
1995	Surface	Phased Released	4	498.93	1.560%	0.00	6.120%	0.06	0.24	-	30.53	2,685.00	0.50	-	536,443.26	-	-
1996	Surface	Phased Released	4	563.71	1.625%	0.00	6.245%	0.06	0.25	-	35.20	2,685.00	0.50	-	717,833.00	-	-
1997	Surface	Phased Released	2	969.50	1.689%	0.00	6.372%	0.03	0.13	-	61.78	2,685.00	0.50	-	1,659,760.00	-	-
1998	Surface	Phased Released	3	511.73	1.753%	0.00	6.502%	0.05	0.20	-	33.27	2,685.00	0.50	-	581,056.00	-	-
1999	Surface	Phased Released	1	14.87	1.817%	0.00	6.635%	0.02	0.07	-	0.99	2,685.00	0.50	-	-	-	-
2000	Surface	Phased Released	1	19.70	1.881%	0.00	6.770%	0.02	0.07	-	1.33	2,685.00	0.50	-	-	-	-
2001	Surface	Phased Released	3	491.55	1.946%	0.00	6.908%	0.06	0.21	-	33.96	2,685.00	0.50	-	493,244.06	-	-
2002	Surface	Phased Released	1	106.29	2.010%	0.00	7.049%	0.02	0.07	-	7.49	2,685.00	0.50	-	76,950.00	-	-
2003	Surface	Phased Released	1	-	2.074%	0.00	7.193%	0.02	0.07	-	-	2,685.00	0.50	-	-	-	-
2004	Surface	Phased Released	2	470.13	2.638%	0.00	7.340%	0.05	0.15	-	34.51	2,685.00	0.50	-	116,250.00	-	-
2005	Surface	Phased Released	1	51.50	2.515%	0.00	7.490%	0.03	0.07	-	3.86	2,685.00	0.50	-	29,520.00	-	-
2006	Surface	Phased Released	1	60.78	2.391%	0.00	7.643%	0.02	0.08	-	4.65	2,685.00	0.50	-	49,200.00	-	-
2007	Surface	Phased Released	-	-	2.268%	0.00	7.799%	-	-	-	-	2,685.00	0.50	-	-	-	-
2008	Surface	Phased Released	-	-	2.144%	0.00	7.958%	-	-	-	-	2,685.00	0.50	-	143,500.00	-	-
2009	Surface	Phased Released	2	220.84	2.021%	0.00	8.120%	0.04	0.16	-	17.93	2,685.00	0.50	-	257,086.00	-	-
2010	Surface	Phased Released	-	-	1.897%	0.00	7.313%	-	-	-	-	2,685.00	0.50	-	-	-	-
2011	Surface	Phased Released	1	55.50	1.773%	0.00	6.505%	0.02	0.07	-	3.61	2,685.00	0.50	-	45,728.00	-	-
2012	Surface	Phased Released	-	-	1.650%	0.00	5.698%	-	-	-	-	2,685.00	0.50	-	-	-	-
2013	Surface	Phased Released	-	-	1.526%	0.00	4.890%	-	-	-	-	2,685.00	0.50	-	-	-	-
2014	Surface	Phased Released	1	27.91	1.403%	0.00	4.083%	0.01	0.04	-	1.14	2,685.00	0.50	-	20,800.00	-	-
2015	Surface	Phased Released	-	-	1.279%	0.00	3.275%	-	-	-	-	2,685.00	0.50	-	-	-	-
2016	Surface	Phased Released	-	-	1.156%	0.00	2.468%	-	-	-	-	2,685.00	0.50	-	-	-	-
2017	Surface	Phased Released	-	-	1.032%	0.00	1.660%	-	-	-	-	2,685.00	0.50	-	-	-	-
2018	Surface	Phased Released	-	-	0.909%	0.00	0.852%	-	-	-	-	2,685.00	0.50	-	-	-	-
2019	Surface	Phased Released	-	-	0.785%	0.00	0.570%	-	-	-	-	2,685.00	0.50	-	-	-	-
2020	Surface	Phased Released	-	-	0.662%	0.00	0.287%	-	-	-	-	2,685.00	0.50	-	-	-	-
2021	Surface	Phased Released	-	-	0.000%	0.00	0.246%	-	-	-	-	2,685.00	0.50	-	-	-	-

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2022																		
Permit Issue Year	Mine Type	Mine Status	Permit Count (4)	Current Bonded Acres (5)	Forfeiture Rate (6)	Adjustment Factor		Release Rate (8)	Forfeited Permit Count (9)	Released Permit Count (10)	Forfeited Acres (11)	Released Acres (12)	Avg Recl Cost per Acre (13)	Adjustment Factor Permit Status (14)	Gross Cost (15)	Current Security Amount (16)	Forfeited Security Amount (17)	Net Cost (18)
						Permit Bond Size (7)	Release Rate (8)											
1963	Underground	Active	-	-	0.152%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1964	Underground	Active	-	-	0.154%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1965	Underground	Active	-	-	0.156%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1966	Underground	Active	-	-	0.157%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1967	Underground	Active	-	-	0.159%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1968	Underground	Active	-	-	0.161%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1969	Underground	Active	-	-	0.163%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1970	Underground	Active	-	-	0.165%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1971	Underground	Active	-	-	0.167%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1972	Underground	Active	-	-	0.169%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1973	Underground	Active	-	-	0.171%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1974	Underground	Active	-	-	0.173%	0.00	0.120%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1975	Underground	Active	-	-	0.175%	0.00	0.261%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1976	Underground	Active	-	-	0.177%	0.00	0.401%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1977	Underground	Active	1	22.53	0.178%	1.50	0.541%	0.00	0.01	0.06	0.12	11,610.00	1.00	700.05	72,960.00	195.26	504.79	
1978	Underground	Active	1	94.87	0.180%	0.50	0.881%	0.00	0.01	0.09	0.65	11,610.00	1.00	993.09	266,720.00	240.48	752.61	
1979	Underground	Active	7	745.26	0.182%	1.21	0.821%	0.01	0.06	1.65	6.12	11,610.00	1.00	19,146.25	4,610,235.00	10,201.56	8,944.69	
1980	Underground	Active	5	222.16	0.184%	1.10	0.961%	0.01	0.05	0.45	2.14	11,610.00	1.00	5,224.33	467,040.00	945.99	4,278.34	
1981	Underground	Active	17	891.30	0.186%	1.21	1.101%	0.03	0.19	2.00	9.82	11,610.00	1.00	23,215.15	5,410,370.00	12,137.87	11,077.29	
1982	Underground	Active	2	33.93	0.188%	1.50	1.241%	0.00	0.02	0.10	0.42	11,610.00	1.00	1,110.56	1,618,334.00	4,562.42	-	
1983	Underground	Active	29	6,929.70	0.190%	0.88	1.382%	0.06	0.40	11.57	95.74	11,610.00	1.00	134,308.90	23,291,846.47	38,883.20	95,425.69	
1984	Underground	Active	16	2,706.46	0.192%	1.00	1.522%	0.03	0.24	5.19	41.18	11,610.00	1.00	60,254.08	13,955,020.00	25,628.44	34,625.63	
1985	Underground	Active	3	49.00	0.194%	1.50	1.662%	0.01	0.05	0.14	0.81	11,610.00	1.00	1,652.59	138,280.00	401.70	1,250.90	
1986	Underground	Active	5	252.11	0.196%	1.10	1.802%	0.01	0.09	0.54	4.54	11,610.00	1.00	6,296.70	681,920.00	1,468.98	4,829.72	
1987	Underground	Active	5	198.36	0.197%	1.10	1.942%	0.01	0.10	0.43	3.85	11,610.00	1.00	5,002.51	694,520.00	1,508.64	3,493.86	
1988	Underground	Active	4	157.83	0.199%	1.25	2.082%	0.01	0.08	0.39	3.29	11,610.00	1.00	4,566.78	615,280.00	1,533.42	3,033.36	
1989	Underground	Active	9	124.08	0.201%	1.50	2.222%	0.02	0.20	0.37	2.76	11,610.00	1.00	4,349.45	585,402.31	1,767.48	2,581.97	
1990	Underground	Active	5	136.22	0.203%	1.30	2.363%	0.01	0.12	0.36	3.22	11,610.00	1.00	4,177.51	462,200.00	1,220.88	2,956.62	
1991	Underground	Active	5	240.32	0.205%	1.30	2.503%	0.01	0.13	0.64	6.01	11,610.00	1.00	7,439.09	688,120.00	1,834.69	5,604.40	
1992	Underground	Active	12	1,027.11	0.207%	1.08	2.643%	0.02	0.32	2.30	27.14	11,610.00	1.00	26,741.22	5,221,728.00	11,709.71	15,031.51	
1993	Underground	Active	9	724.45	0.209%	1.17	2.783%	0.02	0.25	1.77	20.16	11,610.00	1.00	20,499.18	2,540,269.66	6,191.21	14,307.97	
1994	Underground	Active	13	610.69	0.211%	1.04	2.923%	0.03	0.38	1.34	17.85	11,610.00	1.00	15,521.56	1,656,784.00	3,627.01	11,894.55	
1995	Underground	Active	9	334.05	0.213%	1.17	3.063%	0.02	0.28	0.83	10.23	11,610.00	1.00	9,624.76	966,240.00	1,405.23	8,219.53	
1996	Underground	Active	10	244.18	0.215%	1.20	3.203%	0.02	0.32	0.63	7.82	11,610.00	1.00	7,301.22	302,160.00	778.20	6,523.02	
1997	Underground	Active	13	234.02	0.217%	1.35	3.343%	0.03	0.43	0.68	7.82	11,610.00	1.00	7,919.36	2,038,575.53	5,941.99	1,977.37	
1998	Underground	Active	10	523.54	0.218%	1.00	3.484%	0.02	0.35	1.14	18.24	11,610.00	1.00	13,276.92	2,273,844.00	4,966.79	8,310.13	
1999	Underground	Active	10	359.47	0.220%	1.40	3.624%	0.02	0.36	1.11	13.03	11,610.00	1.00	12,873.89	2,161,420.00	6,667.36	6,206.53	
2000	Underground	Active	10	461.64	0.222%	1.20	3.764%	0.02	0.38	1.23	17.38	11,610.00	1.00	14,293.65	1,767,320.00	4,713.27	9,580.37	
2001	Underground	Active	5	224.71	0.224%	0.90	3.904%	0.01	0.20	0.45	8.77	11,610.00	1.00	5,262.29	505,680.00	1,020.12	4,242.84	
2002	Underground	Active	8	288.53	0.226%	1.38	4.044%	0.02	0.32	0.90	11.67	11,610.00	1.00	10,412.03	895,560.00	2,783.60	7,628.43	
2003	Underground	Active	11	969.45	0.228%	1.23	4.184%	0.03	0.46	2.71	40.56	11,610.00	1.00	31,488.59	4,399,200.00	12,307.48	19,181.10	
2004	Underground	Active	8	445.92	0.230%	1.13	3.383%	0.02	0.27	1.15	15.09	11,610.00	1.00	13,387.85	9,500,339.00	24,567.49	-	
2005	Underground	Active	8	360.91	0.232%	1.13	3.249%	0.02	0.26	0.94	11.73	11,610.00	1.00	10,925.41	1,029,400.00	2,684.05	8,241.36	
2006	Underground	Active	9	427.71	0.234%	0.83	3.116%	0.02	0.28	0.83	13.33	11,610.00	1.00	9,669.63	1,311,600.00	2,554.05	7,115.58	
2007	Underground	Active	11	482.68	0.236%	1.23	2.982%	0.03	0.33	1.40	14.39	11,610.00	1.00	16,202.01	1,483,560.00	4,289.26	11,912.75	
2008	Underground	Active	5	111.00	0.237%	1.50	2.848%	0.01	0.14	0.40	3.16	11,610.00	1.00	4,590.72	485,160.00	1,728.27	2,862.46	
2009	Underground	Active	7	320.63	0.239%	1.07	2.714%	0.02	0.19	0.82	8.70	11,610.00	1.00	9,547.83	753,663.49	1,933.06	7,614.77	
2010	Underground	Active	11	269.59	0.241%	1.41	2.580%	0.03	0.28	0.92	6.96	11,610.00	1.00	10,641.99	405,087.88	1,377.32	9,264.67	
2011	Underground	Active	7	192.99	0.243%	1.36	2.447%	0.02	0.17	0.64	4.72	11,610.00	1.00	7,395.31	606,480.00	2,001.73	5,393.58	
2012	Underground	Active	6	171.01	0.245%	1.33	2.313%	0.01	0.14	0.56	3.96	11,610.00	1.00	6,488.51	641,320.00	2,095.88	4,392.63	
2013	Underground	Active	13	398.29	0.247%	1.42	2.179%	0.03	0.28	1.40	8.68	11,610.00	1.00	16,254.57	1,262,995.57	4,439.62	11,814.95	
2014	Underground	Active	22	686.91	0.249%	1.27	2.045%	0.05	0.45	2.18	14.05	11,610.00	1.00	25,265.03	1,806,000.00	5,721.44	19,543.59	
2015	Underground	Active	7	132.11	0.297%	1.50	1.911%	0.02	0.13	0.59	2.53	11,610.00	1.00	6,831.03	361,080.00	1,608.13	5,222.90	
2016	Underground	Active	6	137.58	0.255%	1.50	1.778%	0.02	0.11	0.53	2.45	11,610.00	1.00	6,109.65	324,560.00	1,241.44	4,868.22	
2017	Underground	Active	7	155.37	0.213%	1.50	1.644%	0.01	0.12	0.50	2.55	11,610.00	1.00	5,765.60	159,520.00	509.87	5,255.73	
2018	Underground	Active	3	37.52	0.171%	1.50	1.510%	0.01	0.05	0.10	0.57	11,610.00	1.00	1,118.46	100,760.00	258.71	859.75	
2019	Underground	Active	4	79.46	0.125%	1.25	1.376%	0.01	0.06	0.13	1.09	11,610.00	1.00	1,490.57	118,640.00	191.69	1,298.88	
2020	Underground	Active	7	110.58	0.087%	1.50	1.242%	0.01	0.09	0.14	1.37	11,610.00	1.00	1,682.08	118,640.00	155.44	1,526.64	
2021	Underground	Active	7	76.19	0.000%	1.50	1.105%	0.00	0.08	-	0.84	11,610.00	1.00	-	-	-	-	

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2022																		
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Forfeiture Rate (6)	Adjustment Factor		Released Permit Count (8)	Forfeited Permit Count (9)	Released Permit Count (10)	Forfeited Acres (11)	Released Acres (12)	Avg Recl Cost per Acre (13)	Adjustment Factor Permit Status (14)	Gross Cost (15)	Current Security Amount (16)	Forfeited Security Amount (17)	Net Cost (18)
						Permit Bond Size (7)	Release Rate (8)											
1963	Underground	Inactive	-	-	0.341%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	50	-	-
1964	Underground	Inactive	-	-	0.346%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1965	Underground	Inactive	-	-	0.350%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1966	Underground	Inactive	-	-	0.354%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1967	Underground	Inactive	-	-	0.359%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1968	Underground	Inactive	-	-	0.363%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1969	Underground	Inactive	-	-	0.367%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1970	Underground	Inactive	-	-	0.371%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1971	Underground	Inactive	-	-	0.376%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1972	Underground	Inactive	-	-	0.380%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1973	Underground	Inactive	-	-	0.384%	0.00	0.000%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1974	Underground	Inactive	-	-	0.389%	0.00	0.075%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1975	Underground	Inactive	-	-	0.393%	0.00	0.163%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1976	Underground	Inactive	1	103.30	0.397%	0.50	0.250%	0.00	0.00	0.21	0.26	11,610.00	1.00	-	2,381.59	345,280.00	685.66	1,695.94
1977	Underground	Inactive	-	-	0.401%	0.00	0.338%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1978	Underground	Inactive	1	23.02	0.406%	0.50	0.426%	0.00	0.00	0.05	0.10	11,610.00	1.00	-	542.19	-	-	542.19
1979	Underground	Inactive	1	6.60	0.410%	0.50	0.513%	0.00	0.01	0.01	0.03	11,610.00	1.00	-	157.09	145,877.00	299.06	-
1980	Underground	Inactive	-	-	0.414%	0.00	0.601%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
1981	Underground	Inactive	4	149.03	0.419%	1.00	0.688%	0.02	0.03	0.62	1.03	11,610.00	1.00	-	7,242.67	172,000.00	719.98	6,522.69
1982	Underground	Inactive	2	128.47	0.423%	0.50	0.776%	0.01	0.02	0.27	1.00	11,610.00	1.00	-	3,153.71	329,800.00	697.33	2,456.38
1983	Underground	Inactive	8	500.86	0.427%	0.75	0.863%	0.03	0.07	1.60	4.32	11,610.00	1.00	-	18,629.80	1,326,719.00	4,250.49	14,379.32
1984	Underground	Inactive	1	300.00	0.431%	0.50	0.951%	0.00	0.01	0.65	2.85	11,610.00	1.00	-	7,513.78	315,400.00	680.40	6,833.38
1985	Underground	Inactive	1	220.21	0.436%	0.50	1.039%	0.00	0.01	0.48	2.29	11,610.00	1.00	-	5,570.17	593,520.00	1,293.11	4,277.06
1986	Underground	Inactive	1	43.54	0.440%	0.50	1.126%	0.00	0.01	0.10	0.49	11,610.00	1.00	-	1,112.17	110,880.00	243.95	868.22
1987	Underground	Inactive	1	40.89	0.444%	1.50	1.214%	0.00	0.01	0.27	0.50	11,610.00	1.00	-	3,163.97	73,800.00	491.86	2,672.11
1988	Underground	Inactive	7	154.89	0.449%	1.21	1.301%	0.03	0.09	0.84	2.02	11,610.00	1.00	-	9,795.75	2,638,353.00	14,371.93	-
1989	Underground	Inactive	2	193.50	0.453%	0.50	1.389%	0.01	0.03	0.44	2.69	11,610.00	1.00	-	5,087.15	122,688.00	277.82	4,809.33
1990	Underground	Inactive	3	36.13	0.457%	1.17	1.477%	0.01	0.04	0.19	0.53	11,610.00	1.00	-	2,237.33	82,480.00	439.93	1,797.41
1991	Underground	Inactive	2	141.42	0.461%	1.00	1.564%	0.01	0.03	0.65	2.21	11,610.00	1.00	-	7,576.69	5,492,013.00	25,343.59	-
1992	Underground	Inactive	1	9.00	0.466%	1.50	1.652%	0.00	0.02	0.06	0.15	11,610.00	1.00	-	729.99	1,240.00	148.39	581.60
1993	Underground	Inactive	6	294.11	0.470%	1.00	1.739%	0.03	0.10	1.38	5.12	11,610.00	1.00	-	16,049.94	661,873.00	3,111.04	12,938.90
1994	Underground	Inactive	1	247.11	0.474%	0.50	1.827%	0.00	0.02	0.59	4.51	11,610.00	1.00	-	6,804.04	644,800.00	1,529.22	5,274.82
1995	Underground	Inactive	4	131.50	0.479%	1.00	1.914%	0.02	0.08	0.63	2.52	11,610.00	1.00	-	7,307.01	972,263.00	4,653.35	2,653.66
1996	Underground	Inactive	2	45.38	0.483%	1.50	2.002%	0.01	0.04	0.33	0.91	11,610.00	1.00	-	3,816.30	547,360.00	3,964.78	-
1997	Underground	Inactive	7	294.76	0.487%	1.07	2.090%	0.03	0.15	1.54	6.16	11,610.00	1.00	-	17,863.10	191,920.00	1,001.79	16,861.31
1998	Underground	Inactive	3	93.26	0.491%	1.17	2.177%	0.01	0.07	0.53	2.03	11,610.00	1.00	-	6,208.29	228,992.06	1,313.00	4,895.29
1999	Underground	Inactive	9	618.15	0.496%	1.06	2.265%	0.04	0.20	3.23	14.00	11,610.00	1.00	-	37,555.76	444,920.00	2,328.26	35,227.50
2000	Underground	Inactive	6	76.39	0.500%	1.50	2.352%	0.03	0.14	0.57	1.80	11,610.00	1.00	-	6,652.25	238,721.02	1,790.57	4,861.68
2001	Underground	Inactive	2	6.00	0.504%	1.50	2.440%	0.01	0.05	0.05	0.15	11,610.00	1.00	-	526.98	312,880.00	2,366.93	-
2002	Underground	Inactive	1	47.21	0.509%	0.50	2.528%	0.01	0.03	0.12	1.19	11,610.00	1.00	-	1,393.89	132,480.00	336.91	1,056.98
2003	Underground	Inactive	6	229.90	0.513%	1.00	2.615%	0.03	0.16	1.18	6.01	11,610.00	1.00	-	13,690.15	1,410,984.00	7,237.01	6,453.14
2004	Underground	Inactive	3	181.69	0.517%	0.50	2.703%	0.02	0.06	0.47	3.84	11,610.00	1.00	-	5,454.88	103,680.00	268.11	5,186.77
2005	Underground	Inactive	6	121.31	0.521%	1.50	2.791%	0.03	0.12	0.95	2.46	11,610.00	1.00	-	11,016.83	392,180.00	3,067.70	7,949.13
2006	Underground	Inactive	6	145.55	0.526%	1.17	2.879%	0.03	0.12	0.89	2.83	11,610.00	1.00	-	10,365.34	425,440.00	2,609.62	7,755.72
2007	Underground	Inactive	4	80.93	0.530%	1.25	2.966%	0.02	0.07	0.54	1.51	11,610.00	1.00	-	6,225.45	412,480.00	2,732.95	3,492.50
2008	Underground	Inactive	6	95.14	0.534%	1.50	3.054%	0.03	0.11	0.76	1.69	11,610.00	1.00	-	8,853.27	203,840.00	1,633.80	7,219.48
2009	Underground	Inactive	8	127.40	0.539%	1.38	3.142%	0.04	0.14	0.94	2.16	11,610.00	1.00	-	10,954.48	316,280.00	2,342.40	8,612.08
2010	Underground	Inactive	9	296.02	0.543%	1.28	3.230%	0.05	0.15	2.05	4.77	11,610.00	1.00	-	23,841.79	724,960.00	5,029.21	18,812.59
2011	Underground	Inactive	6	113.07	0.547%	1.50	3.318%	0.03	0.09	0.93	1.73	11,610.00	1.00	-	10,774.99	399,840.00	3,281.89	7,493.11
2012	Underground	Inactive	3	95.72	0.551%	1.17	3.406%	0.02	0.04	0.62	1.38	11,610.00	1.00	-	7,150.18	84,720.00	545.09	6,605.09
2013	Underground	Inactive	3	53.70	0.556%	1.50	3.494%	0.02	0.04	0.45	0.73	11,610.00	1.00	-	5,197.52	63,320.00	527.87	4,669.64
2014	Underground	Inactive	1	12.00	0.560%	1.50	3.582%	0.01	0.01	0.10	0.15	11,610.00	1.00	-	1,170.41	-	-	1,170.41
2015	Underground	Inactive	1	12.04	0.668%	1.50	1.195%	0.01	0.01	0.12	0.14	11,610.00	1.00	-	1,400.75	-	-	1,400.75
2016	Underground	Inactive	-	-	0.574%	0.00	1.111%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
2017	Underground	Inactive	-	-	0.479%	0.00	1.027%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
2018	Underground	Inactive	2	46.96	0.385%	1.50	0.944%	0.01	0.02	0.27	0.44	11,610.00	1.00	-	3,149.69	61,360.00	354.48	2,795.21
2019	Underground	Inactive	-	-	0.291%	0.00	0.860%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
2020	Underground	Inactive	-	-	0.197%	0.00	0.777%	-	-	-	-	11,610.00	1.00	-	-	-	-	-
2021	Underground	Inactive	-	-	0.000%	0.00	0.693%	-	-	-	-	11,610.00	1.00	-	-	-	-	-

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2022																
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Forfeiture Rate (6)	Adjustment				Released Permitted Count (10)	Forfeited Acres (11)	Released Acres (12)	Avg Recl Cost per Acre (13)	Adjustment		Net Cost (18)
						Permit Bond Size (7)	Release Rate (8)	Forfeited Permit Count (9)	Permit Status (14)					Gross Cost (15)	Current Security Amount (16)	
1963	Underground	Phased Released	-	-	0.594%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1964	Underground	Phased Released	-	-	0.602%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1965	Underground	Phased Released	-	-	0.609%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1966	Underground	Phased Released	-	-	0.617%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1967	Underground	Phased Released	-	-	0.624%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1968	Underground	Phased Released	-	-	0.632%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1969	Underground	Phased Released	-	-	0.639%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1970	Underground	Phased Released	-	-	0.647%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1971	Underground	Phased Released	-	-	0.654%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1972	Underground	Phased Released	-	-	0.662%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1973	Underground	Phased Released	-	-	0.669%	0.00	0.000%	-	-	-	-	11,610.00	0.50	-	-	-
1974	Underground	Phased Released	-	-	0.676%	0.00	0.361%	-	-	-	-	11,610.00	0.50	-	-	-
1975	Underground	Phased Released	-	-	0.684%	0.00	0.782%	-	-	-	-	11,610.00	0.50	-	-	-
1976	Underground	Phased Released	-	-	0.691%	0.00	1.202%	-	-	-	-	11,610.00	0.50	-	-	-
1977	Underground	Phased Released	-	-	0.699%	0.00	1.622%	-	-	-	-	11,610.00	0.50	-	-	-
1978	Underground	Phased Released	4	23.13	0.706%	0.00	2.043%	0.03	0.08	-	0.47	11,610.00	0.50	-	38,588.00	-
1979	Underground	Phased Released	2	59.68	0.714%	0.00	2.463%	0.01	0.05	-	1.47	11,610.00	0.50	-	101,728.00	-
1980	Underground	Phased Released	5	87.19	0.721%	0.00	2.884%	0.04	0.14	-	2.51	11,610.00	0.50	-	50,000.00	-
1981	Underground	Phased Released	8	85.14	0.729%	0.00	3.304%	0.06	0.26	-	2.81	11,610.00	0.50	-	212,120.00	-
1982	Underground	Phased Released	4	199.06	0.736%	0.00	3.724%	0.03	0.15	-	7.41	11,610.00	0.50	-	90,296.00	-
1983	Underground	Phased Released	4	57.47	0.744%	0.00	4.145%	0.03	0.17	-	2.38	11,610.00	0.50	-	81,440.00	-
1984	Underground	Phased Released	2	95.60	0.751%	0.00	4.565%	0.02	0.09	-	4.36	11,610.00	0.50	-	10,000.00	-
1985	Underground	Phased Released	3	17.24	0.759%	0.00	4.986%	0.02	0.15	-	0.86	11,610.00	0.50	-	30,720.00	-
1986	Underground	Phased Released	3	118.96	0.766%	0.00	5.406%	0.02	0.16	-	6.43	11,610.00	0.50	-	107,280.00	-
1987	Underground	Phased Released	4	77.09	0.773%	0.00	5.826%	0.03	0.23	-	4.49	11,610.00	0.50	-	106,360.00	-
1988	Underground	Phased Released	5	129.44	0.781%	0.00	6.247%	0.04	0.31	-	8.09	11,610.00	0.50	-	165,576.00	-
1989	Underground	Phased Released	6	119.44	0.788%	0.00	6.667%	0.05	0.40	-	7.96	11,610.00	0.50	-	103,096.00	-
1990	Underground	Phased Released	2	18.31	0.796%	0.00	7.088%	0.02	0.14	-	1.30	11,610.00	0.50	-	20,000.00	-
1991	Underground	Phased Released	2	18.20	0.803%	0.00	7.508%	0.02	0.15	-	1.37	11,610.00	0.50	-	40,000.00	-
1992	Underground	Phased Released	2	39.95	0.811%	0.00	7.928%	0.02	0.16	-	3.17	11,610.00	0.50	-	16,640.00	-
1993	Underground	Phased Released	3	30.79	0.818%	0.00	8.349%	0.02	0.25	-	2.57	11,610.00	0.50	-	31,548.00	-
1994	Underground	Phased Released	3	26.14	0.826%	0.00	8.769%	0.02	0.26	-	2.29	11,610.00	0.50	-	30,624.00	-
1995	Underground	Phased Released	4	65.62	0.833%	0.00	9.190%	0.03	0.37	-	6.03	11,610.00	0.50	-	83,832.00	-
1996	Underground	Phased Released	4	133.37	0.841%	0.00	9.610%	0.03	0.38	-	12.82	11,610.00	0.50	-	105,442.00	-
1997	Underground	Phased Released	5	149.46	0.848%	0.00	10.030%	0.04	0.50	-	14.99	11,610.00	0.50	-	115,842.75	-
1998	Underground	Phased Released	3	70.67	0.856%	0.00	10.451%	0.03	0.31	-	7.39	11,610.00	0.50	-	75,384.00	-
1999	Underground	Phased Released	1	10.68	0.863%	0.00	10.871%	0.01	0.11	-	1.16	11,610.00	0.50	-	10,000.00	-
2000	Underground	Phased Released	2	59.65	0.870%	0.00	11.292%	0.02	0.23	-	6.74	11,610.00	0.50	-	49,536.19	-
2001	Underground	Phased Released	4	36.60	0.878%	0.00	11.712%	0.04	0.47	-	4.29	11,610.00	0.50	-	52,072.00	-
2002	Underground	Phased Released	1	48.55	0.885%	0.00	12.132%	0.01	0.12	-	5.89	11,610.00	0.50	-	92,530.00	-
2003	Underground	Phased Released	3	78.20	0.893%	0.00	12.553%	0.03	0.38	-	9.82	11,610.00	0.50	-	60,200.00	-
2004	Underground	Phased Released	1	16.25	0.900%	0.00	10.149%	0.01	0.10	-	1.65	11,610.00	0.50	-	20,160.00	-
2005	Underground	Phased Released	-	-	0.908%	0.00	9.748%	-	-	-	-	11,610.00	0.50	-	-	-
2006	Underground	Phased Released	-	-	0.915%	0.00	9.347%	-	-	-	-	11,610.00	0.50	-	-	-
2007	Underground	Phased Released	-	-	0.923%	0.00	8.945%	-	-	-	-	11,610.00	0.50	-	-	-
2008	Underground	Phased Released	2	43.07	0.930%	0.00	8.544%	0.02	0.17	-	3.68	11,610.00	0.50	-	44,304.00	-
2009	Underground	Phased Released	2	54.60	0.938%	0.00	8.143%	0.02	0.16	-	4.45	11,610.00	0.50	-	72,624.00	-
2010	Underground	Phased Released	-	-	0.945%	0.00	7.741%	-	-	-	-	11,610.00	0.50	-	-	-
2011	Underground	Phased Released	1	25.60	0.953%	0.00	7.340%	0.01	0.07	-	1.88	11,610.00	0.50	-	-	-
2012	Underground	Phased Released	-	-	0.960%	0.00	6.938%	-	-	-	-	11,610.00	0.50	-	-	-
2013	Underground	Phased Released	-	-	0.967%	0.00	6.537%	-	-	-	-	11,610.00	0.50	-	-	-
2014	Underground	Phased Released	-	-	0.975%	0.00	6.136%	-	-	-	-	11,610.00	0.50	-	-	-
2015	Underground	Phased Released	-	-	1.163%	0.00	5.734%	-	-	-	-	11,610.00	0.50	-	-	-
2016	Underground	Phased Released	-	-	0.999%	0.00	5.333%	-	-	-	-	11,610.00	0.50	-	-	-
2017	Underground	Phased Released	-	-	0.835%	0.00	4.932%	-	-	-	-	11,610.00	0.50	-	-	-
2018	Underground	Phased Released	-	-	0.670%	0.00	4.530%	-	-	-	-	11,610.00	0.50	-	-	-
2019	Underground	Phased Released	-	-	0.506%	0.00	4.129%	-	-	-	-	11,610.00	0.50	-	-	-
2020	Underground	Phased Released	-	-	0.342%	0.00	3.727%	-	-	-	-	11,610.00	0.50	-	-	-
2021	Underground	Phased Released	-	-	0.000%	0.00	3.326%	-	-	-	-	11,610.00	0.50	-	-	-



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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	2022								Avg Recl Cost per Acre (13)	Adjustment Factor Permit Status (14)	Gross Cost (15)	Current Security Amount (16)	Forfeited Security Amount (17)	Net Cost (18)	
				Current Bonded Acres (5)	Forfeiture Rate (6)	Adjustment Factor Permit Bond Size (7)	Release Rate (8)	Forfeited Permit Count (9)	Released Permit Count (10)	Forfeited Acres (11)	Released Acres (12)							
1963	Other	Active	-	-	0.207%	0.00	2.292%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1964	Other	Active	-	-	0.207%	0.00	2.269%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1965	Other	Active	-	-	0.207%	0.00	2.247%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1966	Other	Active	-	-	0.207%	0.00	2.224%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1967	Other	Active	-	-	0.207%	0.00	2.201%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1968	Other	Active	-	-	0.207%	0.00	2.178%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1969	Other	Active	-	-	0.207%	0.00	2.156%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1970	Other	Active	-	-	0.207%	0.00	2.133%	-	-	-	-	8,785.00	1.00	-	-	-	-	
1971	Other	Active	-	-	0.207%	0.00	2.110%	-	-	-	-	8,785.00	1.00	-	20,000.00	-	-	
1972	Other	Active	1	20.00	0.207%	1.50	2.087%	-	0.00	0.02	0.06	0.42	8,785.00	1.00	545.60	-	545.60	
1973	Other	Active	-	-	0.207%	0.00	2.064%	-	-	-	-	8,785.00	1.00	-	29,000.00	-	-	
1974	Other	Active	1	28.52	0.207%	1.50	2.042%	0.00	0.02	0.09	0.58	8,785.00	1.00	778.02	10,500.00	32.61	745.41	
1975	Other	Active	1	6.20	0.207%	1.50	2.019%	0.00	0.02	0.02	0.13	8,785.00	1.00	169.13	75,000.00	232.90	-	
1976	Other	Active	1	75.00	0.207%	1.50	1.996%	0.00	0.02	0.23	1.50	8,785.00	1.00	2,045.99	308,000.00	956.42	1,089.56	
1977	Other	Active	2	307.70	0.207%	1.00	1.973%	0.00	0.04	0.64	6.07	8,785.00	1.00	5,596.00	18,200.00	37.68	5,558.32	
1978	Other	Active	-	-	0.207%	0.00	1.951%	-	-	-	-	8,785.00	1.00	-	65,000.00	-	-	
1979	Other	Active	1	65.00	0.207%	1.50	1.928%	0.00	0.02	0.20	1.25	8,785.00	1.00	1,773.19	530,240.00	1,646.54	126.65	
1980	Other	Active	7	370.67	0.207%	1.21	1.905%	0.01	0.13	0.93	7.06	8,785.00	1.00	8,185.75	20,503,795.00	51,542.25	-	
1981	Other	Active	34	4,857.33	0.207%	0.94	1.882%	0.07	0.64	9.46	91.43	8,785.00	1.00	83,141.66	1,973,080.00	3,844.36	79,297.30	
1982	Other	Active	4	554.75	0.207%	0.75	1.860%	0.01	0.07	0.86	10.32	8,785.00	1.00	7,566.74	12,036,424.00	18,688.18	-	
1983	Other	Active	35	3,438.58	0.207%	0.87	1.837%	0.07	0.64	6.20	63.16	8,785.00	1.00	54,495.54	12,667,940.00	22,853.15	31,642.39	
1984	Other	Active	32	4,454.39	0.207%	0.69	1.814%	0.07	0.58	6.35	80.88	8,785.00	1.00	55,819.36	4,711,104.00	6,705.08	49,114.28	
1985	Other	Active	14	2,329.11	0.207%	1.00	1.791%	0.03	0.25	4.82	41.72	8,785.00	1.00	42,358.45	4,958,480.00	10,264.95	32,093.50	
1986	Other	Active	13	1,411.57	0.207%	0.96	1.768%	0.03	0.23	2.81	24.96	8,785.00	1.00	24,684.20	1,074,720.00	2,139.29	22,544.91	
1987	Other	Active	7	486.71	0.207%	1.07	1.746%	0.01	0.12	1.08	8.50	8,785.00	1.00	9,483.82	1,050,280.00	2,329.57	7,154.25	
1988	Other	Active	7	479.98	0.207%	1.21	1.723%	0.01	0.12	1.21	8.27	8,785.00	1.00	10,599.71	1,137,800.00	2,860.19	7,739.52	
1989	Other	Active	7	290.43	0.207%	1.36	1.700%	0.01	0.12	0.82	4.94	8,785.00	1.00	7,168.31	294,600.00	827.69	6,340.63	
1990	Other	Active	5	254.35	0.207%	1.30	1.677%	0.01	0.08	0.71	4.43	8,785.00	1.00	6,249.89	55,000.00	148.02	6,101.88	
1991	Other	Active	7	431.34	0.207%	1.36	1.655%	0.01	0.12	1.21	7.14	8,785.00	1.00	10,646.22	1,594,600.00	4,480.08	6,166.14	
1992	Other	Active	9	554.74	0.207%	1.06	1.632%	0.02	0.15	1.21	9.05	8,785.00	1.00	10,649.29	1,674,360.00	3,658.80	6,990.49	
1993	Other	Active	8	879.50	0.207%	0.75	0.350%	0.02	0.03	1.37	3.08	8,785.00	1.00	11,996.29	5,372,060.00	8,340.85	3,655.44	
1994	Other	Active	12	1,837.84	0.207%	0.83	0.540%	0.02	0.06	3.17	9.93	8,785.00	1.00	27,853.29	3,965,472.00	6,841.04	21,012.25	
1995	Other	Active	6	939.93	0.207%	1.00	0.730%	0.01	0.04	1.95	6.86	8,785.00	1.00	17,094.07	10,134,530.00	20,980.31	-	
1996	Other	Active	3	1,971.02	0.207%	0.50	0.919%	0.01	0.03	2.04	18.12	8,785.00	1.00	17,923.01	2,562,640.00	2,652.56	15,270.45	
1997	Other	Active	10	1,267.92	0.207%	1.00	1.109%	0.02	0.11	2.62	14.06	8,785.00	1.00	23,059.07	3,491,120.00	7,227.25	15,831.83	
1998	Other	Active	3	1,054.49	0.283%	0.83	1.298%	0.01	0.04	2.48	13.69	8,785.00	1.00	21,816.68	960,360.00	2,261.72	19,554.96	
1999	Other	Active	5	404.95	0.358%	1.10	1.488%	0.02	0.07	1.60	6.03	8,785.00	1.00	14,017.18	33,000.00	130.03	13,887.16	
2000	Other	Active	2	255.10	0.434%	1.00	1.678%	0.01	0.03	1.11	4.28	8,785.00	1.00	9,721.47	803,360.00	3,484.90	6,236.57	
2001	Other	Active	5	860.44	0.509%	0.90	1.867%	0.03	0.09	1.65	6.73	8,785.00	1.00	14,516.43	1,688,586.66	7,741.20	6,775.23	
2002	Other	Active	6	559.59	0.585%	1.33	2.057%	0.04	0.12	4.44	11.72	8,785.00	1.00	39,028.12	4,537,054.00	35,387.30	3,640.82	
2003	Other	Active	3	810.10	0.661%	0.83	2.246%	0.02	0.07	4.46	18.20	8,785.00	1.00	39,175.35	3,605,872.00	19,849.19	19,326.16	
2004	Other	Active	7	1,049.09	0.736%	0.93	2.436%	0.05	0.17	7.17	25.56	8,785.00	1.00	62,999.61	238,600.00	1,631.00	61,368.61	
2005	Other	Active	2	22.99	0.812%	1.00	2.626%	0.02	0.05	0.19	0.60	8,785.00	1.00	1,639.46	1,338,300.00	10,863.56	-	
2006	Other	Active	7	491.96	0.887%	1.07	2.815%	0.06	0.20	4.68	13.85	8,785.00	1.00	41,088.67	1,056,480.00	10,044.12	31,044.55	
2007	Other	Active	5	868.47	0.963%	1.10	3.005%	0.05	0.15	3.90	11.07	8,785.00	1.00	34,286.97	1,650,520.00	17,482.60	16,804.37	
2008	Other	Active	9	649.47	1.039%	1.28	3.194%	0.09	0.29	8.62	20.75	8,785.00	1.00	75,712.79	468,600.00	6,218.29	69,494.51	
2009	Other	Active	6	202.62	1.114%	1.33	3.384%	0.07	0.20	3.01	6.86	8,785.00	1.00	26,441.71	4,295,120.00	63,802.94	-	
2010	Other	Active	9	1,059.98	1.190%	1.06	3.574%	0.11	0.32	13.31	37.88	8,785.00	1.00	116,938.34	491,500.00	6,172.21	110,766.13	
2011	Other	Active	3	350.69	1.265%	0.83	4.298%	0.04	0.13	3.70	15.07	8,785.00	1.00	32,484.28	146,500.00	1,544.71	30,939.57	
2012	Other	Active	7	147.31	1.331%	1.50	8.818%	0.09	0.62	2.94	12.99	8,785.00	1.00	25,830.02	3,844,980.00	76,744.07	-	
2013	Other	Active	17	2,047.67	1.142%	1.03	15.337%	0.19	2.27	24.07	273.11	8,785.00	1.00	211,465.00	659,352.25	7,750.94	203,714.06	
2014	Other	Active	8	259.86	0.953%	1.38	17.857%	0.08	1.43	3.41	46.40	8,785.00	1.00	29,922.51	1,201,800.00	15,749.60	14,172.91	
2015	Other	Active	10	1,229.64	0.765%	1.10	22.376%	0.08	2.24	10.34	275.15	8,785.00	1.00	90,852.30	6,558,600.00	55,160.39	35,691.91	
2016	Other	Active	6	1,513.50	0.576%	1.33	26.896%	0.03	1.61	11.62	407.07	8,785.00	1.00	102,095.55	262,620.00	2,016.56	100,078.99	
2017	Other	Active	7	388.02	0.387%	1.36	38.903%	0.03	2.72	2.04	150.95	8,785.00	1.00	17,913.01	149,500.00	785.62	17,127.39	
2018	Other	Active	4	36.77	0.199%	1.50	32.479%	0.01	1.30	0.11	11.94	8,785.00	1.00	961.93	151,500.00	451.15	510.78	
2019	Other	Active	14	50.90	0.010%	1.50	22.332%	0.00	3.13	0.01	11.37	8,785.00	1.00	66.00	197,260.00	29.12	36.88	
2020	Other	Active	35	777.21	0.000%	1.47	12.185%	-	-	4.26	-	94.70	8,785.00	1.00	-	197,260.00	-	-
2021	Other	Active	35	175.63	0.000%	1.50	2.037%	-	0.71	-	3.58	8,785.00	1.00	-	197,260.00	-	-	

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Permit Issue Year	Mine Type	Mine Status	Permit Count	Current Bonded Acres	Forfeiture Rate	Adjustment						Avg Recl Cost per Acre	Adjustment Factor	Gross Cost	Current Security Amount	Forfeited Security Amount	Net Cost
						Permit Bond Size	Release Rate	Forfeited Permit Count	Released Permit Count	Forfeited Acres	Released Acres						
1963	Other	Inactive	-	-	0.466%	0.00	1.433%	-	-	-	-	8,785.00	1.00	-	50	-	-
1964	Other	Inactive	-	-	0.466%	0.00	1.418%	-	-	-	-	8,785.00	1.00	-	-	-	-
1965	Other	Inactive	-	-	0.466%	0.00	1.404%	-	-	-	-	8,785.00	1.00	-	-	-	-
1966	Other	Inactive	-	-	0.466%	0.00	1.390%	-	-	-	-	8,785.00	1.00	-	-	-	-
1967	Other	Inactive	-	-	0.466%	0.00	1.376%	-	-	-	-	8,785.00	1.00	-	-	-	-
1968	Other	Inactive	-	-	0.466%	0.00	1.361%	-	-	-	-	8,785.00	1.00	-	-	-	-
1969	Other	Inactive	-	-	0.466%	0.00	1.347%	-	-	-	-	8,785.00	1.00	-	-	-	-
1970	Other	Inactive	-	-	0.466%	0.00	1.333%	-	-	-	-	8,785.00	1.00	-	-	-	-
1971	Other	Inactive	-	-	0.466%	0.00	1.319%	-	-	-	-	8,785.00	1.00	-	-	-	-
1972	Other	Inactive	-	-	0.466%	0.00	1.305%	-	-	-	-	8,785.00	1.00	-	-	-	-
1973	Other	Inactive	-	-	0.466%	0.00	1.290%	-	-	-	-	8,785.00	1.00	-	-	-	-
1974	Other	Inactive	-	-	0.466%	0.00	1.276%	-	-	-	-	8,785.00	1.00	-	-	-	-
1975	Other	Inactive	-	-	0.466%	0.00	1.262%	-	-	-	-	8,785.00	1.00	-	-	-	-
1976	Other	Inactive	1	14.48	0.466%	1.50	1.248%	0.00	0.01	0.10	0.18	8,785.00	1.00	888.78	15,000.00	104.80	783.97
1977	Other	Inactive	2	61.00	0.466%	1.50	1.233%	0.01	0.02	0.43	0.75	8,785.00	1.00	3,744.15	62,000.00	433.19	3,310.97
1978	Other	Inactive	-	-	0.466%	0.00	1.219%	-	-	-	-	8,785.00	1.00	-	-	-	-
1979	Other	Inactive	1	7.25	0.466%	1.50	1.205%	0.00	0.01	0.05	0.09	8,785.00	1.00	445.00	10,000.00	69.87	375.13
1980	Other	Inactive	1	114.75	0.466%	0.50	1.191%	0.00	0.01	0.27	1.37	8,785.00	1.00	2,347.77	340,400.00	792.78	1,554.99
1981	Other	Inactive	13	1,477.93	0.466%	0.96	1.176%	0.06	0.15	6.62	17.39	8,785.00	1.00	58,150.45	3,551,200.00	15,904.96	42,245.49
1982	Other	Inactive	3	148.70	0.466%	1.17	1.162%	0.01	0.03	0.81	1.73	8,785.00	1.00	7,098.89	68,000.00	369.53	6,729.36
1983	Other	Inactive	8	1,739.30	0.466%	0.75	1.148%	0.04	0.09	6.08	19.97	8,785.00	1.00	53,378.74	6,709,953.00	23,440.75	29,937.99
1984	Other	Inactive	7	440.78	0.466%	0.93	1.134%	0.03	0.08	1.91	5.00	8,785.00	1.00	16,748.26	6,695,522.00	28,959.46	-
1985	Other	Inactive	3	364.25	0.466%	0.83	1.120%	0.01	0.03	1.41	4.08	8,785.00	1.00	12,420.84	3,391,820.00	13,165.65	-
1986	Other	Inactive	-	-	0.466%	0.00	1.105%	-	-	-	-	8,785.00	1.00	-	10,000.00	-	-
1987	Other	Inactive	1	484.64	0.466%	0.50	1.091%	0.00	0.01	1.13	5.29	8,785.00	1.00	9,915.66	3,433,360.00	7,996.13	1,919.53
1988	Other	Inactive	3	167.79	0.466%	1.17	1.077%	0.01	0.03	0.91	1.81	8,785.00	1.00	8,010.24	183,000.00	994.46	7,015.77
1989	Other	Inactive	5	438.61	0.466%	0.90	1.063%	0.02	0.05	1.84	4.66	8,785.00	1.00	16,153.01	1,760,000.00	737.81	15,415.20
1990	Other	Inactive	3	481.66	0.466%	1.17	1.049%	0.01	0.03	2.62	5.05	8,785.00	1.00	22,994.28	1,961,360.00	10,658.47	12,335.81
1991	Other	Inactive	-	-	0.466%	0.00	1.034%	-	-	-	-	8,785.00	1.00	-	1,298,480.00	-	-
1992	Other	Inactive	5	433.18	0.466%	1.30	1.020%	0.02	0.05	2.62	4.42	8,785.00	1.00	23,043.28	1,239,200.00	7,503.70	15,539.58
1993	Other	Inactive	5	273.92	0.466%	0.90	0.219%	0.02	0.01	1.15	0.60	8,785.00	1.00	10,087.85	2,854,375.45	11,965.87	-
1994	Other	Inactive	4	545.08	0.466%	1.00	0.338%	0.02	0.01	2.54	1.84	8,785.00	1.00	22,304.51	1,111,360.00	5,176.61	17,127.90
1995	Other	Inactive	3	641.22	0.466%	1.17	0.456%	0.01	0.01	3.48	2.92	8,785.00	1.00	30,611.62	3,222,200.00	17,510.16	13,101.47
1996	Other	Inactive	1	152.16	0.466%	0.50	0.575%	0.00	0.01	0.35	0.87	8,785.00	1.00	3,113.17	508,280.00	1,183.76	1,929.41
1997	Other	Inactive	3	158.04	0.466%	0.83	0.693%	0.01	0.02	0.61	1.10	8,785.00	1.00	5,389.13	338,000.00	1,311.98	4,077.15
1998	Other	Inactive	2	206.29	0.636%	1.00	0.812%	0.01	0.02	1.31	1.67	8,785.00	1.00	11,523.60	90,000.00	572.28	10,951.31
1999	Other	Inactive	-	-	0.806%	0.00	0.930%	-	-	-	-	8,785.00	1.00	-	-	-	-
2000	Other	Inactive	1	116.73	0.976%	0.50	1.049%	0.01	0.01	0.57	1.22	8,785.00	1.00	5,004.45	1,044,680.00	5,098.18	-
2001	Other	Inactive	1	250.00	1.146%	0.50	1.167%	0.01	0.01	1.43	2.92	8,785.00	1.00	12,585.69	284,000.00	1,627.47	10,958.21
2002	Other	Inactive	2	222.64	1.316%	1.00	1.286%	0.03	0.03	2.93	2.86	8,785.00	1.00	25,743.18	682,700.00	8,985.60	16,757.58
2003	Other	Inactive	2	78.29	1.486%	1.50	1.404%	0.03	0.03	1.75	1.10	8,785.00	1.00	15,333.30	104,000.00	2,318.57	13,014.72
2004	Other	Inactive	1	56.00	1.656%	1.50	1.523%	0.02	0.02	1.39	0.85	8,785.00	1.00	12,222.83	-	-	12,222.83
2005	Other	Inactive	1	50.69	1.826%	1.50	1.641%	0.02	0.02	1.39	0.83	8,785.00	1.00	12,199.91	-	-	12,199.91
2006	Other	Inactive	-	-	1.997%	0.00	1.760%	-	-	-	-	8,785.00	1.00	-	-	-	-
2007	Other	Inactive	-	-	2.167%	0.00	1.878%	-	-	-	-	8,785.00	1.00	-	26,000.00	-	-
2008	Other	Inactive	1	4.11	2.337%	1.50	1.997%	0.02	0.02	0.14	0.08	8,785.00	1.00	1,265.52	10,000.00	350.50	915.03
2009	Other	Inactive	-	-	2.507%	0.00	2.115%	-	-	-	-	8,785.00	1.00	-	-	-	-
2010	Other	Inactive	-	-	2.677%	0.00	2.234%	-	-	-	-	8,785.00	1.00	-	134,000.00	-	-
2011	Other	Inactive	-	-	2.847%	0.00	2.687%	-	-	-	-	8,785.00	1.00	-	16,000.00	-	-
2012	Other	Inactive	1	66.26	2.994%	0.50	5.511%	0.03	0.06	0.99	3.65	8,785.00	1.00	8,713.75	230,480.00	3,450.21	5,263.54
2013	Other	Inactive	1	57.00	2.569%	1.50	8.336%	0.03	0.08	2.20	4.75	8,785.00	1.00	19,299.14	57,000.00	2,196.83	17,102.31
2014	Other	Inactive	-	-	2.145%	0.00	11.161%	-	-	-	-	8,785.00	1.00	-	-	-	-
2015	Other	Inactive	-	-	1.720%	0.00	13.985%	-	-	-	-	8,785.00	1.00	-	-	-	-
2016	Other	Inactive	-	-	1.296%	0.00	16.810%	-	-	-	-	8,785.00	1.00	-	-	-	-
2017	Other	Inactive	-	-	0.871%	0.00	24.315%	-	-	-	-	8,785.00	1.00	-	-	-	-
2018	Other	Inactive	1	11.88	0.447%	1.50	20.299%	0.00	0.20	0.08	2.41	8,785.00	1.00	699.27	-	-	699.27
2019	Other	Inactive	-	-	0.022%	0.00	13.957%	-	-	-	-	8,785.00	1.00	-	-	-	-
2020	Other	Inactive	-	-	0.000%	0.00	7.615%	-	-	-	-	8,785.00	1.00	-	-	-	-
2021	Other	Inactive	-	-	0.000%	0.00	1.273%	-	-	-	-	8,785.00	1.00	-	-	-	-

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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Forfeiture Rate (6)	Adjustment						Avg Recl Cost per Acre (13)	Adjustment Factor Permit Status (14)	Gross Cost (15)	Current Security Amount (16)	Forfeited Security Amount (17)	Net Cost (18)
						Permit Bond Size (7)	Release Rate (8)	Forfeited Permit Count (9)	Released Permit Count (10)	Forfeited Acres (11)	Released Acres (12)						
1963	Other	Phased Released	-	-	0.811%	0.00	6.877%	-	-	-	-	8,785.00	0.50	-	-	-	-
1964	Other	Phased Released	-	-	0.811%	0.00	6.808%	-	-	-	-	8,785.00	0.50	-	-	-	-
1965	Other	Phased Released	-	-	0.811%	0.00	6.740%	-	-	-	-	8,785.00	0.50	-	-	-	-
1966	Other	Phased Released	-	-	0.811%	0.00	6.672%	-	-	-	-	8,785.00	0.50	-	-	-	-
1967	Other	Phased Released	-	-	0.811%	0.00	6.603%	-	-	-	-	8,785.00	0.50	-	-	-	-
1968	Other	Phased Released	-	-	0.811%	0.00	6.535%	-	-	-	-	8,785.00	0.50	-	-	-	-
1969	Other	Phased Released	-	-	0.811%	0.00	6.467%	-	-	-	-	8,785.00	0.50	-	-	-	-
1970	Other	Phased Released	-	-	0.811%	0.00	6.398%	-	-	-	-	8,785.00	0.50	-	-	-	-
1971	Other	Phased Released	-	-	0.811%	0.00	6.330%	-	-	-	-	8,785.00	0.50	-	-	-	-
1972	Other	Phased Released	-	-	0.811%	0.00	6.262%	-	-	-	-	8,785.00	0.50	-	-	-	-
1973	Other	Phased Released	1	9.00	0.811%	0.00	6.193%	0.01	0.06	-	0.56	8,785.00	0.50	-	10,000.00	-	-
1974	Other	Phased Released	-	-	0.811%	0.00	6.125%	-	-	-	-	8,785.00	0.50	-	-	-	-
1975	Other	Phased Released	-	-	0.811%	0.00	6.057%	-	-	-	-	8,785.00	0.50	-	-	-	-
1976	Other	Phased Released	2	27.88	0.811%	0.00	5.989%	0.02	0.12	-	1.67	8,785.00	0.50	-	10,000.00	-	-
1977	Other	Phased Released	-	-	0.811%	0.00	5.920%	-	-	-	-	8,785.00	0.50	-	-	-	-
1978	Other	Phased Released	1	12.76	0.811%	0.00	5.852%	0.01	0.06	-	0.75	8,785.00	0.50	-	-	-	-
1979	Other	Phased Released	2	58.69	0.811%	0.00	5.784%	0.02	0.12	-	3.39	8,785.00	0.50	-	58,000.00	-	-
1980	Other	Phased Released	1	7.91	0.811%	0.00	5.715%	0.01	0.06	-	0.45	8,785.00	0.50	-	10,000.00	-	-
1981	Other	Phased Released	4	475.54	0.811%	0.00	5.647%	0.03	0.23	-	26.85	8,785.00	0.50	-	204,860.00	-	-
1982	Other	Phased Released	2	201.26	0.811%	0.00	5.579%	0.02	0.11	-	11.23	8,785.00	0.50	-	69,200.00	-	-
1983	Other	Phased Released	3	158.90	0.811%	0.00	5.510%	0.02	0.17	-	8.76	8,785.00	0.50	-	141,200.00	-	-
1984	Other	Phased Released	4	75.79	0.811%	0.00	5.442%	0.03	0.22	-	4.12	8,785.00	0.50	-	84,200.00	-	-
1985	Other	Phased Released	1	43.00	0.811%	0.00	5.374%	0.01	0.05	-	2.31	8,785.00	0.50	-	17,200.00	-	-
1986	Other	Phased Released	-	-	0.811%	0.00	5.305%	-	-	-	-	8,785.00	0.50	-	10,000.00	-	-
1987	Other	Phased Released	1	50.95	0.811%	0.00	5.237%	0.01	0.05	-	2.67	8,785.00	0.50	-	52,300.00	-	-
1988	Other	Phased Released	-	-	0.811%	0.00	5.169%	-	-	-	-	8,785.00	0.50	-	-	-	-
1989	Other	Phased Released	2	38.00	0.811%	0.00	5.100%	0.02	0.10	-	1.94	8,785.00	0.50	-	-	-	-
1990	Other	Phased Released	-	-	0.811%	0.00	5.032%	-	-	-	-	8,785.00	0.50	-	-	-	-
1991	Other	Phased Released	-	-	0.811%	0.00	4.964%	-	-	-	-	8,785.00	0.50	-	-	-	-
1992	Other	Phased Released	-	-	0.811%	0.00	4.895%	-	-	-	-	8,785.00	0.50	-	-	-	-
1993	Other	Phased Released	1	48.00	0.811%	0.00	4.827%	0.01	0.01	-	0.50	8,785.00	0.50	-	-	-	-
1994	Other	Phased Released	-	-	0.811%	0.00	4.758%	-	-	-	-	8,785.00	0.50	-	-	-	-
1995	Other	Phased Released	-	-	0.811%	0.00	4.690%	-	-	-	-	8,785.00	0.50	-	-	-	-
1996	Other	Phased Released	-	-	0.811%	0.00	4.622%	-	-	-	-	8,785.00	0.50	-	-	-	-
1997	Other	Phased Released	1	31.16	0.811%	0.00	4.554%	0.01	0.03	-	1.04	8,785.00	0.50	-	-	-	-
1998	Other	Phased Released	-	-	1.107%	0.00	3.895%	-	-	-	-	8,785.00	0.50	-	-	-	-
1999	Other	Phased Released	1	179.00	1.403%	0.00	4.464%	0.01	0.04	-	7.99	8,785.00	0.50	-	249,600.00	-	-
2000	Other	Phased Released	-	-	1.699%	0.00	5.033%	-	-	-	-	8,785.00	0.50	-	-	-	-
2001	Other	Phased Released	-	-	1.995%	0.00	5.602%	-	-	-	-	8,785.00	0.50	-	-	-	-
2002	Other	Phased Released	-	-	2.291%	0.00	6.171%	-	-	-	-	8,785.00	0.50	-	-	-	-
2003	Other	Phased Released	-	-	2.587%	0.00	6.739%	-	-	-	-	8,785.00	0.50	-	-	-	-
2004	Other	Phased Released	-	-	2.883%	0.00	7.308%	-	-	-	-	8,785.00	0.50	-	-	-	-
2005	Other	Phased Released	-	-	3.179%	0.00	7.877%	-	-	-	-	8,785.00	0.50	-	-	-	-
2006	Other	Phased Released	-	-	3.475%	0.00	8.446%	-	-	-	-	8,785.00	0.50	-	-	-	-
2007	Other	Phased Released	-	-	3.771%	0.00	9.015%	-	-	-	-	8,785.00	0.50	-	-	-	-
2008	Other	Phased Released	-	-	4.068%	0.00	9.583%	-	-	-	-	8,785.00	0.50	-	-	-	-
2009	Other	Phased Released	-	-	4.364%	0.00	10.152%	-	-	-	-	8,785.00	0.50	-	-	-	-
2010	Other	Phased Released	-	-	4.660%	0.00	10.721%	-	-	-	-	8,785.00	0.50	-	-	-	-
2011	Other	Phased Released	-	-	4.956%	0.00	12.895%	-	-	-	-	8,785.00	0.50	-	-	-	-
2012	Other	Phased Released	-	-	5.212%	0.00	26.454%	-	-	-	-	8,785.00	0.50	-	-	-	-
2013	Other	Phased Released	-	-	4.473%	0.00	40.012%	-	-	-	-	8,785.00	0.50	-	-	-	-
2014	Other	Phased Released	-	-	3.734%	0.00	53.571%	-	-	-	-	8,785.00	0.50	-	-	-	-
2015	Other	Phased Released	-	-	2.995%	0.00	67.129%	-	-	-	-	8,785.00	0.50	-	-	-	-
2016	Other	Phased Released	-	-	2.256%	0.00	80.688%	-	-	-	-	8,785.00	0.50	-	-	-	-
2017	Other	Phased Released	-	-	1.517%	0.00	116.710%	-	-	-	-	8,785.00	0.50	-	-	-	-
2018	Other	Phased Released	-	-	0.778%	0.00	97.437%	-	-	-	-	8,785.00	0.50	-	-	-	-
2019	Other	Phased Released	-	-	0.039%	0.00	66.996%	-	-	-	-	8,785.00	0.50	-	-	-	-
2020	Other	Phased Released	-	-	0.000%	0.00	36.554%	-	-	-	-	8,785.00	0.50	-	-	-	-
2021	Other	Phased Released	-	-	0.000%	0.00	6.112%	-	-	-	-	8,785.00	0.50	-	-	-	-

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Permit Issue Year	Mine Type	Mine Status	2023																		
			Current		Adjustment Factor						Adjustment				Adjustment		Adjustment		Forfeited		
			Permit Count (4)	Bonded Acres (5)	Adjusted Permits (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Bond Size (22)	Release Rate (23)	Forfeited Permits (24)	Released Permits (25)	Forfeited Acres (26)	Released Acres (27)	Avg recl Cost per Acre (28)	Permit Status (29)	Gross Cost (30)	Security Amount (31)	Forfeited Security Amount (32)	Net Cost (33)	Adjusted Permits (34)	
1963	Surface	Active	-	-	-	-	0.00%	-	1.07%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1964	Surface	Active	-	-	-	-	0.00%	-	1.07%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1965	Surface	Active	-	-	-	-	0.00%	-	1.09%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1966	Surface	Active	-	-	-	-	0.00%	-	1.11%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1967	Surface	Active	-	-	-	-	0.00%	-	1.14%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1968	Surface	Active	-	-	-	-	0.00%	-	1.16%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1969	Surface	Active	-	-	-	-	0.00%	-	1.18%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1970	Surface	Active	-	-	-	-	0.00%	-	1.21%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1971	Surface	Active	-	-	-	-	0.00%	-	1.23%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1972	Surface	Active	1	400.00	0.99	394.74	0.01%	1.50	1.26%	0.00	0.01	0.03	4.96	2,685.00	1	79.82	32,239.64	2,427,873	77.39	0.97	
1973	Surface	Active	-	-	-	-	0.02%	-	1.28%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1974	Surface	Active	-	-	-	-	0.04%	-	1.31%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1975	Surface	Active	-	-	-	-	0.05%	-	1.33%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1976	Surface	Active	-	-	-	-	0.07%	-	1.36%	-	-	-	-	-	2,685.00	1	-	0	-	-	
1977	Surface	Active	6	1,933.27	5.91	1,904.52	0.09%	0.67	1.39%	0.01	0.08	1.10	26.47	2,685.00	1	2,965.07	4,951,399.60	2870.991	94.08	5.82	
1978	Surface	Active	4	2,280.93	3.94	2,246.56	0.10%	0.50	1.42%	0.00	0.06	1.16	31.86	2,685.00	1	3,117.53	3,661,294.36	1892.268	1,225.26	3.88	
1979	Surface	Active	2	180.00	1.97	177.20	0.12%	1.00	1.45%	0.00	0.03	0.21	2.56	2,685.00	1	569.45	179,754.93	215.2691	354.18	1.94	
1980	Surface	Active	1	455.76	0.98	448.55	0.14%	0.50	1.48%	0.00	0.01	0.31	6.62	2,685.00	1	819.85	5,028,655.75	3423.205	-	0.97	
1981	Surface	Active	9	1,661.03	8.85	1,632.53	0.15%	1.06	1.51%	0.01	0.13	2.63	24.60	2,685.00	1	7,057.77	4,651,610.67	7489.709	-	8.70	
1982	Surface	Active	2	620.00	1.96	609.12	0.17%	1.00	1.54%	0.00	0.03	1.03	9.36	2,685.00	1	2,762.85	2,601,104.66	4394.041	-	1.93	
1983	Surface	Active	2	1,704.33	1.96	1,675.33	0.19%	0.50	1.57%	0.00	0.03	1.55	26.28	2,685.00	1	4,168.10	7,438,384.38	6892.434	-	1.93	
1984	Surface	Active	-	-	-	-	0.20%	-	1.60%	-	-	-	-	-	2,685.00	1	-	3,108,294.00	0	-	-
1985	Surface	Active	5	2,405.91	4.90	2,361.86	0.22%	0.70	1.63%	0.01	0.08	3.61	38.58	2,685.00	1	9,681.83	6,452,662.83	9851.398	-	4.81	
1986	Surface	Active	7	2,331.92	6.86	2,285.99	0.23%	1.07	1.67%	0.02	0.11	5.74	38.10	2,685.00	1	15,421.01	4,516,147.66	11346.51	4,074.50	6.73	
1987	Surface	Active	3	1,371.12	2.94	1,344.27	0.25%	0.83	1.70%	0.01	0.05	2.81	22.86	2,685.00	1	7,546.11	4,016,075.05	8396.423	-	2.88	
1988	Surface	Active	8	1,898.10	7.84	1,859.77	0.27%	0.88	1.74%	0.02	0.14	4.35	32.28	2,685.00	1	11,678.09	2,059,555.30	4816.599	6,861.49	7.68	
1989	Surface	Active	7	2,959.93	6.85	2,900.73	0.28%	0.64	1.77%	0.02	0.12	5.29	51.37	2,685.00	1	14,202.81	5,885,629.04	10732.85	3,469.96	6.71	
1990	Surface	Active	12	2,801.20	11.74	2,742.90	0.30%	0.75	1.81%	0.04	0.21	6.17	49.57	2,685.00	1	16,573.70	5,047,172.74	11358.31	5,215.40	11.49	
1991	Surface	Active	9	2,094.19	8.80	2,048.20	0.32%	0.94	1.84%	0.03	0.16	6.12	37.77	2,685.00	1	16,936.01	10,208,419.84	30505.67	-	8.61	
1992	Surface	Active	6	4,639.40	5.86	4,542.22	0.33%	0.50	1.88%	0.02	0.11	7.56	85.47	2,685.00	1	20,296.32	19,481,323.18	32420.73	-	5.73	
1993	Surface	Active	12	4,377.78	11.72	4,278.67	0.35%	0.83	1.92%	0.04	0.23	12.45	82.15	2,685.00	1	33,433.66	11,295,202.13	32871.87	561.79	11.46	
1994	Surface	Active	7	2,054.59	6.83	2,009.59	0.37%	0.50	1.96%	0.02	0.13	3.67	39.37	2,685.00	1	9,864.00	7,881,492.07	14408.19	-	6.67	
1995	Surface	Active	12	6,620.84	11.71	6,461.60	0.38%	0.92	2.00%	0.04	0.23	22.63	129.18	2,685.00	1	60,753.70	25,487,177.86	89250.39	-	11.43	
1996	Surface	Active	12	6,830.47	11.70	6,664.68	0.40%	0.83	2.04%	0.05	0.24	22.13	135.96	2,685.00	1	59,410.71	18,332,890.45	60865.63	-	11.42	
1997	Surface	Active	24	13,199.94	23.39	12,874.51	0.41%	0.79	2.08%	0.10	0.49	42.28	267.99	2,685.00	1	113,514.03	56,604,140.35	185875.8	-	22.80	
1998	Surface	Active	19	11,029.10	18.50	10,757.58	0.43%	0.66	2.12%	0.08	0.39	30.52	228.50	2,685.00	1	81,936.73	45,238,877.26	128331	-	18.03	
1999	Surface	Active	4	2,072.61	3.89	2,021.96	0.45%	0.50	2.17%	0.02	0.08	4.52	43.82	2,685.00	1	12,149.38	7,184,294.88	16077.58	-	3.79	
2000	Surface	Active	6	4,526.19	5.84	4,413.17	0.46%	0.50	2.21%	0.03	0.13	10.24	97.60	2,685.00	1	27,488.56	19,160,928.72	44450.15	-	5.68	
2001	Surface	Active	19	6,826.55	18.47	6,639.90	0.48%	0.87	2.26%	0.09	0.42	27.70	149.85	2,685.00	1	74,370.49	31,971,147.62	133368.5	-	17.96	
2002	Surface	Active	15	6,499.09	14.57	6,325.25	0.50%	0.63	2.30%	0.07	0.34	19.90	145.66	2,685.00	1	53,430.72	25,484,408.62	80175.82	-	14.16	
2003	Surface	Active	16	6,916.12	15.53	6,720.53	0.51%	0.81	2.35%	0.08	0.36	28.02	157.92	2,685.00	1	75,232.69	40,234,118.59	157704.7	-	15.09	
2004	Surface	Active	21	11,573.91	20.34	11,229.48	0.53%	0.79	2.40%	0.11	0.49	46.72	269.26	2,685.00	1	125,446.70	49,687,613.11	206730	-	19.75	
2005	Surface	Active	15	5,236.53	14.53	5,071.05	0.67%	1.03	2.45%	0.10	0.36	35.30	124.07	2,685.00	1	94,771.41	14,400,215.11	100231.5	-	14.08	
2006	Surface	Active	10	4,862.21	9.68	4,711.63	0.64%	0.90	2.50%	0.06	0.24	27.23	117.63	2,685.00	1	73,101.27	17,646,971.86	101971.8	-	9.38	
2007	Surface	Active	22	6,382.38	21.30	6,186.23	0.61%	0.82	2.55%	0.13	0.54	30.90	157.60	2,685.00	1	82,968.09	17,612,884.68	87977.4	-	20.63	
2008	Surface	Active	12	8,631.88	11.62	8,375.34	0.58%	0.58	2.60%	0.07	0.30	28.29	217.72	2,685.00	1	75,948.15	18,485,126.01	62429.91	13,518.24	11.25	
2009	Surface	Active	16	6,181.98	15.48	5,990.73	0.55%	0.75	2.65%	0.08	0.41	24.60	158.91	2,685.00	1	66,040.55	20,552,945.39	84384.12	-	14.99	
2010	Surface	Active	12	6,203.98	11.65	6,025.21	0.52%	0.92	2.71%	0.06	0.32	28.49	163.09	2,685.00	1	76,503.44	9,172,818.65	43377.79	33,125.65	11.27	
2011	Surface	Active	17	2,986.04	16.55	2,911.35	0.48%	0.74	2.44%	0.08	0.40	10.37	70.97	2,685.00	1	27,839.04	6,737,114.23	23993.28	3,845.76	16.07	
2012	Surface	Active	22	7,650.01	21.49	7,476.89	0.45%	0.86	2.17%	0.10	0.47	29.24	162.13	2,685.00	1	78,506.65	11,464,016.00	44830.97	33,675.68	20.93	
2013	Surface	Active	22	8,508.13	21.56	8,337.79	0.42%	0.95	1.90%	0.09	0.41	33.53	158.35	2,685.00	1	90,021.43	18,768,479.00	75470.91	14,550.51	21.06	
2014	Surface	Active	16	4,158.44	15.72	4,085.76	0.39%	0.75	1.63%	0.06	0.26	11.94	66.60	2,685.00	1	32,065.23	14,722,942.23	43034.01	-	15.41	
2015	Surface	Active	13	4,371.03	12.82	4,312.88	0.36%	0.73	1.36%	0.05	0.17	11.29	58.69	2,685.00	1	30,310.70	10,742,097.29	28117.29	2,193.40	12.60	
2016	Surface	Active	10	3,389.17	9.89	3,354.29	0.33%	0.70	1.09%	0.03	0.11	7.67	36.62	2,685.00	1	20,592.78	6,688,235.46	15292.6	5,300.18	9.75	
2017	Surface	Active	6	1,324.50	5.95	1,313.68	0.30%	1.00	0.82%	0.02	0.05	3.88	10.81	2,685.00	1	10,408.90	3,361,117.36	9918.696	490.21	5.88	
2018	Surface	Active	8	3,466.31	7.96	3,448.42	0.26%	1.00	0.55%	0.02	0.04	9.09	19.08	2,685.00	1	24,403.08	9,044,406.37	23837.49	565.59	7.89	
2019	Surface	Active	8	4,158.88	7.97	4,143.68	0.23%	0.88	0.28%	0.02	0.02	8.41	11.77	2,685.00	1	22,587.29	2,555,429.40	5187.968	17,399.33	7.93	
2020	Surface	Active	11	3,830.10	10.97	3,820.84	0.20%	0.86	0.19%	0.02	0.02	6.62	7.26	2,685.00	1	17,762.49	2,556,185.03	4425.811	13,336.68	10.93	
2021	Surface	Active	7	3,770.84	6.99	3,767.75	0.17%	0.93	0.10%	0.01	0.01	5.91	3.61	2,685.00	1	15,869.78	2,559,920.00	4015.789	11,853.99	6.98	

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Permit Issue Year	Mine Type	Mine Status	Permit Count (4)	Current		Adjusted		Forfeiture Rate (21)	Adjustment Factor		Release Rate (22)	Forfeited Permit Count (24)	Released Permit Count (25)	Forfeited Acres (26)	Released Acres (27)	Avg recl Cost per Acre (28)	Adjustment Factor		Gross Cost (30)	Adjustment Current Security Amount (31)	Forfeited Security Amount (32)	Net Cost (33)	Adjusted Permit Count (34)
				Bonded Acres (5)	Adjusted Permit Count (18)	Adjusted Acres (19)	Permit Bond Size (22)		Release Rate (22)	Permit Status (29)							Permit Status (29)						
1963	Surface	Inactive	-	-	-	-	0.00%	-	0.67%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1964	Surface	Inactive	-	-	-	-	0.00%	-	0.67%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1965	Surface	Inactive	-	-	-	-	0.00%	-	0.68%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1966	Surface	Inactive	-	-	-	-	0.00%	-	0.70%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1967	Surface	Inactive	-	-	-	-	0.00%	-	0.71%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1968	Surface	Inactive	-	-	-	-	0.00%	-	0.72%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1969	Surface	Inactive	-	-	-	-	0.00%	-	0.74%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1970	Surface	Inactive	-	-	-	-	0.00%	-	0.75%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1971	Surface	Inactive	-	-	-	-	0.00%	-	0.77%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1972	Surface	Inactive	-	-	-	-	0.01%	-	0.79%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1973	Surface	Inactive	-	-	-	-	0.05%	-	0.80%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1974	Surface	Inactive	-	-	-	-	0.09%	-	0.82%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1975	Surface	Inactive	-	-	-	-	0.12%	-	0.83%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1976	Surface	Inactive	1	438.80	0.99	434.56	0.16%	0.50	0.85%	0.00	0.01	0.35	3.70	2,685.00	1	926.52	441,567.52	350.6365	575.88	0.98	-	-	-
1977	Surface	Inactive	-	-	-	-	0.20%	-	0.87%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1978	Surface	Inactive	-	-	-	-	0.23%	-	0.89%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1979	Surface	Inactive	-	-	-	-	0.27%	-	0.90%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1980	Surface	Inactive	-	-	-	-	0.31%	-	0.92%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1981	Surface	Inactive	1	4.47	0.99	4.42	0.34%	0.50	0.94%	0.00	0.01	0.01	0.04	2,685.00	1	20.36	-	-	0	20.36	0.97	-	-
1982	Surface	Inactive	-	-	-	-	0.38%	-	0.96%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1983	Surface	Inactive	-	-	-	-	0.42%	-	0.98%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1984	Surface	Inactive	-	-	-	-	0.45%	-	1.00%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1985	Surface	Inactive	-	-	-	-	0.49%	-	1.02%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1986	Surface	Inactive	1	411.07	0.98	405.54	0.53%	0.50	1.04%	0.01	0.01	1.07	4.22	2,685.00	1	2,872.51	757,216.74	1997.577	874.93	0.97	-	-	
1987	Surface	Inactive	2	415.61	1.97	408.60	0.56%	1.00	1.06%	0.01	0.02	2.31	4.34	2,685.00	1	6,193.01	1,210,874.12	6835.264	-	1.93	-	-	
1988	Surface	Inactive	1	1,304.38	0.98	1,285.78	0.60%	0.50	1.08%	0.01	0.01	3.87	13.95	2,685.00	1	10,380.60	3,578,304.19	10759.42	-	0.97	-	-	
1989	Surface	Inactive	2	273.00	1.96	268.07	0.64%	1.00	1.11%	0.01	0.02	1.71	2.97	2,685.00	1	4,593.98	573,501.81	3660.371	933.60	1.93	-	-	
1990	Surface	Inactive	1	81.70	0.98	80.47	0.68%	0.50	1.13%	0.01	0.01	0.27	0.91	2,685.00	1	729.33	472,515.54	1595.044	-	0.96	-	-	
1991	Surface	Inactive	-	-	-	-	0.71%	-	1.15%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1992	Surface	Inactive	-	-	-	-	0.75%	-	1.18%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1993	Surface	Inactive	-	-	-	-	0.79%	-	1.20%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1994	Surface	Inactive	-	-	-	-	0.82%	-	1.02%	-	-	-	-	-	2,685.00	1	-	2,316,000.00	0	-	-	-	-
1995	Surface	Inactive	3	3,503.18	2.93	3,442.81	0.86%	0.50	1.25%	0.03	0.04	14.80	43.02	2,685.00	1	39,727.14	7,178,799.53	30851.85	8,875.29	2.87	-	-	
1996	Surface	Inactive	1	193.90	0.98	190.47	0.90%	0.50	1.27%	0.01	0.01	0.85	2.43	2,685.00	1	2,292.20	5,799,743.02	25994.63	-	0.96	-	-	
1997	Surface	Inactive	-	-	-	-	0.93%	-	1.30%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
1998	Surface	Inactive	1	846.89	0.98	831.15	0.97%	0.50	1.33%	0.01	0.01	4.03	11.03	2,685.00	1	10,825.34	4,088,469.45	19832.46	-	0.95	-	-	
1999	Surface	Inactive	1	2,264.80	0.98	2,221.67	1.01%	0.50	1.35%	0.01	0.01	11.19	30.10	2,685.00	1	30,036.09	2,591,402.88	13048.3	16,987.79	0.95	-	-	
2000	Surface	Inactive	-	-	-	-	1.04%	-	1.38%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
2001	Surface	Inactive	1	596.67	0.97	584.75	1.08%	0.50	1.41%	0.01	0.01	3.16	8.25	2,685.00	1	8,484.57	1,944,074.64	10505.82	-	0.95	-	-	
2002	Surface	Inactive	2	765.87	1.95	750.20	1.12%	0.50	1.44%	0.02	0.03	4.19	10.80	2,685.00	1	11,256.70	7,520,652.56	42028.57	-	1.90	-	-	
2003	Surface	Inactive	4	4,249.33	3.89	4,160.34	1.15%	0.50	1.47%	0.04	0.05	24.02	61.10	2,685.00	1	64,485.26	11,096,740.16	64059.46	425.80	3.79	-	-	
2004	Surface	Inactive	3	3,700.97	2.91	3,616.33	1.19%	0.50	1.50%	0.03	0.04	21.54	54.19	2,685.00	1	57,843.65	4,955,481.27	29520.87	28,322.77	2.83	-	-	
2005	Surface	Inactive	1	25.99	0.97	25.02	1.52%	1.50	1.53%	0.01	0.01	0.57	0.38	2,685.00	1	1,527.29	25,436.90	578.2658	949.03	0.94	-	-	
2006	Surface	Inactive	1	244.59	0.97	239.02	1.44%	0.50	1.56%	0.01	0.02	1.73	3.73	2,685.00	1	4,635.43	817,704.99	5906.314	-	0.94	-	-	
2007	Surface	Inactive	2	399.20	1.94	390.11	1.37%	0.50	1.59%	0.03	0.03	2.68	6.21	2,685.00	1	7,194.14	296,376.93	2035.578	5,158.56	1.88	-	-	
2008	Surface	Inactive	4	864.07	3.88	841.76	1.30%	0.75	1.62%	0.05	0.06	8.22	19.68	2,685.00	1	22,081.63	1,111,703.23	10861.41	11,220.22	3.77	-	-	
2009	Surface	Inactive	3	680.43	2.91	664.97	1.23%	0.50	1.66%	0.04	0.05	4.10	11.02	2,685.00	1	10,995.73	1,752,211.31	10791.07	204.67	2.83	-	-	
2010	Surface	Inactive	1	5.11	0.97	4.95	1.16%	1.50	1.69%	0.01	0.02	0.09	0.08	2,685.00	1	231.34	10,859.53	189.0768	42.27	0.95	-	-	
2011	Surface	Inactive	1	560.86	0.98	550.40	1.09%	0.50	1.52%	0.01	0.01	3.00	8.39	2,685.00	1	8,052.51	4,983,245.14	27153.1	-	0.95	-	-	
2012	Surface	Inactive	2	676.78	1.96	665.54	1.02%	0.50	1.36%	0.02	0.03	3.39	9.02	2,685.00	1	9,102.92	1,697,835.28	8648.853	454.07	1.91	-	-	
2013	Surface	Inactive	1	93.44	0.98	92.08	0.95%	0.50	1.19%	0.01	0.01	0.44	1.09	2,685.00	1	1,171.68	1,052,525.01	4988.142	-	0.96	-	-	
2014	Surface	Inactive	4	2,929.61	3.93	2,886.98	0.88%	0.75	1.02%	0.03	0.04	18.99	29.41	2,685.00	1	50,978.68	4,379,408.45	28801.51	22,177.17	3.86	-	-	
2015	Surface	Inactive	2	704.80	1.97	697.40	0.81%	0.50	0.85%	0.02	0.02	2.81	5.93	2,685.00	1	7,545.42	1,225,480.09	4938.135	2,607.29	1.94	-	-	
2016	Surface	Inactive	1	494.54	0.99	490.36	0.73%	0.50	0.68%	0.01	0.01	1.80	3.35	2,685.00	1	4,838.16	29,302.40	107.6781	4,730.48	0.97	-	-	
2017	Surface	Inactive	-	-	-	-	0.66%	-	0.51%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
2018	Surface	Inactive	1	351.08	0.99	349.54	0.59%	0.50	0.35%	0.01	0.00	1.04	1.21	2,685.00	1	2,782.75	-	0	2,782.75	0.98	-	-	
2019	Surface	Inactive	1	452.10	0.99	448.50	0.52%	1.50	0.18%	0.01	0.00	3.51	0.80	2,685.00	1	9,429.96	-	0	9,429.96	0.99	-	-	
2020	Surface	Inactive	-	-	-	-	0.45%	-	0.12%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-
2021	Surface	Inactive	-	-	-	-	0.38%	-	0.06%	-	-	-	-	-	2,685.00	1	-	-	-	-	0	-	-

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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Adjustment Factor Permit Bond Size (22)		Release Rate (23)	Forfeited Permit Count (24)	Released Permit Count (25)	Forfeited Acres (26)	Released Acres (27)	Avg recl Cost per Acre (28)	Adjustment Factor Permit Status (29)	Gross Cost (30)	Adjustment Current Security Amount (31)	Forfeited Security Amount (32)	Net Cost (33)	Adjusted Permit Count (34)	
								Release Rate (23)	Forfeited Permit Count (24)													
1963	Surface	Phased Released	-	-	-	-	0.00%	-	3.21%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1964	Surface	Phased Released	-	-	-	-	0.00%	-	3.21%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1965	Surface	Phased Released	-	-	-	-	0.00%	-	3.27%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1966	Surface	Phased Released	-	-	-	-	0.00%	-	3.34%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1967	Surface	Phased Released	-	-	-	-	0.00%	-	3.41%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1968	Surface	Phased Released	-	-	-	-	0.00%	-	3.48%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1969	Surface	Phased Released	-	-	-	-	0.00%	-	3.55%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1970	Surface	Phased Released	-	-	-	-	0.00%	-	3.62%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1971	Surface	Phased Released	-	-	-	-	0.00%	-	3.69%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1972	Surface	Phased Released	-	-	-	-	0.02%	-	3.77%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1973	Surface	Phased Released	-	-	-	-	0.08%	-	3.85%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1974	Surface	Phased Released	2	189.60	1.92	182.01	0.15%	-	3.92%	0.00	0.08	-	7.14	2,685.00	0.5	-	-	98,250.00	0	-	1.84	
1975	Surface	Phased Released	2	8.30	1.91	7.96	0.21%	-	4.00%	0.00	0.08	-	0.32	2,685.00	0.5	-	-	30,600.00	0	-	1.83	
1976	Surface	Phased Released	5	626.17	4.77	600.06	0.28%	-	4.09%	0.01	0.20	-	24.52	2,685.00	0.5	-	-	112,250.00	0	-	4.57	
1977	Surface	Phased Released	2	48.00	1.91	45.96	0.34%	-	4.17%	0.01	0.08	-	1.92	2,685.00	0.5	-	-	14,750.00	0	-	1.82	
1978	Surface	Phased Released	2	158.81	1.90	151.92	0.40%	-	4.25%	0.01	0.08	-	6.46	2,685.00	0.5	-	-	115,400.00	0	-	1.82	
1979	Surface	Phased Released	2	358.00	1.90	342.14	0.47%	-	4.34%	0.01	0.08	-	14.85	2,685.00	0.5	-	-	122,400.00	0	-	1.81	
1980	Surface	Phased Released	2	621.75	1.90	593.65	0.53%	-	4.43%	0.01	0.08	-	26.30	2,685.00	0.5	-	-	401,500.00	0	-	1.80	
1981	Surface	Phased Released	9	1,821.81	8.53	1,737.79	0.60%	-	4.52%	0.05	0.39	-	78.55	2,685.00	0.5	-	-	1,675,720.00	0	-	8.09	
1982	Surface	Phased Released	-	-	-	-	0.66%	-	4.61%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
1983	Surface	Phased Released	5	302.61	4.72	288.08	0.73%	-	4.71%	0.03	0.22	-	13.56	2,685.00	0.5	-	-	179,802.37	0	-	4.46	
1984	Surface	Phased Released	4	2,603.39	3.77	2,475.82	0.79%	-	4.80%	0.03	0.18	-	118.90	2,685.00	0.5	-	-	2,263,360.00	0	-	3.56	
1985	Surface	Phased Released	2	1,270.29	1.88	1,206.77	0.85%	-	4.90%	0.02	0.09	-	59.14	2,685.00	0.5	-	-	80,750.00	0	-	1.77	
1986	Surface	Phased Released	5	1,212.46	4.70	1,150.60	0.92%	-	5.00%	0.04	0.23	-	57.53	2,685.00	0.5	-	-	639,708.00	0	-	4.42	
1987	Surface	Phased Released	4	760.81	3.75	721.20	0.98%	-	5.10%	0.04	0.19	-	36.80	2,685.00	0.5	-	-	442,636.00	0	-	3.52	
1988	Surface	Phased Released	5	478.00	4.68	452.61	1.05%	-	5.21%	0.05	0.24	-	23.56	2,685.00	0.5	-	-	111,000.00	0	-	4.39	
1989	Surface	Phased Released	6	1,688.64	5.60	1,597.10	1.11%	-	5.31%	0.06	0.30	-	84.85	2,685.00	0.5	-	-	386,550.00	0	-	5.24	
1990	Surface	Phased Released	3	662.34	2.80	625.70	1.18%	-	5.42%	0.03	0.15	-	33.92	2,685.00	0.5	-	-	506,608.00	0	-	2.61	
1991	Surface	Phased Released	5	1,006.45	4.65	949.64	1.24%	-	5.53%	0.06	0.26	-	52.53	2,685.00	0.5	-	-	537,148.00	0	-	4.34	
1992	Surface	Phased Released	-	-	-	-	1.30%	-	5.64%	-	-	-	-	-	2,685.00	0.5	-	-	29,800.00	0	-	-
1993	Surface	Phased Released	1	562.59	0.93	529.52	1.37%	-	5.76%	0.01	0.05	-	30.50	2,685.00	0.5	-	-	37,838.98	0	-	0.86	
1994	Surface	Phased Released	6	2,470.42	5.55	2,322.26	1.43%	-	5.88%	0.08	0.33	-	136.49	2,685.00	0.5	-	-	1,520,619.00	0	-	5.14	
1995	Surface	Phased Released	4	498.93	3.69	468.40	1.50%	-	6.00%	0.06	0.22	-	28.09	2,685.00	0.5	-	-	536,443.26	0	-	3.42	
1996	Surface	Phased Released	4	563.71	3.69	528.51	1.56%	-	6.12%	0.06	0.23	-	32.34	2,685.00	0.5	-	-	717,833.00	0	-	3.40	
1997	Surface	Phased Released	2	969.50	1.84	907.72	1.62%	-	6.24%	0.03	0.11	-	56.68	2,685.00	0.5	-	-	1,659,760.00	0	-	1.69	
1998	Surface	Phased Released	3	511.73	2.75	478.46	1.69%	-	6.37%	0.05	0.18	-	30.49	2,685.00	0.5	-	-	581,056.00	0	-	2.53	
1999	Surface	Phased Released	1	14.87	0.92	13.88	1.75%	-	6.50%	0.02	0.06	-	0.90	2,685.00	0.5	-	-	-	0	-	0.84	
2000	Surface	Phased Released	1	19.70	0.91	18.37	1.82%	-	6.63%	0.02	0.06	-	1.22	2,685.00	0.5	-	-	-	0	-	0.84	
2001	Surface	Phased Released	3	491.55	2.73	457.59	1.88%	-	6.77%	0.05	0.19	-	30.98	2,685.00	0.5	-	-	493,244.06	0	-	2.50	
2002	Surface	Phased Released	1	106.29	0.91	98.80	1.95%	-	6.91%	0.02	0.06	-	6.83	2,685.00	0.5	-	-	76,950.00	0	-	0.83	
2003	Surface	Phased Released	1	-	0.91	-	2.01%	-	7.05%	0.02	0.06	-	-	2,685.00	0.5	-	-	-	0	-	0.83	
2004	Surface	Phased Released	2	470.13	1.80	435.62	2.07%	-	7.19%	0.04	0.13	-	31.34	2,685.00	0.5	-	-	116,250.00	0	-	1.63	
2005	Surface	Phased Released	1	51.50	0.90	47.64	2.64%	-	7.34%	0.02	0.07	-	3.50	2,685.00	0.5	-	-	29,520.00	0	-	0.81	
2006	Surface	Phased Released	1	60.78	0.90	56.13	2.51%	-	7.49%	0.02	0.07	-	4.20	2,685.00	0.5	-	-	49,200.00	0	-	0.81	
2007	Surface	Phased Released	-	-	-	-	2.39%	-	7.64%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2008	Surface	Phased Released	-	-	-	-	2.27%	-	7.80%	-	-	-	-	-	2,685.00	0.5	-	-	143,500.00	0	-	-
2009	Surface	Phased Released	2	220.84	1.80	202.91	2.14%	-	7.96%	0.04	0.14	-	16.15	2,685.00	0.5	-	-	257,086.00	0	-	1.62	
2010	Surface	Phased Released	-	-	-	-	2.02%	-	8.12%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2011	Surface	Phased Released	1	55.50	0.92	51.89	1.90%	-	7.31%	0.02	0.07	-	3.79	2,685.00	0.5	-	-	45,728.00	0	-	0.83	
2012	Surface	Phased Released	-	-	-	-	1.77%	-	6.51%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2013	Surface	Phased Released	-	-	-	-	1.65%	-	5.70%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2014	Surface	Phased Released	1	27.91	0.95	26.77	1.53%	-	4.89%	0.01	0.05	-	1.31	2,685.00	0.5	-	-	20,800.00	0	-	0.88	
2015	Surface	Phased Released	-	-	-	-	1.40%	-	4.08%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2016	Surface	Phased Released	-	-	-	-	1.28%	-	3.28%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2017	Surface	Phased Released	-	-	-	-	1.16%	-	2.47%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2018	Surface	Phased Released	-	-	-	-	1.03%	-	1.66%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2019	Surface	Phased Released	-	-	-	-	0.91%	-	0.85%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2020	Surface	Phased Released	-	-	-	-	0.79%	-	0.57%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	
2021	Surface	Phased Released	-	-	-	-	0.66%	-	0.29%	-	-	-	-	-	2,685.00	0.5	-	-	0	-	-	

West Virginia Department of Environmental Protection Office of Special Reclam  
 Actuarial Reserve Study as of June 30, 2021  
 Land Reclamation Cost Projection - Deterministic Model

		2023																					
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current			Adjustment Factor							Avg recl Cost per Acre (28)			Adjustment Factor		Gross Cost (30)	Adjustment Current Security Amount (31)	Forfeited Security Amount (32)	Net Cost (33)	Adjusted Cou (34)
				Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Permit Bond Size (22)	Release Rate (23)	Forfeited Cou (24)	Released Cou (25)	Forfeited Acres (26)	Released Acres (27)	Permit Status (29)									
1963	Underground	Active	-	-	-	-	0.15%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1964	Underground	Active	-	-	-	-	0.15%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1965	Underground	Active	-	-	-	-	0.15%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1966	Underground	Active	-	-	-	-	0.16%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1967	Underground	Active	-	-	-	-	0.16%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1968	Underground	Active	-	-	-	-	0.16%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1969	Underground	Active	-	-	-	-	0.16%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1970	Underground	Active	-	-	-	-	0.16%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1971	Underground	Active	-	-	-	-	0.17%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1972	Underground	Active	-	-	-	-	0.17%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1973	Underground	Active	-	-	-	-	0.17%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1974	Underground	Active	-	-	-	-	0.17%	-	0.00%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1975	Underground	Active	-	-	-	-	0.17%	-	0.12%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1976	Underground	Active	-	-	-	-	0.17%	-	0.26%	-	-	-	-	-	-	11,610.00	1	-	-	0	-	-	
1977	Underground	Active	1	22.53	0.99	22.35	0.18%	1.50	0.40%	0.00	0.00	0.06	0.09	11,610.00	1	686.98	72,764.74	192,6615	494.32	0.99			
1978	Underground	Active	1	94.87	0.99	94.14	0.18%	0.50	0.54%	0.00	0.01	0.08	0.51	11,610.00	1	975.02	266,479.52	237,2723	737.30	0.98			
1979	Underground	Active	7	745.26	6.93	737.49	0.18%	1.21	0.68%	0.01	0.05	1.61	5.02	11,610.00	1	18,748.59	4,600,033.44	10072.57	8,676.03	6.87			
1980	Underground	Active	5	222.16	4.94	219.57	0.18%	1.10	0.82%	0.01	0.04	0.44	1.80	11,610.00	1	5,110.11	466,094.01	934.3058	4,175.80	4.89			
1981	Underground	Active	17	891.30	16.78	879.48	0.18%	1.21	0.96%	0.03	0.16	1.95	8.45	11,610.00	1	22,672.81	5,398,232.13	11986.61	10,688.19	16.59			
1982	Underground	Active	2	33.93	1.97	33.41	0.19%	1.50	1.10%	0.00	0.02	0.09	0.37	11,610.00	1	1,082.56	1,613,771.58	4503.434	-	1.95			
1983	Underground	Active	29	6,929.70	28.54	6,822.39	0.19%	0.88	1.24%	0.05	0.35	11.27	84.70	11,610.00	1	130,902.11	23,252,963.27	38428.73	92,478.38	28.14			
1984	Underground	Active	16	2,706.46	15.73	2,660.09	0.19%	1.00	1.38%	0.03	0.22	5.05	36.75	11,610.00	1	58,633.23	13,339,391.56	25325.15	33,308.08	15.48			
1985	Underground	Active	3	49.00	2.94	48.04	0.19%	1.50	1.52%	0.01	0.04	0.14	0.73	11,610.00	1	1,604.39	137,878.30	396.5882	1,207.80	2.89			
1986	Underground	Active	5	252.11	4.90	247.02	0.19%	1.10	1.66%	0.01	0.08	0.53	4.11	11,610.00	1	6,109.58	680,453.02	1449.563	4,660.02	4.81			
1987	Underground	Active	5	198.36	4.89	194.08	0.20%	1.10	1.80%	0.01	0.09	0.42	3.50	11,610.00	1	4,847.26	693,011.36	1490.84	3,356.42	4.80			
1988	Underground	Active	4	157.83	3.91	154.15	0.20%	1.25	1.94%	0.01	0.08	0.38	2.99	11,610.00	1	4,417.69	613,746.58	1514.983	2,902.71	3.83			
1989	Underground	Active	9	124.08	8.78	120.95	0.20%	1.50	2.08%	0.02	0.18	0.36	2.52	11,610.00	1	4,199.53	583,634.83	1745.465	2,454.06	8.58			
1990	Underground	Active	5	136.22	4.87	132.64	0.20%	1.30	2.22%	0.01	0.11	0.35	2.95	11,610.00	1	4,029.64	460,979.12	1206.24	2,821.40	4.75			
1991	Underground	Active	5	240.32	4.86	233.66	0.20%	1.30	2.36%	0.01	0.11	0.62	5.52	11,610.00	1	7,165.88	686,285.31	1812.795	5,353.09	4.74			
1992	Underground	Active	12	1,027.11	11.66	997.66	0.21%	1.08	2.50%	0.02	0.29	2.22	24.97	11,610.00	1	25,735.47	5,210,018.29	11575.92	14,159.55	11.34			
1993	Underground	Active	9	724.45	8.73	702.52	0.21%	1.17	2.64%	0.02	0.23	1.70	18.57	11,610.00	1	19,697.44	2,534,078.45	6119.793	13,577.65	8.48			
1994	Underground	Active	13	610.69	12.59	591.50	0.21%	1.04	2.78%	0.03	0.35	1.28	16.46	11,610.00	1	14,898.00	1,653,156.99	3586.357	11,311.65	12.22			
1995	Underground	Active	9	334.05	8.71	322.99	0.21%	1.17	2.92%	0.02	0.25	0.79	9.44	11,610.00	1	9,222.70	564,834.77	1389.185	7,833.51	8.43			
1996	Underground	Active	10	244.18	9.66	235.73	0.21%	1.20	3.06%	0.02	0.30	0.60	7.22	11,610.00	1	6,905.96	301,381.80	769.3034	6,216.66	9.34			
1997	Underground	Active	13	234.02	12.54	225.51	0.21%	1.35	3.20%	0.03	0.40	0.65	7.22	11,610.00	1	7,564.35	2,032,633.54	5872.537	1,691.81	12.11			
1998	Underground	Active	10	523.54	9.63	504.16	0.22%	1.00	3.34%	0.02	0.32	1.09	16.86	11,610.00	1	12,673.88	2,268,877.21	4912.713	7,761.17	9.29			
1999	Underground	Active	10	359.47	9.62	345.33	0.22%	1.40	3.48%	0.02	0.33	1.06	12.03	11,610.00	1	12,260.72	2,154,752.64	6589.32	5,671.40	9.26			
2000	Underground	Active	10	461.64	9.60	443.03	0.22%	1.20	3.62%	0.02	0.35	1.17	16.05	11,610.00	1	13,599.93	1,762,606.73	4660.404	8,939.53	9.23			
2001	Underground	Active	5	224.71	4.79	215.48	0.22%	0.90	3.76%	0.01	0.18	0.43	8.11	11,610.00	1	5,003.98	504,659.88	1009.41	3,994.58	4.60			
2002	Underground	Active	8	288.53	7.65	275.96	0.22%	1.38	3.90%	0.03	0.30	0.85	10.77	11,610.00	1	9,874.65	892,776.40	2751.559	7,123.09	7.34			
2003	Underground	Active	11	969.45	10.51	926.17	0.23%	1.23	4.04%	0.02	0.43	2.57	37.46	11,610.00	1	29,831.50	4,386,892.52	12170.47	17,661.03	10.07			
2004	Underground	Active	8	445.92	7.71	429.68	0.23%	1.13	4.18%	0.02	0.32	1.10	17.98	11,610.00	1	12,793.37	9,475,771.51	24300.86	-	7.37			
2005	Underground	Active	8	360.91	7.72	348.24	0.23%	1.13	3.88%	0.02	0.26	0.90	11.78	11,610.00	1	10,455.26	1,026,715.95	2655.046	7,800.21	7.44			
2006	Underground	Active	9	427.71	8.70	413.55	0.23%	0.83	3.25%	0.02	0.28	0.80	13.44	11,610.00	1	9,273.31	1,309,045.95	2528.295	6,745.01	8.40			
2007	Underground	Active	11	481.68	10.65	466.89	0.23%	1.23	3.12%	0.02	0.33	1.34	14.55	11,610.00	1	15,545.31	1,479,270.74	4242.271	11,308.04	10.29			
2008	Underground	Active	5	111.00	4.85	107.44	0.24%	1.50	2.98%	0.01	0.14	0.38	3.20	11,610.00	1	4,407.98	483,431.73	1708.295	2,699.68	4.69			
2009	Underground	Active	7	320.63	6.79	311.11	0.24%	1.07	2.85%	0.02	0.19	0.79	8.86	11,610.00	1	9,190.46	751,730.43	1912.758	7,277.70	6.58			
2010	Underground	Active	11	269.59	10.69	261.72	0.24%	1.41	2.71%	0.03	0.29	0.88	7.10	11,610.00	1	10,249.62	403,710.56	1361.802	8,887.82	10.37			
2011	Underground	Active	7	192.99	6.81	187.63	0.24%	1.36	2.58%	0.02	0.18	0.61	4.84	11,610.00	1	7,133.64	604,478.27	1979.493	5,154.14	6.62			
2012	Underground	Active	6	171.01	5.85	166.50	0.24%	1.33	2.45%	0.01	0.14	0.54	4.07	11,610.00	1	6,268.13	639,224.12	2072.791	4,195.34	5.69			
2013	Underground	Active	13	398.29	12.68	388.21	0.25%	1.42	2.31%	0.03	0.29	1.35	8.98	11,610.00	1	15,721.04	1,258,555.95	4389.889	11,331.15	12.36			
2014	Underground	Active	22	685.91	21.50	670.68	0.25%	1.27	2.18%	0.05	0.47	2.11	14.61	11,610.00	1	24,479.45	1,800,278.56	5659.663	18,819.78	20.97			
2015	Underground	Active	7	132.11	6.85	129.00	0.25%	1.50	2.05%	0.02	0.14	0.48	2.64	11,610.00	1	5,591.83	359,471.87	1342.173	4,249.65	6.69			
2016	Underground	Active	6	137.58	5.88	134.61	0.30%	1.50	1.91%	0.02	0.11	0.60	2.57	11,610.00	1	6,960.20	323,318.56	1439.596	5,520.24	6.75			
2017	Underground	Active	7	155.37	6.87	152.32	0.25%	1.50	1.78%	0.02	0.12	0.58	2.71	11,610.00	1	6,764.20	159,010.13	608.2105	6,155.99	6.73			
2018	Underground	Active	3	37.52	2.95	36.86	0.21%	1.50	1.64%	0.01	0.05	0.12	0.61	11,610.00	1	1,367.72	100,501.29	321.2307	1,046.49	2.89			
2019	Underground	Active	4	79.46	3.94	78.24	0.17%	1.25	1.51%	0.01	0.06	0.17	1.18	11,610.00	1	1,943.54	118,448.31	253.4389	1,690.11	3.87			
2020	Underground	Active	7	110.58	6.91	109.06	0.13%	1.50	1.38%	0.01	0.10	0.21	1.50	11,610.00	1	2,455.03	118,484.56	229.7291	2,225.30	6.80			
2021	Underground	Active	7	76.19	6.92	75.35	0.09%	1.50	1.24%	0.01	0.09	0.10	0.94	11,610.00	1	1,146.11	118,640.00	155.4422	990.67	6.83			

West Virginia Department of Environmental Protection Office of Special Reclam  
Actuarial Reserve Study as of June 30, 2021  
Land Reclamation Cost Projection - Deterministic Model

2023																						
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Adjustment Factor		Released Permitted Count (24)	Released Acres (25)	Forfeited Acres (26)	Released Acres (27)	Avg recl Cost per Acre (28)	Adjustment		Gross Cost (30)	Adjustment		Net Cost (33)	Adjusted Count (34)	
								Permit Bond Size (22)	Release Rate (23)						Permit Status (29)	Security Amount (31)		Forfeited Security Amount (32)				
1963	Underground	Inactive	-	-	-	-	0.34%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1964	Underground	Inactive	-	-	-	-	0.34%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1965	Underground	Inactive	-	-	-	-	0.35%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1966	Underground	Inactive	-	-	-	-	0.35%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1967	Underground	Inactive	-	-	-	-	0.35%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1968	Underground	Inactive	-	-	-	-	0.36%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1969	Underground	Inactive	-	-	-	-	0.36%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1970	Underground	Inactive	-	-	-	-	0.37%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1971	Underground	Inactive	-	-	-	-	0.37%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1972	Underground	Inactive	-	-	-	-	0.38%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1973	Underground	Inactive	-	-	-	-	0.38%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1974	Underground	Inactive	-	-	-	-	0.38%	-	0.00%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1975	Underground	Inactive	-	-	-	-	0.39%	-	0.08%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1976	Underground	Inactive	1	103.30	0.99	102.84	0.39%	0.50	0.16%	0.00	0.00	0.20	0.17	11,610.00	1	2,345.31	344,594.34	676,908.8	1,668.40	0.99	-	-
1977	Underground	Inactive	-	-	-	-	0.40%	-	0.25%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1978	Underground	Inactive	1	23.02	0.99	22.88	0.40%	0.50	0.34%	0.00	0.00	0.05	0.08	11,610.00	1	533.09	-	0	533.09	0.98	-	-
1979	Underground	Inactive	1	6.60	0.99	6.55	0.41%	0.50	0.43%	0.00	0.00	0.01	0.03	11,610.00	1	154.33	145,577.94	295.3292	-	0.98	-	-
1980	Underground	Inactive	-	-	-	-	0.41%	-	0.51%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
1981	Underground	Inactive	4	149.03	3.96	147.38	0.41%	1.00	0.60%	0.02	0.02	0.61	0.89	11,610.00	1	7,089.15	171,280.02	709,625.4	6,379.53	3.92	-	-
1982	Underground	Inactive	2	128.47	1.98	127.20	0.42%	0.50	0.69%	0.01	0.01	0.27	0.88	11,610.00	1	3,090.92	329,102.67	688.8021	2,402.12	1.95	-	-
1983	Underground	Inactive	8	500.86	7.90	494.93	0.42%	0.75	0.78%	0.03	0.06	1.57	3.84	11,610.00	1	18,224.51	1,322,468.51	4194.35	14,030.16	7.80	-	-
1984	Underground	Inactive	1	300.00	0.99	296.50	0.43%	0.50	0.86%	0.00	0.01	0.63	2.56	11,610.00	1	7,352.33	314,719.60	672,190.3	6,680.14	0.97	-	-
1985	Underground	Inactive	1	220.21	0.99	217.44	0.43%	0.50	0.95%	0.00	0.01	0.47	2.07	11,610.00	1	5,446.06	592,226.89	1277.595	4,168.47	0.97	-	-
1986	Underground	Inactive	1	43.54	0.98	42.95	0.44%	0.50	1.04%	0.00	0.01	0.09	0.45	11,610.00	1	1,086.51	110,636.05	241,043.6	845.47	0.97	-	-
1987	Underground	Inactive	1	40.89	0.98	40.12	0.44%	1.50	1.13%	0.00	0.01	0.26	0.45	11,610.00	1	3,074.52	73,308.14	483,864.9	2,590.66	0.97	-	-
1988	Underground	Inactive	7	154.89	6.88	152.03	0.44%	1.21	1.21%	0.03	0.08	0.82	1.85	11,610.00	1	9,523.03	2,623,981.07	14157.05	-	6.76	-	-
1989	Underground	Inactive	2	193.50	1.96	190.37	0.45%	0.50	1.30%	0.01	0.03	0.43	2.48	11,610.00	1	4,957.60	122,410.18	274,567.3	4,683.03	1.93	-	-
1990	Underground	Inactive	3	36.13	2.94	35.40	0.45%	1.17	1.39%	0.01	0.04	0.19	0.49	11,610.00	1	2,171.80	82,040.07	433,475.5	1,738.33	2.89	-	-
1991	Underground	Inactive	2	141.42	1.96	138.56	0.46%	1.00	1.48%	0.01	0.03	0.63	2.05	11,610.00	1	7,354.26	5,466,669.41	24992.29	-	1.92	-	-
1992	Underground	Inactive	1	9.00	0.98	8.79	0.46%	1.50	1.56%	0.00	0.02	0.06	0.14	11,610.00	1	706.27	21,091.61	145,994.9	560.28	0.96	-	-
1993	Underground	Inactive	6	294.11	5.87	287.61	0.47%	1.00	1.65%	0.03	0.10	1.34	4.75	11,610.00	1	15,552.20	658,761.96	3068.181	12,484.02	5.74	-	-
1994	Underground	Inactive	1	247.11	0.98	242.01	0.47%	0.50	1.74%	0.00	0.02	0.57	4.21	11,610.00	1	6,603.38	643,270.78	1511.803	5,091.57	0.96	-	-
1995	Underground	Inactive	4	131.50	3.90	128.35	0.47%	1.00	1.83%	0.02	0.07	0.61	2.34	11,610.00	1	7,068.27	967,609.65	4589.598	2,478.67	3.81	-	-
1996	Underground	Inactive	2	45.38	1.95	44.14	0.48%	1.50	1.91%	0.01	0.04	0.32	0.85	11,610.00	1	3,679.30	543,395.22	3901.117	-	1.90	-	-
1997	Underground	Inactive	7	294.76	6.82	287.06	0.48%	1.07	2.00%	0.03	0.14	1.49	5.75	11,610.00	1	17,243.51	190,918.21	987,791.1	16,255.71	6.65	-	-
1998	Underground	Inactive	3	93.26	2.92	90.69	0.49%	1.17	2.09%	0.01	0.06	0.52	1.90	11,610.00	1	5,984.86	227,679.06	1294.085	4,690.78	2.84	-	-
1999	Underground	Inactive	9	618.15	8.75	600.92	0.49%	1.06	2.18%	0.04	0.19	3.12	13.08	11,610.00	1	36,192.97	442,591.74	2296.054	33,896.91	8.52	-	-
2000	Underground	Inactive	6	76.39	5.83	74.02	0.50%	1.50	2.26%	0.03	0.13	0.55	1.68	11,610.00	1	6,390.61	236,930.45	1761.901	4,628.71	5.67	-	-
2001	Underground	Inactive	2	6.00	1.94	5.81	0.50%	1.50	2.35%	0.01	0.05	0.04	0.14	11,610.00	1	505.79	310,513.07	2329.055	-	1.89	-	-
2002	Underground	Inactive	1	47.21	0.97	45.90	0.50%	0.50	2.44%	0.00	0.02	0.12	1.12	11,610.00	1	1,343.69	132,143.09	333,219.5	1,010.47	0.94	-	-
2003	Underground	Inactive	6	229.90	5.81	222.71	0.51%	1.00	2.53%	0.03	0.15	1.13	5.63	11,610.00	1	13,151.07	1,403,746.99	7139.713	6,011.36	5.64	-	-
2004	Underground	Inactive	3	181.69	2.92	177.38	0.51%	0.50	2.62%	0.01	0.08	0.45	4.64	11,610.00	1	5,281.29	103,411.89	265,202.4	5,016.09	2.83	-	-
2005	Underground	Inactive	6	121.31	5.85	117.90	0.52%	1.50	2.11%	0.03	0.12	0.91	2.49	11,610.00	1	10,618.90	389,112.30	3018.686	7,600.22	5.69	-	-
2006	Underground	Inactive	6	145.55	5.85	141.82	0.52%	1.17	2.03%	0.03	0.12	0.86	2.88	11,610.00	1	10,017.57	422,830.38	2572.466	7,445.10	5.70	-	-
2007	Underground	Inactive	4	80.93	3.90	78.89	0.53%	1.25	1.95%	0.02	0.08	0.52	1.54	11,610.00	1	6,019.11	409,747.05	2692.887	3,326.22	3.81	-	-
2008	Underground	Inactive	6	95.14	5.86	92.68	0.53%	1.50	1.86%	0.03	0.11	0.74	1.73	11,610.00	1	8,555.53	202,206.20	1607.699	6,947.83	5.72	-	-
2009	Underground	Inactive	8	127.40	7.82	124.30	0.53%	1.38	1.78%	0.04	0.14	0.91	2.21	11,610.00	1	10,602.46	313,937.60	2306.552	8,295.91	7.64	-	-
2010	Underground	Inactive	9	296.02	8.81	289.19	0.54%	1.28	1.70%	0.05	0.15	1.99	4.91	11,610.00	1	23,107.98	719,930.79	4954.885	18,153.09	8.61	-	-
2011	Underground	Inactive	6	113.07	5.88	110.41	0.54%	1.50	1.61%	0.03	0.09	0.90	1.78	11,610.00	1	10,439.36	396,558.11	3229.449	7,209.91	5.75	-	-
2012	Underground	Inactive	3	95.72	2.94	93.72	0.55%	1.17	1.53%	0.02	0.04	0.60	1.43	11,610.00	1	6,946.40	84,174.91	537.376	6,409.03	2.88	-	-
2013	Underground	Inactive	3	53.70	2.94	52.52	0.55%	1.50	1.45%	0.02	0.04	0.43	0.76	11,610.00	1	5,044.19	62,792.13	519,435.5	4,524.76	2.88	-	-
2014	Underground	Inactive	1	12.00	0.98	11.75	0.56%	1.50	1.36%	0.01	0.01	0.10	0.16	11,610.00	1	1,136.85	-	0	1,136.85	0.96	-	-
2015	Underground	Inactive	1	12.04	0.98	11.78	0.56%	1.50	1.28%	0.01	0.01	0.10	0.15	11,610.00	1	1,148.52	-	0	1,148.52	0.96	-	-
2016	Underground	Inactive	-	-	-	-	0.67%	-	1.19%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
2017	Underground	Inactive	-	-	-	-	0.57%	-	1.11%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
2018	Underground	Inactive	2	46.96	1.97	46.25	0.48%	1.50	1.03%	0.01	0.02	0.33	0.48	11,610.00	1	3,861.27	61,005.52	438,7297	3,422.54	1.94	-	-
2019	Underground	Inactive	-	-	-	-	0.39%	-	0.94%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
2020	Underground	Inactive	-	-	-	-	0.29%	-	0.86%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-
2021	Underground	Inactive	-	-	-	-	0.20%	-	0.78%	-	-	-	-	11,610.00	1	-	-	0	-	-	-	-



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														2023															
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current			Adjustment		Forfeiture Rate (21)	Factor		Released Permit Count (24)	Released Acres (26)	Released Cost per Acre (28)	Adjustment Factor Permit Status (29)	Gross Cost (30)	Adjustment		Net Cost (33)	Adjusted Permit Count (34)									
				Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Permit Bond Size (22)	Release Rate (23)		Forfeited Security Amount (31)	Forfeited Security Amount (32)																		
1963	Underground	Phased Released	-	-	-	-	0.59%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1964	Underground	Phased Released	-	-	-	-	0.59%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1965	Underground	Phased Released	-	-	-	-	0.60%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1966	Underground	Phased Released	-	-	-	-	0.61%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1967	Underground	Phased Released	-	-	-	-	0.62%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1968	Underground	Phased Released	-	-	-	-	0.62%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1969	Underground	Phased Released	-	-	-	-	0.63%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1970	Underground	Phased Released	-	-	-	-	0.64%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1971	Underground	Phased Released	-	-	-	-	0.65%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1972	Underground	Phased Released	-	-	-	-	0.65%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1973	Underground	Phased Released	-	-	-	-	0.66%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1974	Underground	Phased Released	-	-	-	-	0.67%	-	0.00%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1975	Underground	Phased Released	-	-	-	-	0.68%	-	0.36%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1976	Underground	Phased Released	-	-	-	-	0.68%	-	0.78%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1977	Underground	Phased Released	-	-	-	-	0.69%	-	1.20%	-	-	-	11,610.00	0.5	-	-	0	-	-										
1978	Underground	Phased Released	4	23.13	3.89	22.66	0.70%	-	1.62%	0.03	0.06	-	0.37	11,610.00	0.5	-	38,588.00	0	3.80										
1979	Underground	Phased Released	2	59.68	1.94	58.21	0.71%	-	2.04%	0.01	0.04	-	1.19	11,610.00	0.5	-	101,728.00	0	1.88										
1980	Underground	Phased Released	5	87.19	4.82	84.68	0.71%	-	2.46%	0.03	0.12	-	2.09	11,610.00	0.5	-	50,000.00	0	4.67										
1981	Underground	Phased Released	8	85.14	7.68	82.33	0.72%	-	2.88%	0.06	0.22	-	2.37	11,610.00	0.5	-	212,120.00	0	7.40										
1982	Underground	Phased Released	4	199.06	3.82	191.65	0.73%	-	3.30%	0.03	0.13	-	6.33	11,610.00	0.5	-	90,296.00	0	3.67										
1983	Underground	Phased Released	4	57.47	3.80	55.09	0.74%	-	3.72%	0.03	0.14	-	2.05	11,610.00	0.5	-	81,440.00	0	3.63										
1984	Underground	Phased Released	2	95.60	1.89	91.24	0.74%	-	4.14%	0.01	0.08	-	3.78	11,610.00	0.5	-	10,000.00	0	1.80										
1985	Underground	Phased Released	3	17.24	2.83	16.38	0.75%	-	4.57%	0.02	0.13	-	0.75	11,610.00	0.5	-	30,720.00	0	2.68										
1986	Underground	Phased Released	3	118.96	2.81	112.53	0.76%	-	4.99%	0.02	0.14	-	5.61	11,610.00	0.5	-	107,280.00	0	2.65										
1987	Underground	Phased Released	4	77.09	3.74	72.60	0.77%	-	5.41%	0.03	0.20	-	3.92	11,610.00	0.5	-	106,360.00	0	3.51										
1988	Underground	Phased Released	5	129.44	4.65	121.35	0.77%	-	5.83%	0.04	0.27	-	7.07	11,610.00	0.5	-	165,576.00	0	4.34										
1989	Underground	Phased Released	6	119.44	5.55	111.48	0.78%	-	6.25%	0.04	0.35	-	6.96	11,610.00	0.5	-	103,096.00	0	5.16										
1990	Underground	Phased Released	2	18.31	1.94	17.01	0.79%	-	6.67%	0.01	0.11	-	1.13	11,610.00	0.5	-	20,000.00	0	1.70										
1991	Underground	Phased Released	2	18.20	1.83	16.83	0.80%	-	7.09%	0.01	0.13	-	1.19	11,610.00	0.5	-	40,000.00	0	1.69										
1992	Underground	Phased Released	2	39.95	1.83	36.78	0.80%	-	7.51%	0.01	0.14	-	2.76	11,610.00	0.5	-	16,640.00	0	1.67										
1993	Underground	Phased Released	3	30.79	2.72	28.22	0.81%	-	7.93%	0.02	0.22	-	2.24	11,610.00	0.5	-	31,548.00	0	2.49										
1994	Underground	Phased Released	3	26.14	2.71	23.85	0.82%	-	8.35%	0.02	0.23	-	1.99	11,610.00	0.5	-	30,624.00	0	2.46										
1995	Underground	Phased Released	4	65.62	3.60	59.59	0.83%	-	8.77%	0.03	0.32	-	5.23	11,610.00	0.5	-	83,832.00	0	3.25										
1996	Underground	Phased Released	4	133.37	3.58	129.55	0.83%	-	9.19%	0.03	0.33	-	11.08	11,610.00	0.5	-	105,442.00	0	3.22										
1997	Underground	Phased Released	5	149.46	4.46	134.47	0.84%	-	9.61%	0.04	0.43	-	12.92	11,610.00	0.5	-	115,842.75	0	3.99										
1998	Underground	Phased Released	3	70.67	2.66	63.28	0.85%	-	10.03%	0.02	0.27	-	6.35	11,610.00	0.5	-	75,384.00	0	2.37										
1999	Underground	Phased Released	1	10.68	0.88	9.52	0.86%	-	10.45%	0.01	0.09	-	0.99	11,610.00	0.5	-	10,000.00	0	0.78										
2000	Underground	Phased Released	2	59.65	1.76	52.91	0.86%	-	10.87%	0.02	0.19	-	5.75	11,610.00	0.5	-	49,536.19	0	1.55										
2001	Underground	Phased Released	4	36.60	3.50	32.31	0.87%	-	11.29%	0.03	0.39	-	3.65	11,610.00	0.5	-	52,072.00	0	3.07										
2002	Underground	Phased Released	1	48.55	0.87	42.66	0.88%	-	11.71%	0.01	0.10	-	5.00	11,610.00	0.5	-	92,530.00	0	0.76										
2003	Underground	Phased Released	3	78.20	2.60	68.38	0.89%	-	12.13%	0.02	0.32	-	8.30	11,610.00	0.5	-	60,200.00	0	2.26										
2004	Underground	Phased Released	1	16.25	0.89	14.60	0.89%	-	12.55%	0.01	0.11	-	1.83	11,610.00	0.5	-	20,160.00	0	0.77										
2005	Underground	Phased Released	-	-	-	-	0.90%	-	10.15%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2006	Underground	Phased Released	-	-	-	-	0.91%	-	9.75%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2007	Underground	Phased Released	-	-	-	-	0.92%	-	9.35%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2008	Underground	Phased Released	2	43.07	1.81	39.39	0.92%	-	8.95%	0.02	0.16	-	3.52	11,610.00	0.5	-	44,304.00	0	1.63										
2009	Underground	Phased Released	2	54.60	1.82	50.15	0.93%	-	8.54%	0.02	0.16	-	4.29	11,610.00	0.5	-	72,624.00	0	1.65										
2010	Underground	Phased Released	-	-	-	-	0.94%	-	8.14%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2011	Underground	Phased Released	1	25.60	0.92	23.72	0.95%	-	7.74%	0.01	0.07	-	1.84	11,610.00	0.5	-	0	-	0.84										
2012	Underground	Phased Released	-	-	-	-	0.95%	-	7.34%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2013	Underground	Phased Released	-	-	-	-	0.96%	-	6.94%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2014	Underground	Phased Released	-	-	-	-	0.97%	-	6.54%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2015	Underground	Phased Released	-	-	-	-	0.97%	-	6.14%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2016	Underground	Phased Released	-	-	-	-	1.16%	-	5.73%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2017	Underground	Phased Released	-	-	-	-	1.00%	-	5.33%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2018	Underground	Phased Released	-	-	-	-	0.83%	-	4.93%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2019	Underground	Phased Released	-	-	-	-	0.67%	-	4.53%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2020	Underground	Phased Released	-	-	-	-	0.51%	-	4.13%	-	-	-	-	11,610.00	0.5	-	0	-	-										
2021	Underground	Phased Released	-	-	-	-	0.34%	-	3.73%	-	-	-	-	11,610.00	0.5	-	0	-	-										

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		2023																					
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current			Adjustment Factor							Avg recl Cost per Acre (28)		Adjustment Factor Status (29)		Gross Cost (30)	Adjustment Current Security Amount (31)		Forfeited Security Amount (32)	Net Cost (33)	Adjusted Permit Count (34)
				Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Permit Bond Size (22)	Release Rate (23)	Forfeited Countermit Count (24)	Released Countermit Count (25)	Forfeited Acres (26)	Released Acres (27)	Permit Status (29)	Permit Status (29)	Security Amount (31)	Security Amount (31)						
1963	Other	Active	-	-	-	-	0.21%	-	2.29%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1964	Other	Active	-	-	-	-	0.21%	-	2.29%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1965	Other	Active	-	-	-	-	0.21%	-	2.27%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1966	Other	Active	-	-	-	-	0.21%	-	2.25%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1967	Other	Active	-	-	-	-	0.21%	-	2.22%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1968	Other	Active	-	-	-	-	0.21%	-	2.20%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1969	Other	Active	-	-	-	-	0.21%	-	2.18%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1970	Other	Active	-	-	-	-	0.21%	-	2.16%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1971	Other	Active	-	-	-	-	0.21%	-	2.13%	-	-	-	-	-	8,785.00	1	-	-	0	-	-	-	
1972	Other	Active	1	20.00	0.98	19.52	0.21%	1.50	2.11%	0.00	0.02	0.06	0.41	8,785.00	1	532.51	-	20,000.00	0	532.51	0.95		
1973	Other	Active	-	-	-	-	0.21%	-	2.09%	-	-	-	-	-	8,785.00	1	-	29,000.00	0	-	-	-	
1974	Other	Active	1	28.52	0.98	27.85	0.21%	1.50	2.06%	0.00	0.02	0.09	0.57	8,785.00	1	759.72	10,467.39	32,504.1	727.22	0.96			
1975	Other	Active	1	6.20	0.98	6.06	0.21%	1.50	2.04%	0.00	0.02	0.02	0.12	8,785.00	1	165.19	74,767.10	232.1721	-	0.96			
1976	Other	Active	1	75.00	0.98	73.27	0.21%	1.50	2.02%	0.00	0.02	0.23	1.48	8,785.00	1	1,998.79	307,043.58	953.4535	1,045.34	0.96			
1977	Other	Active	2	307.70	1.96	300.99	0.21%	1.00	2.00%	0.00	0.04	0.62	6.01	8,785.00	1	5,473.98	18,162.32	37,599.29	5,436.38	1.91			
1978	Other	Active	-	-	-	-	0.21%	-	1.97%	-	-	-	-	-	8,785.00	1	-	65,000.00	0	-	-	-	
1979	Other	Active	1	65.00	0.98	63.55	0.21%	1.50	1.95%	0.00	0.02	0.20	1.24	8,785.00	1	1,733.50	528,593.46	1641.426	92.07	0.96			
1980	Other	Active	7	370.67	6.85	362.68	0.21%	1.21	1.93%	0.01	0.13	0.91	6.99	8,785.00	1	8,009.22	20,452,252.75	51412.69	-	6.71			
1981	Other	Active	34	4,857.33	33.29	4,756.44	0.21%	0.94	1.91%	0.07	0.63	9.27	90.61	8,785.00	1	81,414.68	1,969,235.64	3836.869	77,577.81	32.59			
1982	Other	Active	4	554.75	3.92	543.57	0.21%	0.75	1.88%	0.01	0.07	0.84	10.23	8,785.00	1	7,414.28	12,017,735.82	18659.16	-	3.84			
1983	Other	Active	35	3,438.58	34.28	3,369.22	0.21%	0.87	1.86%	0.07	0.64	6.08	62.65	8,785.00	1	53,396.27	12,645,086.85	22811.92	30,584.35	33.58			
1984	Other	Active	32	4,464.39	31.35	4,377.05	0.21%	0.69	1.84%	0.06	0.58	6.23	80.40	8,785.00	1	54,727.35	4,704,398.92	6695.532	48,031.82	30.71			
1985	Other	Active	14	2,329.11	13.72	2,282.57	0.21%	1.00	1.81%	0.03	0.25	4.73	41.41	8,785.00	1	41,512.02	4,948,215.05	10243.7	31,268.32	13.44			
1986	Other	Active	13	1,411.57	12.74	1,383.80	0.21%	0.96	1.79%	0.03	0.23	2.75	24.79	8,785.00	1	24,198.54	1,072,580.71	2135.034	22,063.50	12.49			
1987	Other	Active	7	486.71	6.86	477.13	0.21%	1.07	1.77%	0.01	0.12	1.06	8.44	8,785.00	1	9,297.23	1,047,950.43	2324.407	6,972.82	6.73			
1988	Other	Active	7	479.98	6.86	470.50	0.21%	1.21	1.75%	0.01	0.12	1.18	8.21	8,785.00	1	10,390.44	1,134,939.81	2853.001	7,537.44	6.73			
1989	Other	Active	7	290.43	6.87	284.68	0.21%	1.36	1.72%	0.01	0.12	0.80	4.90	8,785.00	1	7,026.30	293,772.31	825.3624	6,200.94	6.73			
1990	Other	Active	5	264.35	4.91	259.20	0.21%	1.30	1.70%	0.01	0.08	0.70	4.41	8,785.00	1	6,128.24	54,851.98	147.6196	5,980.62	4.81			
1991	Other	Active	7	431.34	6.87	422.99	0.21%	1.36	1.68%	0.01	0.12	1.19	7.10	8,785.00	1	10,440.15	1,590,119.92	4467.491	5,972.66	6.74			
1992	Other	Active	9	554.74	8.83	544.48	0.21%	1.06	1.65%	0.02	0.15	1.19	9.01	8,785.00	1	10,452.24	1,670,701.20	3650.801	6,801.44	8.67			
1993	Other	Active	8	879.50	7.96	875.05	0.21%	0.75	1.63%	0.02	0.13	1.36	14.28	8,785.00	1	11,935.63	5,363,719.15	8327.901	3,607.73	7.81			
1994	Other	Active	12	1,837.84	11.91	1,824.74	0.21%	0.83	1.63%	0.02	0.04	3.15	6.39	8,785.00	1	27,654.82	3,958,630.96	6829.234	20,825.58	11.84			
1995	Other	Active	6	939.93	5.94	931.13	0.21%	1.00	1.54%	0.01	0.03	1.93	5.03	8,785.00	1	16,933.96	10,113,549.69	20936.88	-	5.90			
1996	Other	Active	3	1,971.02	2.97	1,950.86	0.21%	0.50	1.73%	0.01	0.02	2.02	14.23	8,785.00	1	17,739.71	2,559,987.44	2649.818	15,089.89	2.94			
1997	Other	Active	10	1,267.92	9.87	1,251.24	0.21%	1.00	1.92%	0.02	0.09	2.59	11.50	8,785.00	1	22,755.65	3,483,892.75	7212.287	15,543.36	9.76			
1998	Other	Active	3	1,054.49	2.95	1,038.31	0.21%	0.83	1.11%	0.01	0.03	1.79	11.51	8,785.00	1	15,736.12	958,098.28	1652.864	14,083.26	2.91			
1999	Other	Active	5	404.95	4.91	397.33	0.28%	1.10	1.30%	0.01	0.06	1.24	5.16	8,785.00	1	10,851.00	32,869.97	102.1828	10,748.82	4.83			
2000	Other	Active	2	255.10	1.96	249.71	0.36%	1.00	1.49%	0.01	0.03	0.89	3.72	8,785.00	1	7,857.95	799,875.10	2865.148	4,992.80	1.92			
2001	Other	Active	5	360.44	4.88	352.06	0.43%	0.90	1.68%	0.02	0.08	1.37	5.91	8,785.00	1	12,074.73	1,680,845.46	6562.208	5,512.52	4.78			
2002	Other	Active	6	569.59	5.84	553.43	0.51%	1.33	1.87%	0.03	0.11	3.76	10.33	8,785.00	1	38,020.77	4,501,665.70	30574.17	2,446.60	5.70			
2003	Other	Active	3	810.10	2.91	787.44	0.58%	0.83	2.06%	0.02	0.06	3.84	16.20	8,785.00	1	33,722.05	3,586,022.81	17481.01	16,241.04	2.84			
2004	Other	Active	7	1,049.09	6.78	1,016.36	0.66%	0.93	2.25%	0.04	0.15	6.23	22.83	8,785.00	1	54,767.06	236,969.00	1453.519	53,313.54	6.58			
2005	Other	Active	2	22.99	1.93	22.20	0.74%	1.00	2.44%	0.01	0.05	0.16	0.54	8,785.00	1	1,435.68	1,327,436.44	9771.962	-	1.87			
2006	Other	Active	7	491.96	6.74	473.43	0.81%	1.07	2.63%	0.05	0.18	4.12	12.43	8,785.00	1	36,172.82	1,046,435.88	9101.118	27,071.70	6.51			
2007	Other	Active	5	368.47	4.80	353.50	0.89%	1.10	2.82%	0.04	0.14	3.45	9.95	8,785.00	1	30,371.94	1,633,037.40	15939.55	14,371.79	4.62			
2008	Other	Active	9	649.47	8.62	620.10	0.96%	1.28	3.00%	0.08	0.26	7.63	18.63	8,785.00	1	67,027.73	462,381.71	5689.164	61,338.56	8.28			
2009	Other	Active	6	202.62	5.73	192.75	1.04%	1.33	3.19%	0.06	0.18	2.67	6.16	8,785.00	1	23,447.45	4,231,317.06	58950.52	-	5.49			
2010	Other	Active	9	1,059.98	8.57	1,008.79	1.11%	1.06	3.38%	0.10	0.29	11.86	34.14	8,785.00	1	104,219.70	485,327.79	5707.461	98,512.23	8.19			
2011	Other	Active	3	350.69	2.83	331.92	1.19%	0.83	3.57%	0.03	0.10	3.29	11.86	8,785.00	1	28,908.64	144,955.29	1437.107	27,471.53	2.70			
2012	Other	Active	7	147.31	6.29	131.38	1.27%	1.50	4.30%	0.08	0.27	2.49	5.65	8,785.00	1	21,905.42	3,768,235.93	71518.54	-	5.94			
2013	Other	Active	17	2,047.67	14.54	1,750.49	1.33%	1.03	8.82%	0.19	1.28	23.98	154.36	8,785.00	1	210,644.62	651,601.31	8925.459	201,718.17	13.06			
2014	Other	Active	8	259.86	6.50	210.05	1.14%	1.38	13.34%	0.07	0.87	3.30	28.02	8,785.00	1	28,974.54	1,185,830.40	18619.71	10,354.83	5.55			
2015	Other	Active	10	1,229.64	7.69	944.15	0.95%	1.10	17.86%	0.07	1.37	9.90	168.60	8,785.00	1	86,973.91	6,503,439.61	68194.6	18,779.31	6.24			
2016	Other	Active	6	1,513.50	4.35	1,094.81	0.76%	1.33	22.38%	0.03	0.97	11.16	244.98	8,785.00	1	98,048.78	260,603.44	2656.699	95,392.08	3.34			
2017	Other	Active	7	388.02	4.25	235.03	0.58%	1.36	26.90%	0.02	1.14	1.84	63.21	8,785.00	1	16,137.32	148,714.38	1162.311	14,975.00	3.08			
2018	Other	Active	4	36.77	2.69	24.72	0.39%	1.50	38.90%	0.01	1.05	0.14	9.62	8,785.00	1	1,261.22	151,048.85	877.3156	383.91	1.63			
2019	Other	Active	14	50.90	10.87	39.52	0.20%	1.50	32.48%	0.02	3.53	0.12	12.84	8,785.00	1	1,033.97	197,230.88	567.3299	446.64	7.32			
2020	Other	Active	35	777.21	30.74	682.51	0.01%	1.47	22.33%	0.00	6.86	0.10	152.42	8,785.00	1	868.14	197,260.00	28,561.27	839.58	23.87			
2021	Other	Active	35	175.63	34.29	172.05	0.00%	1.50	12.18%	-	4.18	-	20.96	8,785.00	1	-	197,260.00	0	-	30.11			

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		2023																		
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current			Adjustment Factor			Released			Avg recl Cost per Acre (28)			Gross Cost (30)	Adjustment		Net Cost (33)	Adjusted Permit Count (34)
				Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Permit Bond Size (22)	Release Rate (23)	Forfeited Permit Count (24)	Released Permit Count (25)	Forfeited Acres (26)	Released Acres (27)	Permit Status (29)	Current Security Amount (31)		Forfeited Security Amount (32)			
1963	Other	Inactive	-	-	-	-	0.47%	-	1.43%	-	-	-	-	8,785.00	1	-	-	0	-	-
1964	Other	Inactive	-	-	-	-	0.47%	-	1.43%	-	-	-	-	8,785.00	1	-	-	0	-	-
1965	Other	Inactive	-	-	-	-	0.47%	-	1.42%	-	-	-	-	8,785.00	1	-	-	0	-	-
1966	Other	Inactive	-	-	-	-	0.47%	-	1.40%	-	-	-	-	8,785.00	1	-	-	0	-	-
1967	Other	Inactive	-	-	-	-	0.47%	-	1.39%	-	-	-	-	8,785.00	1	-	-	0	-	-
1968	Other	Inactive	-	-	-	-	0.47%	-	1.38%	-	-	-	-	8,785.00	1	-	-	0	-	-
1969	Other	Inactive	-	-	-	-	0.47%	-	1.36%	-	-	-	-	8,785.00	1	-	-	0	-	-
1970	Other	Inactive	-	-	-	-	0.47%	-	1.35%	-	-	-	-	8,785.00	1	-	-	0	-	-
1971	Other	Inactive	-	-	-	-	0.47%	-	1.33%	-	-	-	-	8,785.00	1	-	-	0	-	-
1972	Other	Inactive	-	-	-	-	0.47%	-	1.32%	-	-	-	-	8,785.00	1	-	-	0	-	-
1973	Other	Inactive	-	-	-	-	0.47%	-	1.30%	-	-	-	-	8,785.00	1	-	-	0	-	-
1974	Other	Inactive	-	-	-	-	0.47%	-	1.29%	-	-	-	-	8,785.00	1	-	-	0	-	-
1975	Other	Inactive	-	-	-	-	0.47%	-	1.28%	-	-	-	-	8,785.00	1	-	-	0	-	-
1976	Other	Inactive	1	14.48	0.98	14.20	0.47%	1.50	1.26%	0.00	0.01	0.10	0.18	8,785.00	1	871.48	14,895.20	104,070.7	767.41	0.97
1977	Other	Inactive	2	61.00	1.97	59.82	0.47%	1.50	1.25%	0.01	0.02	0.42	0.75	8,785.00	1	3,671.81	61,566.81	430,158.7	3,241.66	1.93
1978	Other	Inactive	-	-	-	-	0.47%	-	1.23%	-	-	-	-	8,785.00	1	-	-	0	-	-
1979	Other	Inactive	1	7.25	0.98	7.11	0.47%	1.50	1.22%	0.00	0.01	0.05	0.09	8,785.00	1	436.53	9,930.13	69,380.44	367.15	0.97
1980	Other	Inactive	1	114.75	0.98	113.12	0.47%	0.50	1.20%	0.00	0.01	0.26	1.36	8,785.00	1	2,314.35	339,607.22	790,929.4	1,523.42	0.97
1981	Other	Inactive	13	1,477.93	12.79	1,453.92	0.47%	0.96	1.19%	0.06	0.15	6.51	17.31	8,785.00	1	57,205.90	3,535,295.04	15,833.72	41,372.17	12.57
1982	Other	Inactive	3	148.70	2.95	146.16	0.47%	1.17	1.18%	0.01	0.03	0.79	1.72	8,785.00	1	6,977.81	67,630.47	367,519.2	6,610.29	2.90
1983	Other	Inactive	8	1,739.30	7.87	1,713.26	0.47%	0.75	1.16%	0.04	0.09	5.99	19.91	8,785.00	1	52,579.48	6,686,512.25	23,358.86	29,220.62	7.74
1984	Other	Inactive	7	440.78	6.89	433.88	0.47%	0.93	1.15%	0.03	0.08	1.88	4.98	8,785.00	1	16,405.94	6,666,562.54	2,8834.21	-	6.78
1985	Other	Inactive	3	364.25	2.95	358.76	0.47%	0.83	1.13%	0.01	0.03	1.39	4.07	8,785.00	1	12,233.57	3,378,654.35	13,114.55	-	2.91
1986	Other	Inactive	-	-	-	-	0.47%	-	1.12%	-	-	-	-	8,785.00	1	-	10,000.00	0	-	-
1987	Other	Inactive	1	484.64	0.98	478.22	0.47%	0.50	1.11%	0.00	0.01	1.11	5.29	8,785.00	1	9,784.39	3,425,363.87	7,977,512	1,806.87	0.97
1988	Other	Inactive	3	167.79	2.95	165.07	0.47%	1.17	1.09%	0.01	0.03	0.90	1.80	8,785.00	1	7,880.45	182,005.54	989,058.9	6,891.39	2.91
1989	Other	Inactive	5	438.61	4.92	432.11	0.47%	0.90	1.08%	0.02	0.05	1.81	4.65	8,785.00	1	15,913.66	175,262.19	734,719.4	15,178.94	4.85
1990	Other	Inactive	3	481.66	2.95	473.99	0.47%	1.17	1.06%	0.01	0.03	2.58	5.04	8,785.00	1	22,628.27	1,950,701.53	10,600.55	12,027.72	2.91
1991	Other	Inactive	-	-	-	-	0.47%	-	1.05%	-	-	-	-	8,785.00	1	-	1,298,480.00	0	-	-
1992	Other	Inactive	5	433.18	4.93	426.14	0.47%	1.30	1.03%	0.02	0.05	2.58	4.41	8,785.00	1	22,668.73	1,231,696.30	7458,264	15,210.46	4.85
1993	Other	Inactive	5	273.92	4.97	272.17	0.47%	0.90	1.02%	0.02	0.05	1.14	2.78	8,785.00	1	10,023.47	2,842,409.58	11,915.71	-	4.89
1994	Other	Inactive	4	545.08	3.97	540.70	0.47%	1.00	1.02%	0.02	0.01	2.52	1.18	8,785.00	1	22,125.34	1,106,183.39	5,152,499	16,972.84	3.94
1995	Other	Inactive	3	641.22	2.97	634.81	0.47%	1.17	0.34%	0.01	0.01	3.45	2.14	8,785.00	1	30,305.68	3,204,689.84	17,415	12,890.67	2.95
1996	Other	Inactive	1	152.16	0.99	150.93	0.47%	0.50	0.46%	0.00	0.00	0.35	0.69	8,785.00	1	3,088.03	507,096.24	11,811,003	1,907.03	0.98
1997	Other	Inactive	3	158.04	2.97	156.33	0.47%	0.83	0.57%	0.01	0.02	0.61	0.90	8,785.00	1	5,330.86	336,688.02	1,306,884	4,023.97	2.93
1998	Other	Inactive	2	206.29	1.97	203.30	0.47%	1.00	0.69%	0.01	0.01	0.95	1.41	8,785.00	1	8,319.15	89,427.72	416,545.9	7,902.60	1.95
1999	Other	Inactive	-	-	-	-	0.81%	-	0.81%	-	-	-	-	8,785.00	1	-	-	0	-	-
2000	Other	Inactive	1	116.73	0.98	114.94	0.81%	0.50	0.93%	0.01	0.01	0.46	1.07	8,785.00	1	4,068.90	1,039,581.82	41,899,248	-	0.96
2001	Other	Inactive	1	250.00	0.98	245.65	0.98%	0.50	1.05%	0.01	0.01	1.20	2.58	8,785.00	1	10,531.50	282,372.53	13,780,017	9,153.49	0.96
2002	Other	Inactive	2	222.64	1.95	216.85	1.15%	1.00	1.17%	0.03	0.02	2.49	2.53	8,785.00	1	21,833.40	673,714.40	7,721,487	14,111.91	1.90
2003	Other	Inactive	2	78.29	1.94	75.45	1.32%	1.50	1.29%	0.03	0.02	1.49	0.97	8,785.00	1	13,085.28	101,681.43	2,007,475	11,077.80	1.89
2004	Other	Inactive	1	56.00	0.97	53.76	1.49%	1.50	1.40%	0.01	0.01	1.20	0.75	8,785.00	1	10,528.26	-	0	10,528.26	0.94
2005	Other	Inactive	1	50.69	0.97	48.47	1.66%	1.50	1.52%	0.02	0.01	1.20	0.74	8,785.00	1	10,579.17	-	0	10,579.17	0.93
2006	Other	Inactive	-	-	-	-	1.83%	-	1.64%	-	-	-	-	8,785.00	1	-	-	0	-	-
2007	Other	Inactive	-	-	-	-	2.00%	-	1.76%	-	-	-	-	8,785.00	1	-	26,000.00	0	-	-
2008	Other	Inactive	1	4.11	0.96	3.88	2.17%	1.50	1.88%	0.02	0.02	0.13	0.07	8,785.00	1	1,108.85	9,649.50	313,596.4	795.26	0.92
2009	Other	Inactive	-	-	-	-	2.34%	-	2.00%	-	-	-	-	8,785.00	1	-	-	0	-	-
2010	Other	Inactive	-	-	-	-	2.51%	-	2.12%	-	-	-	-	8,785.00	1	-	134,000.00	0	-	-
2011	Other	Inactive	-	-	-	-	2.68%	-	2.23%	-	-	-	-	8,785.00	1	-	16,000.00	0	-	-
2012	Other	Inactive	1	66.26	0.91	61.62	2.85%	0.50	2.69%	0.03	0.02	0.88	1.66	8,785.00	1	7,705.12	227,029.79	3,231,653	4,473.47	0.86
2013	Other	Inactive	1	57.00	0.89	50.05	2.99%	1.50	5.51%	0.03	0.05	2.25	2.76	8,785.00	1	19,746.67	54,803.17	246,115.5	17,285.51	0.82
2014	Other	Inactive	-	-	-	-	2.57%	-	8.94%	-	-	-	-	8,785.00	1	-	-	0	-	-
2015	Other	Inactive	-	-	-	-	2.14%	-	11.16%	-	-	-	-	8,785.00	1	-	-	0	-	-
2016	Other	Inactive	-	-	-	-	1.72%	-	13.99%	-	-	-	-	8,785.00	1	-	-	0	-	-
2017	Other	Inactive	-	-	-	-	1.30%	-	16.81%	-	-	-	-	8,785.00	1	-	-	0	-	-
2018	Other	Inactive	1	11.88	0.79	9.39	0.87%	1.50	24.31%	0.01	0.19	0.12	2.28	8,785.00	1	1,077.89	-	0	1,077.89	0.59
2019	Other	Inactive	-	-	-	-	0.45%	-	20.30%	-	-	-	-	8,785.00	1	-	-	0	-	-
2020	Other	Inactive	-	-	-	-	0.02%	-	13.96%	-	-	-	-	8,785.00	1	-	-	0	-	-
2021	Other	Inactive	-	-	-	-	0.00%	-	7.62%	-	-	-	-	8,785.00	1	-	-	0	-	-

West Virginia Department of Environmental Protection Office of Special Reclam  
 Actuarial Reserve Study as of June 30, 2021  
 Land Reclamation Cost Projection - Deterministic Model

														2023													
Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	Permit Count (4)	Current Bonded Acres (5)	Adjusted Permit Count (19)	Adjusted Acres (20)	Forfeiture Rate (21)	Adjustment Factor		Released Rate (23)	Forfeited Permit Count (24)	Released Permit Count (25)	Forfeited Acres (26)	Released Acres (27)	Avg recl Cost per Acre (28)	Adjustment Factor		Gross Cost (30)	Adjustment Current Security Amount (31)	Forfeited Security Amount (32)	Net Cost (33)	Adjusted Permit Count (34)					
								Permit Bond Size (22)	Permit Status (29)							Permit Status (29)	Permit Status (29)										
1963	Other	Phased Released	-	-	-	-	0.81%	-	6.88%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1964	Other	Phased Released	-	-	-	-	0.81%	-	6.88%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1965	Other	Phased Released	-	-	-	-	0.81%	-	6.81%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1966	Other	Phased Released	-	-	-	-	0.81%	-	6.74%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1967	Other	Phased Released	-	-	-	-	0.81%	-	6.67%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1968	Other	Phased Released	-	-	-	-	0.81%	-	6.60%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1969	Other	Phased Released	-	-	-	-	0.81%	-	6.54%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1970	Other	Phased Released	-	-	-	-	0.81%	-	6.47%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1971	Other	Phased Released	-	-	-	-	0.81%	-	6.40%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1972	Other	Phased Released	-	-	-	-	0.81%	-	6.33%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1973	Other	Phased Released	1	9.00	0.93	8.44	0.81%	-	6.26%	0.01	0.05	-	0.53	8,785.00	0.5	-	-	10,000.00	0	-	0.86						
1974	Other	Phased Released	-	-	-	-	0.81%	-	6.19%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1975	Other	Phased Released	-	-	-	-	0.81%	-	6.13%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1976	Other	Phased Released	2	27.88	1.86	26.21	0.81%	-	6.06%	0.02	0.11	-	1.59	8,785.00	0.5	-	-	10,000.00	0	-	1.74						
1977	Other	Phased Released	-	-	-	-	0.81%	-	5.99%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1978	Other	Phased Released	1	12.76	0.93	12.01	0.81%	-	5.92%	0.01	0.05	-	0.71	8,785.00	0.5	-	-	-	0	-	0.87						
1979	Other	Phased Released	2	58.69	1.87	55.30	0.81%	-	5.85%	0.02	0.11	-	3.24	8,785.00	0.5	-	-	58,000.00	0	-	1.74						
1980	Other	Phased Released	1	7.91	0.93	7.46	0.81%	-	5.78%	0.01	0.05	-	0.43	8,785.00	0.5	-	-	10,000.00	0	-	0.87						
1981	Other	Phased Released	4	475.54	3.74	448.69	0.81%	-	5.72%	0.03	0.21	-	25.64	8,785.00	0.5	-	-	204,860.00	0	-	3.50						
1982	Other	Phased Released	2	201.26	1.87	190.03	0.81%	-	5.65%	0.02	0.11	-	10.73	8,785.00	0.5	-	-	69,200.00	0	-	1.75						
1983	Other	Phased Released	3	158.90	2.81	150.14	0.81%	-	5.58%	0.02	0.16	-	8.38	8,785.00	0.5	-	-	141,200.00	0	-	2.63						
1984	Other	Phased Released	4	75.79	3.75	71.67	0.81%	-	5.51%	0.03	0.21	-	3.95	8,785.00	0.5	-	-	84,200.00	0	-	3.51						
1985	Other	Phased Released	1	43.00	0.94	40.69	0.81%	-	5.44%	0.01	0.05	-	2.21	8,785.00	0.5	-	-	17,200.00	0	-	0.88						
1986	Other	Phased Released	-	-	-	-	0.81%	-	5.37%	-	-	-	-	-	8,785.00	0.5	-	-	10,000.00	0	-	-					
1987	Other	Phased Released	1	50.95	0.94	48.28	0.81%	-	5.31%	0.01	0.05	-	2.56	8,785.00	0.5	-	-	52,300.00	0	-	0.88						
1988	Other	Phased Released	-	-	-	-	0.81%	-	5.24%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1989	Other	Phased Released	2	38.00	1.88	36.06	0.81%	-	5.17%	0.02	0.10	-	1.86	8,785.00	0.5	-	-	-	0	-	1.77						
1990	Other	Phased Released	-	-	-	-	0.81%	-	5.10%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1991	Other	Phased Released	-	-	-	-	0.81%	-	5.03%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1992	Other	Phased Released	-	-	-	-	0.81%	-	4.96%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1993	Other	Phased Released	1	48.00	0.98	47.50	0.81%	-	4.90%	0.01	0.05	-	2.33	8,785.00	0.5	-	-	-	0	-	0.93						
1994	Other	Phased Released	-	-	-	-	0.81%	-	1.05%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1995	Other	Phased Released	-	-	-	-	0.81%	-	1.62%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1996	Other	Phased Released	-	-	-	-	0.81%	-	2.19%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1997	Other	Phased Released	1	31.16	0.96	30.12	0.81%	-	2.76%	0.01	0.03	-	0.83	8,785.00	0.5	-	-	-	0	-	0.92						
1998	Other	Phased Released	-	-	-	-	0.81%	-	3.33%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
1999	Other	Phased Released	1	179.00	0.94	171.01	1.11%	-	3.90%	0.01	0.04	-	6.66	8,785.00	0.5	-	-	249,600.00	0	-	0.89						
2000	Other	Phased Released	-	-	-	-	1.40%	-	4.46%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2001	Other	Phased Released	-	-	-	-	1.70%	-	5.03%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2002	Other	Phased Released	-	-	-	-	2.00%	-	5.60%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2003	Other	Phased Released	-	-	-	-	2.29%	-	6.17%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2004	Other	Phased Released	-	-	-	-	2.59%	-	6.74%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2005	Other	Phased Released	-	-	-	-	2.88%	-	7.31%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2006	Other	Phased Released	-	-	-	-	3.18%	-	7.88%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2007	Other	Phased Released	-	-	-	-	3.48%	-	8.45%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2008	Other	Phased Released	-	-	-	-	3.77%	-	9.01%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2009	Other	Phased Released	-	-	-	-	4.07%	-	9.58%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2010	Other	Phased Released	-	-	-	-	4.36%	-	10.15%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2011	Other	Phased Released	-	-	-	-	4.66%	-	10.72%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2012	Other	Phased Released	-	-	-	-	4.96%	-	12.90%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2013	Other	Phased Released	-	-	-	-	5.21%	-	26.45%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2014	Other	Phased Released	-	-	-	-	4.47%	-	40.01%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2015	Other	Phased Released	-	-	-	-	3.73%	-	53.57%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2016	Other	Phased Released	-	-	-	-	2.99%	-	67.13%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2017	Other	Phased Released	-	-	-	-	2.26%	-	80.69%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2018	Other	Phased Released	-	-	-	-	1.52%	-	116.71%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2019	Other	Phased Released	-	-	-	-	0.78%	-	97.44%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2020	Other	Phased Released	-	-	-	-	0.04%	-	67.00%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					
2021	Other	Phased Released	-	-	-	-	0.00%	-	36.55%	-	-	-	-	-	8,785.00	0.5	-	-	-	0	-	-					

West Virginia Department of Environmental Protection Office of Special Reclamation  
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 Water Capital Cost Projection - Deterministic Model  
 Water Capital Total - All Mine Types

Fiscal Year Ending 6/30	(1) (2) (3) (4) Gross Liability				(5) (6) (7) (8) Gross Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	3,894,820	1,079,301	0	4,974,121	0	0	0	0
2023	3,752,883	1,029,257	0	4,782,140	0	0	0	0
2024	3,599,935	998,366	0	4,598,301	0	0	0	0
2025	3,456,381	967,752	0	4,424,133	1,947,410	539,651	0	2,487,060
2026	3,296,825	936,618	0	4,233,444	3,823,851	1,054,279	0	4,878,130
2027	3,131,495	902,356	0	4,033,851	3,676,409	1,013,811	0	4,690,220
2028	2,975,291	873,548	0	3,848,839	3,528,158	983,059	0	4,511,217
2029	2,820,487	849,620	0	3,670,107	5,025,016	1,420,494	0	6,445,510
2030	2,688,658	824,101	0	3,512,759	3,131,495	902,356	0	4,033,851
2031	2,538,019	798,559	0	3,336,578	2,975,291	873,548	0	3,848,839
2032	2,381,834	775,894	0	3,157,728	2,820,487	849,620	0	3,670,107
2033	2,247,670	730,596	0	2,978,267	2,688,658	824,101	0	3,512,759
2034	2,118,990	700,070	0	2,819,060	2,538,019	798,559	0	3,336,578
2035	1,996,839	670,596	0	2,667,435	2,381,834	775,894	0	3,157,728
2036	1,886,293	643,966	0	2,530,260	2,247,670	730,596	0	2,978,267
2037	1,771,055	616,241	0	2,387,296	2,118,990	700,070	0	2,819,060
2038	1,657,175	584,965	0	2,242,140	1,996,839	670,596	0	2,667,435
2039	1,551,649	560,155	0	2,111,804	1,886,293	643,966	0	2,530,260
2040	1,447,043	536,723	0	1,983,766	1,771,055	616,241	0	2,387,296
2041	1,360,661	514,440	0	1,875,101	1,657,175	584,965	0	2,242,140

Notes: Cols (1) - (3) from Exhibit E-99, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Cols (5) - (8) based on (1) - (4) with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
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 Water Capital Cost Projection - Deterministic Model  
 Surface Mines

Fiscal Year Ending 6/30	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Gross Liability				Gross Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	2,258,985	535,533	0	2,794,518	0	0	0	0
2023	2,209,824	508,533	0	2,718,356	0	0	0	0
2024	2,153,261	499,791	0	2,653,052	0	0	0	0
2025	2,095,848	489,858	0	2,585,706	1,129,493	267,766	0	1,397,259
2026	2,028,624	478,553	0	2,507,177	2,234,404	522,033	0	2,756,437
2027	1,956,555	461,251	0	2,417,806	2,181,542	504,162	0	2,685,704
2028	1,881,837	445,959	0	2,327,797	2,124,555	494,825	0	2,619,379
2029	1,798,622	433,904	0	2,232,526	3,076,548	723,482	0	3,800,030
2030	1,728,083	418,840	0	2,146,922	1,956,555	461,251	0	2,417,806
2031	1,636,331	402,549	0	2,038,880	1,881,837	445,959	0	2,327,797
2032	1,532,781	388,820	0	1,921,601	1,798,622	433,904	0	2,232,526
2033	1,446,214	352,198	0	1,798,411	1,728,083	418,840	0	2,146,922
2034	1,359,062	330,027	0	1,689,090	1,636,331	402,549	0	2,038,880
2035	1,275,329	308,668	0	1,583,996	1,532,781	388,820	0	1,921,601
2036	1,196,893	289,917	0	1,486,809	1,446,214	352,198	0	1,798,411
2037	1,111,225	269,849	0	1,381,074	1,359,062	330,027	0	1,689,090
2038	1,024,987	245,733	0	1,270,720	1,275,329	308,668	0	1,583,996
2039	939,978	227,397	0	1,167,375	1,196,893	289,917	0	1,486,809
2040	854,333	210,286	0	1,064,619	1,111,225	269,849	0	1,381,074
2041	783,901	194,142	0	978,043	1,024,987	245,733	0	1,270,720

Notes: Cols (1) - (3) from Exhibit E-99, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Cols (5) - (8) based on (1) - (4) with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water Capital Cost Projection - Deterministic Model  
 Underground Mines

Fiscal Year <u>Ending 6/30</u>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<u>Gross Liability</u>				<u>Gross Liability - Three Year Delay</u>			
	<u>Active</u>	<u>Inactive</u>	<u>Phase Released</u>	<u>Total</u>	<u>Active</u>	<u>Inactive</u>	<u>Phase Released</u>	<u>Total</u>
2022	292,530	143,763	0	436,292	0	0	0	0
2023	284,463	139,564	0	424,027	0	0	0	0
2024	276,044	135,622	0	411,666	0	0	0	0
2025	267,483	131,815	0	399,298	146,265	71,881	0	218,146
2026	259,687	127,407	0	387,094	288,496	141,663	0	430,160
2027	251,990	123,555	0	375,545	280,254	137,593	0	417,847
2028	244,237	119,861	0	364,098	271,764	133,718	0	405,482
2029	236,800	116,321	0	353,121	393,428	193,315	0	586,743
2030	230,049	112,914	0	342,963	251,990	123,555	0	375,545
2031	223,708	109,671	0	333,379	244,237	119,861	0	364,098
2032	217,754	106,593	0	324,347	236,800	116,321	0	353,121
2033	212,140	103,677	0	315,817	230,049	112,914	0	342,963
2034	206,779	100,916	0	307,695	223,708	109,671	0	333,379
2035	201,691	98,300	0	299,991	217,754	106,593	0	324,347
2036	196,863	95,833	0	292,696	212,140	103,677	0	315,817
2037	192,282	93,495	0	285,777	206,779	100,916	0	307,695
2038	187,945	91,274	0	279,220	201,691	98,300	0	299,991
2039	183,921	89,168	0	273,089	196,863	95,833	0	292,696
2040	180,125	87,168	0	267,293	192,282	93,495	0	285,777
2041	176,628	85,299	0	261,928	187,945	91,274	0	279,220

Notes: Cols (1) - (3) from Exhibit E-99, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Cols (5) - (8) based on (1) - (4) with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water Capital Cost Projection - Deterministic Model  
 Other

Fiscal Year Ending 6/30	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Gross Liability				Gross Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	1,343,305	400,006	0	1,743,310	0	0	0	0
2023	1,258,596	381,160	0	1,639,756	0	0	0	0
2024	1,170,629	362,953	0	1,533,583	0	0	0	0
2025	1,093,050	346,078	0	1,439,128	671,652	200,003	0	871,655
2026	1,008,515	330,658	0	1,339,173	1,300,950	390,583	0	1,691,533
2027	922,950	317,550	0	1,240,500	1,214,613	372,057	0	1,586,669
2028	849,217	307,728	0	1,156,945	1,131,840	354,516	0	1,486,355
2029	785,065	299,396	0	1,084,461	1,555,040	503,697	0	2,058,737
2030	730,527	292,347	0	1,022,874	922,950	317,550	0	1,240,500
2031	677,980	286,339	0	964,319	849,217	307,728	0	1,156,945
2032	631,299	280,481	0	911,780	785,065	299,396	0	1,084,461
2033	589,316	274,722	0	864,038	730,527	292,347	0	1,022,874
2034	553,149	269,126	0	822,275	677,980	286,339	0	964,319
2035	519,819	263,628	0	783,448	631,299	280,481	0	911,780
2036	492,538	258,216	0	750,754	589,316	274,722	0	864,038
2037	467,549	252,897	0	720,446	553,149	269,126	0	822,275
2038	444,243	247,957	0	692,200	519,819	263,628	0	783,448
2039	427,750	243,589	0	671,340	492,538	258,216	0	750,754
2040	412,585	239,270	0	651,855	467,549	252,897	0	720,446
2041	400,132	234,998	0	635,130	444,243	247,957	0	692,200

Notes: Cols (1) - (3) from Exhibit E-99, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Cols (5) - (8) based on (1) - (4) with a three-year delay



West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water Capital Cost Projection - Deterministic Model

Permit Issue Year	Mine Type	Mine Status	2022							Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current	Adjustment		Adjustment						
			Bonded Acres	Forfeiture Rate	Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Cost per Acre			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Surface	Active	-	0.000%	0.00	1.069%	-	-	3,490.00	1.00	-	
1964	Surface	Active	-	0.000%	0.00	1.090%	-	-	3,490.00	1.00	-	
1965	Surface	Active	-	0.000%	0.00	1.113%	-	-	3,490.00	1.00	-	
1966	Surface	Active	-	0.000%	0.00	1.135%	-	-	3,490.00	1.00	-	
1967	Surface	Active	-	0.000%	0.00	1.159%	-	-	3,490.00	1.00	-	
1968	Surface	Active	-	0.000%	0.00	1.182%	-	-	3,490.00	1.00	-	
1969	Surface	Active	-	0.000%	0.00	1.206%	-	-	3,490.00	1.00	-	
1970	Surface	Active	-	0.000%	0.00	1.231%	-	-	3,490.00	1.00	-	
1971	Surface	Active	-	0.005%	0.00	1.256%	-	-	3,490.00	1.00	-	
1972	Surface	Active	400.00	0.021%	1.50	1.282%	0.13	5.13	3,490.00	1.00	448.35	
1973	Surface	Active	-	0.038%	0.00	1.308%	-	-	3,490.00	1.00	-	
1974	Surface	Active	-	0.054%	0.00	1.335%	-	-	3,490.00	1.00	-	
1975	Surface	Active	-	0.071%	0.00	1.362%	-	-	3,490.00	1.00	-	
1976	Surface	Active	-	0.087%	0.00	1.390%	-	-	3,490.00	1.00	-	
1977	Surface	Active	1,933.27	0.103%	0.67	1.418%	1.33	27.41	3,490.00	1.00	4,649.48	
1978	Surface	Active	2,280.93	0.120%	0.50	1.447%	1.37	33.00	3,490.00	1.00	4,766.60	
1979	Surface	Active	180.00	0.136%	1.00	1.476%	0.25	2.66	3,490.00	1.00	855.28	
1980	Surface	Active	455.76	0.153%	0.50	1.507%	0.35	6.87	3,490.00	1.00	1,213.14	
1981	Surface	Active	1,661.03	0.169%	1.06	1.537%	2.96	25.54	3,490.00	1.00	10,336.90	
1982	Surface	Active	620.00	0.185%	1.00	1.569%	1.15	9.73	3,490.00	1.00	4,009.97	
1983	Surface	Active	1,704.33	0.202%	0.50	1.601%	1.72	27.28	3,490.00	1.00	5,999.02	
1984	Surface	Active	-	0.218%	0.00	1.633%	-	-	3,490.00	1.00	-	
1985	Surface	Active	2,405.91	0.234%	0.70	1.667%	3.95	40.10	3,490.00	1.00	13,782.68	
1986	Surface	Active	2,331.92	0.251%	1.07	1.701%	6.27	39.66	3,490.00	1.00	21,876.41	
1987	Surface	Active	1,371.12	0.267%	0.83	1.736%	3.05	23.80	3,490.00	1.00	10,658.07	
1988	Surface	Active	1,898.10	0.284%	0.88	1.771%	4.71	33.61	3,490.00	1.00	16,442.22	
1989	Surface	Active	2,959.93	0.300%	0.64	1.807%	5.71	53.49	3,490.00	1.00	19,926.25	
1990	Surface	Active	2,801.20	0.316%	0.75	1.844%	6.65	51.65	3,490.00	1.00	23,202.43	
1991	Surface	Active	2,094.19	0.333%	0.94	1.882%	6.58	39.40	3,490.00	1.00	22,974.83	
1992	Surface	Active	4,639.40	0.349%	0.50	1.920%	8.10	89.08	3,490.00	1.00	28,272.80	
1993	Surface	Active	4,377.78	0.366%	0.83	1.959%	13.34	85.77	3,490.00	1.00	46,551.02	
1994	Surface	Active	2,054.59	0.382%	0.50	1.999%	3.92	41.07	3,490.00	1.00	13,696.12	
1995	Surface	Active	6,620.84	0.398%	0.92	2.040%	24.18	135.06	3,490.00	1.00	84,386.39	
1996	Surface	Active	6,830.47	0.415%	0.83	2.082%	23.61	142.18	3,490.00	1.00	82,399.96	
1997	Surface	Active	13,199.94	0.431%	0.79	2.124%	45.06	280.37	3,490.00	1.00	157,254.51	
1998	Surface	Active	11,029.10	0.448%	0.66	2.167%	32.48	239.04	3,490.00	1.00	113,341.35	
1999	Surface	Active	2,072.61	0.464%	0.50	2.212%	4.81	45.84	3,490.00	1.00	16,780.30	
2000	Surface	Active	4,526.19	0.480%	0.50	2.257%	10.87	102.15	3,490.00	1.00	37,939.60	
2001	Surface	Active	6,826.55	0.497%	0.87	2.303%	29.45	157.20	3,490.00	1.00	102,776.44	
2002	Surface	Active	6,499.09	0.513%	0.63	2.350%	21.12	152.72	3,490.00	1.00	73,713.27	
2003	Surface	Active	6,916.12	0.530%	0.81	2.398%	29.76	165.83	3,490.00	1.00	103,848.96	
2004	Surface	Active	11,573.91	0.674%	0.79	2.447%	61.25	283.18	3,490.00	1.00	213,778.87	
2005	Surface	Active	5,236.53	0.642%	1.03	2.497%	34.74	130.74	3,490.00	1.00	121,248.62	
2006	Surface	Active	4,862.21	0.611%	0.90	2.548%	26.72	123.87	3,490.00	1.00	93,237.89	
2007	Surface	Active	6,382.38	0.579%	0.82	2.600%	30.23	165.92	3,490.00	1.00	105,514.32	
2008	Surface	Active	8,631.88	0.547%	0.58	2.653%	27.56	228.97	3,490.00	1.00	96,199.55	
2009	Surface	Active	6,181.98	0.516%	0.75	2.707%	23.92	167.33	3,490.00	1.00	83,477.13	
2010	Surface	Active	6,203.98	0.484%	0.92	2.438%	27.54	151.23	3,490.00	1.00	96,130.65	
2011	Surface	Active	2,986.04	0.453%	0.74	2.168%	9.94	64.75	3,490.00	1.00	34,697.05	
2012	Surface	Active	7,650.01	0.421%	0.86	1.899%	27.83	145.29	3,490.00	1.00	97,134.22	
2013	Surface	Active	8,508.13	0.390%	0.95	1.630%	31.65	138.69	3,490.00	1.00	110,461.81	
2014	Surface	Active	4,153.44	0.358%	0.75	1.361%	11.16	56.52	3,490.00	1.00	38,940.26	
2015	Surface	Active	4,371.03	0.327%	0.73	1.092%	10.43	47.72	3,490.00	1.00	36,413.39	
2016	Surface	Active	3,389.17	0.295%	0.70	0.823%	7.00	27.88	3,490.00	1.00	24,433.61	
2017	Surface	Active	1,324.50	0.264%	1.00	0.553%	3.49	7.33	3,490.00	1.00	12,183.10	
2018	Surface	Active	3,466.31	0.232%	1.00	0.284%	8.04	9.85	3,490.00	1.00	28,068.43	
2019	Surface	Active	4,158.88	0.200%	0.88	0.190%	7.30	7.90	3,490.00	1.00	25,461.24	
2020	Surface	Active	3,830.10	0.169%	0.86	0.096%	5.59	3.67	3,490.00	1.00	19,502.74	
2021	Surface	Active	3,770.84	0.000%	0.93	0.082%	-	3.09	3,490.00	1.00	-	

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 Water Capital Cost Projection - Deterministic Model

Permit Issue Year	Mine Type	Mine Status	2022								Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Forfeiture Rate	Adjustment Factor		Forfeited Acres	Released Acres	Adjustment				
			(4)	(5)	Permit Bond Size	Release Rate	(8)	(9)	(10)	(11)			
1963	Surface	Inactive	-	0.000%	0.00	0.668%	-	-	3,490.00	1.00	-		
1964	Surface	Inactive	-	0.000%	0.00	0.682%	-	-	3,490.00	1.00	-		
1965	Surface	Inactive	-	0.000%	0.00	0.695%	-	-	3,490.00	1.00	-		
1966	Surface	Inactive	-	0.000%	0.00	0.710%	-	-	3,490.00	1.00	-		
1967	Surface	Inactive	-	0.000%	0.00	0.724%	-	-	3,490.00	1.00	-		
1968	Surface	Inactive	-	0.000%	0.00	0.739%	-	-	3,490.00	1.00	-		
1969	Surface	Inactive	-	0.000%	0.00	0.754%	-	-	3,490.00	1.00	-		
1970	Surface	Inactive	-	0.000%	0.00	0.769%	-	-	3,490.00	1.00	-		
1971	Surface	Inactive	-	0.011%	0.00	0.785%	-	-	3,490.00	1.00	-		
1972	Surface	Inactive	-	0.048%	0.00	0.801%	-	-	3,490.00	1.00	-		
1973	Surface	Inactive	-	0.085%	0.00	0.817%	-	-	3,490.00	1.00	-		
1974	Surface	Inactive	-	0.122%	0.00	0.834%	-	-	3,490.00	1.00	-		
1975	Surface	Inactive	-	0.159%	0.00	0.851%	-	-	3,490.00	1.00	-		
1976	Surface	Inactive	438.80	0.196%	0.50	0.869%	0.43	3.81	3,490.00	1.00	1,498.44		
1977	Surface	Inactive	-	0.233%	0.00	0.886%	-	-	3,490.00	1.00	-		
1978	Surface	Inactive	-	0.269%	0.00	0.904%	-	-	3,490.00	1.00	-		
1979	Surface	Inactive	-	0.306%	0.00	0.923%	-	-	3,490.00	1.00	-		
1980	Surface	Inactive	-	0.343%	0.00	0.942%	-	-	3,490.00	1.00	-		
1981	Surface	Inactive	4.47	0.380%	0.50	0.961%	0.01	0.04	3,490.00	1.00	29.65		
1982	Surface	Inactive	-	0.417%	0.00	0.980%	-	-	3,490.00	1.00	-		
1983	Surface	Inactive	-	0.454%	0.00	1.000%	-	-	3,490.00	1.00	-		
1984	Surface	Inactive	-	0.491%	0.00	1.021%	-	-	3,490.00	1.00	-		
1985	Surface	Inactive	-	0.528%	0.00	1.042%	-	-	3,490.00	1.00	-		
1986	Surface	Inactive	411.07	0.564%	0.50	1.063%	1.16	4.37	3,490.00	1.00	4,049.18		
1987	Surface	Inactive	415.61	0.601%	1.00	1.085%	2.50	4.51	3,490.00	1.00	8,722.74		
1988	Surface	Inactive	1,304.38	0.638%	0.50	1.107%	4.16	14.44	3,490.00	1.00	14,527.47		
1989	Surface	Inactive	273.00	0.675%	1.00	1.129%	1.84	3.08	3,490.00	1.00	6,432.42		
1990	Surface	Inactive	81.70	0.712%	0.50	1.152%	0.29	0.94	3,490.00	1.00	1,015.09		
1991	Surface	Inactive	-	0.749%	0.00	1.176%	-	-	3,490.00	1.00	-		
1992	Surface	Inactive	-	0.786%	0.00	1.200%	-	-	3,490.00	1.00	-		
1993	Surface	Inactive	-	0.823%	0.00	1.224%	-	-	3,490.00	1.00	-		
1994	Surface	Inactive	-	0.860%	0.00	1.249%	-	-	3,490.00	1.00	-		
1995	Surface	Inactive	3,503.18	0.896%	0.50	1.275%	15.70	44.66	3,490.00	1.00	54,797.76		
1996	Surface	Inactive	193.90	0.933%	0.50	1.301%	0.90	2.52	3,490.00	1.00	3,157.82		
1997	Surface	Inactive	-	0.970%	0.00	1.328%	-	-	3,490.00	1.00	-		
1998	Surface	Inactive	846.89	1.007%	0.50	1.355%	4.26	11.47	3,490.00	1.00	14,882.35		
1999	Surface	Inactive	2,264.80	1.044%	0.50	1.382%	11.82	31.31	3,490.00	1.00	41,256.70		
2000	Surface	Inactive	-	1.081%	0.00	1.410%	-	-	3,490.00	1.00	-		
2001	Surface	Inactive	596.67	1.118%	0.50	1.439%	3.33	8.59	3,490.00	1.00	11,637.20		
2002	Surface	Inactive	765.87	1.155%	0.50	1.469%	4.42	11.25	3,490.00	1.00	15,430.09		
2003	Surface	Inactive	4,249.33	1.191%	0.50	1.499%	25.31	63.68	3,490.00	1.00	88,346.48		
2004	Surface	Inactive	3,700.97	1.516%	0.50	1.529%	28.05	56.59	3,490.00	1.00	97,878.68		
2005	Surface	Inactive	25.99	1.445%	1.50	1.560%	0.56	0.41	3,490.00	1.00	1,965.50		
2006	Surface	Inactive	244.59	1.374%	0.50	1.592%	1.68	3.89	3,490.00	1.00	5,862.83		
2007	Surface	Inactive	399.20	1.303%	0.50	1.625%	2.60	6.49	3,490.00	1.00	9,074.48		
2008	Surface	Inactive	864.07	1.232%	0.75	1.658%	7.98	14.33	3,490.00	1.00	27,857.59		
2009	Surface	Inactive	680.43	1.161%	0.50	1.692%	3.95	11.51	3,490.00	1.00	13,782.08		
2010	Surface	Inactive	5.11	1.090%	1.50	1.523%	0.08	0.08	3,490.00	1.00	291.52		
2011	Surface	Inactive	560.86	1.019%	0.50	1.355%	2.86	7.60	3,490.00	1.00	9,971.09		
2012	Surface	Inactive	676.78	0.948%	0.50	1.187%	3.21	8.03	3,490.00	1.00	11,193.85		
2013	Surface	Inactive	93.44	0.877%	0.50	1.019%	0.41	0.95	3,490.00	1.00	1,429.77		
2014	Surface	Inactive	2,929.61	0.806%	0.75	0.851%	17.71	24.92	3,490.00	1.00	61,799.25		
2015	Surface	Inactive	704.80	0.735%	0.50	0.682%	2.59	4.81	3,490.00	1.00	9,038.90		
2016	Surface	Inactive	494.54	0.664%	0.50	0.514%	1.64	2.54	3,490.00	1.00	5,729.94		
2017	Surface	Inactive	-	0.593%	0.00	0.346%	-	-	3,490.00	1.00	-		
2018	Surface	Inactive	351.08	0.522%	0.50	0.178%	0.92	0.62	3,490.00	1.00	3,198.23		
2019	Surface	Inactive	452.10	0.451%	1.50	0.119%	3.06	0.54	3,490.00	1.00	10,675.87		
2020	Surface	Inactive	-	0.380%	0.00	0.060%	-	-	3,490.00	1.00	-		
2021	Surface	Inactive	-	0.000%	0.00	0.051%	-	-	3,490.00	1.00	-		

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Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Forfeiture Rate	Adjustment				Avg Recl Cost per Acre	Adjustment Factor	Gross Cost
					Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1963	Surface	Phased Released	-	0.000%	0.00	3.206%	-	-	3,490.00	0.50	-
1964	Surface	Phased Released	-	0.000%	0.00	3.271%	-	-	3,490.00	0.50	-
1965	Surface	Phased Released	-	0.000%	0.00	3.338%	-	-	3,490.00	0.50	-
1966	Surface	Phased Released	-	0.000%	0.00	3.406%	-	-	3,490.00	0.50	-
1967	Surface	Phased Released	-	0.000%	0.00	3.476%	-	-	3,490.00	0.50	-
1968	Surface	Phased Released	-	0.000%	0.00	3.547%	-	-	3,490.00	0.50	-
1969	Surface	Phased Released	-	0.000%	0.00	3.619%	-	-	3,490.00	0.50	-
1970	Surface	Phased Released	-	0.000%	0.00	3.693%	-	-	3,490.00	0.50	-
1971	Surface	Phased Released	-	0.020%	0.00	3.768%	-	-	3,490.00	0.50	-
1972	Surface	Phased Released	-	0.084%	0.00	3.845%	-	-	3,490.00	0.50	-
1973	Surface	Phased Released	-	0.148%	0.00	3.924%	-	-	3,490.00	0.50	-
1974	Surface	Phased Released	189.60	0.212%	0.00	4.004%	-	7.59	3,490.00	0.50	-
1975	Surface	Phased Released	8.30	0.276%	0.00	4.086%	-	0.34	3,490.00	0.50	-
1976	Surface	Phased Released	626.17	0.341%	0.00	4.169%	-	26.11	3,490.00	0.50	-
1977	Surface	Phased Released	48.00	0.405%	0.00	4.254%	-	2.04	3,490.00	0.50	-
1978	Surface	Phased Released	158.81	0.469%	0.00	4.341%	-	6.89	3,490.00	0.50	-
1979	Surface	Phased Released	358.00	0.533%	0.00	4.429%	-	15.86	3,490.00	0.50	-
1980	Surface	Phased Released	621.75	0.597%	0.00	4.520%	-	28.10	3,490.00	0.50	-
1981	Surface	Phased Released	1,821.81	0.662%	0.00	4.612%	-	84.02	3,490.00	0.50	-
1982	Surface	Phased Released	-	0.726%	0.00	4.706%	-	-	3,490.00	0.50	-
1983	Surface	Phased Released	302.61	0.790%	0.00	4.802%	-	14.53	3,490.00	0.50	-
1984	Surface	Phased Released	2,603.39	0.854%	0.00	4.900%	-	127.57	3,490.00	0.50	-
1985	Surface	Phased Released	1,270.29	0.918%	0.00	5.000%	-	63.52	3,490.00	0.50	-
1986	Surface	Phased Released	1,212.46	0.983%	0.00	5.102%	-	61.86	3,490.00	0.50	-
1987	Surface	Phased Released	760.81	1.047%	0.00	5.207%	-	39.61	3,490.00	0.50	-
1988	Surface	Phased Released	478.00	1.111%	0.00	5.313%	-	25.39	3,490.00	0.50	-
1989	Surface	Phased Released	1,688.64	1.175%	0.00	5.421%	-	91.54	3,490.00	0.50	-
1990	Surface	Phased Released	662.34	1.239%	0.00	5.532%	-	36.64	3,490.00	0.50	-
1991	Surface	Phased Released	1,006.45	1.304%	0.00	5.645%	-	56.81	3,490.00	0.50	-
1992	Surface	Phased Released	-	1.368%	0.00	5.760%	-	-	3,490.00	0.50	-
1993	Surface	Phased Released	562.59	1.432%	0.00	5.877%	-	33.07	3,490.00	0.50	-
1994	Surface	Phased Released	2,470.42	1.496%	0.00	5.997%	-	148.16	3,490.00	0.50	-
1995	Surface	Phased Released	498.93	1.560%	0.00	6.120%	-	30.53	3,490.00	0.50	-
1996	Surface	Phased Released	563.71	1.625%	0.00	6.245%	-	35.20	3,490.00	0.50	-
1997	Surface	Phased Released	969.50	1.689%	0.00	6.372%	-	61.78	3,490.00	0.50	-
1998	Surface	Phased Released	511.73	1.753%	0.00	6.502%	-	33.27	3,490.00	0.50	-
1999	Surface	Phased Released	14.87	1.817%	0.00	6.635%	-	0.99	3,490.00	0.50	-
2000	Surface	Phased Released	19.70	1.881%	0.00	6.770%	-	1.33	3,490.00	0.50	-
2001	Surface	Phased Released	491.55	1.946%	0.00	6.908%	-	33.96	3,490.00	0.50	-
2002	Surface	Phased Released	106.29	2.010%	0.00	7.049%	-	7.49	3,490.00	0.50	-
2003	Surface	Phased Released	-	2.074%	0.00	7.193%	-	-	3,490.00	0.50	-
2004	Surface	Phased Released	470.13	2.638%	0.00	7.340%	-	34.51	3,490.00	0.50	-
2005	Surface	Phased Released	51.50	2.515%	0.00	7.490%	-	3.86	3,490.00	0.50	-
2006	Surface	Phased Released	60.78	2.391%	0.00	7.643%	-	4.65	3,490.00	0.50	-
2007	Surface	Phased Released	-	2.268%	0.00	7.799%	-	-	3,490.00	0.50	-
2008	Surface	Phased Released	-	2.144%	0.00	7.958%	-	-	3,490.00	0.50	-
2009	Surface	Phased Released	220.84	2.021%	0.00	8.120%	-	17.93	3,490.00	0.50	-
2010	Surface	Phased Released	-	1.897%	0.00	7.313%	-	-	3,490.00	0.50	-
2011	Surface	Phased Released	55.50	1.773%	0.00	6.505%	-	3.61	3,490.00	0.50	-
2012	Surface	Phased Released	-	1.650%	0.00	5.698%	-	-	3,490.00	0.50	-
2013	Surface	Phased Released	-	1.526%	0.00	4.890%	-	-	3,490.00	0.50	-
2014	Surface	Phased Released	27.91	1.403%	0.00	4.083%	-	1.14	3,490.00	0.50	-
2015	Surface	Phased Released	-	1.279%	0.00	3.275%	-	-	3,490.00	0.50	-
2016	Surface	Phased Released	-	1.156%	0.00	2.468%	-	-	3,490.00	0.50	-
2017	Surface	Phased Released	-	1.032%	0.00	1.660%	-	-	3,490.00	0.50	-
2018	Surface	Phased Released	-	0.909%	0.00	0.852%	-	-	3,490.00	0.50	-
2019	Surface	Phased Released	-	0.785%	0.00	0.570%	-	-	3,490.00	0.50	-
2020	Surface	Phased Released	-	0.662%	0.00	0.287%	-	-	3,490.00	0.50	-
2021	Surface	Phased Released	-	0.000%	0.00	0.246%	-	-	3,490.00	0.50	-

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Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Forfeiture Rate	Adjustment				Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
					Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1963	Underground	Active	-	0.152%	0.00	0.000%	-	-	5,595.00	1.00	-
1964	Underground	Active	-	0.154%	0.00	0.000%	-	-	5,595.00	1.00	-
1965	Underground	Active	-	0.156%	0.00	0.000%	-	-	5,595.00	1.00	-
1966	Underground	Active	-	0.157%	0.00	0.000%	-	-	5,595.00	1.00	-
1967	Underground	Active	-	0.159%	0.00	0.000%	-	-	5,595.00	1.00	-
1968	Underground	Active	-	0.161%	0.00	0.000%	-	-	5,595.00	1.00	-
1969	Underground	Active	-	0.163%	0.00	0.000%	-	-	5,595.00	1.00	-
1970	Underground	Active	-	0.165%	0.00	0.000%	-	-	5,595.00	1.00	-
1971	Underground	Active	-	0.167%	0.00	0.000%	-	-	5,595.00	1.00	-
1972	Underground	Active	-	0.169%	0.00	0.000%	-	-	5,595.00	1.00	-
1973	Underground	Active	-	0.171%	0.00	0.000%	-	-	5,595.00	1.00	-
1974	Underground	Active	-	0.173%	0.00	0.120%	-	-	5,595.00	1.00	-
1975	Underground	Active	-	0.175%	0.00	0.261%	-	-	5,595.00	1.00	-
1976	Underground	Active	-	0.177%	0.00	0.401%	-	-	5,595.00	1.00	-
1977	Underground	Active	22.53	0.178%	1.50	0.541%	0.06	0.12	5,595.00	1.00	337.36
1978	Underground	Active	94.87	0.180%	0.50	0.681%	0.09	0.65	5,595.00	1.00	478.58
1979	Underground	Active	745.26	0.182%	1.21	0.821%	1.65	6.12	5,595.00	1.00	9,226.81
1980	Underground	Active	222.16	0.184%	1.10	0.961%	0.45	2.14	5,595.00	1.00	2,517.67
1981	Underground	Active	891.30	0.186%	1.21	1.101%	2.00	9.82	5,595.00	1.00	11,187.66
1982	Underground	Active	33.93	0.188%	1.50	1.241%	0.10	0.42	5,595.00	1.00	535.19
1983	Underground	Active	6,929.70	0.190%	0.88	1.382%	11.57	95.74	5,595.00	1.00	64,725.09
1984	Underground	Active	2,706.46	0.192%	1.00	1.522%	5.19	41.18	5,595.00	1.00	29,037.17
1985	Underground	Active	49.00	0.194%	1.50	1.662%	0.14	0.81	5,595.00	1.00	796.40
1986	Underground	Active	252.11	0.196%	1.10	1.802%	0.54	4.54	5,595.00	1.00	3,034.46
1987	Underground	Active	198.36	0.197%	1.10	1.942%	0.43	3.85	5,595.00	1.00	2,410.77
1988	Underground	Active	157.83	0.199%	1.25	2.082%	0.39	3.29	5,595.00	1.00	2,200.79
1989	Underground	Active	124.08	0.201%	1.50	2.222%	0.37	2.76	5,595.00	1.00	2,096.05
1990	Underground	Active	136.22	0.203%	1.30	2.363%	0.36	3.22	5,595.00	1.00	2,013.19
1991	Underground	Active	240.32	0.205%	1.30	2.503%	0.64	6.01	5,595.00	1.00	3,584.99
1992	Underground	Active	1,027.11	0.207%	1.08	2.643%	2.30	27.14	5,595.00	1.00	12,886.92
1993	Underground	Active	724.45	0.209%	1.17	2.783%	1.77	20.16	5,595.00	1.00	9,878.80
1994	Underground	Active	610.69	0.211%	1.04	2.923%	1.34	17.85	5,595.00	1.00	7,480.03
1995	Underground	Active	334.05	0.213%	1.17	3.063%	0.83	10.23	5,595.00	1.00	4,638.29
1996	Underground	Active	244.18	0.215%	1.20	3.203%	0.63	7.82	5,595.00	1.00	3,518.55
1997	Underground	Active	234.02	0.217%	1.35	3.343%	0.68	7.82	5,595.00	1.00	3,816.44
1998	Underground	Active	523.54	0.218%	1.00	3.484%	1.14	18.24	5,595.00	1.00	6,398.31
1999	Underground	Active	359.47	0.220%	1.40	3.624%	1.11	13.03	5,595.00	1.00	6,204.08
2000	Underground	Active	461.64	0.222%	1.20	3.764%	1.23	17.38	5,595.00	1.00	6,888.28
2001	Underground	Active	224.71	0.224%	0.90	3.904%	0.45	8.77	5,595.00	1.00	2,536.29
2002	Underground	Active	288.53	0.226%	1.38	4.044%	0.90	11.67	5,595.00	1.00	5,017.68
2003	Underground	Active	969.45	0.228%	1.23	4.184%	2.71	40.56	5,595.00	1.00	15,174.73
2004	Underground	Active	445.92	0.230%	1.13	3.383%	1.15	15.09	5,595.00	1.00	6,451.77
2005	Underground	Active	360.91	0.232%	1.13	3.249%	0.94	11.73	5,595.00	1.00	5,265.09
2006	Underground	Active	427.71	0.234%	0.83	3.116%	0.83	13.33	5,595.00	1.00	4,659.91
2007	Underground	Active	482.68	0.236%	1.23	2.982%	1.40	14.39	5,595.00	1.00	7,807.95
2008	Underground	Active	111.00	0.237%	1.50	2.848%	0.40	3.16	5,595.00	1.00	2,212.33
2009	Underground	Active	320.63	0.239%	1.07	2.714%	0.82	8.70	5,595.00	1.00	4,601.21
2010	Underground	Active	269.59	0.241%	1.41	2.580%	0.92	6.96	5,595.00	1.00	5,128.50
2011	Underground	Active	192.99	0.243%	1.36	2.447%	0.64	4.72	5,595.00	1.00	3,563.89
2012	Underground	Active	171.01	0.245%	1.33	2.313%	0.56	3.96	5,595.00	1.00	3,126.89
2013	Underground	Active	398.29	0.247%	1.42	2.179%	1.40	8.68	5,595.00	1.00	7,833.27
2014	Underground	Active	686.91	0.249%	1.27	2.045%	2.18	14.05	5,595.00	1.00	12,175.53
2015	Underground	Active	132.11	0.297%	1.50	1.911%	0.59	2.53	5,595.00	1.00	3,291.96
2016	Underground	Active	137.58	0.255%	1.50	1.778%	0.53	2.45	5,595.00	1.00	2,944.32
2017	Underground	Active	155.37	0.213%	1.50	1.644%	0.50	2.55	5,595.00	1.00	2,778.51
2018	Underground	Active	37.52	0.171%	1.50	1.510%	0.10	0.57	5,595.00	1.00	539.00
2019	Underground	Active	79.46	0.129%	1.25	1.376%	0.13	1.09	5,595.00	1.00	718.33
2020	Underground	Active	110.58	0.087%	1.50	1.242%	0.14	1.37	5,595.00	1.00	810.61
2021	Underground	Active	76.19	0.000%	1.50	1.109%	-	0.84	5,595.00	1.00	-

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			Current Bonded Acres	Forfeiture Rate	Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Factor			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Underground	Inactive	-	0.341%	0.00	0.000%	-	-	5,595.00	1.00	-	
1964	Underground	Inactive	-	0.346%	0.00	0.000%	-	-	5,595.00	1.00	-	
1965	Underground	Inactive	-	0.350%	0.00	0.000%	-	-	5,595.00	1.00	-	
1966	Underground	Inactive	-	0.354%	0.00	0.000%	-	-	5,595.00	1.00	-	
1967	Underground	Inactive	-	0.359%	0.00	0.000%	-	-	5,595.00	1.00	-	
1968	Underground	Inactive	-	0.363%	0.00	0.000%	-	-	5,595.00	1.00	-	
1969	Underground	Inactive	-	0.367%	0.00	0.000%	-	-	5,595.00	1.00	-	
1970	Underground	Inactive	-	0.371%	0.00	0.000%	-	-	5,595.00	1.00	-	
1971	Underground	Inactive	-	0.376%	0.00	0.000%	-	-	5,595.00	1.00	-	
1972	Underground	Inactive	-	0.380%	0.00	0.000%	-	-	5,595.00	1.00	-	
1973	Underground	Inactive	-	0.384%	0.00	0.000%	-	-	5,595.00	1.00	-	
1974	Underground	Inactive	-	0.389%	0.00	0.075%	-	-	5,595.00	1.00	-	
1975	Underground	Inactive	-	0.393%	0.00	0.163%	-	-	5,595.00	1.00	-	
1976	Underground	Inactive	103.30	0.397%	0.50	0.250%	0.21	0.26	5,595.00	1.00	1,147.72	
1977	Underground	Inactive	-	0.401%	0.00	0.338%	-	-	5,595.00	1.00	-	
1978	Underground	Inactive	23.02	0.406%	0.50	0.426%	0.05	0.10	5,595.00	1.00	261.29	
1979	Underground	Inactive	6.60	0.410%	0.50	0.513%	0.01	0.03	5,595.00	1.00	75.70	
1980	Underground	Inactive	-	0.414%	0.00	0.601%	-	-	5,595.00	1.00	-	
1981	Underground	Inactive	149.03	0.419%	1.00	0.688%	0.62	1.03	5,595.00	1.00	3,490.33	
1982	Underground	Inactive	128.47	0.423%	0.50	0.776%	0.27	1.00	5,595.00	1.00	1,519.81	
1983	Underground	Inactive	500.86	0.427%	0.75	0.863%	1.60	4.32	5,595.00	1.00	8,977.93	
1984	Underground	Inactive	300.00	0.431%	0.50	0.951%	0.65	2.85	5,595.00	1.00	3,620.98	
1985	Underground	Inactive	220.21	0.436%	0.50	1.039%	0.48	2.29	5,595.00	1.00	2,684.33	
1986	Underground	Inactive	43.54	0.440%	0.50	1.126%	0.10	0.49	5,595.00	1.00	535.97	
1987	Underground	Inactive	40.89	0.444%	1.50	1.214%	0.27	0.50	5,595.00	1.00	1,524.75	
1988	Underground	Inactive	154.89	0.449%	1.21	1.301%	0.84	2.02	5,595.00	1.00	4,720.69	
1989	Underground	Inactive	193.50	0.453%	0.50	1.389%	0.44	2.69	5,595.00	1.00	2,451.56	
1990	Underground	Inactive	36.13	0.457%	1.17	1.477%	0.19	0.53	5,595.00	1.00	1,078.20	
1991	Underground	Inactive	141.42	0.461%	1.00	1.564%	0.65	2.21	5,595.00	1.00	3,651.30	
1992	Underground	Inactive	9.00	0.466%	1.50	1.652%	0.06	0.15	5,595.00	1.00	351.79	
1993	Underground	Inactive	294.11	0.470%	1.00	1.739%	1.38	5.12	5,595.00	1.00	7,734.66	
1994	Underground	Inactive	247.11	0.474%	0.50	1.827%	0.59	4.51	5,595.00	1.00	3,278.95	
1995	Underground	Inactive	131.50	0.479%	1.00	1.914%	0.63	2.52	5,595.00	1.00	3,521.34	
1996	Underground	Inactive	45.38	0.483%	1.50	2.002%	0.33	0.91	5,595.00	1.00	1,839.12	
1997	Underground	Inactive	294.76	0.487%	1.07	2.090%	1.54	6.16	5,595.00	1.00	8,608.45	
1998	Underground	Inactive	93.26	0.491%	1.17	2.177%	0.53	2.03	5,595.00	1.00	2,991.85	
1999	Underground	Inactive	618.15	0.496%	1.06	2.265%	3.23	14.00	5,595.00	1.00	18,098.58	
2000	Underground	Inactive	76.39	0.500%	1.50	2.352%	0.57	1.80	5,595.00	1.00	3,205.80	
2001	Underground	Inactive	6.00	0.504%	1.50	2.440%	0.05	0.15	5,595.00	1.00	253.96	
2002	Underground	Inactive	47.21	0.509%	0.50	2.528%	0.12	1.19	5,595.00	1.00	671.73	
2003	Underground	Inactive	229.90	0.513%	1.00	2.615%	1.18	6.01	5,595.00	1.00	6,597.45	
2004	Underground	Inactive	181.69	0.517%	0.50	2.703%	0.47	3.84	5,595.00	1.00	2,628.77	
2005	Underground	Inactive	121.31	0.521%	1.50	2.791%	0.95	2.46	5,595.00	1.00	5,309.15	
2006	Underground	Inactive	145.55	0.526%	1.17	2.879%	0.89	2.83	5,595.00	1.00	4,995.18	
2007	Underground	Inactive	80.93	0.530%	1.25	2.967%	0.54	1.51	5,595.00	1.00	3,000.12	
2008	Underground	Inactive	95.14	0.534%	1.50	3.055%	0.76	1.69	5,595.00	1.00	4,266.50	
2009	Underground	Inactive	127.40	0.539%	1.38	3.143%	0.94	2.16	5,595.00	1.00	5,279.10	
2010	Underground	Inactive	296.02	0.543%	1.28	3.231%	2.05	4.77	5,595.00	1.00	11,489.65	
2011	Underground	Inactive	113.07	0.547%	1.50	3.319%	0.93	1.73	5,595.00	1.00	5,192.60	
2012	Underground	Inactive	95.72	0.551%	1.17	3.407%	0.62	1.38	5,595.00	1.00	3,445.76	
2013	Underground	Inactive	53.70	0.556%	1.50	3.495%	0.45	0.73	5,595.00	1.00	2,504.75	
2014	Underground	Inactive	12.00	0.560%	1.50	3.583%	0.10	0.15	5,595.00	1.00	564.04	
2015	Underground	Inactive	12.04	0.568%	1.50	3.671%	0.12	0.14	5,595.00	1.00	675.04	
2016	Underground	Inactive	-	0.574%	0.00	3.759%	-	-	5,595.00	1.00	-	
2017	Underground	Inactive	-	0.479%	0.00	3.847%	-	-	5,595.00	1.00	-	
2018	Underground	Inactive	46.96	0.385%	1.50	3.935%	0.27	0.44	5,595.00	1.00	1,517.88	
2019	Underground	Inactive	-	0.291%	0.00	4.023%	-	-	5,595.00	1.00	-	
2020	Underground	Inactive	-	0.197%	0.00	4.111%	-	-	5,595.00	1.00	-	
2021	Underground	Inactive	-	0.000%	0.00	4.199%	-	-	5,595.00	1.00	-	

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Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	2022						Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
				Forfeiture Rate	Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Factor			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Underground	Phased Released	-	0.594%	0.00	0.000%	-	-	5,595.00	0.50	-	
1964	Underground	Phased Released	-	0.602%	0.00	0.000%	-	-	5,595.00	0.50	-	
1965	Underground	Phased Released	-	0.609%	0.00	0.000%	-	-	5,595.00	0.50	-	
1966	Underground	Phased Released	-	0.617%	0.00	0.000%	-	-	5,595.00	0.50	-	
1967	Underground	Phased Released	-	0.624%	0.00	0.000%	-	-	5,595.00	0.50	-	
1968	Underground	Phased Released	-	0.632%	0.00	0.000%	-	-	5,595.00	0.50	-	
1969	Underground	Phased Released	-	0.639%	0.00	0.000%	-	-	5,595.00	0.50	-	
1970	Underground	Phased Released	-	0.647%	0.00	0.000%	-	-	5,595.00	0.50	-	
1971	Underground	Phased Released	-	0.654%	0.00	0.000%	-	-	5,595.00	0.50	-	
1972	Underground	Phased Released	-	0.662%	0.00	0.000%	-	-	5,595.00	0.50	-	
1973	Underground	Phased Released	-	0.669%	0.00	0.000%	-	-	5,595.00	0.50	-	
1974	Underground	Phased Released	-	0.676%	0.00	0.361%	-	-	5,595.00	0.50	-	
1975	Underground	Phased Released	-	0.684%	0.00	0.782%	-	-	5,595.00	0.50	-	
1976	Underground	Phased Released	-	0.691%	0.00	1.202%	-	-	5,595.00	0.50	-	
1977	Underground	Phased Released	-	0.699%	0.00	1.622%	-	-	5,595.00	0.50	-	
1978	Underground	Phased Released	23.13	0.706%	0.00	2.043%	-	0.47	5,595.00	0.50	-	
1979	Underground	Phased Released	59.68	0.714%	0.00	2.463%	-	1.47	5,595.00	0.50	-	
1980	Underground	Phased Released	87.19	0.721%	0.00	2.884%	-	2.51	5,595.00	0.50	-	
1981	Underground	Phased Released	85.14	0.729%	0.00	3.304%	-	2.81	5,595.00	0.50	-	
1982	Underground	Phased Released	199.06	0.736%	0.00	3.724%	-	7.41	5,595.00	0.50	-	
1983	Underground	Phased Released	57.47	0.744%	0.00	4.145%	-	2.38	5,595.00	0.50	-	
1984	Underground	Phased Released	95.60	0.751%	0.00	4.565%	-	4.36	5,595.00	0.50	-	
1985	Underground	Phased Released	17.24	0.759%	0.00	4.986%	-	0.86	5,595.00	0.50	-	
1986	Underground	Phased Released	118.96	0.766%	0.00	5.406%	-	6.43	5,595.00	0.50	-	
1987	Underground	Phased Released	77.09	0.773%	0.00	5.826%	-	4.49	5,595.00	0.50	-	
1988	Underground	Phased Released	129.44	0.781%	0.00	6.247%	-	8.09	5,595.00	0.50	-	
1989	Underground	Phased Released	119.44	0.788%	0.00	6.667%	-	7.96	5,595.00	0.50	-	
1990	Underground	Phased Released	18.31	0.796%	0.00	7.088%	-	1.30	5,595.00	0.50	-	
1991	Underground	Phased Released	18.20	0.803%	0.00	7.508%	-	1.37	5,595.00	0.50	-	
1992	Underground	Phased Released	39.95	0.811%	0.00	7.928%	-	3.17	5,595.00	0.50	-	
1993	Underground	Phased Released	30.79	0.818%	0.00	8.349%	-	2.57	5,595.00	0.50	-	
1994	Underground	Phased Released	26.14	0.826%	0.00	8.769%	-	2.29	5,595.00	0.50	-	
1995	Underground	Phased Released	65.62	0.833%	0.00	9.190%	-	6.03	5,595.00	0.50	-	
1996	Underground	Phased Released	133.37	0.841%	0.00	9.610%	-	12.82	5,595.00	0.50	-	
1997	Underground	Phased Released	149.46	0.848%	0.00	10.030%	-	14.99	5,595.00	0.50	-	
1998	Underground	Phased Released	70.67	0.856%	0.00	10.451%	-	7.39	5,595.00	0.50	-	
1999	Underground	Phased Released	10.68	0.863%	0.00	10.871%	-	1.16	5,595.00	0.50	-	
2000	Underground	Phased Released	59.65	0.870%	0.00	11.292%	-	6.74	5,595.00	0.50	-	
2001	Underground	Phased Released	36.60	0.878%	0.00	11.712%	-	4.29	5,595.00	0.50	-	
2002	Underground	Phased Released	48.55	0.885%	0.00	12.132%	-	5.89	5,595.00	0.50	-	
2003	Underground	Phased Released	78.20	0.893%	0.00	12.553%	-	9.82	5,595.00	0.50	-	
2004	Underground	Phased Released	16.25	0.900%	0.00	10.149%	-	1.65	5,595.00	0.50	-	
2005	Underground	Phased Released	-	0.908%	0.00	9.748%	-	-	5,595.00	0.50	-	
2006	Underground	Phased Released	-	0.915%	0.00	9.347%	-	-	5,595.00	0.50	-	
2007	Underground	Phased Released	-	0.923%	0.00	8.945%	-	-	5,595.00	0.50	-	
2008	Underground	Phased Released	43.07	0.930%	0.00	8.544%	-	3.68	5,595.00	0.50	-	
2009	Underground	Phased Released	54.60	0.938%	0.00	8.143%	-	4.45	5,595.00	0.50	-	
2010	Underground	Phased Released	-	0.945%	0.00	7.741%	-	-	5,595.00	0.50	-	
2011	Underground	Phased Released	25.60	0.953%	0.00	7.340%	-	1.88	5,595.00	0.50	-	
2012	Underground	Phased Released	-	0.960%	0.00	6.938%	-	-	5,595.00	0.50	-	
2013	Underground	Phased Released	-	0.967%	0.00	6.537%	-	-	5,595.00	0.50	-	
2014	Underground	Phased Released	-	0.975%	0.00	6.136%	-	-	5,595.00	0.50	-	
2015	Underground	Phased Released	-	1.163%	0.00	5.734%	-	-	5,595.00	0.50	-	
2016	Underground	Phased Released	-	0.999%	0.00	5.333%	-	-	5,595.00	0.50	-	
2017	Underground	Phased Released	-	0.835%	0.00	4.932%	-	-	5,595.00	0.50	-	
2018	Underground	Phased Released	-	0.670%	0.00	4.530%	-	-	5,595.00	0.50	-	
2019	Underground	Phased Released	-	0.506%	0.00	4.129%	-	-	5,595.00	0.50	-	
2020	Underground	Phased Released	-	0.342%	0.00	3.727%	-	-	5,595.00	0.50	-	
2021	Underground	Phased Released	-	0.000%	0.00	3.326%	-	-	5,595.00	0.50	-	

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Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Forfeiture Rate	Adjustment				Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
					Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1963	Other	Active	-	0.207%	0.00	2.292%	-	-	8,145.00	1.00	-
1964	Other	Active	-	0.207%	0.00	2.269%	-	-	8,145.00	1.00	-
1965	Other	Active	-	0.207%	0.00	2.247%	-	-	8,145.00	1.00	-
1966	Other	Active	-	0.207%	0.00	2.224%	-	-	8,145.00	1.00	-
1967	Other	Active	-	0.207%	0.00	2.201%	-	-	8,145.00	1.00	-
1968	Other	Active	-	0.207%	0.00	2.178%	-	-	8,145.00	1.00	-
1969	Other	Active	-	0.207%	0.00	2.156%	-	-	8,145.00	1.00	-
1970	Other	Active	-	0.207%	0.00	2.133%	-	-	8,145.00	1.00	-
1971	Other	Active	-	0.207%	0.00	2.110%	-	-	8,145.00	1.00	-
1972	Other	Active	20.00	0.207%	1.50	2.087%	0.06	0.42	8,145.00	1.00	505.85
1973	Other	Active	-	0.207%	0.00	2.064%	-	-	8,145.00	1.00	-
1974	Other	Active	28.52	0.207%	1.50	2.042%	0.09	0.58	8,145.00	1.00	721.34
1975	Other	Active	6.20	0.207%	1.50	2.019%	0.02	0.13	8,145.00	1.00	156.81
1976	Other	Active	75.00	0.207%	1.50	1.996%	0.23	1.50	8,145.00	1.00	1,896.93
1977	Other	Active	307.70	0.207%	1.00	1.973%	0.64	6.07	8,145.00	1.00	5,188.32
1978	Other	Active	-	0.207%	0.00	1.951%	-	-	8,145.00	1.00	-
1979	Other	Active	65.00	0.207%	1.50	1.928%	0.20	1.25	8,145.00	1.00	1,644.01
1980	Other	Active	370.67	0.207%	1.21	1.905%	0.93	7.06	8,145.00	1.00	7,589.40
1981	Other	Active	4,857.33	0.207%	0.94	1.882%	9.46	91.43	8,145.00	1.00	77,084.67
1982	Other	Active	554.75	0.207%	0.75	1.860%	0.86	10.32	8,145.00	1.00	7,015.49
1983	Other	Active	3,438.58	0.207%	0.87	1.837%	6.20	63.16	8,145.00	1.00	50,525.46
1984	Other	Active	4,464.39	0.207%	0.69	1.814%	6.35	80.98	8,145.00	1.00	51,752.84
1985	Other	Active	2,329.11	0.207%	1.00	1.791%	4.82	41.72	8,145.00	1.00	39,272.57
1986	Other	Active	1,411.57	0.207%	0.96	1.768%	2.81	24.96	8,145.00	1.00	22,885.92
1987	Other	Active	486.71	0.207%	1.07	1.746%	1.08	8.50	8,145.00	1.00	8,792.91
1988	Other	Active	479.98	0.207%	1.21	1.723%	1.21	8.27	8,145.00	1.00	9,827.51
1989	Other	Active	290.43	0.207%	1.36	1.700%	0.82	4.94	8,145.00	1.00	6,646.09
1990	Other	Active	264.35	0.207%	1.30	1.677%	0.71	4.43	8,145.00	1.00	5,794.58
1991	Other	Active	431.34	0.207%	1.36	1.655%	1.21	7.14	8,145.00	1.00	9,870.62
1992	Other	Active	554.74	0.207%	1.06	1.632%	1.21	9.05	8,145.00	1.00	9,873.47
1993	Other	Active	879.50	0.207%	0.75	0.350%	1.37	3.08	8,145.00	1.00	11,122.35
1994	Other	Active	1,837.84	0.207%	0.83	0.540%	3.17	9.93	8,145.00	1.00	25,824.14
1995	Other	Active	939.93	0.207%	1.00	0.730%	1.95	6.86	8,145.00	1.00	15,848.74
1996	Other	Active	1,971.02	0.207%	0.50	0.919%	2.04	18.12	8,145.00	1.00	16,617.30
1997	Other	Active	1,267.92	0.207%	1.00	1.109%	2.62	14.06	8,145.00	1.00	21,379.19
1998	Other	Active	1,054.49	0.283%	0.83	1.298%	2.48	13.69	8,145.00	1.00	20,227.30
1999	Other	Active	404.95	0.358%	1.10	1.488%	1.60	6.03	8,145.00	1.00	12,996.01
2000	Other	Active	255.10	0.434%	1.00	1.678%	1.11	4.28	8,145.00	1.00	9,013.25
2001	Other	Active	360.44	0.509%	0.90	1.867%	1.65	6.73	8,145.00	1.00	13,458.89
2002	Other	Active	569.59	0.585%	1.33	2.057%	4.44	11.72	8,145.00	1.00	36,184.86
2003	Other	Active	810.10	0.661%	0.83	2.246%	4.46	18.20	8,145.00	1.00	36,321.37
2004	Other	Active	1,049.09	0.736%	0.93	2.436%	7.17	25.56	8,145.00	1.00	58,410.00
2005	Other	Active	22.99	0.812%	1.00	2.626%	0.19	0.60	8,145.00	1.00	1,520.02
2006	Other	Active	491.96	0.887%	1.07	2.815%	4.68	13.85	8,145.00	1.00	38,095.30
2007	Other	Active	368.47	0.963%	1.10	3.005%	3.90	11.07	8,145.00	1.00	31,789.11
2008	Other	Active	649.47	1.039%	1.28	3.194%	8.62	20.75	8,145.00	1.00	70,197.01
2009	Other	Active	202.62	1.114%	1.33	3.384%	3.01	6.86	8,145.00	1.00	24,515.39
2010	Other	Active	1,059.98	1.190%	1.06	3.574%	13.31	37.88	8,145.00	1.00	108,419.22
2011	Other	Active	350.69	1.265%	0.83	4.298%	3.70	15.07	8,145.00	1.00	30,117.75
2012	Other	Active	147.31	1.331%	1.50	8.818%	2.94	12.99	8,145.00	1.00	23,948.26
2013	Other	Active	2,047.67	1.142%	1.03	13.337%	24.07	273.11	8,145.00	1.00	196,059.46
2014	Other	Active	259.86	0.953%	1.38	17.857%	3.41	46.40	8,145.00	1.00	27,742.62
2015	Other	Active	1,229.64	0.765%	1.10	22.376%	10.34	275.15	8,145.00	1.00	84,233.58
2016	Other	Active	1,513.50	0.576%	1.33	26.896%	11.62	407.07	8,145.00	1.00	94,657.74
2017	Other	Active	388.02	0.387%	1.36	38.903%	2.04	150.95	8,145.00	1.00	16,608.02
2018	Other	Active	36.77	0.199%	1.50	32.479%	0.11	11.94	8,145.00	1.00	891.85
2019	Other	Active	50.90	0.010%	1.50	22.332%	0.01	11.37	8,145.00	1.00	61.19
2020	Other	Active	777.21	0.000%	1.47	12.185%	-	94.70	8,145.00	1.00	-
2021	Other	Active	175.63	0.000%	1.50	2.037%	-	3.58	8,145.00	1.00	-

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Permit Issue Year	Mine Type	Mine Status	2022							Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Cost per Acre			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Other	Inactive	-	0.466%	0.00	1.433%	-	-	8,145.00	1.00	-	
1964	Other	Inactive	-	0.466%	0.00	1.418%	-	-	8,145.00	1.00	-	
1965	Other	Inactive	-	0.466%	0.00	1.404%	-	-	8,145.00	1.00	-	
1966	Other	Inactive	-	0.466%	0.00	1.390%	-	-	8,145.00	1.00	-	
1967	Other	Inactive	-	0.466%	0.00	1.376%	-	-	8,145.00	1.00	-	
1968	Other	Inactive	-	0.466%	0.00	1.361%	-	-	8,145.00	1.00	-	
1969	Other	Inactive	-	0.466%	0.00	1.347%	-	-	8,145.00	1.00	-	
1970	Other	Inactive	-	0.466%	0.00	1.333%	-	-	8,145.00	1.00	-	
1971	Other	Inactive	-	0.466%	0.00	1.319%	-	-	8,145.00	1.00	-	
1972	Other	Inactive	-	0.466%	0.00	1.305%	-	-	8,145.00	1.00	-	
1973	Other	Inactive	-	0.466%	0.00	1.290%	-	-	8,145.00	1.00	-	
1974	Other	Inactive	-	0.466%	0.00	1.276%	-	-	8,145.00	1.00	-	
1975	Other	Inactive	-	0.466%	0.00	1.262%	-	-	8,145.00	1.00	-	
1976	Other	Inactive	14.48	0.466%	1.50	1.248%	0.10	0.18	8,145.00	1.00	824.03	
1977	Other	Inactive	61.00	0.466%	1.50	1.233%	0.43	0.75	8,145.00	1.00	3,471.39	
1978	Other	Inactive	-	0.466%	0.00	1.219%	-	-	8,145.00	1.00	-	
1979	Other	Inactive	7.25	0.466%	1.50	1.205%	0.05	0.09	8,145.00	1.00	412.58	
1980	Other	Inactive	114.75	0.466%	0.50	1.191%	0.27	1.37	8,145.00	1.00	2,176.73	
1981	Other	Inactive	1,477.93	0.466%	0.96	1.176%	6.62	17.39	8,145.00	1.00	53,914.10	
1982	Other	Inactive	148.70	0.466%	1.17	1.162%	0.81	1.73	8,145.00	1.00	6,581.72	
1983	Other	Inactive	1,739.30	0.466%	0.75	1.148%	6.08	19.97	8,145.00	1.00	49,490.02	
1984	Other	Inactive	440.78	0.466%	0.93	1.134%	1.91	5.00	8,145.00	1.00	15,528.13	
1985	Other	Inactive	364.25	0.466%	0.83	1.120%	1.41	4.08	8,145.00	1.00	11,515.96	
1986	Other	Inactive	-	0.466%	0.00	1.105%	-	-	8,145.00	1.00	-	
1987	Other	Inactive	484.64	0.466%	0.50	1.091%	1.13	5.29	8,145.00	1.00	9,193.29	
1988	Other	Inactive	167.79	0.466%	1.17	1.077%	0.91	1.81	8,145.00	1.00	7,426.68	
1989	Other	Inactive	438.61	0.466%	0.90	1.063%	1.84	4.66	8,145.00	1.00	14,976.24	
1990	Other	Inactive	481.66	0.466%	1.17	1.048%	2.62	5.05	8,145.00	1.00	21,319.12	
1991	Other	Inactive	-	0.466%	0.00	1.034%	-	-	8,145.00	1.00	-	
1992	Other	Inactive	433.18	0.466%	1.30	1.020%	2.62	4.42	8,145.00	1.00	21,364.54	
1993	Other	Inactive	273.92	0.466%	0.90	0.219%	1.15	0.60	8,145.00	1.00	9,352.94	
1994	Other	Inactive	545.08	0.466%	1.00	0.338%	2.54	1.84	8,145.00	1.00	20,679.60	
1995	Other	Inactive	641.22	0.466%	1.17	0.456%	3.48	2.92	8,145.00	1.00	28,381.52	
1996	Other	Inactive	152.16	0.466%	0.50	0.575%	0.35	0.87	8,145.00	1.00	2,886.37	
1997	Other	Inactive	158.04	0.466%	0.83	0.693%	0.61	1.10	8,145.00	1.00	4,996.52	
1998	Other	Inactive	206.29	0.636%	1.00	0.812%	1.31	1.67	8,145.00	1.00	10,684.09	
1999	Other	Inactive	-	0.806%	0.00	0.930%	-	-	8,145.00	1.00	-	
2000	Other	Inactive	116.73	0.976%	0.50	1.049%	0.57	1.22	8,145.00	1.00	4,639.87	
2001	Other	Inactive	250.00	1.146%	0.50	1.167%	1.43	2.92	8,145.00	1.00	11,668.80	
2002	Other	Inactive	222.64	1.316%	1.00	1.286%	2.93	2.86	8,145.00	1.00	23,867.75	
2003	Other	Inactive	78.29	1.486%	1.50	1.404%	1.75	1.10	8,145.00	1.00	14,216.25	
2004	Other	Inactive	56.00	1.656%	1.50	1.523%	1.39	0.85	8,145.00	1.00	11,332.38	
2005	Other	Inactive	50.69	1.826%	1.50	1.641%	1.39	0.83	8,145.00	1.00	11,311.13	
2006	Other	Inactive	-	1.997%	0.00	1.760%	-	-	8,145.00	1.00	-	
2007	Other	Inactive	-	2.167%	0.00	1.878%	-	-	8,145.00	1.00	-	
2008	Other	Inactive	4.11	2.337%	1.50	1.997%	0.14	0.08	8,145.00	1.00	1,173.33	
2009	Other	Inactive	-	2.507%	0.00	2.115%	-	-	8,145.00	1.00	-	
2010	Other	Inactive	-	2.677%	0.00	2.234%	-	-	8,145.00	1.00	-	
2011	Other	Inactive	-	2.847%	0.00	2.687%	-	-	8,145.00	1.00	-	
2012	Other	Inactive	66.26	2.994%	0.50	5.511%	0.99	3.65	8,145.00	1.00	8,078.94	
2013	Other	Inactive	57.00	2.569%	1.50	8.336%	2.20	4.75	8,145.00	1.00	17,893.17	
2014	Other	Inactive	-	2.145%	0.00	11.161%	-	-	8,145.00	1.00	-	
2015	Other	Inactive	-	1.720%	0.00	13.985%	-	-	8,145.00	1.00	-	
2016	Other	Inactive	-	1.296%	0.00	16.810%	-	-	8,145.00	1.00	-	
2017	Other	Inactive	-	0.871%	0.00	24.315%	-	-	8,145.00	1.00	-	
2018	Other	Inactive	11.88	0.447%	1.50	20.299%	0.08	2.41	8,145.00	1.00	648.33	
2019	Other	Inactive	-	0.022%	0.00	13.957%	-	-	8,145.00	1.00	-	
2020	Other	Inactive	-	0.000%	0.00	7.615%	-	-	8,145.00	1.00	-	
2021	Other	Inactive	-	0.000%	0.00	1.273%	-	-	8,145.00	1.00	-	



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Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Forfeiture Rate	2022				Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
					Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1963	Other	Phased Released	-	0.811%	0.00	6.877%	-	-	8,145.00	0.50	-
1964	Other	Phased Released	-	0.811%	0.00	6.808%	-	-	8,145.00	0.50	-
1965	Other	Phased Released	-	0.811%	0.00	6.740%	-	-	8,145.00	0.50	-
1966	Other	Phased Released	-	0.811%	0.00	6.672%	-	-	8,145.00	0.50	-
1967	Other	Phased Released	-	0.811%	0.00	6.603%	-	-	8,145.00	0.50	-
1968	Other	Phased Released	-	0.811%	0.00	6.535%	-	-	8,145.00	0.50	-
1969	Other	Phased Released	-	0.811%	0.00	6.467%	-	-	8,145.00	0.50	-
1970	Other	Phased Released	-	0.811%	0.00	6.398%	-	-	8,145.00	0.50	-
1971	Other	Phased Released	-	0.811%	0.00	6.330%	-	-	8,145.00	0.50	-
1972	Other	Phased Released	-	0.811%	0.00	6.262%	-	-	8,145.00	0.50	-
1973	Other	Phased Released	9.00	0.811%	0.00	6.193%	-	0.56	8,145.00	0.50	-
1974	Other	Phased Released	-	0.811%	0.00	6.125%	-	-	8,145.00	0.50	-
1975	Other	Phased Released	-	0.811%	0.00	6.057%	-	-	8,145.00	0.50	-
1976	Other	Phased Released	27.88	0.811%	0.00	5.989%	-	1.67	8,145.00	0.50	-
1977	Other	Phased Released	-	0.811%	0.00	5.920%	-	-	8,145.00	0.50	-
1978	Other	Phased Released	12.76	0.811%	0.00	5.852%	-	0.75	8,145.00	0.50	-
1979	Other	Phased Released	58.69	0.811%	0.00	5.784%	-	3.39	8,145.00	0.50	-
1980	Other	Phased Released	7.91	0.811%	0.00	5.715%	-	0.45	8,145.00	0.50	-
1981	Other	Phased Released	475.54	0.811%	0.00	5.647%	-	26.85	8,145.00	0.50	-
1982	Other	Phased Released	201.26	0.811%	0.00	5.579%	-	11.23	8,145.00	0.50	-
1983	Other	Phased Released	158.90	0.811%	0.00	5.510%	-	8.76	8,145.00	0.50	-
1984	Other	Phased Released	75.79	0.811%	0.00	5.442%	-	4.12	8,145.00	0.50	-
1985	Other	Phased Released	43.00	0.811%	0.00	5.374%	-	2.31	8,145.00	0.50	-
1986	Other	Phased Released	-	0.811%	0.00	5.305%	-	-	8,145.00	0.50	-
1987	Other	Phased Released	50.95	0.811%	0.00	5.237%	-	2.67	8,145.00	0.50	-
1988	Other	Phased Released	-	0.811%	0.00	5.169%	-	-	8,145.00	0.50	-
1989	Other	Phased Released	38.00	0.811%	0.00	5.100%	-	1.94	8,145.00	0.50	-
1990	Other	Phased Released	-	0.811%	0.00	5.032%	-	-	8,145.00	0.50	-
1991	Other	Phased Released	-	0.811%	0.00	4.964%	-	-	8,145.00	0.50	-
1992	Other	Phased Released	-	0.811%	0.00	4.895%	-	-	8,145.00	0.50	-
1993	Other	Phased Released	48.00	0.811%	0.00	1.051%	-	0.50	8,145.00	0.50	-
1994	Other	Phased Released	-	0.811%	0.00	1.620%	-	-	8,145.00	0.50	-
1995	Other	Phased Released	-	0.811%	0.00	2.189%	-	-	8,145.00	0.50	-
1996	Other	Phased Released	-	0.811%	0.00	2.758%	-	-	8,145.00	0.50	-
1997	Other	Phased Released	31.16	0.811%	0.00	3.327%	-	1.04	8,145.00	0.50	-
1998	Other	Phased Released	-	1.107%	0.00	3.895%	-	-	8,145.00	0.50	-
1999	Other	Phased Released	179.00	1.403%	0.00	4.464%	-	7.99	8,145.00	0.50	-
2000	Other	Phased Released	-	1.699%	0.00	5.033%	-	-	8,145.00	0.50	-
2001	Other	Phased Released	-	1.995%	0.00	5.602%	-	-	8,145.00	0.50	-
2002	Other	Phased Released	-	2.291%	0.00	6.171%	-	-	8,145.00	0.50	-
2003	Other	Phased Released	-	2.587%	0.00	6.739%	-	-	8,145.00	0.50	-
2004	Other	Phased Released	-	2.883%	0.00	7.308%	-	-	8,145.00	0.50	-
2005	Other	Phased Released	-	3.179%	0.00	7.877%	-	-	8,145.00	0.50	-
2006	Other	Phased Released	-	3.475%	0.00	8.446%	-	-	8,145.00	0.50	-
2007	Other	Phased Released	-	3.771%	0.00	9.015%	-	-	8,145.00	0.50	-
2008	Other	Phased Released	-	4.068%	0.00	9.583%	-	-	8,145.00	0.50	-
2009	Other	Phased Released	-	4.364%	0.00	10.152%	-	-	8,145.00	0.50	-
2010	Other	Phased Released	-	4.660%	0.00	10.721%	-	-	8,145.00	0.50	-
2011	Other	Phased Released	-	4.956%	0.00	12.895%	-	-	8,145.00	0.50	-
2012	Other	Phased Released	-	5.212%	0.00	26.454%	-	-	8,145.00	0.50	-
2013	Other	Phased Released	-	4.473%	0.00	40.012%	-	-	8,145.00	0.50	-
2014	Other	Phased Released	-	3.734%	0.00	53.571%	-	-	8,145.00	0.50	-
2015	Other	Phased Released	-	2.995%	0.00	67.129%	-	-	8,145.00	0.50	-
2016	Other	Phased Released	-	2.256%	0.00	80.688%	-	-	8,145.00	0.50	-
2017	Other	Phased Released	-	1.517%	0.00	116.710%	-	-	8,145.00	0.50	-
2018	Other	Phased Released	-	0.778%	0.00	97.437%	-	-	8,145.00	0.50	-
2019	Other	Phased Released	-	0.039%	0.00	66.996%	-	-	8,145.00	0.50	-

Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	2023						Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1963	Surface	Active	-	-	0.00%	-	1.07%	-	-	3,490.00	1	-
1964	Surface	Active	-	-	0.00%	-	1.07%	-	-	3,490.00	1	-
1965	Surface	Active	-	-	0.00%	-	1.09%	-	-	3,490.00	1	-
1966	Surface	Active	-	-	0.00%	-	1.11%	-	-	3,490.00	1	-
1967	Surface	Active	-	-	0.00%	-	1.14%	-	-	3,490.00	1	-
1968	Surface	Active	-	-	0.00%	-	1.16%	-	-	3,490.00	1	-
1969	Surface	Active	-	-	0.00%	-	1.18%	-	-	3,490.00	1	-
1970	Surface	Active	-	-	0.00%	-	1.21%	-	-	3,490.00	1	-
1971	Surface	Active	-	-	0.00%	-	1.23%	-	-	3,490.00	1	-
1972	Surface	Active	400.00	394.74	0.01%	1.50	1.26%	0.03	4.96	3,490.00	1	103.75
1973	Surface	Active	-	-	0.02%	-	1.28%	-	-	3,490.00	1	-
1974	Surface	Active	-	-	0.04%	-	1.31%	-	-	3,490.00	1	-
1975	Surface	Active	-	-	0.05%	-	1.33%	-	-	3,490.00	1	-
1976	Surface	Active	-	-	0.07%	-	1.36%	-	-	3,490.00	1	-
1977	Surface	Active	1,933.27	1,904.52	0.09%	0.67	1.39%	1.10	26.47	3,490.00	1	3,854.03
1978	Surface	Active	2,280.93	2,246.56	0.10%	0.50	1.42%	1.16	31.86	3,490.00	1	4,052.21
1979	Surface	Active	180.00	177.10	0.12%	1.00	1.45%	0.21	2.56	3,490.00	1	740.18
1980	Surface	Active	455.76	448.55	0.14%	0.50	1.48%	0.31	6.62	3,490.00	1	1,065.65
1981	Surface	Active	1,661.03	1,632.53	0.15%	1.06	1.51%	2.63	24.60	3,490.00	1	9,173.79
1982	Surface	Active	620.00	609.12	0.17%	1.00	1.54%	1.03	9.36	3,490.00	1	3,591.19
1983	Surface	Active	1,704.33	1,675.33	0.19%	0.50	1.57%	1.55	26.28	3,490.00	1	5,417.76
1984	Surface	Active	-	-	0.20%	-	1.60%	-	-	3,490.00	1	-
1985	Surface	Active	2,405.91	2,361.86	0.22%	0.70	1.63%	3.61	38.58	3,490.00	1	12,584.57
1986	Surface	Active	2,331.92	2,285.99	0.23%	1.07	1.67%	5.74	38.10	3,490.00	1	20,044.44
1987	Surface	Active	1,371.12	1,344.27	0.25%	0.83	1.70%	2.81	22.86	3,490.00	1	9,808.54
1988	Surface	Active	1,898.10	1,859.77	0.27%	0.88	1.74%	4.35	32.28	3,490.00	1	15,179.34
1989	Surface	Active	2,959.93	2,900.73	0.28%	0.64	1.77%	5.29	51.37	3,490.00	1	18,461.01
1990	Surface	Active	2,801.20	2,742.90	0.30%	0.75	1.81%	6.17	49.57	3,490.00	1	21,542.73
1991	Surface	Active	2,094.19	2,048.20	0.32%	0.94	1.84%	6.12	37.77	3,490.00	1	21,363.75
1992	Surface	Active	4,639.40	4,542.22	0.33%	0.50	1.88%	7.56	85.47	3,490.00	1	26,381.43
1993	Surface	Active	4,377.78	4,278.67	0.35%	0.83	1.92%	12.45	82.15	3,490.00	1	43,457.53
1994	Surface	Active	2,054.59	2,009.59	0.37%	0.50	1.96%	3.67	39.37	3,490.00	1	12,821.37
1995	Surface	Active	6,620.84	6,461.60	0.38%	0.92	2.00%	22.63	129.18	3,490.00	1	78,968.49
1996	Surface	Active	6,830.47	6,664.68	0.40%	0.83	2.04%	22.13	135.96	3,490.00	1	77,222.86
1997	Surface	Active	13,199.94	12,874.51	0.41%	0.79	2.08%	42.28	267.99	3,490.00	1	147,547.10
1998	Surface	Active	11,029.10	10,757.58	0.43%	0.66	2.12%	30.52	228.50	3,490.00	1	106,502.49
1999	Surface	Active	2,072.61	2,021.96	0.45%	0.50	2.17%	4.52	43.82	3,490.00	1	15,791.93
2000	Surface	Active	4,526.19	4,413.17	0.46%	0.50	2.21%	10.24	97.60	3,490.00	1	35,730.01
2001	Surface	Active	6,826.55	6,639.90	0.48%	0.87	2.26%	27.70	149.85	3,490.00	1	96,667.79
2002	Surface	Active	6,499.09	6,325.25	0.50%	0.63	2.30%	19.90	145.66	3,490.00	1	69,449.98
2003	Surface	Active	6,916.12	6,720.53	0.51%	0.81	2.35%	28.02	157.92	3,490.00	1	97,788.49
2004	Surface	Active	11,573.91	11,229.48	0.53%	0.79	2.40%	46.72	269.26	3,490.00	1	163,057.36
2005	Surface	Active	5,236.53	5,071.05	0.67%	1.03	2.45%	35.30	124.07	3,490.00	1	123,185.18
2006	Surface	Active	4,862.21	4,711.63	0.64%	0.90	2.50%	27.23	117.63	3,490.00	1	95,018.03
2007	Surface	Active	6,382.38	6,186.23	0.61%	0.82	2.55%	30.90	157.60	3,490.00	1	107,843.06
2008	Surface	Active	8,631.88	8,375.34	0.58%	0.58	2.60%	28.29	217.72	3,490.00	1	98,718.46
2009	Surface	Active	6,181.98	5,990.73	0.55%	0.75	2.65%	24.60	158.91	3,490.00	1	85,840.41
2010	Surface	Active	6,203.98	6,025.21	0.52%	0.92	2.71%	28.49	163.09	3,490.00	1	99,440.23
2011	Surface	Active	2,986.04	2,911.35	0.48%	0.74	2.44%	10.37	70.97	3,490.00	1	36,185.56
2012	Surface	Active	7,650.01	7,476.89	0.45%	0.86	2.17%	29.24	162.13	3,490.00	1	102,044.02
2013	Surface	Active	8,508.13	8,337.79	0.42%	0.95	1.90%	33.53	158.35	3,490.00	1	117,011.09
2014	Surface	Active	4,153.44	4,085.76	0.39%	0.75	1.63%	11.94	66.60	3,490.00	1	41,678.83
2015	Surface	Active	4,371.03	4,312.88	0.36%	0.73	1.36%	11.29	58.69	3,490.00	1	39,398.26
2016	Surface	Active	3,389.17	3,354.29	0.33%	0.70	1.09%	7.67	36.62	3,490.00	1	26,766.78
2017	Surface	Active	1,324.50	1,313.68	0.30%	1.00	0.82%	3.88	10.81	3,490.00	1	13,529.63
2018	Surface	Active	3,466.31	3,448.42	0.26%	1.00	0.55%	9.09	19.08	3,490.00	1	31,719.46
2019	Surface	Active	4,158.88	4,143.68	0.23%	0.88	0.28%	8.41	11.77	3,490.00	1	29,359.27
2020	Surface	Active	3,830.10	3,820.84	0.20%	0.86	0.19%	6.62	7.26	3,490.00	1	23,087.93
2021	Surface	Active	3,770.84	3,767.75	0.17%	0.93	0.10%	5.91	3.61	3,490.00	1	20,627.75

Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Surface	Inactive	-	-	0.00%	-	0.67%	-	-	3,490.00	1	-	
1964	Surface	Inactive	-	-	0.00%	-	0.67%	-	-	3,490.00	1	-	
1965	Surface	Inactive	-	-	0.00%	-	0.68%	-	-	3,490.00	1	-	
1966	Surface	Inactive	-	-	0.00%	-	0.70%	-	-	3,490.00	1	-	
1967	Surface	Inactive	-	-	0.00%	-	0.71%	-	-	3,490.00	1	-	
1968	Surface	Inactive	-	-	0.00%	-	0.72%	-	-	3,490.00	1	-	
1969	Surface	Inactive	-	-	0.00%	-	0.74%	-	-	3,490.00	1	-	
1970	Surface	Inactive	-	-	0.00%	-	0.75%	-	-	3,490.00	1	-	
1971	Surface	Inactive	-	-	0.00%	-	0.77%	-	-	3,490.00	1	-	
1972	Surface	Inactive	-	-	0.01%	-	0.79%	-	-	3,490.00	1	-	
1973	Surface	Inactive	-	-	0.05%	-	0.80%	-	-	3,490.00	1	-	
1974	Surface	Inactive	-	-	0.09%	-	0.82%	-	-	3,490.00	1	-	
1975	Surface	Inactive	-	-	0.12%	-	0.83%	-	-	3,490.00	1	-	
1976	Surface	Inactive	438.80	434.56	0.16%	0.50	0.85%	0.35	3.70	3,490.00	1	1,204.30	
1977	Surface	Inactive	-	-	0.20%	-	0.87%	-	-	3,490.00	1	-	
1978	Surface	Inactive	-	-	0.23%	-	0.89%	-	-	3,490.00	1	-	
1979	Surface	Inactive	-	-	0.27%	-	0.90%	-	-	3,490.00	1	-	
1980	Surface	Inactive	-	-	0.31%	-	0.92%	-	-	3,490.00	1	-	
1981	Surface	Inactive	4.47	4.42	0.34%	0.50	0.94%	0.01	0.04	3,490.00	1	26.46	
1982	Surface	Inactive	-	-	0.38%	-	0.96%	-	-	3,490.00	1	-	
1983	Surface	Inactive	-	-	0.42%	-	0.98%	-	-	3,490.00	1	-	
1984	Surface	Inactive	-	-	0.45%	-	1.00%	-	-	3,490.00	1	-	
1985	Surface	Inactive	-	-	0.49%	-	1.02%	-	-	3,490.00	1	-	
1986	Surface	Inactive	411.07	405.54	0.53%	0.50	1.04%	1.07	4.22	3,490.00	1	3,733.73	
1987	Surface	Inactive	415.61	408.60	0.56%	1.00	1.06%	2.31	4.34	3,490.00	1	8,049.76	
1988	Surface	Inactive	1,304.38	1,285.78	0.60%	0.50	1.08%	3.87	13.95	3,490.00	1	13,492.85	
1989	Surface	Inactive	273.00	268.07	0.64%	1.00	1.11%	1.71	2.97	3,490.00	1	5,971.31	
1990	Surface	Inactive	81.70	80.47	0.68%	0.50	1.13%	0.27	0.91	3,490.00	1	947.99	
1991	Surface	Inactive	-	-	0.71%	-	1.15%	-	-	3,490.00	1	-	
1992	Surface	Inactive	-	-	0.75%	-	1.18%	-	-	3,490.00	1	-	
1993	Surface	Inactive	-	-	0.79%	-	1.20%	-	-	3,490.00	1	-	
1994	Surface	Inactive	-	-	0.82%	-	1.22%	-	-	3,490.00	1	-	
1995	Surface	Inactive	3,503.18	3,442.81	0.86%	0.50	1.25%	14.80	43.02	3,490.00	1	51,637.89	
1996	Surface	Inactive	193.90	190.47	0.90%	0.50	1.27%	0.85	2.43	3,490.00	1	2,979.43	
1997	Surface	Inactive	-	-	0.93%	-	1.30%	-	-	3,490.00	1	-	
1998	Surface	Inactive	846.89	831.15	0.97%	0.50	1.33%	4.03	11.03	3,490.00	1	14,070.92	
1999	Surface	Inactive	2,264.80	2,221.67	1.01%	0.50	1.35%	11.19	30.10	3,490.00	1	39,041.32	
2000	Surface	Inactive	-	-	1.04%	-	1.38%	-	-	3,490.00	1	-	
2001	Surface	Inactive	596.67	584.75	1.08%	0.50	1.41%	3.16	8.25	3,490.00	1	11,028.37	
2002	Surface	Inactive	765.87	750.20	1.12%	0.50	1.44%	4.19	10.80	3,490.00	1	14,631.61	
2003	Surface	Inactive	4,249.33	4,160.34	1.15%	0.50	1.47%	24.02	61.10	3,490.00	1	83,818.83	
2004	Surface	Inactive	3,700.97	3,616.33	1.19%	0.50	1.50%	21.54	54.19	3,490.00	1	75,185.97	
2005	Surface	Inactive	25.99	25.02	1.52%	1.50	1.53%	0.57	0.38	3,490.00	1	1,985.20	
2006	Surface	Inactive	244.59	239.02	1.44%	0.50	1.56%	1.73	3.73	3,490.00	1	6,025.20	
2007	Surface	Inactive	399.20	390.11	1.37%	0.50	1.59%	2.68	6.21	3,490.00	1	9,351.05	
2008	Surface	Inactive	864.07	841.76	1.30%	0.75	1.62%	8.22	13.68	3,490.00	1	28,702.01	
2009	Surface	Inactive	680.43	664.97	1.23%	0.50	1.66%	4.10	11.02	3,490.00	1	14,292.41	
2010	Surface	Inactive	5.11	4.95	1.16%	1.50	1.69%	0.09	0.08	3,490.00	1	300.70	
2011	Surface	Inactive	560.86	550.40	1.09%	0.50	1.52%	3.00	8.39	3,490.00	1	10,466.76	
2012	Surface	Inactive	676.78	665.54	1.02%	0.50	1.36%	3.39	9.02	3,490.00	1	11,832.10	
2013	Surface	Inactive	93.44	92.08	0.95%	0.50	1.19%	0.44	1.09	3,490.00	1	1,522.96	
2014	Surface	Inactive	2,929.61	2,886.98	0.88%	0.75	1.02%	18.99	29.41	3,490.00	1	66,262.79	
2015	Surface	Inactive	704.80	697.40	0.81%	0.50	0.85%	2.81	5.93	3,490.00	1	9,807.65	
2016	Surface	Inactive	494.54	490.36	0.73%	0.50	0.68%	1.80	3.35	3,490.00	1	6,288.70	
2017	Surface	Inactive	-	-	0.66%	-	0.51%	-	-	3,490.00	1	-	
2018	Surface	Inactive	351.08	349.54	0.59%	0.50	0.35%	1.04	1.21	3,490.00	1	3,617.06	
2019	Surface	Inactive	452.10	448.50	0.52%	1.50	0.18%	3.51	0.80	3,490.00	1	12,257.19	
2020	Surface	Inactive	-	-	0.45%	-	0.12%	-	-	3,490.00	1	-	
2021	Surface	Inactive	-	-	0.38%	-	0.06%	-	-	3,490.00	1	-	

Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Adjustment							Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost (21)
				Adjusted Acres	Forfeiture Rate	Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	(19)			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Surface	Phased Released	-	-	0.00%	-	3.21%	-	-	3,490.00	0.5	-	
1964	Surface	Phased Released	-	-	0.00%	-	3.21%	-	-	3,490.00	0.5	-	
1965	Surface	Phased Released	-	-	0.00%	-	3.27%	-	-	3,490.00	0.5	-	
1966	Surface	Phased Released	-	-	0.00%	-	3.34%	-	-	3,490.00	0.5	-	
1967	Surface	Phased Released	-	-	0.00%	-	3.41%	-	-	3,490.00	0.5	-	
1968	Surface	Phased Released	-	-	0.00%	-	3.48%	-	-	3,490.00	0.5	-	
1969	Surface	Phased Released	-	-	0.00%	-	3.55%	-	-	3,490.00	0.5	-	
1970	Surface	Phased Released	-	-	0.00%	-	3.62%	-	-	3,490.00	0.5	-	
1971	Surface	Phased Released	-	-	0.00%	-	3.69%	-	-	3,490.00	0.5	-	
1972	Surface	Phased Released	-	-	0.02%	-	3.77%	-	-	3,490.00	0.5	-	
1973	Surface	Phased Released	-	-	0.08%	-	3.85%	-	-	3,490.00	0.5	-	
1974	Surface	Phased Released	189.60	182.01	0.15%	-	3.92%	-	7.14	3,490.00	0.5	-	
1975	Surface	Phased Released	8.30	7.96	0.21%	-	4.00%	-	0.32	3,490.00	0.5	-	
1976	Surface	Phased Released	626.17	600.06	0.28%	-	4.09%	-	24.52	3,490.00	0.5	-	
1977	Surface	Phased Released	48.00	45.96	0.34%	-	4.17%	-	1.92	3,490.00	0.5	-	
1978	Surface	Phased Released	158.81	151.92	0.40%	-	4.25%	-	6.46	3,490.00	0.5	-	
1979	Surface	Phased Released	358.00	342.14	0.47%	-	4.34%	-	14.85	3,490.00	0.5	-	
1980	Surface	Phased Released	621.75	593.65	0.53%	-	4.43%	-	26.30	3,490.00	0.5	-	
1981	Surface	Phased Released	1,821.81	1,737.79	0.60%	-	4.52%	-	78.55	3,490.00	0.5	-	
1982	Surface	Phased Released	-	-	0.66%	-	4.61%	-	-	3,490.00	0.5	-	
1983	Surface	Phased Released	302.61	288.08	0.73%	-	4.71%	-	13.56	3,490.00	0.5	-	
1984	Surface	Phased Released	2,603.39	2,475.82	0.79%	-	4.80%	-	118.90	3,490.00	0.5	-	
1985	Surface	Phased Released	1,270.29	1,206.77	0.85%	-	4.90%	-	59.14	3,490.00	0.5	-	
1986	Surface	Phased Released	1,212.46	1,150.60	0.92%	-	5.00%	-	57.53	3,490.00	0.5	-	
1987	Surface	Phased Released	760.81	721.20	0.98%	-	5.10%	-	36.80	3,490.00	0.5	-	
1988	Surface	Phased Released	478.00	452.61	1.05%	-	5.21%	-	23.56	3,490.00	0.5	-	
1989	Surface	Phased Released	1,688.64	1,597.10	1.11%	-	5.31%	-	84.85	3,490.00	0.5	-	
1990	Surface	Phased Released	662.34	625.70	1.18%	-	5.42%	-	33.92	3,490.00	0.5	-	
1991	Surface	Phased Released	1,006.45	949.64	1.24%	-	5.53%	-	52.53	3,490.00	0.5	-	
1992	Surface	Phased Released	-	-	1.30%	-	5.64%	-	-	3,490.00	0.5	-	
1993	Surface	Phased Released	562.59	529.52	1.37%	-	5.76%	-	30.50	3,490.00	0.5	-	
1994	Surface	Phased Released	2,470.42	2,322.26	1.43%	-	5.88%	-	136.49	3,490.00	0.5	-	
1995	Surface	Phased Released	498.93	468.40	1.50%	-	6.00%	-	28.09	3,490.00	0.5	-	
1996	Surface	Phased Released	563.71	528.51	1.56%	-	6.12%	-	32.34	3,490.00	0.5	-	
1997	Surface	Phased Released	969.50	907.72	1.62%	-	6.24%	-	56.68	3,490.00	0.5	-	
1998	Surface	Phased Released	511.73	478.46	1.69%	-	6.37%	-	30.49	3,490.00	0.5	-	
1999	Surface	Phased Released	14.87	13.88	1.75%	-	6.50%	-	0.90	3,490.00	0.5	-	
2000	Surface	Phased Released	19.70	18.37	1.82%	-	6.63%	-	1.22	3,490.00	0.5	-	
2001	Surface	Phased Released	491.55	457.59	1.88%	-	6.77%	-	30.98	3,490.00	0.5	-	
2002	Surface	Phased Released	106.29	98.80	1.95%	-	6.91%	-	6.83	3,490.00	0.5	-	
2003	Surface	Phased Released	-	-	2.01%	-	7.05%	-	-	3,490.00	0.5	-	
2004	Surface	Phased Released	470.13	435.62	2.07%	-	7.19%	-	31.34	3,490.00	0.5	-	
2005	Surface	Phased Released	51.50	47.64	2.64%	-	7.34%	-	3.50	3,490.00	0.5	-	
2006	Surface	Phased Released	60.78	56.13	2.51%	-	7.49%	-	4.20	3,490.00	0.5	-	
2007	Surface	Phased Released	-	-	2.39%	-	7.64%	-	-	3,490.00	0.5	-	
2008	Surface	Phased Released	-	-	2.27%	-	7.80%	-	-	3,490.00	0.5	-	
2009	Surface	Phased Released	220.84	202.91	2.14%	-	7.96%	-	16.15	3,490.00	0.5	-	
2010	Surface	Phased Released	-	-	2.02%	-	8.12%	-	-	3,490.00	0.5	-	
2011	Surface	Phased Released	55.50	51.89	1.90%	-	7.31%	-	3.79	3,490.00	0.5	-	
2012	Surface	Phased Released	-	-	1.77%	-	6.51%	-	-	3,490.00	0.5	-	
2013	Surface	Phased Released	-	-	1.65%	-	5.70%	-	-	3,490.00	0.5	-	
2014	Surface	Phased Released	27.91	26.77	1.53%	-	4.89%	-	1.31	3,490.00	0.5	-	
2015	Surface	Phased Released	-	-	1.40%	-	4.08%	-	-	3,490.00	0.5	-	
2016	Surface	Phased Released	-	-	1.28%	-	3.28%	-	-	3,490.00	0.5	-	
2017	Surface	Phased Released	-	-	1.16%	-	2.47%	-	-	3,490.00	0.5	-	
2018	Surface	Phased Released	-	-	1.03%	-	1.66%	-	-	3,490.00	0.5	-	
2019	Surface	Phased Released	-	-	0.91%	-	0.85%	-	-	3,490.00	0.5	-	
2020	Surface	Phased Released	-	-	0.79%	-	0.57%	-	-	3,490.00	0.5	-	
2021	Surface	Phased Released	-	-	0.66%	-	0.29%	-	-	3,490.00	0.5	-	

Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost (21)
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	(19)			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Underground	Active	-	-	0.15%	-	0.00%	-	-	5,595.00	1	-	
1964	Underground	Active	-	-	0.15%	-	0.00%	-	-	5,595.00	1	-	
1965	Underground	Active	-	-	0.15%	-	0.00%	-	-	5,595.00	1	-	
1966	Underground	Active	-	-	0.16%	-	0.00%	-	-	5,595.00	1	-	
1967	Underground	Active	-	-	0.16%	-	0.00%	-	-	5,595.00	1	-	
1968	Underground	Active	-	-	0.16%	-	0.00%	-	-	5,595.00	1	-	
1969	Underground	Active	-	-	0.16%	-	0.00%	-	-	5,595.00	1	-	
1970	Underground	Active	-	-	0.16%	-	0.00%	-	-	5,595.00	1	-	
1971	Underground	Active	-	-	0.17%	-	0.00%	-	-	5,595.00	1	-	
1972	Underground	Active	-	-	0.17%	-	0.00%	-	-	5,595.00	1	-	
1973	Underground	Active	-	-	0.17%	-	0.00%	-	-	5,595.00	1	-	
1974	Underground	Active	-	-	0.17%	-	0.00%	-	-	5,595.00	1	-	
1975	Underground	Active	-	-	0.17%	-	0.12%	-	-	5,595.00	1	-	
1976	Underground	Active	-	-	0.17%	-	0.26%	-	-	5,595.00	1	-	
1977	Underground	Active	22.53	22.35	0.18%	1.50	0.40%	0.06	0.09	5,595.00	1	331.06	
1978	Underground	Active	94.87	94.14	0.18%	0.50	0.54%	0.08	0.51	5,595.00	1	469.88	
1979	Underground	Active	745.26	737.49	0.18%	1.21	0.68%	1.61	5.02	5,595.00	1	9,035.18	
1980	Underground	Active	222.16	219.57	0.18%	1.10	0.82%	0.44	1.80	5,595.00	1	2,462.62	
1981	Underground	Active	891.30	879.48	0.18%	1.21	0.96%	1.95	8.45	5,595.00	1	10,926.30	
1982	Underground	Active	33.93	33.41	0.19%	1.50	1.10%	0.09	0.37	5,595.00	1	521.70	
1983	Underground	Active	6,929.70	6,822.39	0.19%	0.88	1.24%	11.27	84.70	5,595.00	1	63,083.32	
1984	Underground	Active	2,706.46	2,660.09	0.19%	1.00	1.38%	5.05	36.75	5,595.00	1	28,256.06	
1985	Underground	Active	49.00	48.04	0.19%	1.50	1.52%	0.14	0.73	5,595.00	1	773.17	
1986	Underground	Active	252.11	247.02	0.19%	1.10	1.66%	0.53	4.11	5,595.00	1	2,944.28	
1987	Underground	Active	198.36	194.08	0.20%	1.10	1.80%	0.42	3.50	5,595.00	1	2,335.95	
1988	Underground	Active	157.83	154.15	0.20%	1.25	1.94%	0.38	2.99	5,595.00	1	2,128.94	
1989	Underground	Active	124.08	120.95	0.20%	1.50	2.08%	0.36	2.52	5,595.00	1	2,023.80	
1990	Underground	Active	136.22	132.64	0.20%	1.30	2.22%	0.35	2.95	5,595.00	1	1,941.93	
1991	Underground	Active	240.32	233.66	0.20%	1.30	2.36%	0.62	5.52	5,595.00	1	3,453.33	
1992	Underground	Active	1,027.11	997.66	0.21%	1.08	2.50%	2.22	24.97	5,595.00	1	12,402.23	
1993	Underground	Active	724.45	702.52	0.21%	1.17	2.64%	1.70	18.57	5,595.00	1	9,492.44	
1994	Underground	Active	610.69	591.50	0.21%	1.04	2.78%	1.28	16.46	5,595.00	1	7,179.53	
1995	Underground	Active	334.05	322.99	0.21%	1.17	2.92%	0.79	9.44	5,595.00	1	4,444.53	
1996	Underground	Active	244.18	235.73	0.21%	1.20	3.06%	0.60	7.22	5,595.00	1	3,366.62	
1997	Underground	Active	234.02	225.51	0.21%	1.35	3.20%	0.65	7.22	5,595.00	1	3,645.35	
1998	Underground	Active	523.54	504.16	0.22%	1.00	3.34%	1.09	16.86	5,595.00	1	6,107.70	
1999	Underground	Active	359.47	345.33	0.22%	1.40	3.48%	1.06	12.03	5,595.00	1	5,908.59	
2000	Underground	Active	461.64	443.03	0.22%	1.20	3.62%	1.17	16.05	5,595.00	1	6,553.97	
2001	Underground	Active	224.71	215.48	0.22%	0.90	3.76%	0.43	8.11	5,595.00	1	2,411.48	
2002	Underground	Active	288.53	275.96	0.22%	1.38	3.90%	0.85	10.77	5,595.00	1	4,758.72	
2003	Underground	Active	969.45	926.17	0.23%	1.23	4.04%	2.57	37.46	5,595.00	1	14,376.16	
2004	Underground	Active	445.92	429.68	0.23%	1.13	4.18%	1.10	17.98	5,595.00	1	6,165.28	
2005	Underground	Active	360.91	348.24	0.23%	1.13	3.38%	0.90	11.78	5,595.00	1	5,038.52	
2006	Underground	Active	427.71	413.55	0.23%	0.83	3.25%	0.80	13.44	5,595.00	1	4,468.92	
2007	Underground	Active	482.68	466.89	0.23%	1.23	3.12%	1.34	14.55	5,595.00	1	7,491.48	
2008	Underground	Active	111.00	107.44	0.24%	1.50	2.98%	0.38	3.20	5,595.00	1	2,124.26	
2009	Underground	Active	320.63	311.11	0.24%	1.07	2.85%	0.79	8.86	5,595.00	1	4,428.99	
2010	Underground	Active	269.59	261.72	0.24%	1.41	2.71%	0.88	7.10	5,595.00	1	4,939.42	
2011	Underground	Active	192.99	187.63	0.24%	1.36	2.58%	0.61	4.84	5,595.00	1	3,437.79	
2012	Underground	Active	171.01	166.50	0.24%	1.33	2.45%	0.54	4.07	5,595.00	1	3,020.69	
2013	Underground	Active	398.29	388.21	0.25%	1.42	2.31%	1.35	8.98	5,595.00	1	7,576.16	
2014	Underground	Active	686.91	670.68	0.25%	1.27	2.18%	2.11	14.61	5,595.00	1	11,796.94	
2015	Underground	Active	132.11	129.00	0.25%	1.50	2.05%	0.48	2.64	5,595.00	1	2,694.77	
2016	Underground	Active	137.58	134.61	0.30%	1.50	1.91%	0.60	2.57	5,595.00	1	3,354.20	
2017	Underground	Active	155.37	152.32	0.25%	1.50	1.78%	0.58	2.71	5,595.00	1	3,259.75	
2018	Underground	Active	37.52	36.86	0.21%	1.50	1.64%	0.12	0.61	5,595.00	1	659.12	
2019	Underground	Active	79.46	78.24	0.17%	1.25	1.51%	0.17	1.18	5,595.00	1	936.62	
2020	Underground	Active	110.58	109.06	0.13%	1.50	1.38%	0.21	1.50	5,595.00	1	1,183.11	
2021	Underground	Active	76.19	75.35	0.09%	1.50	1.24%	0.10	0.94	5,595.00	1	552.32	

Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Adjustment						Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1963	Underground	Inactive	-	-	0.34%	-	0.00%	-	-	5,595.00	1	-
1964	Underground	Inactive	-	-	0.34%	-	0.00%	-	-	5,595.00	1	-
1965	Underground	Inactive	-	-	0.35%	-	0.00%	-	-	5,595.00	1	-
1966	Underground	Inactive	-	-	0.35%	-	0.00%	-	-	5,595.00	1	-
1967	Underground	Inactive	-	-	0.35%	-	0.00%	-	-	5,595.00	1	-
1968	Underground	Inactive	-	-	0.36%	-	0.00%	-	-	5,595.00	1	-
1969	Underground	Inactive	-	-	0.36%	-	0.00%	-	-	5,595.00	1	-
1970	Underground	Inactive	-	-	0.37%	-	0.00%	-	-	5,595.00	1	-
1971	Underground	Inactive	-	-	0.37%	-	0.00%	-	-	5,595.00	1	-
1972	Underground	Inactive	-	-	0.38%	-	0.00%	-	-	5,595.00	1	-
1973	Underground	Inactive	-	-	0.38%	-	0.00%	-	-	5,595.00	1	-
1974	Underground	Inactive	-	-	0.38%	-	0.00%	-	-	5,595.00	1	-
1975	Underground	Inactive	-	-	0.39%	-	0.08%	-	-	5,595.00	1	-
1976	Underground	Inactive	103.30	102.84	0.39%	0.50	0.16%	0.20	0.17	5,595.00	1	1,130.23
1977	Underground	Inactive	-	-	0.40%	-	0.25%	-	-	5,595.00	1	-
1978	Underground	Inactive	23.02	22.88	0.40%	0.50	0.34%	0.05	0.08	5,595.00	1	256.90
1979	Underground	Inactive	6.60	6.55	0.41%	0.50	0.43%	0.01	0.03	5,595.00	1	74.37
1980	Underground	Inactive	-	-	0.41%	-	0.51%	-	-	5,595.00	1	-
1981	Underground	Inactive	149.03	147.38	0.41%	1.00	0.60%	0.61	0.89	5,595.00	1	3,416.35
1982	Underground	Inactive	128.47	127.20	0.42%	0.50	0.69%	0.27	0.88	5,595.00	1	1,489.55
1983	Underground	Inactive	500.86	494.93	0.42%	0.75	0.78%	1.57	3.84	5,595.00	1	8,782.61
1984	Underground	Inactive	300.00	296.50	0.43%	0.50	0.86%	0.63	2.56	5,595.00	1	3,543.18
1985	Underground	Inactive	220.21	217.44	0.43%	0.50	0.95%	0.47	2.07	5,595.00	1	2,624.52
1986	Underground	Inactive	43.54	42.95	0.44%	0.50	1.04%	0.09	0.45	5,595.00	1	523.60
1987	Underground	Inactive	40.89	40.12	0.44%	1.50	1.13%	0.26	0.45	5,595.00	1	1,481.65
1988	Underground	Inactive	154.89	152.03	0.44%	1.21	1.21%	0.82	1.85	5,595.00	1	4,589.26
1989	Underground	Inactive	193.50	190.37	0.45%	0.50	1.30%	0.43	2.48	5,595.00	1	2,389.13
1990	Underground	Inactive	36.13	35.40	0.45%	1.17	1.39%	0.19	0.49	5,595.00	1	1,046.62
1991	Underground	Inactive	141.42	138.56	0.46%	1.00	1.48%	0.63	2.05	5,595.00	1	3,544.11
1992	Underground	Inactive	9.00	8.79	0.46%	1.50	1.56%	0.06	0.14	5,595.00	1	340.36
1993	Underground	Inactive	294.11	287.61	0.47%	1.00	1.65%	1.34	4.75	5,595.00	1	7,494.79
1994	Underground	Inactive	247.11	242.01	0.47%	0.50	1.74%	0.57	4.21	5,595.00	1	3,182.25
1995	Underground	Inactive	131.50	128.35	0.47%	1.00	1.83%	0.61	2.34	5,595.00	1	3,406.28
1996	Underground	Inactive	45.38	44.14	0.48%	1.50	1.91%	0.32	0.85	5,595.00	1	1,773.10
1997	Underground	Inactive	294.76	287.06	0.48%	1.07	2.00%	1.49	5.75	5,595.00	1	8,309.85
1998	Underground	Inactive	93.26	90.69	0.49%	1.17	2.09%	0.52	1.90	5,595.00	1	2,884.18
1999	Underground	Inactive	618.15	600.92	0.49%	1.06	2.18%	3.12	13.08	5,595.00	1	17,441.83
2000	Underground	Inactive	76.39	74.02	0.50%	1.50	2.26%	0.55	1.68	5,595.00	1	3,079.71
2001	Underground	Inactive	6.00	5.81	0.50%	1.50	2.35%	0.04	0.14	5,595.00	1	243.75
2002	Underground	Inactive	47.21	45.90	0.50%	0.50	2.44%	0.12	1.12	5,595.00	1	647.54
2003	Underground	Inactive	229.90	222.71	0.51%	1.00	2.53%	1.13	5.63	5,595.00	1	6,337.66
2004	Underground	Inactive	181.69	177.38	0.51%	0.50	2.62%	0.45	4.64	5,595.00	1	2,545.12
2005	Underground	Inactive	121.31	117.90	0.52%	1.50	2.11%	0.91	2.49	5,595.00	1	5,117.38
2006	Underground	Inactive	145.55	141.82	0.52%	1.17	2.03%	0.86	2.88	5,595.00	1	4,827.59
2007	Underground	Inactive	80.93	78.89	0.53%	1.25	1.95%	0.52	1.54	5,595.00	1	2,900.68
2008	Underground	Inactive	95.14	92.68	0.53%	1.50	1.86%	0.74	1.73	5,595.00	1	4,123.01
2009	Underground	Inactive	127.40	124.30	0.53%	1.38	1.78%	0.91	2.21	5,595.00	1	5,109.46
2010	Underground	Inactive	296.02	289.19	0.54%	1.28	1.70%	1.99	4.91	5,595.00	1	11,136.01
2011	Underground	Inactive	113.07	110.41	0.54%	1.50	1.61%	0.90	1.78	5,595.00	1	5,030.85
2012	Underground	Inactive	95.72	93.72	0.55%	1.17	1.53%	0.60	1.43	5,595.00	1	3,347.55
2013	Underground	Inactive	53.70	52.52	0.55%	1.50	1.45%	0.43	0.76	5,595.00	1	2,430.86
2014	Underground	Inactive	12.00	11.75	0.56%	1.50	1.36%	0.10	0.16	5,595.00	1	547.86
2015	Underground	Inactive	12.04	11.78	0.56%	1.50	1.28%	0.10	0.15	5,595.00	1	553.49
2016	Underground	Inactive	-	-	0.67%	-	1.19%	-	-	5,595.00	1	-
2017	Underground	Inactive	-	-	0.57%	-	1.11%	-	-	5,595.00	1	-
2018	Underground	Inactive	46.96	46.25	0.48%	1.50	1.03%	0.33	0.48	5,595.00	1	1,860.79
2019	Underground	Inactive	-	-	0.39%	-	0.94%	-	-	5,595.00	1	-
2020	Underground	Inactive	-	-	0.29%	-	0.86%	-	-	5,595.00	1	-
2021	Underground	Inactive	-	-	0.20%	-	0.78%	-	-	5,595.00	1	-

Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	2023							Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Underground	Phased Released	-	-	0.59%	-	0.00%	-	-	5,595.00	0.5	-	
1964	Underground	Phased Released	-	-	0.59%	-	0.00%	-	-	5,595.00	0.5	-	
1965	Underground	Phased Released	-	-	0.60%	-	0.00%	-	-	5,595.00	0.5	-	
1966	Underground	Phased Released	-	-	0.61%	-	0.00%	-	-	5,595.00	0.5	-	
1967	Underground	Phased Released	-	-	0.62%	-	0.00%	-	-	5,595.00	0.5	-	
1968	Underground	Phased Released	-	-	0.62%	-	0.00%	-	-	5,595.00	0.5	-	
1969	Underground	Phased Released	-	-	0.63%	-	0.00%	-	-	5,595.00	0.5	-	
1970	Underground	Phased Released	-	-	0.64%	-	0.00%	-	-	5,595.00	0.5	-	
1971	Underground	Phased Released	-	-	0.65%	-	0.00%	-	-	5,595.00	0.5	-	
1972	Underground	Phased Released	-	-	0.65%	-	0.00%	-	-	5,595.00	0.5	-	
1973	Underground	Phased Released	-	-	0.66%	-	0.00%	-	-	5,595.00	0.5	-	
1974	Underground	Phased Released	-	-	0.67%	-	0.00%	-	-	5,595.00	0.5	-	
1975	Underground	Phased Released	-	-	0.68%	-	0.36%	-	-	5,595.00	0.5	-	
1976	Underground	Phased Released	-	-	0.68%	-	0.78%	-	-	5,595.00	0.5	-	
1977	Underground	Phased Released	-	-	0.69%	-	1.20%	-	-	5,595.00	0.5	-	
1978	Underground	Phased Released	23.13	22.66	0.70%	-	1.62%	-	0.37	5,595.00	0.5	-	
1979	Underground	Phased Released	59.68	58.21	0.71%	-	2.04%	-	1.19	5,595.00	0.5	-	
1980	Underground	Phased Released	87.19	84.68	0.71%	-	2.46%	-	2.09	5,595.00	0.5	-	
1981	Underground	Phased Released	85.14	82.33	0.72%	-	2.88%	-	2.37	5,595.00	0.5	-	
1982	Underground	Phased Released	199.06	191.65	0.73%	-	3.30%	-	6.33	5,595.00	0.5	-	
1983	Underground	Phased Released	57.47	55.09	0.74%	-	3.72%	-	2.05	5,595.00	0.5	-	
1984	Underground	Phased Released	95.60	91.24	0.74%	-	4.14%	-	3.78	5,595.00	0.5	-	
1985	Underground	Phased Released	17.24	16.38	0.75%	-	4.57%	-	0.75	5,595.00	0.5	-	
1986	Underground	Phased Released	118.96	112.53	0.76%	-	4.99%	-	5.61	5,595.00	0.5	-	
1987	Underground	Phased Released	77.09	72.60	0.77%	-	5.41%	-	3.92	5,595.00	0.5	-	
1988	Underground	Phased Released	129.44	121.35	0.77%	-	5.83%	-	7.07	5,595.00	0.5	-	
1989	Underground	Phased Released	119.44	111.48	0.78%	-	6.25%	-	6.96	5,595.00	0.5	-	
1990	Underground	Phased Released	18.31	17.01	0.79%	-	6.67%	-	1.13	5,595.00	0.5	-	
1991	Underground	Phased Released	18.20	16.83	0.80%	-	7.09%	-	1.19	5,595.00	0.5	-	
1992	Underground	Phased Released	39.95	36.78	0.80%	-	7.51%	-	2.76	5,595.00	0.5	-	
1993	Underground	Phased Released	30.79	28.22	0.81%	-	7.93%	-	2.24	5,595.00	0.5	-	
1994	Underground	Phased Released	26.14	23.85	0.82%	-	8.35%	-	1.99	5,595.00	0.5	-	
1995	Underground	Phased Released	65.62	59.59	0.83%	-	8.77%	-	5.23	5,595.00	0.5	-	
1996	Underground	Phased Released	133.37	120.55	0.83%	-	9.19%	-	11.08	5,595.00	0.5	-	
1997	Underground	Phased Released	149.46	134.47	0.84%	-	9.61%	-	12.92	5,595.00	0.5	-	
1998	Underground	Phased Released	70.67	63.28	0.85%	-	10.03%	-	6.35	5,595.00	0.5	-	
1999	Underground	Phased Released	10.68	9.52	0.86%	-	10.45%	-	0.99	5,595.00	0.5	-	
2000	Underground	Phased Released	59.65	52.91	0.86%	-	10.87%	-	5.75	5,595.00	0.5	-	
2001	Underground	Phased Released	36.60	32.31	0.87%	-	11.29%	-	3.65	5,595.00	0.5	-	
2002	Underground	Phased Released	48.55	42.66	0.88%	-	11.71%	-	5.00	5,595.00	0.5	-	
2003	Underground	Phased Released	78.20	68.38	0.89%	-	12.13%	-	8.30	5,595.00	0.5	-	
2004	Underground	Phased Released	16.25	14.60	0.89%	-	12.55%	-	1.83	5,595.00	0.5	-	
2005	Underground	Phased Released	-	-	0.90%	-	10.15%	-	-	5,595.00	0.5	-	
2006	Underground	Phased Released	-	-	0.91%	-	9.75%	-	-	5,595.00	0.5	-	
2007	Underground	Phased Released	-	-	0.92%	-	9.35%	-	-	5,595.00	0.5	-	
2008	Underground	Phased Released	43.07	39.39	0.92%	-	8.95%	-	3.52	5,595.00	0.5	-	
2009	Underground	Phased Released	54.60	50.15	0.93%	-	8.54%	-	4.29	5,595.00	0.5	-	
2010	Underground	Phased Released	-	-	0.94%	-	8.14%	-	-	5,595.00	0.5	-	
2011	Underground	Phased Released	25.60	23.72	0.95%	-	7.74%	-	1.84	5,595.00	0.5	-	
2012	Underground	Phased Released	-	-	0.95%	-	7.34%	-	-	5,595.00	0.5	-	
2013	Underground	Phased Released	-	-	0.96%	-	6.94%	-	-	5,595.00	0.5	-	
2014	Underground	Phased Released	-	-	0.97%	-	6.54%	-	-	5,595.00	0.5	-	
2015	Underground	Phased Released	-	-	0.97%	-	6.14%	-	-	5,595.00	0.5	-	
2016	Underground	Phased Released	-	-	1.16%	-	5.73%	-	-	5,595.00	0.5	-	
2017	Underground	Phased Released	-	-	1.00%	-	5.33%	-	-	5,595.00	0.5	-	
2018	Underground	Phased Released	-	-	0.83%	-	4.93%	-	-	5,595.00	0.5	-	
2019	Underground	Phased Released	-	-	0.67%	-	4.53%	-	-	5,595.00	0.5	-	
2020	Underground	Phased Released	-	-	0.51%	-	4.13%	-	-	5,595.00	0.5	-	
2021	Underground	Phased Released	-	-	0.34%	-	3.73%	-	-	5,595.00	0.5	-	

West Virginia Department of Environmental Protection Office of Sp  
 Actuarial Reserve Study as of June 30, 2021  
 Water Capital Cost Projection - Deterministic Model

Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	2023								Avg recl Cost per Acce (19)	Adjustment Factor Permit Status (20)	Gross Cost (21)
			Current Bonded Acres (4)	Adjusted Acres (13)	Forfeiture Rate (14)	Adjustment Factor Permit Bond Size (15)	Release Rate (16)	Forfeited Acres (17)	Released Acres (18)				
1963	Other	Active	-	-	0.21%	-	2.29%	-	-	8,145.00	1	-	
1964	Other	Active	-	-	0.21%	-	2.29%	-	-	8,145.00	1	-	
1965	Other	Active	-	-	0.21%	-	2.27%	-	-	8,145.00	1	-	
1966	Other	Active	-	-	0.21%	-	2.25%	-	-	8,145.00	1	-	
1967	Other	Active	-	-	0.21%	-	2.22%	-	-	8,145.00	1	-	
1968	Other	Active	-	-	0.21%	-	2.20%	-	-	8,145.00	1	-	
1969	Other	Active	-	-	0.21%	-	2.18%	-	-	8,145.00	1	-	
1970	Other	Active	-	-	0.21%	-	2.16%	-	-	8,145.00	1	-	
1971	Other	Active	-	-	0.21%	-	2.13%	-	-	8,145.00	1	-	
1972	Other	Active	20.00	19.52	0.21%	1.50	2.11%	0.06	0.41	8,145.00	1	493.72	
1973	Other	Active	-	-	0.21%	-	2.09%	-	-	8,145.00	1	-	
1974	Other	Active	28.52	27.85	0.21%	1.50	2.06%	0.09	0.57	8,145.00	1	704.37	
1975	Other	Active	6.20	6.06	0.21%	1.50	2.04%	0.02	0.12	8,145.00	1	153.16	
1976	Other	Active	75.00	73.27	0.21%	1.50	2.02%	0.23	1.48	8,145.00	1	1,853.18	
1977	Other	Active	307.70	300.99	0.21%	1.00	2.00%	0.62	6.01	8,145.00	1	5,075.19	
1978	Other	Active	-	-	0.21%	-	1.97%	-	-	8,145.00	1	-	
1979	Other	Active	65.00	63.55	0.21%	1.50	1.95%	0.20	1.24	8,145.00	1	1,607.21	
1980	Other	Active	370.67	362.68	0.21%	1.21	1.93%	0.91	6.99	8,145.00	1	7,425.74	
1981	Other	Active	4,857.33	4,756.44	0.21%	0.94	1.91%	9.27	90.61	8,145.00	1	75,483.50	
1982	Other	Active	554.75	543.57	0.21%	0.75	1.88%	0.84	10.23	8,145.00	1	6,874.14	
1983	Other	Active	3,438.58	3,369.22	0.21%	0.87	1.86%	6.08	62.65	8,145.00	1	49,506.27	
1984	Other	Active	4,464.39	4,377.05	0.21%	0.69	1.84%	6.23	80.40	8,145.00	1	50,740.38	
1985	Other	Active	2,329.11	2,282.57	0.21%	1.00	1.81%	4.73	41.41	8,145.00	1	38,487.81	
1986	Other	Active	1,411.57	1,383.80	0.21%	0.96	1.79%	2.75	24.79	8,145.00	1	22,435.64	
1987	Other	Active	486.71	477.13	0.21%	1.07	1.77%	1.06	8.44	8,145.00	1	8,619.91	
1988	Other	Active	479.98	470.50	0.21%	1.21	1.75%	1.18	8.21	8,145.00	1	9,633.48	
1989	Other	Active	290.43	284.68	0.21%	1.36	1.72%	0.80	4.90	8,145.00	1	6,514.43	
1990	Other	Active	264.35	259.20	0.21%	1.30	1.70%	0.70	4.41	8,145.00	1	5,681.79	
1991	Other	Active	431.34	422.99	0.21%	1.36	1.68%	1.19	7.10	8,145.00	1	9,679.57	
1992	Other	Active	554.74	544.48	0.21%	1.06	1.65%	1.19	9.01	8,145.00	1	9,690.78	
1993	Other	Active	879.50	875.05	0.21%	0.75	1.63%	1.36	14.28	8,145.00	1	11,066.10	
1994	Other	Active	1,837.84	1,824.74	0.21%	0.83	0.35%	3.15	6.39	8,145.00	1	25,640.12	
1995	Other	Active	939.93	931.13	0.21%	1.00	0.54%	1.93	5.03	8,145.00	1	15,700.29	
1996	Other	Active	1,971.02	1,950.86	0.21%	0.50	0.73%	2.02	14.23	8,145.00	1	16,447.34	
1997	Other	Active	1,267.92	1,251.24	0.21%	1.00	0.92%	2.59	11.50	8,145.00	1	21,097.87	
1998	Other	Active	1,054.49	1,038.31	0.21%	0.83	1.11%	1.79	11.51	8,145.00	1	14,589.72	
1999	Other	Active	404.95	397.33	0.28%	1.10	1.30%	1.24	5.16	8,145.00	1	10,060.49	
2000	Other	Active	255.10	249.71	0.36%	1.00	1.49%	0.89	3.72	8,145.00	1	7,285.48	
2001	Other	Active	360.44	352.06	0.43%	0.90	1.68%	1.37	5.91	8,145.00	1	11,195.06	
2002	Other	Active	569.59	553.43	0.51%	1.33	1.87%	3.76	10.33	8,145.00	1	30,615.16	
2003	Other	Active	810.10	787.44	0.58%	0.83	2.06%	3.84	16.20	8,145.00	1	31,265.35	
2004	Other	Active	1,049.09	1,016.36	0.66%	0.93	2.25%	6.23	22.83	8,145.00	1	50,777.20	
2005	Other	Active	22.99	22.20	0.74%	1.00	2.44%	0.16	0.54	8,145.00	1	1,331.09	
2006	Other	Active	491.96	473.43	0.81%	1.07	2.63%	4.12	12.43	8,145.00	1	33,537.58	
2007	Other	Active	368.47	353.50	0.89%	1.10	2.82%	3.45	9.95	8,145.00	1	28,103.12	
2008	Other	Active	649.47	620.10	0.96%	1.28	3.00%	7.63	18.63	8,145.00	1	62,144.66	
2009	Other	Active	202.62	192.75	1.04%	1.33	3.19%	2.67	6.16	8,145.00	1	21,739.26	
2010	Other	Active	1,059.98	1,008.79	1.11%	1.06	3.38%	11.86	34.14	8,145.00	1	96,627.14	
2011	Other	Active	350.69	331.92	1.19%	0.83	3.57%	3.29	11.86	8,145.00	1	26,802.60	
2012	Other	Active	147.31	131.38	1.27%	1.50	4.30%	2.49	5.65	8,145.00	1	20,309.58	
2013	Other	Active	2,047.67	1,750.49	1.33%	1.03	8.82%	23.98	154.36	8,145.00	1	195,298.86	
2014	Other	Active	259.86	210.05	1.14%	1.38	13.34%	3.30	28.02	8,145.00	1	26,863.70	
2015	Other	Active	1,229.64	944.15	0.95%	1.10	17.86%	9.90	168.60	8,145.00	1	80,637.74	
2016	Other	Active	1,513.50	1,094.81	0.76%	1.33	22.38%	11.16	244.98	8,145.00	1	90,905.79	
2017	Other	Active	388.02	235.03	0.58%	1.36	26.90%	1.84	63.21	8,145.00	1	14,961.69	
2018	Other	Active	36.77	24.72	0.39%	1.50	38.90%	0.14	9.62	8,145.00	1	1,169.34	
2019	Other	Active	50.90	39.52	0.20%	1.50	32.48%	0.12	12.84	8,145.00	1	958.65	
2020	Other	Active	777.21	682.51	0.01%	1.47	22.33%	0.10	152.42	8,145.00	1	804.89	
2021	Other	Active	175.63	172.05	0.00%	1.50	12.18%	-	20.96	8,145.00	1	-	



Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	Adjustment						Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1963	Other	Inactive	-	-	0.47%	-	1.43%	-	-	8,145.00	1	-
1964	Other	Inactive	-	-	0.47%	-	1.43%	-	-	8,145.00	1	-
1965	Other	Inactive	-	-	0.47%	-	1.42%	-	-	8,145.00	1	-
1966	Other	Inactive	-	-	0.47%	-	1.40%	-	-	8,145.00	1	-
1967	Other	Inactive	-	-	0.47%	-	1.39%	-	-	8,145.00	1	-
1968	Other	Inactive	-	-	0.47%	-	1.38%	-	-	8,145.00	1	-
1969	Other	Inactive	-	-	0.47%	-	1.36%	-	-	8,145.00	1	-
1970	Other	Inactive	-	-	0.47%	-	1.35%	-	-	8,145.00	1	-
1971	Other	Inactive	-	-	0.47%	-	1.33%	-	-	8,145.00	1	-
1972	Other	Inactive	-	-	0.47%	-	1.32%	-	-	8,145.00	1	-
1973	Other	Inactive	-	-	0.47%	-	1.30%	-	-	8,145.00	1	-
1974	Other	Inactive	-	-	0.47%	-	1.29%	-	-	8,145.00	1	-
1975	Other	Inactive	-	-	0.47%	-	1.28%	-	-	8,145.00	1	-
1976	Other	Inactive	14.48	14.20	0.47%	1.50	1.26%	0.10	0.18	8,145.00	1	807.99
1977	Other	Inactive	61.00	59.82	0.47%	1.50	1.25%	0.42	0.75	8,145.00	1	3,404.32
1978	Other	Inactive	-	-	0.47%	-	1.23%	-	-	8,145.00	1	-
1979	Other	Inactive	7.25	7.11	0.47%	1.50	1.22%	0.05	0.09	8,145.00	1	404.73
1980	Other	Inactive	114.75	113.12	0.47%	0.50	1.20%	0.26	1.36	8,145.00	1	2,145.74
1981	Other	Inactive	1,477.93	1,453.92	0.47%	0.96	1.19%	6.51	17.31	8,145.00	1	53,038.36
1982	Other	Inactive	148.70	146.16	0.47%	1.17	1.18%	0.79	1.72	8,145.00	1	6,469.46
1983	Other	Inactive	1,739.30	1,713.26	0.47%	0.75	1.16%	5.99	19.91	8,145.00	1	48,748.99
1984	Other	Inactive	440.78	433.88	0.47%	0.93	1.15%	1.88	4.98	8,145.00	1	15,284.91
1985	Other	Inactive	364.25	358.76	0.47%	0.83	1.13%	1.39	4.07	8,145.00	1	11,342.34
1986	Other	Inactive	-	-	0.47%	-	1.12%	-	-	8,145.00	1	-
1987	Other	Inactive	484.64	478.22	0.47%	0.50	1.11%	1.11	5.29	8,145.00	1	9,071.58
1988	Other	Inactive	167.79	165.07	0.47%	1.17	1.09%	0.90	1.80	8,145.00	1	7,306.35
1989	Other	Inactive	438.61	432.11	0.47%	0.90	1.08%	1.81	4.65	8,145.00	1	14,754.33
1990	Other	Inactive	481.66	473.99	0.47%	1.17	1.06%	2.58	5.04	8,145.00	1	20,979.76
1991	Other	Inactive	-	-	0.47%	-	1.05%	-	-	8,145.00	1	-
1992	Other	Inactive	433.18	426.14	0.47%	1.30	1.03%	2.58	4.41	8,145.00	1	21,017.28
1993	Other	Inactive	273.92	272.17	0.47%	0.90	1.02%	1.14	2.78	8,145.00	1	9,293.25
1994	Other	Inactive	545.08	540.70	0.47%	1.00	0.22%	2.52	1.18	8,145.00	1	20,513.48
1995	Other	Inactive	641.22	634.81	0.47%	1.17	0.34%	3.45	2.14	8,145.00	1	28,097.86
1996	Other	Inactive	152.16	150.93	0.47%	0.50	0.46%	0.35	0.69	8,145.00	1	2,863.07
1997	Other	Inactive	158.04	156.33	0.47%	0.83	0.57%	0.61	0.90	8,145.00	1	4,942.50
1998	Other	Inactive	206.29	203.30	0.47%	1.00	0.69%	0.95	1.41	8,145.00	1	7,713.09
1999	Other	Inactive	-	-	0.64%	-	0.81%	-	-	8,145.00	1	-
2000	Other	Inactive	116.73	114.94	0.81%	0.50	0.93%	0.46	1.07	8,145.00	1	3,772.47
2001	Other	Inactive	250.00	245.65	0.98%	0.50	1.05%	1.20	2.58	8,145.00	1	9,764.27
2002	Other	Inactive	222.64	216.85	1.15%	1.00	1.17%	2.49	2.53	8,145.00	1	20,242.81
2003	Other	Inactive	78.29	75.45	1.32%	1.50	1.29%	1.49	0.97	8,145.00	1	12,132.00
2004	Other	Inactive	56.00	53.76	1.49%	1.50	1.40%	1.20	0.75	8,145.00	1	9,761.26
2005	Other	Inactive	50.69	48.47	1.66%	1.50	1.52%	1.20	0.74	8,145.00	1	9,808.46
2006	Other	Inactive	-	-	1.83%	-	1.64%	-	-	8,145.00	1	-
2007	Other	Inactive	-	-	2.00%	-	1.76%	-	-	8,145.00	1	-
2008	Other	Inactive	4.11	3.88	2.17%	1.50	1.88%	0.13	0.07	8,145.00	1	1,028.07
2009	Other	Inactive	-	-	2.34%	-	2.00%	-	-	8,145.00	1	-
2010	Other	Inactive	-	-	2.51%	-	2.12%	-	-	8,145.00	1	-
2011	Other	Inactive	-	-	2.68%	-	2.23%	-	-	8,145.00	1	-
2012	Other	Inactive	66.26	61.62	2.85%	0.50	2.69%	0.88	1.66	8,145.00	1	7,143.80
2013	Other	Inactive	57.00	50.05	2.99%	1.50	5.51%	2.25	2.76	8,145.00	1	18,308.09
2014	Other	Inactive	-	-	2.57%	-	8.34%	-	-	8,145.00	1	-
2015	Other	Inactive	-	-	2.14%	-	11.16%	-	-	8,145.00	1	-
2016	Other	Inactive	-	-	1.72%	-	13.99%	-	-	8,145.00	1	-
2017	Other	Inactive	-	-	1.30%	-	16.81%	-	-	8,145.00	1	-
2018	Other	Inactive	11.88	9.39	0.87%	1.50	24.31%	0.12	2.28	8,145.00	1	999.36
2019	Other	Inactive	-	-	0.45%	-	20.30%	-	-	8,145.00	1	-
2020	Other	Inactive	-	-	0.02%	-	13.96%	-	-	8,145.00	1	-
2021	Other	Inactive	-	-	0.00%	-	7.62%	-	-	8,145.00	1	-

Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	2023							Avg recl Cost per Acres	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Adjustment Factor Permit Status			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Other	Phased Released	-	-	0.81%	-	6.88%	-	-	8,145.00	0.5	-	
1964	Other	Phased Released	-	-	0.81%	-	6.88%	-	-	8,145.00	0.5	-	
1965	Other	Phased Released	-	-	0.81%	-	6.81%	-	-	8,145.00	0.5	-	
1966	Other	Phased Released	-	-	0.81%	-	6.74%	-	-	8,145.00	0.5	-	
1967	Other	Phased Released	-	-	0.81%	-	6.67%	-	-	8,145.00	0.5	-	
1968	Other	Phased Released	-	-	0.81%	-	6.60%	-	-	8,145.00	0.5	-	
1969	Other	Phased Released	-	-	0.81%	-	6.54%	-	-	8,145.00	0.5	-	
1970	Other	Phased Released	-	-	0.81%	-	6.47%	-	-	8,145.00	0.5	-	
1971	Other	Phased Released	-	-	0.81%	-	6.40%	-	-	8,145.00	0.5	-	
1972	Other	Phased Released	-	-	0.81%	-	6.33%	-	-	8,145.00	0.5	-	
1973	Other	Phased Released	9.00	8.44	0.81%	-	6.26%	-	0.53	8,145.00	0.5	-	
1974	Other	Phased Released	-	-	0.81%	-	6.19%	-	-	8,145.00	0.5	-	
1975	Other	Phased Released	-	-	0.81%	-	6.13%	-	-	8,145.00	0.5	-	
1976	Other	Phased Released	27.88	26.21	0.81%	-	6.06%	-	1.59	8,145.00	0.5	-	
1977	Other	Phased Released	-	-	0.81%	-	5.99%	-	-	8,145.00	0.5	-	
1978	Other	Phased Released	12.76	12.01	0.81%	-	5.92%	-	0.71	8,145.00	0.5	-	
1979	Other	Phased Released	58.69	55.30	0.81%	-	5.85%	-	3.24	8,145.00	0.5	-	
1980	Other	Phased Released	7.91	7.46	0.81%	-	5.78%	-	0.43	8,145.00	0.5	-	
1981	Other	Phased Released	475.54	448.69	0.81%	-	5.72%	-	25.64	8,145.00	0.5	-	
1982	Other	Phased Released	201.26	190.03	0.81%	-	5.65%	-	10.73	8,145.00	0.5	-	
1983	Other	Phased Released	158.90	150.14	0.81%	-	5.58%	-	8.38	8,145.00	0.5	-	
1984	Other	Phased Released	75.79	71.67	0.81%	-	5.51%	-	3.95	8,145.00	0.5	-	
1985	Other	Phased Released	43.00	40.69	0.81%	-	5.44%	-	2.21	8,145.00	0.5	-	
1986	Other	Phased Released	-	-	0.81%	-	5.37%	-	-	8,145.00	0.5	-	
1987	Other	Phased Released	50.95	48.28	0.81%	-	5.31%	-	2.56	8,145.00	0.5	-	
1988	Other	Phased Released	-	-	0.81%	-	5.24%	-	-	8,145.00	0.5	-	
1989	Other	Phased Released	38.00	36.06	0.81%	-	5.17%	-	1.86	8,145.00	0.5	-	
1990	Other	Phased Released	-	-	0.81%	-	5.10%	-	-	8,145.00	0.5	-	
1991	Other	Phased Released	-	-	0.81%	-	5.03%	-	-	8,145.00	0.5	-	
1992	Other	Phased Released	-	-	0.81%	-	4.96%	-	-	8,145.00	0.5	-	
1993	Other	Phased Released	48.00	47.50	0.81%	-	4.90%	-	2.33	8,145.00	0.5	-	
1994	Other	Phased Released	-	-	0.81%	-	1.05%	-	-	8,145.00	0.5	-	
1995	Other	Phased Released	-	-	0.81%	-	1.62%	-	-	8,145.00	0.5	-	
1996	Other	Phased Released	-	-	0.81%	-	2.19%	-	-	8,145.00	0.5	-	
1997	Other	Phased Released	31.16	30.12	0.81%	-	2.76%	-	0.83	8,145.00	0.5	-	
1998	Other	Phased Released	-	-	0.81%	-	3.33%	-	-	8,145.00	0.5	-	
1999	Other	Phased Released	179.00	171.01	1.11%	-	3.90%	-	6.66	8,145.00	0.5	-	
2000	Other	Phased Released	-	-	1.40%	-	4.46%	-	-	8,145.00	0.5	-	
2001	Other	Phased Released	-	-	1.70%	-	5.03%	-	-	8,145.00	0.5	-	
2002	Other	Phased Released	-	-	2.00%	-	5.60%	-	-	8,145.00	0.5	-	
2003	Other	Phased Released	-	-	2.29%	-	6.17%	-	-	8,145.00	0.5	-	
2004	Other	Phased Released	-	-	2.59%	-	6.74%	-	-	8,145.00	0.5	-	
2005	Other	Phased Released	-	-	2.88%	-	7.31%	-	-	8,145.00	0.5	-	
2006	Other	Phased Released	-	-	3.18%	-	7.88%	-	-	8,145.00	0.5	-	
2007	Other	Phased Released	-	-	3.48%	-	8.45%	-	-	8,145.00	0.5	-	
2008	Other	Phased Released	-	-	3.77%	-	9.01%	-	-	8,145.00	0.5	-	
2009	Other	Phased Released	-	-	4.07%	-	9.58%	-	-	8,145.00	0.5	-	
2010	Other	Phased Released	-	-	4.36%	-	10.15%	-	-	8,145.00	0.5	-	
2011	Other	Phased Released	-	-	4.66%	-	10.72%	-	-	8,145.00	0.5	-	
2012	Other	Phased Released	-	-	4.96%	-	12.90%	-	-	8,145.00	0.5	-	
2013	Other	Phased Released	-	-	5.21%	-	26.45%	-	-	8,145.00	0.5	-	
2014	Other	Phased Released	-	-	4.47%	-	40.01%	-	-	8,145.00	0.5	-	
2015	Other	Phased Released	-	-	3.73%	-	53.57%	-	-	8,145.00	0.5	-	
2016	Other	Phased Released	-	-	2.99%	-	67.13%	-	-	8,145.00	0.5	-	
2017	Other	Phased Released	-	-	2.26%	-	80.69%	-	-	8,145.00	0.5	-	
2018	Other	Phased Released	-	-	1.52%	-	116.71%	-	-	8,145.00	0.5	-	
2019	Other	Phased Released	-	-	0.78%	-	97.44%	-	-	8,145.00	0.5	-	

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 Water O&M Cost Projection - Deterministic Model  
 Water O&M Total - All Mine Types

Fiscal Year <u>Ending 6/30</u>	(1) - (4) Incremental Yearly Liability				(5) - (8) Incremental Yearly Liability - Three Year Delay			
	<u>Active</u>	<u>Inactive</u>	<u>Phase Released</u>	<u>Total</u>	<u>Active</u>	<u>Inactive</u>	<u>Phase Released</u>	<u>Total</u>
2022	87,839	24,038	0	111,877	0	0	0	0
2023	84,966	22,924	0	107,889	0	0	0	0
2024	81,838	22,298	0	104,136	0	0	0	0
2025	78,858	21,667	0	100,524	43,920	12,019	0	55,938
2026	75,528	21,009	0	96,537	86,402	23,481	0	109,883
2027	72,058	20,250	0	92,308	83,402	22,611	0	106,013
2028	68,716	19,600	0	88,316	80,348	21,982	0	102,330
2029	65,320	19,062	0	84,383	114,957	31,843	0	146,799
2030	62,428	18,472	0	80,900	72,058	20,250	0	92,308
2031	59,033	17,871	0	76,904	68,716	19,600	0	88,316
2032	55,440	17,343	0	72,782	65,320	19,062	0	84,383
2033	52,371	16,230	0	68,601	62,428	18,472	0	80,900
2034	49,390	15,497	0	64,886	59,033	17,871	0	76,904
2035	46,551	14,789	0	61,340	55,440	17,343	0	72,782
2036	43,955	14,154	0	58,109	52,371	16,230	0	68,601
2037	41,217	13,490	0	54,707	49,390	15,497	0	64,886
2038	38,498	12,731	0	51,229	46,551	14,789	0	61,340
2039	35,932	12,133	0	48,065	43,955	14,154	0	58,109
2040	33,377	11,570	0	44,947	41,217	13,490	0	54,707
2041	31,267	11,036	0	42,303	38,498	12,731	0	51,229

Notes: Col (1) - (3) from Exhibit E-121, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (5) - (8) based on (1) - (4) with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
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 Surface Mines

Fiscal Year <u>Ending 6/30</u>	<u>Incremental Yearly Liability</u>				<u>Incremental Yearly Liability - Three Year Delay</u>			
	<u>Active</u>	<u>Inactive</u>	<u>Phase Released</u>	<u>Total</u>	<u>Active</u>	<u>Inactive</u>	<u>Phase Released</u>	<u>Total</u>
2022	58,255	13,810	0	72,065	0	0	0	0
2023	56,987	13,114	0	70,101	0	0	0	0
2024	55,528	12,889	0	68,417	0	0	0	0
2025	54,048	12,632	0	66,680	29,127	6,905	0	36,032
2026	52,314	12,341	0	64,655	57,621	13,462	0	71,083
2027	50,456	11,895	0	62,350	56,258	13,001	0	69,259
2028	48,529	11,500	0	60,029	54,788	12,761	0	67,548
2029	46,383	11,189	0	57,572	79,338	18,657	0	97,995
2030	44,564	10,801	0	55,365	50,456	11,895	0	62,350
2031	42,198	10,381	0	52,579	48,529	11,500	0	60,029
2032	39,527	10,027	0	49,554	46,383	11,189	0	57,572
2033	37,295	9,082	0	46,377	44,564	10,801	0	55,365
2034	35,047	8,511	0	43,558	42,198	10,381	0	52,579
2035	32,888	7,960	0	40,848	39,527	10,027	0	49,554
2036	30,865	7,476	0	38,342	37,295	9,082	0	46,377
2037	28,656	6,959	0	35,615	35,047	8,511	0	43,558
2038	26,432	6,337	0	32,769	32,888	7,960	0	40,848
2039	24,240	5,864	0	30,104	30,865	7,476	0	38,342
2040	22,032	5,423	0	27,454	28,656	6,959	0	35,615
2041	20,215	5,007	0	25,222	26,432	6,337	0	32,769

Notes: Col (1) - (3) from Exhibit E-121, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (5) - (8) based on (1) - (4) with a three-year delay

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 Water O&M Cost Projection - Deterministic Model  
 Underground Mines

Fiscal Year Ending 6/30	Incremental Yearly Liability				Incremental Yearly Liability - Three Year Delay			
	(1) Active	(2) Inactive	(3) Phase Released	(4) Total	(5) Active	(6) Inactive	(7) Phase Released	(8) Total
2022	7,320	3,597	0	10,917	0	0	0	0
2023	7,118	3,492	0	10,610	0	0	0	0
2024	6,907	3,394	0	10,301	0	0	0	0
2025	6,693	3,298	0	9,991	3,660	1,799	0	5,459
2026	6,498	3,188	0	9,686	7,219	3,545	0	10,764
2027	6,305	3,092	0	9,397	7,013	3,443	0	10,456
2028	6,111	2,999	0	9,111	6,800	3,346	0	10,146
2029	5,925	2,911	0	8,836	9,844	4,837	0	14,682
2030	5,756	2,825	0	8,582	6,305	3,092	0	9,397
2031	5,598	2,744	0	8,342	6,111	2,999	0	9,111
2032	5,449	2,667	0	8,116	5,925	2,911	0	8,836
2033	5,308	2,594	0	7,902	5,756	2,825	0	8,582
2034	5,174	2,525	0	7,699	5,598	2,744	0	8,342
2035	5,047	2,460	0	7,506	5,449	2,667	0	8,116
2036	4,926	2,398	0	7,324	5,308	2,594	0	7,902
2037	4,811	2,339	0	7,151	5,174	2,525	0	7,699
2038	4,703	2,284	0	6,987	5,047	2,460	0	7,506
2039	4,602	2,231	0	6,833	4,926	2,398	0	7,324
2040	4,507	2,181	0	6,688	4,811	2,339	0	7,151
2041	4,420	2,134	0	6,554	4,703	2,284	0	6,987

Notes: Col (1) - (3) from Exhibit E-121, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (5) - (8) based on (1) - (4) with a three-year delay

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 Water O&M Cost Projection - Deterministic Model  
 Other

Fiscal Year Ending 6/30	(1) - (4) Incremental Yearly Liability				(5) - (8) Incremental Yearly Liability - Three Year Delay			
	Active	Inactive	Phase Released	Total	Active	Inactive	Phase Released	Total
2022	22,265	6,630	0	28,895	0	0	0	0
2023	20,861	6,318	0	27,178	0	0	0	0
2024	19,403	6,016	0	25,418	0	0	0	0
2025	18,117	5,736	0	23,853	11,132	3,315	0	14,447
2026	16,716	5,481	0	22,196	21,563	6,474	0	28,036
2027	15,298	5,263	0	20,561	20,132	6,167	0	26,298
2028	14,075	5,100	0	19,176	18,760	5,876	0	24,636
2029	13,012	4,962	0	17,974	25,774	8,349	0	34,123
2030	12,108	4,846	0	16,954	15,298	5,263	0	20,561
2031	11,237	4,746	0	15,983	14,075	5,100	0	19,176
2032	10,464	4,649	0	15,112	13,012	4,962	0	17,974
2033	9,768	4,553	0	14,321	12,108	4,846	0	16,954
2034	9,168	4,461	0	13,629	11,237	4,746	0	15,983
2035	8,616	4,370	0	12,985	10,464	4,649	0	15,112
2036	8,164	4,280	0	12,443	9,768	4,553	0	14,321
2037	7,749	4,192	0	11,941	9,168	4,461	0	13,629
2038	7,363	4,110	0	11,473	8,616	4,370	0	12,985
2039	7,090	4,037	0	11,127	8,164	4,280	0	12,443
2040	6,838	3,966	0	10,804	7,749	4,192	0	11,941
2041	6,632	3,895	0	10,527	7,363	4,110	0	11,473

Notes: Col (1) - (3) from Exhibit E-121, Col (12), (21), etc.  
 Col (4) = (1) + (2) + (3)  
 Col (5) - (8) based on (1) - (4) with a three-year delay

West Virginia Department of Environmental Protection Office of Special Reclamation  
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 Water Operations & Maintenance Cost Projection - Deterministic Model

Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	2022							Avg Recl Cost per Acre (10)	Adjustment Factor Permit Status (11)	Gross Cost (12)
			Current Bonded Acres (4)	Forfeiture Rate (5)	Adjustment Factor Permit Bond Size (6)	Release Rate (7)	Forfeited Acres (8)	Released Acres (9)				
1963	Surface	Active	-	0.000%	0.00	1.069%	-	-	90.00	1.00	-	
1964	Surface	Active	-	0.000%	0.00	1.090%	-	-	90.00	1.00	-	
1965	Surface	Active	-	0.000%	0.00	1.113%	-	-	90.00	1.00	-	
1966	Surface	Active	-	0.000%	0.00	1.135%	-	-	90.00	1.00	-	
1967	Surface	Active	-	0.000%	0.00	1.159%	-	-	90.00	1.00	-	
1968	Surface	Active	-	0.000%	0.00	1.182%	-	-	90.00	1.00	-	
1969	Surface	Active	-	0.000%	0.00	1.206%	-	-	90.00	1.00	-	
1970	Surface	Active	-	0.000%	0.00	1.231%	-	-	90.00	1.00	-	
1971	Surface	Active	-	0.005%	0.00	1.256%	-	-	90.00	1.00	-	
1972	Surface	Active	400.00	0.021%	1.50	1.282%	0.13	5.13	90.00	1.00	11.56	
1973	Surface	Active	-	0.038%	0.00	1.308%	-	-	90.00	1.00	-	
1974	Surface	Active	-	0.054%	0.00	1.335%	-	-	90.00	1.00	-	
1975	Surface	Active	-	0.071%	0.00	1.362%	-	-	90.00	1.00	-	
1976	Surface	Active	-	0.087%	0.00	1.390%	-	-	90.00	1.00	-	
1977	Surface	Active	1,933.27	0.103%	0.67	1.418%	1.33	27.41	90.00	1.00	119.90	
1978	Surface	Active	2,280.93	0.120%	0.50	1.447%	1.37	33.00	90.00	1.00	122.92	
1979	Surface	Active	180.00	0.136%	1.00	1.476%	0.25	2.66	90.00	1.00	22.06	
1980	Surface	Active	455.76	0.153%	0.50	1.507%	0.35	6.87	90.00	1.00	31.28	
1981	Surface	Active	1,661.03	0.169%	1.06	1.537%	2.96	25.54	90.00	1.00	266.57	
1982	Surface	Active	620.00	0.185%	1.00	1.569%	1.15	9.73	90.00	1.00	103.41	
1983	Surface	Active	1,704.33	0.202%	0.50	1.601%	1.72	27.28	90.00	1.00	154.70	
1984	Surface	Active	-	0.218%	0.00	1.633%	-	-	90.00	1.00	-	
1985	Surface	Active	2,405.91	0.234%	0.70	1.667%	3.95	40.10	90.00	1.00	355.43	
1986	Surface	Active	2,331.92	0.251%	1.07	1.701%	6.27	39.66	90.00	1.00	564.15	
1987	Surface	Active	1,371.12	0.267%	0.83	1.736%	3.05	23.80	90.00	1.00	274.85	
1988	Surface	Active	1,898.10	0.284%	0.88	1.771%	4.71	33.61	90.00	1.00	424.01	
1989	Surface	Active	2,959.93	0.300%	0.64	1.807%	5.71	53.49	90.00	1.00	513.86	
1990	Surface	Active	2,801.20	0.316%	0.75	1.844%	6.65	51.65	90.00	1.00	598.34	
1991	Surface	Active	2,094.19	0.333%	0.94	1.882%	6.58	39.40	90.00	1.00	592.47	
1992	Surface	Active	4,639.40	0.349%	0.50	1.920%	8.10	89.08	90.00	1.00	729.10	
1993	Surface	Active	4,377.78	0.366%	0.83	1.959%	13.34	85.77	90.00	1.00	1,200.46	
1994	Surface	Active	2,054.59	0.382%	0.50	1.999%	3.92	41.07	90.00	1.00	353.20	
1995	Surface	Active	6,620.84	0.398%	0.92	2.040%	24.18	135.06	90.00	1.00	2,176.15	
1996	Surface	Active	6,830.47	0.415%	0.83	2.082%	23.61	142.18	90.00	1.00	2,124.93	
1997	Surface	Active	13,199.94	0.431%	0.79	2.124%	45.06	280.37	90.00	1.00	4,055.27	
1998	Surface	Active	11,029.10	0.448%	0.66	2.167%	32.48	239.04	90.00	1.00	2,922.84	
1999	Surface	Active	2,072.61	0.464%	0.50	2.212%	4.81	45.84	90.00	1.00	432.73	
2000	Surface	Active	4,526.19	0.480%	0.50	2.257%	10.87	102.15	90.00	1.00	978.39	
2001	Surface	Active	6,826.55	0.497%	0.87	2.303%	29.45	157.20	90.00	1.00	2,650.40	
2002	Surface	Active	6,499.09	0.513%	0.63	2.350%	21.12	152.72	90.00	1.00	1,900.92	
2003	Surface	Active	6,916.12	0.530%	0.81	2.398%	29.76	165.83	90.00	1.00	2,678.05	
2004	Surface	Active	11,573.91	0.674%	0.79	2.447%	61.25	283.18	90.00	1.00	5,512.92	
2005	Surface	Active	5,236.53	0.642%	1.03	2.497%	34.74	130.74	90.00	1.00	3,126.76	
2006	Surface	Active	4,862.21	0.611%	0.90	2.548%	26.72	123.87	90.00	1.00	2,404.42	
2007	Surface	Active	6,382.38	0.579%	0.82	2.600%	30.23	165.92	90.00	1.00	2,721.00	
2008	Surface	Active	8,631.88	0.547%	0.58	2.653%	27.56	228.97	90.00	1.00	2,480.79	
2009	Surface	Active	6,181.98	0.516%	0.75	2.707%	23.92	167.33	90.00	1.00	2,152.71	
2010	Surface	Active	6,203.98	0.484%	0.92	2.438%	27.54	151.23	90.00	1.00	2,479.01	
2011	Surface	Active	2,986.04	0.453%	0.74	2.168%	9.94	64.75	90.00	1.00	894.77	
2012	Surface	Active	7,650.01	0.421%	0.86	1.899%	27.83	145.29	90.00	1.00	2,504.89	
2013	Surface	Active	8,508.13	0.390%	0.95	1.630%	31.65	138.69	90.00	1.00	2,848.59	
2014	Surface	Active	4,153.44	0.358%	0.75	1.361%	11.16	56.52	90.00	1.00	1,004.19	
2015	Surface	Active	4,371.03	0.327%	0.73	1.092%	10.43	47.72	90.00	1.00	939.03	
2016	Surface	Active	3,389.17	0.295%	0.70	0.823%	7.00	27.88	90.00	1.00	630.09	
2017	Surface	Active	1,324.50	0.264%	1.00	0.553%	3.49	7.33	90.00	1.00	314.18	
2018	Surface	Active	3,466.31	0.232%	1.00	0.284%	8.04	9.85	90.00	1.00	723.83	
2019	Surface	Active	4,158.88	0.200%	0.88	0.190%	7.30	7.90	90.00	1.00	656.59	
2020	Surface	Active	3,830.10	0.169%	0.86	0.096%	5.59	3.67	90.00	1.00	502.94	
2021	Surface	Active	3,770.84	0.000%	0.93	0.082%	-	3.09	90.00	1.00	-	

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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	2022							Avg Recl Cost per Acre (10)	Adjustment Factor Permit Status (11)	Gross Cost (12)
			Current Bonded Acres (4)	Forfeiture Rate (5)	Adjustment Factor Permit Bond Size (6)	Release Rate (7)	Forfeited Acres (8)	Released Acres (9)				
1963	Surface	Inactive	-	0.000%	0.00	0.668%	-	-	90.00	1.00	-	
1964	Surface	Inactive	-	0.000%	0.00	0.682%	-	-	90.00	1.00	-	
1965	Surface	Inactive	-	0.000%	0.00	0.695%	-	-	90.00	1.00	-	
1966	Surface	Inactive	-	0.000%	0.00	0.710%	-	-	90.00	1.00	-	
1967	Surface	Inactive	-	0.000%	0.00	0.724%	-	-	90.00	1.00	-	
1968	Surface	Inactive	-	0.000%	0.00	0.739%	-	-	90.00	1.00	-	
1969	Surface	Inactive	-	0.000%	0.00	0.754%	-	-	90.00	1.00	-	
1970	Surface	Inactive	-	0.000%	0.00	0.769%	-	-	90.00	1.00	-	
1971	Surface	Inactive	-	0.011%	0.00	0.785%	-	-	90.00	1.00	-	
1972	Surface	Inactive	-	0.048%	0.00	0.801%	-	-	90.00	1.00	-	
1973	Surface	Inactive	-	0.085%	0.00	0.817%	-	-	90.00	1.00	-	
1974	Surface	Inactive	-	0.122%	0.00	0.834%	-	-	90.00	1.00	-	
1975	Surface	Inactive	-	0.159%	0.00	0.851%	-	-	90.00	1.00	-	
1976	Surface	Inactive	438.80	0.196%	0.50	0.869%	0.43	3.81	90.00	1.00	38.64	
1977	Surface	Inactive	-	0.233%	0.00	0.886%	-	-	90.00	1.00	-	
1978	Surface	Inactive	-	0.269%	0.00	0.904%	-	-	90.00	1.00	-	
1979	Surface	Inactive	-	0.306%	0.00	0.923%	-	-	90.00	1.00	-	
1980	Surface	Inactive	-	0.343%	0.00	0.942%	-	-	90.00	1.00	-	
1981	Surface	Inactive	4.47	0.380%	0.50	0.961%	0.01	0.04	90.00	1.00	0.76	
1982	Surface	Inactive	-	0.417%	0.00	0.980%	-	-	90.00	1.00	-	
1983	Surface	Inactive	-	0.454%	0.00	1.000%	-	-	90.00	1.00	-	
1984	Surface	Inactive	-	0.491%	0.00	1.021%	-	-	90.00	1.00	-	
1985	Surface	Inactive	-	0.528%	0.00	1.042%	-	-	90.00	1.00	-	
1986	Surface	Inactive	411.07	0.564%	0.50	1.063%	1.16	4.37	90.00	1.00	104.42	
1987	Surface	Inactive	415.61	0.601%	1.00	1.085%	2.50	4.51	90.00	1.00	224.94	
1988	Surface	Inactive	1,304.38	0.638%	0.50	1.107%	4.16	14.44	90.00	1.00	374.63	
1989	Surface	Inactive	273.00	0.675%	1.00	1.129%	1.84	3.08	90.00	1.00	165.88	
1990	Surface	Inactive	81.70	0.712%	0.50	1.152%	0.29	0.94	90.00	1.00	26.18	
1991	Surface	Inactive	-	0.749%	0.00	1.176%	-	-	90.00	1.00	-	
1992	Surface	Inactive	-	0.786%	0.00	1.200%	-	-	90.00	1.00	-	
1993	Surface	Inactive	-	0.823%	0.00	1.224%	-	-	90.00	1.00	-	
1994	Surface	Inactive	-	0.860%	0.00	1.249%	-	-	90.00	1.00	-	
1995	Surface	Inactive	3,503.18	0.896%	0.50	1.275%	15.70	44.66	90.00	1.00	1,413.12	
1996	Surface	Inactive	193.90	0.933%	0.50	1.301%	0.90	2.52	90.00	1.00	81.43	
1997	Surface	Inactive	-	0.970%	0.00	1.328%	-	-	90.00	1.00	-	
1998	Surface	Inactive	846.89	1.007%	0.50	1.355%	4.26	11.47	90.00	1.00	383.79	
1999	Surface	Inactive	2,264.80	1.044%	0.50	1.382%	11.82	31.31	90.00	1.00	1,063.93	
2000	Surface	Inactive	-	1.081%	0.00	1.410%	-	-	90.00	1.00	-	
2001	Surface	Inactive	596.67	1.118%	0.50	1.439%	3.33	8.59	90.00	1.00	300.10	
2002	Surface	Inactive	765.87	1.155%	0.50	1.469%	4.42	11.25	90.00	1.00	397.91	
2003	Surface	Inactive	4,249.33	1.191%	0.50	1.499%	25.31	63.68	90.00	1.00	2,278.28	
2004	Surface	Inactive	3,700.97	1.516%	0.50	1.529%	28.05	56.59	90.00	1.00	2,524.09	
2005	Surface	Inactive	25.99	1.445%	1.50	1.560%	0.56	0.41	90.00	1.00	50.69	
2006	Surface	Inactive	244.59	1.374%	0.50	1.592%	1.68	3.89	90.00	1.00	151.19	
2007	Surface	Inactive	399.20	1.303%	0.50	1.625%	2.60	6.49	90.00	1.00	234.01	
2008	Surface	Inactive	864.07	1.232%	0.75	1.658%	7.98	14.33	90.00	1.00	718.39	
2009	Surface	Inactive	680.43	1.161%	0.50	1.692%	3.95	11.51	90.00	1.00	355.41	
2010	Surface	Inactive	5.11	1.090%	1.50	1.523%	0.08	0.08	90.00	1.00	7.52	
2011	Surface	Inactive	560.86	1.019%	0.50	1.355%	2.86	7.60	90.00	1.00	257.13	
2012	Surface	Inactive	676.78	0.948%	0.50	1.187%	3.21	8.03	90.00	1.00	288.67	
2013	Surface	Inactive	93.44	0.877%	0.50	1.019%	0.41	0.95	90.00	1.00	36.87	
2014	Surface	Inactive	2,929.61	0.806%	0.75	0.851%	17.71	24.92	90.00	1.00	1,593.68	
2015	Surface	Inactive	704.80	0.735%	0.50	0.682%	2.59	4.81	90.00	1.00	233.09	
2016	Surface	Inactive	494.54	0.664%	0.50	0.514%	1.64	2.54	90.00	1.00	147.76	
2017	Surface	Inactive	-	0.593%	0.00	0.346%	-	-	90.00	1.00	-	
2018	Surface	Inactive	351.08	0.522%	0.50	0.178%	0.92	0.62	90.00	1.00	82.48	
2019	Surface	Inactive	452.10	0.451%	1.50	0.119%	3.06	0.54	90.00	1.00	275.31	
2020	Surface	Inactive	-	0.380%	0.00	0.060%	-	-	90.00	1.00	-	
2021	Surface	Inactive	-	0.000%	0.00	0.051%	-	-	90.00	1.00	-	



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Permit Issue Year	Mine Type	Mine Status	2022							Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Surface	Phased Released	-	0.000%	0.00	3.206%	-	-	90.00	1.00	-	
1964	Surface	Phased Released	-	0.000%	0.00	3.271%	-	-	90.00	1.00	-	
1965	Surface	Phased Released	-	0.000%	0.00	3.338%	-	-	90.00	1.00	-	
1966	Surface	Phased Released	-	0.000%	0.00	3.406%	-	-	90.00	1.00	-	
1967	Surface	Phased Released	-	0.000%	0.00	3.476%	-	-	90.00	1.00	-	
1968	Surface	Phased Released	-	0.000%	0.00	3.547%	-	-	90.00	1.00	-	
1969	Surface	Phased Released	-	0.000%	0.00	3.619%	-	-	90.00	1.00	-	
1970	Surface	Phased Released	-	0.000%	0.00	3.693%	-	-	90.00	1.00	-	
1971	Surface	Phased Released	-	0.020%	0.00	3.768%	-	-	90.00	1.00	-	
1972	Surface	Phased Released	-	0.084%	0.00	3.845%	-	-	90.00	1.00	-	
1973	Surface	Phased Released	-	0.148%	0.00	3.924%	-	-	90.00	1.00	-	
1974	Surface	Phased Released	189.60	0.212%	0.00	4.004%	-	7.59	90.00	1.00	-	
1975	Surface	Phased Released	8.30	0.276%	0.00	4.086%	-	0.34	90.00	1.00	-	
1976	Surface	Phased Released	626.17	0.341%	0.00	4.169%	-	26.11	90.00	1.00	-	
1977	Surface	Phased Released	48.00	0.405%	0.00	4.254%	-	2.04	90.00	1.00	-	
1978	Surface	Phased Released	158.81	0.469%	0.00	4.341%	-	6.89	90.00	1.00	-	
1979	Surface	Phased Released	358.00	0.533%	0.00	4.429%	-	15.86	90.00	1.00	-	
1980	Surface	Phased Released	621.75	0.597%	0.00	4.520%	-	28.10	90.00	1.00	-	
1981	Surface	Phased Released	1,821.81	0.662%	0.00	4.612%	-	84.02	90.00	1.00	-	
1982	Surface	Phased Released	-	0.726%	0.00	4.706%	-	-	90.00	1.00	-	
1983	Surface	Phased Released	302.61	0.790%	0.00	4.802%	-	14.53	90.00	1.00	-	
1984	Surface	Phased Released	2,603.39	0.854%	0.00	4.900%	-	127.57	90.00	1.00	-	
1985	Surface	Phased Released	1,270.29	0.918%	0.00	5.000%	-	63.52	90.00	1.00	-	
1986	Surface	Phased Released	1,212.46	0.983%	0.00	5.102%	-	61.86	90.00	1.00	-	
1987	Surface	Phased Released	760.81	1.047%	0.00	5.207%	-	39.61	90.00	1.00	-	
1988	Surface	Phased Released	478.00	1.111%	0.00	5.313%	-	25.39	90.00	1.00	-	
1989	Surface	Phased Released	1,688.64	1.175%	0.00	5.421%	-	91.54	90.00	1.00	-	
1990	Surface	Phased Released	662.34	1.239%	0.00	5.532%	-	36.64	90.00	1.00	-	
1991	Surface	Phased Released	1,006.45	1.304%	0.00	5.645%	-	56.81	90.00	1.00	-	
1992	Surface	Phased Released	-	1.368%	0.00	5.760%	-	-	90.00	1.00	-	
1993	Surface	Phased Released	562.59	1.432%	0.00	5.877%	-	33.07	90.00	1.00	-	
1994	Surface	Phased Released	2,470.42	1.496%	0.00	5.997%	-	148.16	90.00	1.00	-	
1995	Surface	Phased Released	498.93	1.560%	0.00	6.120%	-	30.53	90.00	1.00	-	
1996	Surface	Phased Released	563.71	1.625%	0.00	6.245%	-	35.20	90.00	1.00	-	
1997	Surface	Phased Released	969.50	1.689%	0.00	6.372%	-	61.78	90.00	1.00	-	
1998	Surface	Phased Released	511.73	1.753%	0.00	6.502%	-	33.27	90.00	1.00	-	
1999	Surface	Phased Released	14.87	1.817%	0.00	6.635%	-	0.99	90.00	1.00	-	
2000	Surface	Phased Released	19.70	1.881%	0.00	6.770%	-	1.33	90.00	1.00	-	
2001	Surface	Phased Released	491.55	1.946%	0.00	6.908%	-	33.96	90.00	1.00	-	
2002	Surface	Phased Released	106.29	2.010%	0.00	7.049%	-	7.49	90.00	1.00	-	
2003	Surface	Phased Released	-	2.074%	0.00	7.193%	-	-	90.00	1.00	-	
2004	Surface	Phased Released	470.13	2.638%	0.00	7.340%	-	34.51	90.00	1.00	-	
2005	Surface	Phased Released	51.50	2.515%	0.00	7.490%	-	3.86	90.00	1.00	-	
2006	Surface	Phased Released	60.78	2.391%	0.00	7.643%	-	4.65	90.00	1.00	-	
2007	Surface	Phased Released	-	2.268%	0.00	7.799%	-	-	90.00	1.00	-	
2008	Surface	Phased Released	-	2.144%	0.00	7.958%	-	-	90.00	1.00	-	
2009	Surface	Phased Released	220.84	2.021%	0.00	8.120%	-	17.93	90.00	1.00	-	
2010	Surface	Phased Released	-	1.897%	0.00	7.313%	-	-	90.00	1.00	-	
2011	Surface	Phased Released	55.50	1.773%	0.00	6.505%	-	3.61	90.00	1.00	-	
2012	Surface	Phased Released	-	1.650%	0.00	5.698%	-	-	90.00	1.00	-	
2013	Surface	Phased Released	-	1.526%	0.00	4.890%	-	-	90.00	1.00	-	
2014	Surface	Phased Released	27.91	1.403%	0.00	4.083%	-	1.14	90.00	1.00	-	
2015	Surface	Phased Released	-	1.279%	0.00	3.275%	-	-	90.00	1.00	-	
2016	Surface	Phased Released	-	1.156%	0.00	2.468%	-	-	90.00	1.00	-	
2017	Surface	Phased Released	-	1.032%	0.00	1.660%	-	-	90.00	1.00	-	
2018	Surface	Phased Released	-	0.909%	0.00	0.852%	-	-	90.00	1.00	-	
2019	Surface	Phased Released	-	0.785%	0.00	0.570%	-	-	90.00	1.00	-	
2020	Surface	Phased Released	-	0.662%	0.00	0.287%	-	-	90.00	1.00	-	
2021	Surface	Phased Released	-	0.000%	0.00	0.246%	-	-	90.00	1.00	-	

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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	2022							Avg Recl Cost per Acre (10)	Adjustment Factor Permit Status (11)	Gross Cost (12)
			Current Bonded Acres (4)	Forfeiture Rate (5)	Adjustment Factor Permit Bond Size (6)	Release Rate (7)	Forfeited Acres (8)	Released Acres (9)				
1963	Underground	Active	-	0.152%	0.00	0.000%	-	-	140.00	1.00	-	
1964	Underground	Active	-	0.154%	0.00	0.000%	-	-	140.00	1.00	-	
1965	Underground	Active	-	0.156%	0.00	0.000%	-	-	140.00	1.00	-	
1966	Underground	Active	-	0.157%	0.00	0.000%	-	-	140.00	1.00	-	
1967	Underground	Active	-	0.159%	0.00	0.000%	-	-	140.00	1.00	-	
1968	Underground	Active	-	0.161%	0.00	0.000%	-	-	140.00	1.00	-	
1969	Underground	Active	-	0.163%	0.00	0.000%	-	-	140.00	1.00	-	
1970	Underground	Active	-	0.165%	0.00	0.000%	-	-	140.00	1.00	-	
1971	Underground	Active	-	0.167%	0.00	0.000%	-	-	140.00	1.00	-	
1972	Underground	Active	-	0.169%	0.00	0.000%	-	-	140.00	1.00	-	
1973	Underground	Active	-	0.171%	0.00	0.000%	-	-	140.00	1.00	-	
1974	Underground	Active	-	0.173%	0.00	0.120%	-	-	140.00	1.00	-	
1975	Underground	Active	-	0.175%	0.00	0.261%	-	-	140.00	1.00	-	
1976	Underground	Active	-	0.177%	0.00	0.401%	-	-	140.00	1.00	-	
1977	Underground	Active	22.53	0.178%	1.50	0.541%	0.06	0.12	140.00	1.00	8.44	
1978	Underground	Active	94.87	0.180%	0.50	0.681%	0.09	0.65	140.00	1.00	11.98	
1979	Underground	Active	745.26	0.182%	1.21	0.821%	1.65	6.12	140.00	1.00	230.88	
1980	Underground	Active	222.16	0.184%	1.10	0.961%	0.45	2.14	140.00	1.00	63.00	
1981	Underground	Active	891.30	0.186%	1.21	1.101%	2.00	9.82	140.00	1.00	279.94	
1982	Underground	Active	33.93	0.188%	1.50	1.241%	0.10	0.42	140.00	1.00	13.39	
1983	Underground	Active	6,929.70	0.190%	0.88	1.382%	11.57	95.74	140.00	1.00	1,619.57	
1984	Underground	Active	2,706.46	0.192%	1.00	1.522%	5.19	41.18	140.00	1.00	726.58	
1985	Underground	Active	49.00	0.194%	1.50	1.662%	0.14	0.81	140.00	1.00	19.93	
1986	Underground	Active	252.11	0.196%	1.10	1.802%	0.54	4.54	140.00	1.00	75.93	
1987	Underground	Active	198.36	0.197%	1.10	1.942%	0.43	3.85	140.00	1.00	60.32	
1988	Underground	Active	157.83	0.199%	1.25	2.082%	0.39	3.29	140.00	1.00	55.07	
1989	Underground	Active	124.08	0.201%	1.50	2.222%	0.37	2.76	140.00	1.00	52.45	
1990	Underground	Active	136.22	0.203%	1.30	2.363%	0.36	3.22	140.00	1.00	50.37	
1991	Underground	Active	240.32	0.205%	1.30	2.503%	0.64	6.01	140.00	1.00	89.70	
1992	Underground	Active	1,027.11	0.207%	1.08	2.643%	2.30	27.14	140.00	1.00	322.46	
1993	Underground	Active	724.45	0.209%	1.17	2.783%	1.77	20.16	140.00	1.00	247.19	
1994	Underground	Active	610.69	0.211%	1.04	2.923%	1.34	17.85	140.00	1.00	187.17	
1995	Underground	Active	334.05	0.213%	1.17	3.063%	0.83	10.23	140.00	1.00	116.06	
1996	Underground	Active	244.18	0.215%	1.20	3.203%	0.63	7.82	140.00	1.00	88.04	
1997	Underground	Active	234.02	0.217%	1.35	3.343%	0.68	7.82	140.00	1.00	95.50	
1998	Underground	Active	523.54	0.218%	1.00	3.484%	1.14	18.24	140.00	1.00	160.10	
1999	Underground	Active	359.47	0.220%	1.40	3.624%	1.11	13.03	140.00	1.00	155.24	
2000	Underground	Active	461.64	0.222%	1.20	3.764%	1.23	17.38	140.00	1.00	172.36	
2001	Underground	Active	224.71	0.224%	0.90	3.904%	0.45	8.77	140.00	1.00	63.46	
2002	Underground	Active	288.53	0.226%	1.38	4.044%	0.90	11.67	140.00	1.00	125.55	
2003	Underground	Active	969.45	0.228%	1.23	4.184%	2.71	40.56	140.00	1.00	379.71	
2004	Underground	Active	445.92	0.230%	1.13	3.383%	1.15	15.09	140.00	1.00	161.44	
2005	Underground	Active	360.91	0.232%	1.13	3.249%	0.94	11.73	140.00	1.00	131.74	
2006	Underground	Active	427.71	0.234%	0.83	3.116%	0.83	13.33	140.00	1.00	116.60	
2007	Underground	Active	482.68	0.236%	1.23	2.982%	1.40	14.39	140.00	1.00	195.37	
2008	Underground	Active	111.00	0.237%	1.50	2.848%	0.40	3.16	140.00	1.00	55.36	
2009	Underground	Active	320.63	0.239%	1.07	2.714%	0.82	8.70	140.00	1.00	115.13	
2010	Underground	Active	269.59	0.241%	1.41	2.580%	0.92	6.96	140.00	1.00	128.33	
2011	Underground	Active	192.99	0.243%	1.36	2.447%	0.64	4.72	140.00	1.00	89.18	
2012	Underground	Active	171.01	0.245%	1.33	2.313%	0.56	3.96	140.00	1.00	78.24	
2013	Underground	Active	398.29	0.247%	1.42	2.179%	1.40	8.68	140.00	1.00	196.01	
2014	Underground	Active	686.91	0.249%	1.27	2.045%	2.18	14.05	140.00	1.00	304.66	
2015	Underground	Active	132.11	0.297%	1.50	1.911%	0.59	2.53	140.00	1.00	82.37	
2016	Underground	Active	137.58	0.255%	1.50	1.778%	0.53	2.45	140.00	1.00	73.67	
2017	Underground	Active	155.37	0.213%	1.50	1.644%	0.50	2.55	140.00	1.00	69.52	
2018	Underground	Active	37.52	0.171%	1.50	1.510%	0.10	0.57	140.00	1.00	13.49	
2019	Underground	Active	79.46	0.129%	1.25	1.376%	0.13	1.09	140.00	1.00	17.97	
2020	Underground	Active	110.58	0.087%	1.50	1.242%	0.14	1.37	140.00	1.00	20.28	
2021	Underground	Active	76.19	0.000%	1.50	1.109%	-	0.84	140.00	1.00	-	

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Permit Issue Year	Mine Type	Mine Status	2022							Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Underground	Inactive	-	0.341%	0.00	0.000%	-	-	140.00	1.00	-	
1964	Underground	Inactive	-	0.346%	0.00	0.000%	-	-	140.00	1.00	-	
1965	Underground	Inactive	-	0.350%	0.00	0.000%	-	-	140.00	1.00	-	
1966	Underground	Inactive	-	0.354%	0.00	0.000%	-	-	140.00	1.00	-	
1967	Underground	Inactive	-	0.359%	0.00	0.000%	-	-	140.00	1.00	-	
1968	Underground	Inactive	-	0.363%	0.00	0.000%	-	-	140.00	1.00	-	
1969	Underground	Inactive	-	0.367%	0.00	0.000%	-	-	140.00	1.00	-	
1970	Underground	Inactive	-	0.371%	0.00	0.000%	-	-	140.00	1.00	-	
1971	Underground	Inactive	-	0.376%	0.00	0.000%	-	-	140.00	1.00	-	
1972	Underground	Inactive	-	0.380%	0.00	0.000%	-	-	140.00	1.00	-	
1973	Underground	Inactive	-	0.384%	0.00	0.000%	-	-	140.00	1.00	-	
1974	Underground	Inactive	-	0.389%	0.00	0.075%	-	-	140.00	1.00	-	
1975	Underground	Inactive	-	0.393%	0.00	0.163%	-	-	140.00	1.00	-	
1976	Underground	Inactive	103.30	0.397%	0.50	0.250%	0.21	0.26	140.00	1.00	28.72	
1977	Underground	Inactive	-	0.401%	0.00	0.338%	-	-	140.00	1.00	-	
1978	Underground	Inactive	23.02	0.406%	0.50	0.426%	0.05	0.10	140.00	1.00	6.54	
1979	Underground	Inactive	6.60	0.410%	0.50	0.513%	0.01	0.03	140.00	1.00	1.89	
1980	Underground	Inactive	-	0.414%	0.00	0.601%	-	-	140.00	1.00	-	
1981	Underground	Inactive	149.03	0.419%	1.00	0.688%	0.62	1.03	140.00	1.00	87.34	
1982	Underground	Inactive	128.47	0.423%	0.50	0.776%	0.27	1.00	140.00	1.00	38.03	
1983	Underground	Inactive	500.86	0.427%	0.75	0.863%	1.60	4.32	140.00	1.00	224.65	
1984	Underground	Inactive	300.00	0.431%	0.50	0.951%	0.65	2.85	140.00	1.00	90.61	
1985	Underground	Inactive	220.21	0.436%	0.50	1.039%	0.48	2.29	140.00	1.00	67.17	
1986	Underground	Inactive	43.54	0.440%	0.50	1.126%	0.10	0.49	140.00	1.00	13.41	
1987	Underground	Inactive	40.89	0.444%	1.50	1.214%	0.27	0.50	140.00	1.00	38.15	
1988	Underground	Inactive	154.89	0.449%	1.21	1.301%	0.84	2.02	140.00	1.00	118.12	
1989	Underground	Inactive	193.50	0.453%	0.50	1.389%	0.44	2.69	140.00	1.00	61.34	
1990	Underground	Inactive	36.13	0.457%	1.17	1.477%	0.19	0.53	140.00	1.00	26.98	
1991	Underground	Inactive	141.42	0.461%	1.00	1.564%	0.65	2.21	140.00	1.00	91.36	
1992	Underground	Inactive	9.00	0.466%	1.50	1.652%	0.06	0.15	140.00	1.00	8.80	
1993	Underground	Inactive	294.11	0.470%	1.00	1.739%	1.38	5.12	140.00	1.00	193.54	
1994	Underground	Inactive	247.11	0.474%	0.50	1.827%	0.59	4.51	140.00	1.00	82.05	
1995	Underground	Inactive	131.50	0.479%	1.00	1.914%	0.63	2.52	140.00	1.00	88.11	
1996	Underground	Inactive	45.38	0.483%	1.50	2.002%	0.33	0.91	140.00	1.00	46.02	
1997	Underground	Inactive	294.76	0.487%	1.07	2.090%	1.54	6.16	140.00	1.00	215.40	
1998	Underground	Inactive	93.26	0.491%	1.17	2.177%	0.53	2.03	140.00	1.00	74.86	
1999	Underground	Inactive	618.15	0.496%	1.06	2.265%	3.23	14.00	140.00	1.00	452.87	
2000	Underground	Inactive	76.39	0.500%	1.50	2.352%	0.57	1.80	140.00	1.00	80.22	
2001	Underground	Inactive	6.00	0.504%	1.50	2.440%	0.05	0.15	140.00	1.00	6.35	
2002	Underground	Inactive	47.21	0.509%	0.50	2.528%	0.12	1.19	140.00	1.00	16.81	
2003	Underground	Inactive	229.90	0.513%	1.00	2.615%	1.18	6.01	140.00	1.00	165.08	
2004	Underground	Inactive	181.69	0.517%	0.50	2.703%	0.47	3.84	140.00	1.00	65.78	
2005	Underground	Inactive	121.31	0.521%	1.50	2.791%	0.95	2.46	140.00	1.00	132.85	
2006	Underground	Inactive	145.55	0.526%	1.17	2.879%	0.89	2.83	140.00	1.00	124.99	
2007	Underground	Inactive	80.93	0.530%	1.25	2.967%	0.54	1.51	140.00	1.00	75.07	
2008	Underground	Inactive	95.14	0.534%	1.50	3.055%	0.76	1.69	140.00	1.00	106.76	
2009	Underground	Inactive	127.40	0.539%	1.38	3.143%	0.94	2.16	140.00	1.00	132.10	
2010	Underground	Inactive	296.02	0.543%	1.28	3.231%	2.05	4.77	140.00	1.00	287.50	
2011	Underground	Inactive	113.07	0.547%	1.50	3.319%	0.93	1.73	140.00	1.00	129.93	
2012	Underground	Inactive	95.72	0.551%	1.17	3.407%	0.62	1.38	140.00	1.00	86.22	
2013	Underground	Inactive	53.70	0.556%	1.50	3.495%	0.45	0.73	140.00	1.00	62.67	
2014	Underground	Inactive	12.00	0.560%	1.50	3.583%	0.10	0.15	140.00	1.00	14.11	
2015	Underground	Inactive	12.04	0.568%	1.50	3.671%	0.12	0.14	140.00	1.00	16.89	
2016	Underground	Inactive	-	0.574%	0.00	3.759%	-	-	140.00	1.00	-	
2017	Underground	Inactive	-	0.479%	0.00	3.847%	-	-	140.00	1.00	-	
2018	Underground	Inactive	46.96	0.385%	1.50	3.935%	0.27	0.44	140.00	1.00	37.98	
2019	Underground	Inactive	-	0.291%	0.00	4.023%	-	-	140.00	1.00	-	
2020	Underground	Inactive	-	0.197%	0.00	4.111%	-	-	140.00	1.00	-	
2021	Underground	Inactive	-	0.000%	0.00	4.199%	-	-	140.00	1.00	-	

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Permit Issue Year	Mine Type	Mine Status	2022							Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Underground	Phased Released	-	0.594%	0.00	0.000%	-	-	140.00	1.00	-	
1964	Underground	Phased Released	-	0.602%	0.00	0.000%	-	-	140.00	1.00	-	
1965	Underground	Phased Released	-	0.609%	0.00	0.000%	-	-	140.00	1.00	-	
1966	Underground	Phased Released	-	0.617%	0.00	0.000%	-	-	140.00	1.00	-	
1967	Underground	Phased Released	-	0.624%	0.00	0.000%	-	-	140.00	1.00	-	
1968	Underground	Phased Released	-	0.632%	0.00	0.000%	-	-	140.00	1.00	-	
1969	Underground	Phased Released	-	0.639%	0.00	0.000%	-	-	140.00	1.00	-	
1970	Underground	Phased Released	-	0.647%	0.00	0.000%	-	-	140.00	1.00	-	
1971	Underground	Phased Released	-	0.654%	0.00	0.000%	-	-	140.00	1.00	-	
1972	Underground	Phased Released	-	0.662%	0.00	0.000%	-	-	140.00	1.00	-	
1973	Underground	Phased Released	-	0.669%	0.00	0.000%	-	-	140.00	1.00	-	
1974	Underground	Phased Released	-	0.676%	0.00	0.361%	-	-	140.00	1.00	-	
1975	Underground	Phased Released	-	0.684%	0.00	0.782%	-	-	140.00	1.00	-	
1976	Underground	Phased Released	-	0.691%	0.00	1.202%	-	-	140.00	1.00	-	
1977	Underground	Phased Released	-	0.699%	0.00	1.622%	-	-	140.00	1.00	-	
1978	Underground	Phased Released	23.13	0.706%	0.00	2.043%	-	0.47	140.00	1.00	-	
1979	Underground	Phased Released	59.68	0.714%	0.00	2.463%	-	1.47	140.00	1.00	-	
1980	Underground	Phased Released	87.19	0.721%	0.00	2.884%	-	2.51	140.00	1.00	-	
1981	Underground	Phased Released	85.14	0.729%	0.00	3.304%	-	2.81	140.00	1.00	-	
1982	Underground	Phased Released	199.06	0.736%	0.00	3.724%	-	7.41	140.00	1.00	-	
1983	Underground	Phased Released	57.47	0.744%	0.00	4.145%	-	2.38	140.00	1.00	-	
1984	Underground	Phased Released	95.60	0.751%	0.00	4.565%	-	4.36	140.00	1.00	-	
1985	Underground	Phased Released	17.24	0.759%	0.00	4.986%	-	0.86	140.00	1.00	-	
1986	Underground	Phased Released	118.96	0.766%	0.00	5.406%	-	6.43	140.00	1.00	-	
1987	Underground	Phased Released	77.09	0.773%	0.00	5.826%	-	4.49	140.00	1.00	-	
1988	Underground	Phased Released	129.44	0.781%	0.00	6.247%	-	8.09	140.00	1.00	-	
1989	Underground	Phased Released	119.44	0.788%	0.00	6.667%	-	7.96	140.00	1.00	-	
1990	Underground	Phased Released	18.31	0.796%	0.00	7.088%	-	1.30	140.00	1.00	-	
1991	Underground	Phased Released	18.20	0.803%	0.00	7.508%	-	1.37	140.00	1.00	-	
1992	Underground	Phased Released	39.95	0.811%	0.00	7.928%	-	3.17	140.00	1.00	-	
1993	Underground	Phased Released	30.79	0.818%	0.00	8.349%	-	2.57	140.00	1.00	-	
1994	Underground	Phased Released	26.14	0.826%	0.00	8.769%	-	2.29	140.00	1.00	-	
1995	Underground	Phased Released	65.62	0.833%	0.00	9.190%	-	6.03	140.00	1.00	-	
1996	Underground	Phased Released	133.37	0.841%	0.00	9.610%	-	12.82	140.00	1.00	-	
1997	Underground	Phased Released	149.46	0.848%	0.00	10.030%	-	14.99	140.00	1.00	-	
1998	Underground	Phased Released	70.67	0.856%	0.00	10.451%	-	7.39	140.00	1.00	-	
1999	Underground	Phased Released	10.68	0.863%	0.00	10.871%	-	1.16	140.00	1.00	-	
2000	Underground	Phased Released	59.65	0.870%	0.00	11.292%	-	6.74	140.00	1.00	-	
2001	Underground	Phased Released	36.60	0.878%	0.00	11.712%	-	4.29	140.00	1.00	-	
2002	Underground	Phased Released	48.55	0.885%	0.00	12.132%	-	5.89	140.00	1.00	-	
2003	Underground	Phased Released	78.20	0.893%	0.00	12.553%	-	9.82	140.00	1.00	-	
2004	Underground	Phased Released	16.25	0.900%	0.00	10.149%	-	1.65	140.00	1.00	-	
2005	Underground	Phased Released	-	0.908%	0.00	9.748%	-	-	140.00	1.00	-	
2006	Underground	Phased Released	-	0.915%	0.00	9.347%	-	-	140.00	1.00	-	
2007	Underground	Phased Released	-	0.923%	0.00	8.945%	-	-	140.00	1.00	-	
2008	Underground	Phased Released	43.07	0.930%	0.00	8.544%	-	3.68	140.00	1.00	-	
2009	Underground	Phased Released	54.60	0.938%	0.00	8.143%	-	4.45	140.00	1.00	-	
2010	Underground	Phased Released	-	0.945%	0.00	7.741%	-	-	140.00	1.00	-	
2011	Underground	Phased Released	25.60	0.953%	0.00	7.340%	-	1.88	140.00	1.00	-	
2012	Underground	Phased Released	-	0.960%	0.00	6.938%	-	-	140.00	1.00	-	
2013	Underground	Phased Released	-	0.967%	0.00	6.537%	-	-	140.00	1.00	-	
2014	Underground	Phased Released	-	0.975%	0.00	6.136%	-	-	140.00	1.00	-	
2015	Underground	Phased Released	-	1.163%	0.00	5.734%	-	-	140.00	1.00	-	
2016	Underground	Phased Released	-	0.999%	0.00	5.333%	-	-	140.00	1.00	-	
2017	Underground	Phased Released	-	0.835%	0.00	4.932%	-	-	140.00	1.00	-	
2018	Underground	Phased Released	-	0.670%	0.00	4.530%	-	-	140.00	1.00	-	
2019	Underground	Phased Released	-	0.506%	0.00	4.129%	-	-	140.00	1.00	-	
2020	Underground	Phased Released	-	0.342%	0.00	3.727%	-	-	140.00	1.00	-	
2021	Underground	Phased Released	-	0.000%	0.00	3.326%	-	-	140.00	1.00	-	

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			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Other	Active	-	0.207%	0.00	2.292%	-	-	135.00	1.00	-	
1964	Other	Active	-	0.207%	0.00	2.269%	-	-	135.00	1.00	-	
1965	Other	Active	-	0.207%	0.00	2.247%	-	-	135.00	1.00	-	
1966	Other	Active	-	0.207%	0.00	2.224%	-	-	135.00	1.00	-	
1967	Other	Active	-	0.207%	0.00	2.201%	-	-	135.00	1.00	-	
1968	Other	Active	-	0.207%	0.00	2.178%	-	-	135.00	1.00	-	
1969	Other	Active	-	0.207%	0.00	2.156%	-	-	135.00	1.00	-	
1970	Other	Active	-	0.207%	0.00	2.133%	-	-	135.00	1.00	-	
1971	Other	Active	-	0.207%	0.00	2.110%	-	-	135.00	1.00	-	
1972	Other	Active	20.00	0.207%	1.50	2.087%	0.06	0.42	135.00	1.00	8.38	
1973	Other	Active	-	0.207%	0.00	2.064%	-	-	135.00	1.00	-	
1974	Other	Active	28.52	0.207%	1.50	2.042%	0.09	0.58	135.00	1.00	11.96	
1975	Other	Active	6.20	0.207%	1.50	2.019%	0.02	0.13	135.00	1.00	2.60	
1976	Other	Active	75.00	0.207%	1.50	1.996%	0.23	1.50	135.00	1.00	31.44	
1977	Other	Active	307.70	0.207%	1.50	1.973%	0.64	6.07	135.00	1.00	85.99	
1978	Other	Active	-	0.207%	0.00	1.951%	-	-	135.00	1.00	-	
1979	Other	Active	65.00	0.207%	1.50	1.928%	0.20	1.25	135.00	1.00	27.25	
1980	Other	Active	370.67	0.207%	1.21	1.905%	0.93	7.06	135.00	1.00	125.79	
1981	Other	Active	4,857.33	0.207%	0.94	1.882%	9.46	91.43	135.00	1.00	1,277.65	
1982	Other	Active	554.75	0.207%	0.75	1.860%	0.86	10.32	135.00	1.00	116.28	
1983	Other	Active	3,438.58	0.207%	0.87	1.837%	6.20	63.16	135.00	1.00	837.44	
1984	Other	Active	4,464.39	0.207%	0.69	1.814%	6.35	80.98	135.00	1.00	857.78	
1985	Other	Active	2,329.11	0.207%	1.00	1.791%	4.82	41.72	135.00	1.00	650.93	
1986	Other	Active	1,411.57	0.207%	0.96	1.768%	2.81	24.96	135.00	1.00	379.32	
1987	Other	Active	486.71	0.207%	1.07	1.746%	1.08	8.50	135.00	1.00	145.74	
1988	Other	Active	479.98	0.207%	1.21	1.723%	1.21	8.27	135.00	1.00	162.89	
1989	Other	Active	290.43	0.207%	1.36	1.700%	0.82	4.94	135.00	1.00	110.16	
1990	Other	Active	264.35	0.207%	1.30	1.677%	0.71	4.43	135.00	1.00	96.04	
1991	Other	Active	431.34	0.207%	1.36	1.655%	1.21	7.14	135.00	1.00	163.60	
1992	Other	Active	554.74	0.207%	1.06	1.632%	1.21	9.05	135.00	1.00	163.65	
1993	Other	Active	879.50	0.207%	0.75	0.350%	1.37	3.08	135.00	1.00	184.35	
1994	Other	Active	1,837.84	0.207%	0.83	0.540%	3.17	9.93	135.00	1.00	428.02	
1995	Other	Active	939.93	0.207%	1.00	0.730%	1.95	6.86	135.00	1.00	262.69	
1996	Other	Active	1,971.02	0.207%	0.50	0.919%	2.04	18.12	135.00	1.00	275.42	
1997	Other	Active	1,267.92	0.207%	1.00	1.109%	2.62	14.06	135.00	1.00	354.35	
1998	Other	Active	1,054.49	0.283%	0.83	1.298%	2.48	13.69	135.00	1.00	335.26	
1999	Other	Active	404.95	0.358%	1.10	1.488%	1.60	6.03	135.00	1.00	215.40	
2000	Other	Active	255.10	0.434%	1.00	1.678%	1.11	4.28	135.00	1.00	149.39	
2001	Other	Active	360.44	0.509%	0.90	1.867%	1.65	6.73	135.00	1.00	223.08	
2002	Other	Active	569.59	0.585%	1.33	2.057%	4.44	11.72	135.00	1.00	599.75	
2003	Other	Active	810.10	0.661%	0.83	2.246%	4.46	18.20	135.00	1.00	602.01	
2004	Other	Active	1,049.09	0.736%	0.93	2.436%	7.17	25.56	135.00	1.00	968.12	
2005	Other	Active	22.99	0.812%	1.00	2.626%	0.19	0.60	135.00	1.00	25.19	
2006	Other	Active	491.96	0.887%	1.07	2.815%	4.68	13.85	135.00	1.00	631.41	
2007	Other	Active	368.47	0.963%	1.10	3.005%	3.90	11.07	135.00	1.00	526.89	
2008	Other	Active	649.47	1.039%	1.28	3.194%	8.62	20.75	135.00	1.00	1,163.49	
2009	Other	Active	202.62	1.114%	1.33	3.384%	3.01	6.86	135.00	1.00	406.33	
2010	Other	Active	1,059.98	1.190%	1.06	3.574%	13.31	37.88	135.00	1.00	1,797.00	
2011	Other	Active	350.69	1.265%	0.83	4.298%	3.70	15.07	135.00	1.00	499.19	
2012	Other	Active	147.31	1.331%	1.50	8.818%	2.94	12.99	135.00	1.00	396.93	
2013	Other	Active	2,047.67	1.142%	1.03	13.337%	24.07	273.11	135.00	1.00	3,249.60	
2014	Other	Active	259.86	0.953%	1.38	17.857%	3.41	46.40	135.00	1.00	459.82	
2015	Other	Active	1,229.64	0.765%	1.10	22.376%	10.34	275.15	135.00	1.00	1,396.14	
2016	Other	Active	1,513.50	0.576%	1.33	26.896%	11.62	407.07	135.00	1.00	1,568.91	
2017	Other	Active	388.02	0.387%	1.36	38.903%	2.04	150.95	135.00	1.00	275.27	
2018	Other	Active	36.77	0.199%	1.50	32.479%	0.11	11.94	135.00	1.00	14.78	
2019	Other	Active	50.90	0.010%	1.50	22.332%	0.01	11.37	135.00	1.00	1.01	
2020	Other	Active	777.21	0.000%	1.47	12.185%	-	94.70	135.00	1.00	-	
2021	Other	Active	175.63	0.000%	1.50	2.037%	-	3.58	135.00	1.00	-	

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			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Other	Inactive	-	0.466%	0.00	1.433%	-	-	135.00	1.00	-	
1964	Other	Inactive	-	0.466%	0.00	1.418%	-	-	135.00	1.00	-	
1965	Other	Inactive	-	0.466%	0.00	1.404%	-	-	135.00	1.00	-	
1966	Other	Inactive	-	0.466%	0.00	1.390%	-	-	135.00	1.00	-	
1967	Other	Inactive	-	0.466%	0.00	1.376%	-	-	135.00	1.00	-	
1968	Other	Inactive	-	0.466%	0.00	1.361%	-	-	135.00	1.00	-	
1969	Other	Inactive	-	0.466%	0.00	1.347%	-	-	135.00	1.00	-	
1970	Other	Inactive	-	0.466%	0.00	1.333%	-	-	135.00	1.00	-	
1971	Other	Inactive	-	0.466%	0.00	1.319%	-	-	135.00	1.00	-	
1972	Other	Inactive	-	0.466%	0.00	1.305%	-	-	135.00	1.00	-	
1973	Other	Inactive	-	0.466%	0.00	1.290%	-	-	135.00	1.00	-	
1974	Other	Inactive	-	0.466%	0.00	1.276%	-	-	135.00	1.00	-	
1975	Other	Inactive	-	0.466%	0.00	1.262%	-	-	135.00	1.00	-	
1976	Other	Inactive	14.48	0.466%	1.50	1.248%	0.10	0.18	135.00	1.00	13.66	
1977	Other	Inactive	61.00	0.466%	1.50	1.233%	0.43	0.75	135.00	1.00	57.54	
1978	Other	Inactive	-	0.466%	0.00	1.219%	-	-	135.00	1.00	-	
1979	Other	Inactive	7.25	0.466%	1.50	1.205%	0.05	0.09	135.00	1.00	6.84	
1980	Other	Inactive	114.75	0.466%	0.50	1.191%	0.27	1.37	135.00	1.00	36.08	
1981	Other	Inactive	1,477.93	0.466%	0.96	1.176%	6.62	17.39	135.00	1.00	893.60	
1982	Other	Inactive	148.70	0.466%	1.17	1.162%	0.81	1.73	135.00	1.00	109.09	
1983	Other	Inactive	1,739.30	0.466%	0.75	1.148%	6.08	19.97	135.00	1.00	820.28	
1984	Other	Inactive	440.78	0.466%	0.93	1.134%	1.91	5.00	135.00	1.00	257.37	
1985	Other	Inactive	364.25	0.466%	0.83	1.120%	1.41	4.08	135.00	1.00	190.87	
1986	Other	Inactive	-	0.466%	0.00	1.105%	-	-	135.00	1.00	-	
1987	Other	Inactive	484.64	0.466%	0.50	1.091%	1.13	5.29	135.00	1.00	152.38	
1988	Other	Inactive	167.79	0.466%	1.17	1.077%	0.91	1.81	135.00	1.00	123.09	
1989	Other	Inactive	438.61	0.466%	0.90	1.063%	1.84	4.66	135.00	1.00	248.23	
1990	Other	Inactive	481.66	0.466%	1.17	1.048%	2.62	5.05	135.00	1.00	353.36	
1991	Other	Inactive	-	0.466%	0.00	1.034%	-	-	135.00	1.00	-	
1992	Other	Inactive	433.18	0.466%	1.30	1.020%	2.62	4.42	135.00	1.00	354.11	
1993	Other	Inactive	273.92	0.466%	0.90	1.019%	1.15	0.60	135.00	1.00	155.02	
1994	Other	Inactive	545.08	0.466%	1.00	1.003%	2.54	1.84	135.00	1.00	342.76	
1995	Other	Inactive	641.22	0.466%	1.17	0.986%	3.48	2.92	135.00	1.00	470.41	
1996	Other	Inactive	152.16	0.466%	0.50	0.975%	0.35	0.87	135.00	1.00	47.84	
1997	Other	Inactive	158.04	0.466%	0.83	0.963%	0.61	1.10	135.00	1.00	82.82	
1998	Other	Inactive	206.29	0.636%	1.00	0.812%	1.31	1.67	135.00	1.00	177.08	
1999	Other	Inactive	-	0.806%	0.00	0.930%	-	-	135.00	1.00	-	
2000	Other	Inactive	116.73	0.976%	0.50	1.049%	0.57	1.22	135.00	1.00	76.90	
2001	Other	Inactive	250.00	1.146%	0.50	1.167%	1.43	2.92	135.00	1.00	193.41	
2002	Other	Inactive	222.64	1.316%	1.00	1.286%	2.93	2.86	135.00	1.00	395.60	
2003	Other	Inactive	78.29	1.486%	1.50	1.404%	1.75	1.10	135.00	1.00	235.63	
2004	Other	Inactive	56.00	1.656%	1.50	1.523%	1.39	0.85	135.00	1.00	187.83	
2005	Other	Inactive	50.69	1.826%	1.50	1.641%	1.39	0.83	135.00	1.00	187.48	
2006	Other	Inactive	-	1.997%	0.00	1.760%	-	-	135.00	1.00	-	
2007	Other	Inactive	-	2.167%	0.00	1.878%	-	-	135.00	1.00	-	
2008	Other	Inactive	4.11	2.337%	1.50	1.997%	0.14	0.08	135.00	1.00	19.45	
2009	Other	Inactive	-	2.507%	0.00	2.115%	-	-	135.00	1.00	-	
2010	Other	Inactive	-	2.677%	0.00	2.234%	-	-	135.00	1.00	-	
2011	Other	Inactive	-	2.847%	0.00	2.687%	-	-	135.00	1.00	-	
2012	Other	Inactive	66.26	2.994%	0.50	5.511%	0.99	3.65	135.00	1.00	133.91	
2013	Other	Inactive	57.00	2.569%	1.50	8.336%	2.20	4.75	135.00	1.00	296.57	
2014	Other	Inactive	-	2.145%	0.00	11.161%	-	-	135.00	1.00	-	
2015	Other	Inactive	-	1.720%	0.00	13.985%	-	-	135.00	1.00	-	
2016	Other	Inactive	-	1.296%	0.00	16.810%	-	-	135.00	1.00	-	
2017	Other	Inactive	-	0.871%	0.00	24.315%	-	-	135.00	1.00	-	
2018	Other	Inactive	11.88	0.447%	1.50	20.299%	0.08	2.41	135.00	1.00	10.75	
2019	Other	Inactive	-	0.022%	0.00	13.957%	-	-	135.00	1.00	-	
2020	Other	Inactive	-	0.000%	0.00	7.615%	-	-	135.00	1.00	-	
2021	Other	Inactive	-	0.000%	0.00	1.273%	-	-	135.00	1.00	-	

West Virginia Department of Environmental Protection Office of Special Reclamation  
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Permit Issue Year	Mine Type	Mine Status	2022							Avg Recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	
1963	Other	Phased Released	-	0.811%	0.00	6.877%	-	-	135.00	1.00	-	
1964	Other	Phased Released	-	0.811%	0.00	6.808%	-	-	135.00	1.00	-	
1965	Other	Phased Released	-	0.811%	0.00	6.740%	-	-	135.00	1.00	-	
1966	Other	Phased Released	-	0.811%	0.00	6.672%	-	-	135.00	1.00	-	
1967	Other	Phased Released	-	0.811%	0.00	6.603%	-	-	135.00	1.00	-	
1968	Other	Phased Released	-	0.811%	0.00	6.535%	-	-	135.00	1.00	-	
1969	Other	Phased Released	-	0.811%	0.00	6.467%	-	-	135.00	1.00	-	
1970	Other	Phased Released	-	0.811%	0.00	6.398%	-	-	135.00	1.00	-	
1971	Other	Phased Released	-	0.811%	0.00	6.330%	-	-	135.00	1.00	-	
1972	Other	Phased Released	-	0.811%	0.00	6.262%	-	-	135.00	1.00	-	
1973	Other	Phased Released	9.00	0.811%	0.00	6.193%	-	0.56	135.00	1.00	-	
1974	Other	Phased Released	-	0.811%	0.00	6.125%	-	-	135.00	1.00	-	
1975	Other	Phased Released	-	0.811%	0.00	6.057%	-	-	135.00	1.00	-	
1976	Other	Phased Released	27.88	0.811%	0.00	5.989%	-	1.67	135.00	1.00	-	
1977	Other	Phased Released	-	0.811%	0.00	5.920%	-	-	135.00	1.00	-	
1978	Other	Phased Released	12.76	0.811%	0.00	5.852%	-	0.75	135.00	1.00	-	
1979	Other	Phased Released	58.69	0.811%	0.00	5.784%	-	3.39	135.00	1.00	-	
1980	Other	Phased Released	7.91	0.811%	0.00	5.715%	-	0.45	135.00	1.00	-	
1981	Other	Phased Released	475.54	0.811%	0.00	5.647%	-	26.85	135.00	1.00	-	
1982	Other	Phased Released	201.26	0.811%	0.00	5.579%	-	11.23	135.00	1.00	-	
1983	Other	Phased Released	158.90	0.811%	0.00	5.510%	-	8.76	135.00	1.00	-	
1984	Other	Phased Released	75.79	0.811%	0.00	5.442%	-	4.12	135.00	1.00	-	
1985	Other	Phased Released	43.00	0.811%	0.00	5.374%	-	2.31	135.00	1.00	-	
1986	Other	Phased Released	-	0.811%	0.00	5.305%	-	-	135.00	1.00	-	
1987	Other	Phased Released	50.95	0.811%	0.00	5.237%	-	2.67	135.00	1.00	-	
1988	Other	Phased Released	-	0.811%	0.00	5.169%	-	-	135.00	1.00	-	
1989	Other	Phased Released	38.00	0.811%	0.00	5.100%	-	1.94	135.00	1.00	-	
1990	Other	Phased Released	-	0.811%	0.00	5.032%	-	-	135.00	1.00	-	
1991	Other	Phased Released	-	0.811%	0.00	4.964%	-	-	135.00	1.00	-	
1992	Other	Phased Released	-	0.811%	0.00	4.895%	-	-	135.00	1.00	-	
1993	Other	Phased Released	48.00	0.811%	0.00	4.827%	-	0.50	135.00	1.00	-	
1994	Other	Phased Released	-	0.811%	0.00	4.758%	-	-	135.00	1.00	-	
1995	Other	Phased Released	-	0.811%	0.00	4.689%	-	-	135.00	1.00	-	
1996	Other	Phased Released	-	0.811%	0.00	4.620%	-	-	135.00	1.00	-	
1997	Other	Phased Released	31.16	0.811%	0.00	4.551%	-	1.04	135.00	1.00	-	
1998	Other	Phased Released	-	1.107%	0.00	3.895%	-	-	135.00	1.00	-	
1999	Other	Phased Released	179.00	1.403%	0.00	4.464%	-	7.99	135.00	1.00	-	
2000	Other	Phased Released	-	1.699%	0.00	5.033%	-	-	135.00	1.00	-	
2001	Other	Phased Released	-	1.995%	0.00	5.602%	-	-	135.00	1.00	-	
2002	Other	Phased Released	-	2.291%	0.00	6.171%	-	-	135.00	1.00	-	
2003	Other	Phased Released	-	2.587%	0.00	6.739%	-	-	135.00	1.00	-	
2004	Other	Phased Released	-	2.883%	0.00	7.308%	-	-	135.00	1.00	-	
2005	Other	Phased Released	-	3.179%	0.00	7.877%	-	-	135.00	1.00	-	
2006	Other	Phased Released	-	3.475%	0.00	8.446%	-	-	135.00	1.00	-	
2007	Other	Phased Released	-	3.771%	0.00	9.015%	-	-	135.00	1.00	-	
2008	Other	Phased Released	-	4.068%	0.00	9.583%	-	-	135.00	1.00	-	
2009	Other	Phased Released	-	4.364%	0.00	10.152%	-	-	135.00	1.00	-	
2010	Other	Phased Released	-	4.660%	0.00	10.721%	-	-	135.00	1.00	-	
2011	Other	Phased Released	-	4.956%	0.00	12.895%	-	-	135.00	1.00	-	
2012	Other	Phased Released	-	5.212%	0.00	26.454%	-	-	135.00	1.00	-	
2013	Other	Phased Released	-	4.473%	0.00	40.012%	-	-	135.00	1.00	-	
2014	Other	Phased Released	-	3.734%	0.00	53.571%	-	-	135.00	1.00	-	
2015	Other	Phased Released	-	2.995%	0.00	67.129%	-	-	135.00	1.00	-	
2016	Other	Phased Released	-	2.256%	0.00	80.688%	-	-	135.00	1.00	-	
2017	Other	Phased Released	-	1.517%	0.00	116.710%	-	-	135.00	1.00	-	
2018	Other	Phased Released	-	0.778%	0.00	97.437%	-	-	135.00	1.00	-	
2019	Other	Phased Released	-	0.039%	0.00	66.996%	-	-	135.00	1.00	-	

Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	2023								Avg recl Cost per Acre (19)	Adjustment Factor Permit Status (20)	Gross Cost (21)
			Current Bonded Acres (4)	Adjusted Acres (13)	Forfeiture Rate (14)	Adjustment Factor Permit Bond Size (15)	Release Rate (16)	Forfeited Acres (17)	Released Acres (18)				
1963	Surface	Active	-	-	0.00%	-	1.07%	-	-	90.00	1	-	
1964	Surface	Active	-	-	0.00%	-	1.07%	-	-	90.00	1	-	
1965	Surface	Active	-	-	0.00%	-	1.09%	-	-	90.00	1	-	
1966	Surface	Active	-	-	0.00%	-	1.11%	-	-	90.00	1	-	
1967	Surface	Active	-	-	0.00%	-	1.14%	-	-	90.00	1	-	
1968	Surface	Active	-	-	0.00%	-	1.16%	-	-	90.00	1	-	
1969	Surface	Active	-	-	0.00%	-	1.18%	-	-	90.00	1	-	
1970	Surface	Active	-	-	0.00%	-	1.21%	-	-	90.00	1	-	
1971	Surface	Active	-	-	0.00%	-	1.23%	-	-	90.00	1	-	
1972	Surface	Active	400.00	394.74	0.01%	1.50	1.26%	0.03	4.96	90.00	1	2.68	
1973	Surface	Active	-	-	0.02%	-	1.28%	-	-	90.00	1	-	
1974	Surface	Active	-	-	0.04%	-	1.31%	-	-	90.00	1	-	
1975	Surface	Active	-	-	0.05%	-	1.33%	-	-	90.00	1	-	
1976	Surface	Active	-	-	0.07%	-	1.36%	-	-	90.00	1	-	
1977	Surface	Active	1,933.27	1,904.52	0.09%	0.67	1.39%	1.10	26.47	90.00	1	99.39	
1978	Surface	Active	2,280.93	2,246.56	0.10%	0.50	1.42%	1.16	31.86	90.00	1	104.50	
1979	Surface	Active	180.00	177.10	0.12%	1.00	1.45%	0.21	2.56	90.00	1	19.09	
1980	Surface	Active	455.76	448.55	0.14%	0.50	1.48%	0.31	6.62	90.00	1	27.48	
1981	Surface	Active	1,661.03	1,632.53	0.15%	1.06	1.51%	2.63	24.60	90.00	1	236.57	
1982	Surface	Active	620.00	609.12	0.17%	1.00	1.54%	1.03	9.36	90.00	1	92.61	
1983	Surface	Active	1,704.33	1,675.33	0.19%	0.50	1.57%	1.55	26.28	90.00	1	139.71	
1984	Surface	Active	-	-	0.20%	-	1.60%	-	-	90.00	1	-	
1985	Surface	Active	2,405.91	2,361.86	0.22%	0.70	1.63%	3.61	38.58	90.00	1	324.53	
1986	Surface	Active	2,331.92	2,285.99	0.23%	1.07	1.67%	5.74	38.10	90.00	1	516.91	
1987	Surface	Active	1,371.12	1,344.27	0.25%	0.83	1.70%	2.81	22.86	90.00	1	252.94	
1988	Surface	Active	1,898.10	1,859.77	0.27%	0.88	1.74%	4.35	32.28	90.00	1	391.44	
1989	Surface	Active	2,959.93	2,900.73	0.28%	0.64	1.77%	5.29	51.37	90.00	1	476.07	
1990	Surface	Active	2,801.20	2,742.90	0.30%	0.75	1.81%	6.17	49.57	90.00	1	555.54	
1991	Surface	Active	2,094.19	2,048.20	0.32%	0.94	1.84%	6.12	37.77	90.00	1	550.93	
1992	Surface	Active	4,639.40	4,542.22	0.33%	0.50	1.88%	7.56	85.47	90.00	1	680.32	
1993	Surface	Active	4,377.78	4,278.67	0.35%	0.83	1.92%	12.45	82.15	90.00	1	1,120.68	
1994	Surface	Active	2,054.59	2,009.59	0.37%	0.50	1.96%	3.67	39.37	90.00	1	330.64	
1995	Surface	Active	6,620.84	6,461.60	0.38%	0.92	2.00%	22.63	129.18	90.00	1	2,036.44	
1996	Surface	Active	6,830.47	6,664.68	0.40%	0.83	2.04%	22.13	135.96	90.00	1	1,991.42	
1997	Surface	Active	13,199.94	12,874.51	0.41%	0.79	2.08%	42.28	267.99	90.00	1	3,804.94	
1998	Surface	Active	11,029.10	10,757.58	0.43%	0.66	2.12%	30.52	228.50	90.00	1	2,746.48	
1999	Surface	Active	2,072.61	2,021.96	0.45%	0.50	2.17%	4.52	43.82	90.00	1	407.24	
2000	Surface	Active	4,526.19	4,413.17	0.46%	0.50	2.21%	10.24	97.60	90.00	1	921.40	
2001	Surface	Active	6,826.55	6,639.90	0.48%	0.87	2.26%	27.70	149.85	90.00	1	2,492.87	
2002	Surface	Active	6,499.09	6,325.25	0.50%	0.63	2.30%	19.90	145.66	90.00	1	1,790.97	
2003	Surface	Active	6,916.12	6,720.53	0.51%	0.81	2.35%	28.02	157.92	90.00	1	2,521.77	
2004	Surface	Active	11,573.91	11,229.48	0.53%	0.79	2.40%	46.72	269.26	90.00	1	4,204.92	
2005	Surface	Active	5,236.53	5,071.05	0.67%	1.03	2.45%	35.30	124.07	90.00	1	3,176.70	
2006	Surface	Active	4,862.21	4,711.63	0.64%	0.90	2.50%	27.23	117.63	90.00	1	2,450.32	
2007	Surface	Active	6,382.38	6,186.23	0.61%	0.82	2.55%	30.90	157.60	90.00	1	2,781.05	
2008	Surface	Active	8,631.88	8,375.34	0.58%	0.58	2.60%	28.29	217.72	90.00	1	2,545.75	
2009	Surface	Active	6,181.98	5,990.73	0.55%	0.75	2.65%	24.60	158.91	90.00	1	2,213.65	
2010	Surface	Active	6,203.98	6,025.21	0.52%	0.92	2.71%	28.49	163.09	90.00	1	2,564.36	
2011	Surface	Active	2,986.04	2,911.35	0.48%	0.74	2.44%	10.37	70.97	90.00	1	933.15	
2012	Surface	Active	7,650.01	7,476.89	0.45%	0.86	2.17%	29.24	162.13	90.00	1	2,631.51	
2013	Surface	Active	8,508.13	8,337.79	0.42%	0.95	1.90%	33.53	158.35	90.00	1	3,017.48	
2014	Surface	Active	4,153.44	4,085.76	0.39%	0.75	1.63%	11.94	66.60	90.00	1	1,074.81	
2015	Surface	Active	4,371.03	4,312.88	0.36%	0.73	1.36%	11.29	58.69	90.00	1	1,016.00	
2016	Surface	Active	3,389.17	3,354.29	0.33%	0.70	1.09%	7.67	36.62	90.00	1	690.26	
2017	Surface	Active	1,324.50	1,313.68	0.30%	1.00	0.82%	3.88	10.81	90.00	1	348.90	
2018	Surface	Active	3,466.31	3,448.42	0.26%	1.00	0.55%	9.09	19.08	90.00	1	817.98	
2019	Surface	Active	4,158.88	4,143.68	0.23%	0.88	0.28%	8.41	11.77	90.00	1	757.12	
2020	Surface	Active	3,830.10	3,820.84	0.20%	0.86	0.19%	6.62	7.26	90.00	1	595.39	
2021	Surface	Active	3,770.84	3,767.75	0.17%	0.93	0.10%	5.91	3.61	90.00	1	531.95	



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Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Cost per Acre			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Surface	Inactive	-	-	0.00%	-	0.67%	-	-	90.00	1	-	
1964	Surface	Inactive	-	-	0.00%	-	0.67%	-	-	90.00	1	-	
1965	Surface	Inactive	-	-	0.00%	-	0.68%	-	-	90.00	1	-	
1966	Surface	Inactive	-	-	0.00%	-	0.70%	-	-	90.00	1	-	
1967	Surface	Inactive	-	-	0.00%	-	0.71%	-	-	90.00	1	-	
1968	Surface	Inactive	-	-	0.00%	-	0.72%	-	-	90.00	1	-	
1969	Surface	Inactive	-	-	0.00%	-	0.74%	-	-	90.00	1	-	
1970	Surface	Inactive	-	-	0.00%	-	0.75%	-	-	90.00	1	-	
1971	Surface	Inactive	-	-	0.00%	-	0.77%	-	-	90.00	1	-	
1972	Surface	Inactive	-	-	0.01%	-	0.79%	-	-	90.00	1	-	
1973	Surface	Inactive	-	-	0.05%	-	0.80%	-	-	90.00	1	-	
1974	Surface	Inactive	-	-	0.09%	-	0.82%	-	-	90.00	1	-	
1975	Surface	Inactive	-	-	0.12%	-	0.83%	-	-	90.00	1	-	
1976	Surface	Inactive	438.80	434.56	0.16%	0.50	0.85%	0.35	3.70	90.00	1	31.06	
1977	Surface	Inactive	-	-	0.20%	-	0.87%	-	-	90.00	1	-	
1978	Surface	Inactive	-	-	0.23%	-	0.89%	-	-	90.00	1	-	
1979	Surface	Inactive	-	-	0.27%	-	0.90%	-	-	90.00	1	-	
1980	Surface	Inactive	-	-	0.31%	-	0.92%	-	-	90.00	1	-	
1981	Surface	Inactive	4.47	4.42	0.34%	0.50	0.94%	0.01	0.04	90.00	1	0.68	
1982	Surface	Inactive	-	-	0.38%	-	0.96%	-	-	90.00	1	-	
1983	Surface	Inactive	-	-	0.42%	-	0.98%	-	-	90.00	1	-	
1984	Surface	Inactive	-	-	0.45%	-	1.00%	-	-	90.00	1	-	
1985	Surface	Inactive	-	-	0.49%	-	1.02%	-	-	90.00	1	-	
1986	Surface	Inactive	411.07	405.54	0.53%	0.50	1.04%	1.07	4.22	90.00	1	96.29	
1987	Surface	Inactive	415.61	408.60	0.56%	1.00	1.06%	2.31	4.34	90.00	1	207.59	
1988	Surface	Inactive	1,304.38	1,285.78	0.60%	0.50	1.08%	3.87	13.95	90.00	1	347.95	
1989	Surface	Inactive	273.00	268.07	0.64%	1.00	1.11%	1.71	2.97	90.00	1	153.99	
1990	Surface	Inactive	81.70	80.47	0.68%	0.50	1.13%	0.27	0.91	90.00	1	24.45	
1991	Surface	Inactive	-	-	0.71%	-	1.15%	-	-	90.00	1	-	
1992	Surface	Inactive	-	-	0.75%	-	1.18%	-	-	90.00	1	-	
1993	Surface	Inactive	-	-	0.79%	-	1.20%	-	-	90.00	1	-	
1994	Surface	Inactive	-	-	0.82%	-	1.22%	-	-	90.00	1	-	
1995	Surface	Inactive	3,503.18	3,442.81	0.86%	0.50	1.25%	14.80	43.02	90.00	1	1,331.64	
1996	Surface	Inactive	193.90	190.47	0.90%	0.50	1.27%	0.85	2.43	90.00	1	76.83	
1997	Surface	Inactive	-	-	0.93%	-	1.30%	-	-	90.00	1	-	
1998	Surface	Inactive	846.89	831.15	0.97%	0.50	1.33%	4.03	11.03	90.00	1	362.86	
1999	Surface	Inactive	2,264.80	2,221.67	1.01%	0.50	1.35%	11.19	30.10	90.00	1	1,006.80	
2000	Surface	Inactive	-	-	1.04%	-	1.38%	-	-	90.00	1	-	
2001	Surface	Inactive	596.67	584.75	1.08%	0.50	1.41%	3.16	8.25	90.00	1	284.40	
2002	Surface	Inactive	765.87	750.20	1.12%	0.50	1.44%	4.19	10.80	90.00	1	377.32	
2003	Surface	Inactive	4,249.33	4,160.34	1.15%	0.50	1.47%	24.02	61.10	90.00	1	2,161.52	
2004	Surface	Inactive	3,700.97	3,616.33	1.19%	0.50	1.50%	21.54	54.19	90.00	1	1,938.89	
2005	Surface	Inactive	25.99	25.02	1.52%	1.50	1.53%	0.57	0.38	90.00	1	51.19	
2006	Surface	Inactive	244.59	239.02	1.44%	0.50	1.56%	1.73	3.73	90.00	1	155.38	
2007	Surface	Inactive	399.20	390.11	1.37%	0.50	1.59%	2.68	6.21	90.00	1	241.14	
2008	Surface	Inactive	864.07	841.76	1.30%	0.75	1.62%	8.22	13.68	90.00	1	740.17	
2009	Surface	Inactive	680.43	664.97	1.23%	0.50	1.66%	4.10	11.02	90.00	1	368.57	
2010	Surface	Inactive	5.11	4.95	1.16%	1.50	1.69%	0.09	0.08	90.00	1	7.75	
2011	Surface	Inactive	560.86	550.40	1.09%	0.50	1.52%	3.00	8.39	90.00	1	269.92	
2012	Surface	Inactive	676.78	665.54	1.02%	0.50	1.36%	3.39	9.02	90.00	1	305.13	
2013	Surface	Inactive	93.44	92.08	0.95%	0.50	1.19%	0.44	1.09	90.00	1	39.27	
2014	Surface	Inactive	2,929.61	2,886.98	0.88%	0.75	1.02%	18.99	29.41	90.00	1	1,708.78	
2015	Surface	Inactive	704.80	697.40	0.81%	0.50	0.85%	2.81	5.93	90.00	1	252.92	
2016	Surface	Inactive	494.54	490.36	0.73%	0.50	0.68%	1.80	3.35	90.00	1	162.17	
2017	Surface	Inactive	-	-	0.66%	-	0.51%	-	-	90.00	1	-	
2018	Surface	Inactive	351.08	349.54	0.59%	0.50	0.35%	1.04	1.21	90.00	1	93.28	
2019	Surface	Inactive	452.10	448.50	0.52%	1.50	0.18%	3.51	0.80	90.00	1	316.09	
2020	Surface	Inactive	-	-	0.45%	-	0.12%	-	-	90.00	1	-	
2021	Surface	Inactive	-	-	0.38%	-	0.06%	-	-	90.00	1	-	

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Permit Issue Year (1)	Mine Type (2)	Mine Status (3)	2023								Avg recl Cost per Acre (19)	Adjustment Factor Permit Status (20)	Gross Cost (21)
			Current Bonded Acres (4)	Adjusted Acres (13)	Forfeiture Rate (14)	Adjustment Factor Permit Bond Size (15)	Release Rate (16)	Forfeited Acres (17)	Released Acres (18)				
1963	Surface	Phased Released	-	-	0.00%	-	3.21%	-	-	90.00	1	-	
1964	Surface	Phased Released	-	-	0.00%	-	3.21%	-	-	90.00	1	-	
1965	Surface	Phased Released	-	-	0.00%	-	3.27%	-	-	90.00	1	-	
1966	Surface	Phased Released	-	-	0.00%	-	3.34%	-	-	90.00	1	-	
1967	Surface	Phased Released	-	-	0.00%	-	3.41%	-	-	90.00	1	-	
1968	Surface	Phased Released	-	-	0.00%	-	3.48%	-	-	90.00	1	-	
1969	Surface	Phased Released	-	-	0.00%	-	3.55%	-	-	90.00	1	-	
1970	Surface	Phased Released	-	-	0.00%	-	3.62%	-	-	90.00	1	-	
1971	Surface	Phased Released	-	-	0.00%	-	3.69%	-	-	90.00	1	-	
1972	Surface	Phased Released	-	-	0.02%	-	3.77%	-	-	90.00	1	-	
1973	Surface	Phased Released	-	-	0.08%	-	3.85%	-	-	90.00	1	-	
1974	Surface	Phased Released	189.60	182.01	0.15%	-	3.92%	-	7.14	90.00	1	-	
1975	Surface	Phased Released	8.30	7.96	0.21%	-	4.00%	-	0.32	90.00	1	-	
1976	Surface	Phased Released	626.17	600.06	0.28%	-	4.09%	-	24.52	90.00	1	-	
1977	Surface	Phased Released	48.00	45.96	0.34%	-	4.17%	-	1.92	90.00	1	-	
1978	Surface	Phased Released	158.81	151.92	0.40%	-	4.25%	-	6.46	90.00	1	-	
1979	Surface	Phased Released	358.00	342.14	0.47%	-	4.34%	-	14.85	90.00	1	-	
1980	Surface	Phased Released	621.75	593.65	0.53%	-	4.43%	-	26.30	90.00	1	-	
1981	Surface	Phased Released	1,821.81	1,737.79	0.60%	-	4.52%	-	78.55	90.00	1	-	
1982	Surface	Phased Released	-	-	0.66%	-	4.61%	-	-	90.00	1	-	
1983	Surface	Phased Released	302.61	288.08	0.73%	-	4.71%	-	13.56	90.00	1	-	
1984	Surface	Phased Released	2,603.39	2,475.82	0.79%	-	4.80%	-	118.90	90.00	1	-	
1985	Surface	Phased Released	1,270.29	1,206.77	0.85%	-	4.90%	-	59.14	90.00	1	-	
1986	Surface	Phased Released	1,212.46	1,150.60	0.92%	-	5.00%	-	57.53	90.00	1	-	
1987	Surface	Phased Released	760.81	721.20	0.98%	-	5.10%	-	36.80	90.00	1	-	
1988	Surface	Phased Released	478.00	452.61	1.05%	-	5.21%	-	23.56	90.00	1	-	
1989	Surface	Phased Released	1,688.64	1,597.10	1.11%	-	5.31%	-	84.85	90.00	1	-	
1990	Surface	Phased Released	662.34	625.70	1.18%	-	5.42%	-	33.92	90.00	1	-	
1991	Surface	Phased Released	1,006.45	949.64	1.24%	-	5.53%	-	52.53	90.00	1	-	
1992	Surface	Phased Released	-	-	1.30%	-	5.64%	-	-	90.00	1	-	
1993	Surface	Phased Released	562.59	529.52	1.37%	-	5.76%	-	30.50	90.00	1	-	
1994	Surface	Phased Released	2,470.42	2,322.26	1.43%	-	5.88%	-	136.49	90.00	1	-	
1995	Surface	Phased Released	498.93	468.40	1.50%	-	6.00%	-	28.09	90.00	1	-	
1996	Surface	Phased Released	563.71	528.51	1.56%	-	6.12%	-	32.34	90.00	1	-	
1997	Surface	Phased Released	969.50	907.72	1.62%	-	6.24%	-	56.68	90.00	1	-	
1998	Surface	Phased Released	511.73	478.46	1.69%	-	6.37%	-	30.49	90.00	1	-	
1999	Surface	Phased Released	14.87	13.88	1.75%	-	6.50%	-	0.90	90.00	1	-	
2000	Surface	Phased Released	19.70	18.37	1.82%	-	6.63%	-	1.22	90.00	1	-	
2001	Surface	Phased Released	491.55	457.59	1.88%	-	6.77%	-	30.98	90.00	1	-	
2002	Surface	Phased Released	106.29	98.80	1.95%	-	6.91%	-	6.83	90.00	1	-	
2003	Surface	Phased Released	-	-	2.01%	-	7.05%	-	-	90.00	1	-	
2004	Surface	Phased Released	470.13	435.62	2.07%	-	7.19%	-	31.34	90.00	1	-	
2005	Surface	Phased Released	51.50	47.64	2.64%	-	7.34%	-	3.50	90.00	1	-	
2006	Surface	Phased Released	60.78	56.13	2.51%	-	7.49%	-	4.20	90.00	1	-	
2007	Surface	Phased Released	-	-	2.39%	-	7.64%	-	-	90.00	1	-	
2008	Surface	Phased Released	-	-	2.27%	-	7.80%	-	-	90.00	1	-	
2009	Surface	Phased Released	220.84	202.91	2.14%	-	7.96%	-	16.15	90.00	1	-	
2010	Surface	Phased Released	-	-	2.02%	-	8.12%	-	-	90.00	1	-	
2011	Surface	Phased Released	55.50	51.89	1.90%	-	7.31%	-	3.79	90.00	1	-	
2012	Surface	Phased Released	-	-	1.77%	-	6.51%	-	-	90.00	1	-	
2013	Surface	Phased Released	-	-	1.65%	-	5.70%	-	-	90.00	1	-	
2014	Surface	Phased Released	27.91	26.77	1.53%	-	4.89%	-	1.31	90.00	1	-	
2015	Surface	Phased Released	-	-	1.40%	-	4.08%	-	-	90.00	1	-	
2016	Surface	Phased Released	-	-	1.28%	-	3.28%	-	-	90.00	1	-	
2017	Surface	Phased Released	-	-	1.16%	-	2.47%	-	-	90.00	1	-	
2018	Surface	Phased Released	-	-	1.03%	-	1.66%	-	-	90.00	1	-	
2019	Surface	Phased Released	-	-	0.91%	-	0.85%	-	-	90.00	1	-	
2020	Surface	Phased Released	-	-	0.79%	-	0.57%	-	-	90.00	1	-	
2021	Surface	Phased Released	-	-	0.66%	-	0.29%	-	-	90.00	1	-	

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Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	2023							Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Permit Status			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Underground	Active	-	-	0.15%	-	0.00%	-	-	140.00	1	-	
1964	Underground	Active	-	-	0.15%	-	0.00%	-	-	140.00	1	-	
1965	Underground	Active	-	-	0.15%	-	0.00%	-	-	140.00	1	-	
1966	Underground	Active	-	-	0.16%	-	0.00%	-	-	140.00	1	-	
1967	Underground	Active	-	-	0.16%	-	0.00%	-	-	140.00	1	-	
1968	Underground	Active	-	-	0.16%	-	0.00%	-	-	140.00	1	-	
1969	Underground	Active	-	-	0.16%	-	0.00%	-	-	140.00	1	-	
1970	Underground	Active	-	-	0.16%	-	0.00%	-	-	140.00	1	-	
1971	Underground	Active	-	-	0.17%	-	0.00%	-	-	140.00	1	-	
1972	Underground	Active	-	-	0.17%	-	0.00%	-	-	140.00	1	-	
1973	Underground	Active	-	-	0.17%	-	0.00%	-	-	140.00	1	-	
1974	Underground	Active	-	-	0.17%	-	0.00%	-	-	140.00	1	-	
1975	Underground	Active	-	-	0.17%	-	0.12%	-	-	140.00	1	-	
1976	Underground	Active	-	-	0.17%	-	0.26%	-	-	140.00	1	-	
1977	Underground	Active	22.53	22.35	0.18%	1.50	0.40%	0.06	0.09	140.00	1	8.28	
1978	Underground	Active	94.87	94.14	0.18%	0.50	0.54%	0.08	0.51	140.00	1	11.76	
1979	Underground	Active	745.26	737.49	0.18%	1.21	0.68%	1.61	5.02	140.00	1	226.08	
1980	Underground	Active	222.16	219.57	0.18%	1.10	0.82%	0.44	1.80	140.00	1	61.62	
1981	Underground	Active	891.30	879.48	0.18%	1.21	0.96%	1.95	8.45	140.00	1	273.40	
1982	Underground	Active	33.93	33.41	0.19%	1.50	1.10%	0.09	0.37	140.00	1	13.05	
1983	Underground	Active	6,929.70	6,822.39	0.19%	0.88	1.24%	11.27	84.70	140.00	1	1,578.49	
1984	Underground	Active	2,706.46	2,660.09	0.19%	1.00	1.38%	5.05	36.75	140.00	1	707.03	
1985	Underground	Active	49.00	48.04	0.19%	1.50	1.52%	0.14	0.73	140.00	1	19.35	
1986	Underground	Active	252.11	247.02	0.19%	1.10	1.66%	0.53	4.11	140.00	1	73.67	
1987	Underground	Active	198.36	194.08	0.20%	1.10	1.80%	0.42	3.50	140.00	1	58.45	
1988	Underground	Active	157.83	154.15	0.20%	1.25	1.94%	0.38	2.99	140.00	1	53.27	
1989	Underground	Active	124.08	120.95	0.20%	1.50	2.08%	0.36	2.52	140.00	1	50.64	
1990	Underground	Active	136.22	132.64	0.20%	1.30	2.22%	0.35	2.95	140.00	1	48.59	
1991	Underground	Active	240.32	233.66	0.20%	1.30	2.36%	0.62	5.52	140.00	1	86.41	
1992	Underground	Active	1,027.11	997.66	0.21%	1.08	2.50%	2.22	24.97	140.00	1	310.33	
1993	Underground	Active	724.45	702.52	0.21%	1.17	2.64%	1.70	18.57	140.00	1	237.52	
1994	Underground	Active	610.69	591.50	0.21%	1.04	2.78%	1.28	16.46	140.00	1	179.65	
1995	Underground	Active	334.05	322.99	0.21%	1.17	2.92%	0.79	9.44	140.00	1	111.21	
1996	Underground	Active	244.18	235.73	0.21%	1.20	3.06%	0.60	7.22	140.00	1	84.24	
1997	Underground	Active	234.02	225.51	0.21%	1.35	3.20%	0.65	7.22	140.00	1	91.22	
1998	Underground	Active	523.54	504.16	0.22%	1.00	3.34%	1.09	16.86	140.00	1	152.83	
1999	Underground	Active	359.47	345.33	0.22%	1.40	3.48%	1.06	12.03	140.00	1	147.85	
2000	Underground	Active	461.64	443.03	0.22%	1.20	3.62%	1.17	16.05	140.00	1	164.00	
2001	Underground	Active	224.71	215.48	0.22%	0.90	3.76%	0.43	8.11	140.00	1	60.34	
2002	Underground	Active	288.53	275.96	0.22%	1.38	3.90%	0.85	10.77	140.00	1	119.07	
2003	Underground	Active	969.45	926.17	0.23%	1.23	4.04%	2.57	37.46	140.00	1	359.73	
2004	Underground	Active	445.92	429.68	0.23%	1.13	4.18%	1.10	17.98	140.00	1	154.27	
2005	Underground	Active	360.91	348.24	0.23%	1.13	3.38%	0.90	11.78	140.00	1	126.08	
2006	Underground	Active	427.71	413.55	0.23%	0.83	3.25%	0.80	13.44	140.00	1	111.82	
2007	Underground	Active	482.68	466.89	0.23%	1.23	3.12%	1.34	14.55	140.00	1	187.45	
2008	Underground	Active	111.00	107.44	0.24%	1.50	2.98%	0.38	3.20	140.00	1	53.15	
2009	Underground	Active	320.63	311.11	0.24%	1.07	2.85%	0.79	8.86	140.00	1	110.82	
2010	Underground	Active	269.59	261.72	0.24%	1.41	2.71%	0.88	7.10	140.00	1	123.60	
2011	Underground	Active	192.99	187.63	0.24%	1.36	2.58%	0.61	4.84	140.00	1	86.02	
2012	Underground	Active	171.01	166.50	0.24%	1.33	2.45%	0.54	4.07	140.00	1	75.58	
2013	Underground	Active	398.29	388.21	0.25%	1.42	2.31%	1.35	8.98	140.00	1	189.57	
2014	Underground	Active	686.91	670.68	0.25%	1.27	2.18%	2.11	14.61	140.00	1	295.19	
2015	Underground	Active	132.11	129.00	0.25%	1.50	2.05%	0.48	2.64	140.00	1	67.43	
2016	Underground	Active	137.58	134.61	0.30%	1.50	1.91%	0.60	2.57	140.00	1	83.93	
2017	Underground	Active	155.37	152.32	0.25%	1.50	1.78%	0.58	2.71	140.00	1	81.57	
2018	Underground	Active	37.52	36.86	0.21%	1.50	1.64%	0.12	0.61	140.00	1	16.49	
2019	Underground	Active	79.46	78.24	0.17%	1.25	1.51%	0.17	1.18	140.00	1	23.44	
2020	Underground	Active	110.58	109.06	0.13%	1.50	1.38%	0.21	1.50	140.00	1	29.60	
2021	Underground	Active	76.19	75.35	0.09%	1.50	1.24%	0.10	0.94	140.00	1	13.82	

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Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Cost per Acre			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Underground	Inactive	-	-	0.34%	-	0.00%	-	-	140.00	1	-	
1964	Underground	Inactive	-	-	0.34%	-	0.00%	-	-	140.00	1	-	
1965	Underground	Inactive	-	-	0.35%	-	0.00%	-	-	140.00	1	-	
1966	Underground	Inactive	-	-	0.35%	-	0.00%	-	-	140.00	1	-	
1967	Underground	Inactive	-	-	0.35%	-	0.00%	-	-	140.00	1	-	
1968	Underground	Inactive	-	-	0.36%	-	0.00%	-	-	140.00	1	-	
1969	Underground	Inactive	-	-	0.36%	-	0.00%	-	-	140.00	1	-	
1970	Underground	Inactive	-	-	0.37%	-	0.00%	-	-	140.00	1	-	
1971	Underground	Inactive	-	-	0.37%	-	0.00%	-	-	140.00	1	-	
1972	Underground	Inactive	-	-	0.38%	-	0.00%	-	-	140.00	1	-	
1973	Underground	Inactive	-	-	0.38%	-	0.00%	-	-	140.00	1	-	
1974	Underground	Inactive	-	-	0.38%	-	0.00%	-	-	140.00	1	-	
1975	Underground	Inactive	-	-	0.39%	-	0.08%	-	-	140.00	1	-	
1976	Underground	Inactive	103.30	102.84	0.39%	0.50	0.16%	0.20	0.17	140.00	1	28.28	
1977	Underground	Inactive	-	-	0.40%	-	0.25%	-	-	140.00	1	-	
1978	Underground	Inactive	23.02	22.88	0.40%	0.50	0.34%	0.05	0.08	140.00	1	6.43	
1979	Underground	Inactive	6.60	6.55	0.41%	0.50	0.43%	0.01	0.03	140.00	1	1.86	
1980	Underground	Inactive	-	-	0.41%	-	0.51%	-	-	140.00	1	-	
1981	Underground	Inactive	149.03	147.38	0.41%	1.00	0.60%	0.61	0.89	140.00	1	85.49	
1982	Underground	Inactive	128.47	127.20	0.42%	0.50	0.69%	0.27	0.88	140.00	1	37.27	
1983	Underground	Inactive	500.86	494.93	0.42%	0.75	0.78%	1.57	3.84	140.00	1	219.76	
1984	Underground	Inactive	300.00	296.50	0.43%	0.50	0.86%	0.63	2.56	140.00	1	88.66	
1985	Underground	Inactive	220.21	217.44	0.43%	0.50	0.95%	0.47	2.07	140.00	1	65.67	
1986	Underground	Inactive	43.54	42.95	0.44%	0.50	1.04%	0.09	0.45	140.00	1	13.10	
1987	Underground	Inactive	40.89	40.12	0.44%	1.50	1.13%	0.26	0.45	140.00	1	37.07	
1988	Underground	Inactive	154.89	152.03	0.44%	1.21	1.21%	0.82	1.85	140.00	1	114.83	
1989	Underground	Inactive	193.50	190.37	0.45%	0.50	1.30%	0.43	2.48	140.00	1	59.78	
1990	Underground	Inactive	36.13	35.40	0.45%	1.17	1.39%	0.19	0.49	140.00	1	26.19	
1991	Underground	Inactive	141.42	138.56	0.46%	1.00	1.48%	0.63	2.05	140.00	1	88.68	
1992	Underground	Inactive	9.00	8.79	0.46%	1.50	1.56%	0.06	0.14	140.00	1	8.52	
1993	Underground	Inactive	294.11	287.61	0.47%	1.00	1.65%	1.34	4.75	140.00	1	187.54	
1994	Underground	Inactive	247.11	242.01	0.47%	0.50	1.74%	0.57	4.21	140.00	1	79.63	
1995	Underground	Inactive	131.50	128.35	0.47%	1.00	1.83%	0.61	2.34	140.00	1	85.23	
1996	Underground	Inactive	45.38	44.14	0.48%	1.50	1.91%	0.32	0.85	140.00	1	44.37	
1997	Underground	Inactive	294.76	287.06	0.48%	1.07	2.00%	1.49	5.75	140.00	1	207.93	
1998	Underground	Inactive	93.26	90.69	0.49%	1.17	2.09%	0.52	1.90	140.00	1	72.17	
1999	Underground	Inactive	618.15	600.92	0.49%	1.06	2.18%	3.12	13.08	140.00	1	436.44	
2000	Underground	Inactive	76.39	74.02	0.50%	1.50	2.26%	0.55	1.68	140.00	1	77.06	
2001	Underground	Inactive	6.00	5.81	0.50%	1.50	2.35%	0.04	0.14	140.00	1	6.10	
2002	Underground	Inactive	47.21	45.90	0.50%	0.50	2.44%	0.12	1.12	140.00	1	16.20	
2003	Underground	Inactive	229.90	222.71	0.51%	1.00	2.53%	1.13	5.63	140.00	1	158.58	
2004	Underground	Inactive	181.69	177.38	0.51%	0.50	2.62%	0.45	4.64	140.00	1	63.68	
2005	Underground	Inactive	121.31	117.90	0.52%	1.50	2.11%	0.91	2.49	140.00	1	128.05	
2006	Underground	Inactive	145.55	141.82	0.52%	1.17	2.03%	0.86	2.88	140.00	1	120.80	
2007	Underground	Inactive	80.93	78.89	0.53%	1.25	1.95%	0.52	1.54	140.00	1	72.58	
2008	Underground	Inactive	95.14	92.68	0.53%	1.50	1.86%	0.74	1.73	140.00	1	103.17	
2009	Underground	Inactive	127.40	124.30	0.53%	1.38	1.78%	0.91	2.21	140.00	1	127.85	
2010	Underground	Inactive	296.02	289.19	0.54%	1.28	1.70%	1.99	4.91	140.00	1	278.65	
2011	Underground	Inactive	113.07	110.41	0.54%	1.50	1.61%	0.90	1.78	140.00	1	125.88	
2012	Underground	Inactive	95.72	93.72	0.55%	1.17	1.53%	0.60	1.43	140.00	1	83.76	
2013	Underground	Inactive	53.70	52.52	0.55%	1.50	1.45%	0.43	0.76	140.00	1	60.83	
2014	Underground	Inactive	12.00	11.75	0.56%	1.50	1.36%	0.10	0.16	140.00	1	13.71	
2015	Underground	Inactive	12.04	11.78	0.56%	1.50	1.28%	0.10	0.15	140.00	1	13.85	
2016	Underground	Inactive	-	-	0.67%	-	1.19%	-	-	140.00	1	-	
2017	Underground	Inactive	-	-	0.57%	-	1.11%	-	-	140.00	1	-	
2018	Underground	Inactive	46.96	46.25	0.48%	1.50	1.03%	0.33	0.48	140.00	1	46.56	
2019	Underground	Inactive	-	-	0.39%	-	0.94%	-	-	140.00	1	-	
2020	Underground	Inactive	-	-	0.29%	-	0.86%	-	-	140.00	1	-	
2021	Underground	Inactive	-	-	0.20%	-	0.78%	-	-	140.00	1	-	

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Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres				
			(4)	(13)	(14)	(15)	(16)	(17)	(18)				
1963	Underground	Phased Released	-	-	0.59%	-	0.00%	-	-	140.00	1	-	
1964	Underground	Phased Released	-	-	0.59%	-	0.00%	-	-	140.00	1	-	
1965	Underground	Phased Released	-	-	0.60%	-	0.00%	-	-	140.00	1	-	
1966	Underground	Phased Released	-	-	0.61%	-	0.00%	-	-	140.00	1	-	
1967	Underground	Phased Released	-	-	0.62%	-	0.00%	-	-	140.00	1	-	
1968	Underground	Phased Released	-	-	0.62%	-	0.00%	-	-	140.00	1	-	
1969	Underground	Phased Released	-	-	0.63%	-	0.00%	-	-	140.00	1	-	
1970	Underground	Phased Released	-	-	0.64%	-	0.00%	-	-	140.00	1	-	
1971	Underground	Phased Released	-	-	0.65%	-	0.00%	-	-	140.00	1	-	
1972	Underground	Phased Released	-	-	0.65%	-	0.00%	-	-	140.00	1	-	
1973	Underground	Phased Released	-	-	0.66%	-	0.00%	-	-	140.00	1	-	
1974	Underground	Phased Released	-	-	0.67%	-	0.00%	-	-	140.00	1	-	
1975	Underground	Phased Released	-	-	0.68%	-	0.36%	-	-	140.00	1	-	
1976	Underground	Phased Released	-	-	0.68%	-	0.78%	-	-	140.00	1	-	
1977	Underground	Phased Released	-	-	0.69%	-	1.20%	-	-	140.00	1	-	
1978	Underground	Phased Released	23.13	22.66	0.70%	-	1.62%	-	0.37	140.00	1	-	
1979	Underground	Phased Released	59.68	58.21	0.71%	-	2.04%	-	1.19	140.00	1	-	
1980	Underground	Phased Released	87.19	84.68	0.71%	-	2.46%	-	2.09	140.00	1	-	
1981	Underground	Phased Released	85.14	82.33	0.72%	-	2.88%	-	2.37	140.00	1	-	
1982	Underground	Phased Released	199.06	191.65	0.73%	-	3.30%	-	6.33	140.00	1	-	
1983	Underground	Phased Released	57.47	55.09	0.74%	-	3.72%	-	2.05	140.00	1	-	
1984	Underground	Phased Released	95.60	91.24	0.74%	-	4.14%	-	3.78	140.00	1	-	
1985	Underground	Phased Released	17.24	16.38	0.75%	-	4.57%	-	0.75	140.00	1	-	
1986	Underground	Phased Released	118.96	112.53	0.76%	-	4.99%	-	5.61	140.00	1	-	
1987	Underground	Phased Released	77.09	72.60	0.77%	-	5.41%	-	3.92	140.00	1	-	
1988	Underground	Phased Released	129.44	121.35	0.77%	-	5.83%	-	7.07	140.00	1	-	
1989	Underground	Phased Released	119.44	111.48	0.78%	-	6.25%	-	6.96	140.00	1	-	
1990	Underground	Phased Released	18.31	17.01	0.79%	-	6.67%	-	1.13	140.00	1	-	
1991	Underground	Phased Released	18.20	16.83	0.80%	-	7.09%	-	1.19	140.00	1	-	
1992	Underground	Phased Released	39.95	36.78	0.80%	-	7.51%	-	2.76	140.00	1	-	
1993	Underground	Phased Released	30.79	28.22	0.81%	-	7.93%	-	2.24	140.00	1	-	
1994	Underground	Phased Released	26.14	23.85	0.82%	-	8.35%	-	1.99	140.00	1	-	
1995	Underground	Phased Released	65.62	59.59	0.83%	-	8.77%	-	5.23	140.00	1	-	
1996	Underground	Phased Released	133.37	120.55	0.83%	-	9.19%	-	11.08	140.00	1	-	
1997	Underground	Phased Released	149.46	134.47	0.84%	-	9.61%	-	12.92	140.00	1	-	
1998	Underground	Phased Released	70.67	63.28	0.85%	-	10.03%	-	6.35	140.00	1	-	
1999	Underground	Phased Released	10.68	9.52	0.86%	-	10.45%	-	0.99	140.00	1	-	
2000	Underground	Phased Released	59.65	52.91	0.86%	-	10.87%	-	5.75	140.00	1	-	
2001	Underground	Phased Released	36.60	32.31	0.87%	-	11.29%	-	3.65	140.00	1	-	
2002	Underground	Phased Released	48.55	42.66	0.88%	-	11.71%	-	5.00	140.00	1	-	
2003	Underground	Phased Released	78.20	68.38	0.89%	-	12.13%	-	8.30	140.00	1	-	
2004	Underground	Phased Released	16.25	14.60	0.89%	-	12.55%	-	1.83	140.00	1	-	
2005	Underground	Phased Released	-	-	0.90%	-	10.15%	-	-	140.00	1	-	
2006	Underground	Phased Released	-	-	0.91%	-	9.75%	-	-	140.00	1	-	
2007	Underground	Phased Released	-	-	0.92%	-	9.35%	-	-	140.00	1	-	
2008	Underground	Phased Released	43.07	39.39	0.92%	-	8.95%	-	3.52	140.00	1	-	
2009	Underground	Phased Released	54.60	50.15	0.93%	-	8.54%	-	4.29	140.00	1	-	
2010	Underground	Phased Released	-	-	0.94%	-	8.14%	-	-	140.00	1	-	
2011	Underground	Phased Released	25.60	23.72	0.95%	-	7.74%	-	1.84	140.00	1	-	
2012	Underground	Phased Released	-	-	0.95%	-	7.34%	-	-	140.00	1	-	
2013	Underground	Phased Released	-	-	0.96%	-	6.94%	-	-	140.00	1	-	
2014	Underground	Phased Released	-	-	0.97%	-	6.54%	-	-	140.00	1	-	
2015	Underground	Phased Released	-	-	0.97%	-	6.14%	-	-	140.00	1	-	
2016	Underground	Phased Released	-	-	1.16%	-	5.73%	-	-	140.00	1	-	
2017	Underground	Phased Released	-	-	1.00%	-	5.33%	-	-	140.00	1	-	
2018	Underground	Phased Released	-	-	0.83%	-	4.93%	-	-	140.00	1	-	
2019	Underground	Phased Released	-	-	0.67%	-	4.53%	-	-	140.00	1	-	
2020	Underground	Phased Released	-	-	0.51%	-	4.13%	-	-	140.00	1	-	
2021	Underground	Phased Released	-	-	0.34%	-	3.73%	-	-	140.00	1	-	

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Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres	Cost per Acre			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Other	Active	-	-	0.21%	-	2.29%	-	-	135.00	1	-	
1964	Other	Active	-	-	0.21%	-	2.29%	-	-	135.00	1	-	
1965	Other	Active	-	-	0.21%	-	2.27%	-	-	135.00	1	-	
1966	Other	Active	-	-	0.21%	-	2.25%	-	-	135.00	1	-	
1967	Other	Active	-	-	0.21%	-	2.22%	-	-	135.00	1	-	
1968	Other	Active	-	-	0.21%	-	2.20%	-	-	135.00	1	-	
1969	Other	Active	-	-	0.21%	-	2.18%	-	-	135.00	1	-	
1970	Other	Active	-	-	0.21%	-	2.16%	-	-	135.00	1	-	
1971	Other	Active	-	-	0.21%	-	2.13%	-	-	135.00	1	-	
1972	Other	Active	20.00	19.52	0.21%	1.50	2.11%	0.06	0.41	135.00	1	8.18	
1973	Other	Active	-	-	0.21%	-	2.09%	-	-	135.00	1	-	
1974	Other	Active	28.52	27.85	0.21%	1.50	2.06%	0.09	0.57	135.00	1	11.67	
1975	Other	Active	6.20	6.06	0.21%	1.50	2.04%	0.02	0.12	135.00	1	2.54	
1976	Other	Active	75.00	73.27	0.21%	1.50	2.02%	0.23	1.48	135.00	1	30.72	
1977	Other	Active	307.70	300.99	0.21%	1.00	2.00%	0.62	6.01	135.00	1	84.12	
1978	Other	Active	-	-	0.21%	-	1.97%	-	-	135.00	1	-	
1979	Other	Active	65.00	63.55	0.21%	1.50	1.95%	0.20	1.24	135.00	1	26.64	
1980	Other	Active	370.67	362.68	0.21%	1.21	1.93%	0.91	6.99	135.00	1	123.08	
1981	Other	Active	4,857.33	4,756.44	0.21%	0.94	1.91%	9.27	90.61	135.00	1	1,251.11	
1982	Other	Active	554.75	543.57	0.21%	0.75	1.88%	0.84	10.23	135.00	1	113.94	
1983	Other	Active	3,438.58	3,369.22	0.21%	0.87	1.86%	6.08	62.65	135.00	1	820.55	
1984	Other	Active	4,464.39	4,377.05	0.21%	0.69	1.84%	6.23	80.40	135.00	1	841.00	
1985	Other	Active	2,329.11	2,282.57	0.21%	1.00	1.81%	4.73	41.41	135.00	1	637.92	
1986	Other	Active	1,411.57	1,383.80	0.21%	0.96	1.79%	2.75	24.79	135.00	1	371.86	
1987	Other	Active	486.71	477.13	0.21%	1.07	1.77%	1.06	8.44	135.00	1	142.87	
1988	Other	Active	479.98	470.50	0.21%	1.21	1.75%	1.18	8.21	135.00	1	159.67	
1989	Other	Active	290.43	284.68	0.21%	1.36	1.72%	0.80	4.90	135.00	1	107.97	
1990	Other	Active	264.35	259.20	0.21%	1.30	1.70%	0.70	4.41	135.00	1	94.17	
1991	Other	Active	431.34	422.99	0.21%	1.36	1.68%	1.19	7.10	135.00	1	160.43	
1992	Other	Active	554.74	544.48	0.21%	1.06	1.65%	1.19	9.01	135.00	1	160.62	
1993	Other	Active	879.50	875.05	0.21%	0.75	1.63%	1.36	14.28	135.00	1	183.42	
1994	Other	Active	1,837.84	1,824.74	0.21%	0.83	1.63%	3.15	6.39	135.00	1	424.97	
1995	Other	Active	939.93	931.13	0.21%	1.00	1.63%	1.93	5.03	135.00	1	260.23	
1996	Other	Active	1,971.02	1,950.86	0.21%	0.50	1.63%	2.02	14.23	135.00	1	272.61	
1997	Other	Active	1,267.92	1,251.24	0.21%	1.00	1.63%	2.59	11.50	135.00	1	349.69	
1998	Other	Active	1,054.49	1,038.31	0.21%	0.83	1.63%	1.79	11.51	135.00	1	241.82	
1999	Other	Active	404.95	397.33	0.28%	1.10	1.30%	1.24	5.16	135.00	1	166.75	
2000	Other	Active	255.10	249.71	0.36%	1.00	1.49%	0.89	3.72	135.00	1	120.75	
2001	Other	Active	360.44	352.06	0.43%	0.90	1.68%	1.37	5.91	135.00	1	185.55	
2002	Other	Active	569.59	553.43	0.51%	1.33	1.87%	3.76	10.33	135.00	1	507.43	
2003	Other	Active	810.10	787.44	0.58%	0.83	2.06%	3.84	16.20	135.00	1	518.21	
2004	Other	Active	1,049.09	1,016.36	0.66%	0.93	2.25%	6.23	22.83	135.00	1	841.61	
2005	Other	Active	22.99	22.20	0.74%	1.00	2.44%	0.16	0.54	135.00	1	22.06	
2006	Other	Active	491.96	473.43	0.81%	1.07	2.63%	4.12	12.43	135.00	1	555.87	
2007	Other	Active	368.47	353.50	0.89%	1.10	2.82%	3.45	9.95	135.00	1	465.80	
2008	Other	Active	649.47	620.10	0.96%	1.28	3.00%	7.63	18.63	135.00	1	1,030.02	
2009	Other	Active	202.62	192.75	1.04%	1.33	3.19%	2.67	6.16	135.00	1	360.32	
2010	Other	Active	1,059.98	1,008.79	1.11%	1.06	3.38%	11.86	34.14	135.00	1	1,601.55	
2011	Other	Active	350.69	331.92	1.19%	0.83	3.57%	3.29	11.86	135.00	1	444.24	
2012	Other	Active	147.31	131.38	1.27%	1.50	4.30%	2.49	5.65	135.00	1	336.62	
2013	Other	Active	2,047.67	1,750.49	1.33%	1.03	8.82%	23.98	154.36	135.00	1	3,237.00	
2014	Other	Active	259.86	210.05	1.14%	1.38	13.34%	3.30	28.02	135.00	1	445.25	
2015	Other	Active	1,229.64	944.15	0.95%	1.10	17.86%	9.90	168.60	135.00	1	1,336.54	
2016	Other	Active	1,513.50	1,094.81	0.76%	1.33	22.38%	11.16	244.98	135.00	1	1,506.73	
2017	Other	Active	388.02	235.03	0.58%	1.36	26.90%	1.84	63.21	135.00	1	247.98	
2018	Other	Active	36.77	24.72	0.39%	1.50	38.90%	0.14	9.62	135.00	1	19.38	
2019	Other	Active	50.90	39.52	0.20%	1.50	32.48%	0.12	12.84	135.00	1	15.89	
2020	Other	Active	777.21	682.51	0.01%	1.47	22.33%	0.10	152.42	135.00	1	13.34	
2021	Other	Active	175.63	172.05	0.00%	1.50	12.18%	-	20.96	135.00	1	-	

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Water Operations & Maintenance Cost Projection - Deterministic N

Permit Issue Year	Mine Type	Mine Status	Current Bonded Acres	2023						Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
				Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres			
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)
1963	Other	Inactive	-	-	0.47%	-	1.43%	-	-	135.00	1	-
1964	Other	Inactive	-	-	0.47%	-	1.43%	-	-	135.00	1	-
1965	Other	Inactive	-	-	0.47%	-	1.42%	-	-	135.00	1	-
1966	Other	Inactive	-	-	0.47%	-	1.40%	-	-	135.00	1	-
1967	Other	Inactive	-	-	0.47%	-	1.39%	-	-	135.00	1	-
1968	Other	Inactive	-	-	0.47%	-	1.38%	-	-	135.00	1	-
1969	Other	Inactive	-	-	0.47%	-	1.36%	-	-	135.00	1	-
1970	Other	Inactive	-	-	0.47%	-	1.35%	-	-	135.00	1	-
1971	Other	Inactive	-	-	0.47%	-	1.33%	-	-	135.00	1	-
1972	Other	Inactive	-	-	0.47%	-	1.32%	-	-	135.00	1	-
1973	Other	Inactive	-	-	0.47%	-	1.30%	-	-	135.00	1	-
1974	Other	Inactive	-	-	0.47%	-	1.29%	-	-	135.00	1	-
1975	Other	Inactive	-	-	0.47%	-	1.28%	-	-	135.00	1	-
1976	Other	Inactive	14.48	14.20	0.47%	1.50	1.26%	0.10	0.18	135.00	1	13.39
1977	Other	Inactive	61.00	59.82	0.47%	1.50	1.25%	0.42	0.75	135.00	1	56.43
1978	Other	Inactive	-	-	0.47%	-	1.23%	-	-	135.00	1	-
1979	Other	Inactive	7.25	7.11	0.47%	1.50	1.22%	0.05	0.09	135.00	1	6.71
1980	Other	Inactive	114.75	113.12	0.47%	0.50	1.20%	0.26	1.36	135.00	1	35.56
1981	Other	Inactive	1,477.93	1,453.92	0.47%	0.96	1.19%	6.51	17.31	135.00	1	879.09
1982	Other	Inactive	148.70	146.16	0.47%	1.17	1.18%	0.79	1.72	135.00	1	107.23
1983	Other	Inactive	1,739.30	1,713.26	0.47%	0.75	1.16%	5.99	19.91	135.00	1	807.99
1984	Other	Inactive	440.78	433.88	0.47%	0.93	1.15%	1.88	4.98	135.00	1	253.34
1985	Other	Inactive	364.25	358.76	0.47%	0.83	1.13%	1.39	4.07	135.00	1	187.99
1986	Other	Inactive	-	-	0.47%	-	1.12%	-	-	135.00	1	-
1987	Other	Inactive	484.64	478.22	0.47%	0.50	1.11%	1.11	5.29	135.00	1	150.36
1988	Other	Inactive	167.79	165.07	0.47%	1.17	1.09%	0.90	1.80	135.00	1	121.10
1989	Other	Inactive	438.61	432.11	0.47%	0.90	1.08%	1.81	4.65	135.00	1	244.55
1990	Other	Inactive	481.66	473.99	0.47%	1.17	1.06%	2.58	5.04	135.00	1	347.73
1991	Other	Inactive	-	-	0.47%	-	1.05%	-	-	135.00	1	-
1992	Other	Inactive	433.18	426.14	0.47%	1.30	1.03%	2.58	4.41	135.00	1	348.35
1993	Other	Inactive	273.92	272.17	0.47%	0.90	1.02%	1.14	2.78	135.00	1	154.03
1994	Other	Inactive	545.08	540.70	0.47%	1.00	0.22%	2.52	1.18	135.00	1	340.00
1995	Other	Inactive	641.22	634.81	0.47%	1.17	0.34%	3.45	2.14	135.00	1	465.71
1996	Other	Inactive	152.16	150.93	0.47%	0.50	0.46%	0.35	0.69	135.00	1	47.45
1997	Other	Inactive	158.04	156.33	0.47%	0.83	0.57%	0.61	0.90	135.00	1	81.92
1998	Other	Inactive	206.29	203.30	0.47%	1.00	0.69%	0.95	1.41	135.00	1	127.84
1999	Other	Inactive	-	-	0.64%	-	0.81%	-	-	135.00	1	-
2000	Other	Inactive	116.73	114.94	0.81%	0.50	0.93%	0.46	1.07	135.00	1	62.53
2001	Other	Inactive	250.00	245.65	0.98%	0.50	1.05%	1.20	2.58	135.00	1	161.84
2002	Other	Inactive	222.64	216.85	1.15%	1.00	1.17%	2.49	2.53	135.00	1	335.52
2003	Other	Inactive	78.29	75.45	1.32%	1.50	1.29%	1.49	0.97	135.00	1	201.08
2004	Other	Inactive	56.00	53.76	1.49%	1.50	1.40%	1.20	0.75	135.00	1	161.79
2005	Other	Inactive	50.69	48.47	1.66%	1.50	1.52%	1.20	0.74	135.00	1	162.57
2006	Other	Inactive	-	-	1.83%	-	1.64%	-	-	135.00	1	-
2007	Other	Inactive	-	-	2.00%	-	1.76%	-	-	135.00	1	-
2008	Other	Inactive	4.11	3.88	2.17%	1.50	1.88%	0.13	0.07	135.00	1	17.04
2009	Other	Inactive	-	-	2.34%	-	2.00%	-	-	135.00	1	-
2010	Other	Inactive	-	-	2.51%	-	2.12%	-	-	135.00	1	-
2011	Other	Inactive	-	-	2.68%	-	2.23%	-	-	135.00	1	-
2012	Other	Inactive	66.26	61.62	2.85%	0.50	2.69%	0.88	1.66	135.00	1	118.41
2013	Other	Inactive	57.00	50.05	2.99%	1.50	5.51%	2.25	2.76	135.00	1	303.45
2014	Other	Inactive	-	-	2.57%	-	8.34%	-	-	135.00	1	-
2015	Other	Inactive	-	-	2.14%	-	11.16%	-	-	135.00	1	-
2016	Other	Inactive	-	-	1.72%	-	13.99%	-	-	135.00	1	-
2017	Other	Inactive	-	-	1.30%	-	16.81%	-	-	135.00	1	-
2018	Other	Inactive	11.88	9.39	0.87%	1.50	24.31%	0.12	2.28	135.00	1	16.56
2019	Other	Inactive	-	-	0.45%	-	20.30%	-	-	135.00	1	-
2020	Other	Inactive	-	-	0.02%	-	13.96%	-	-	135.00	1	-
2021	Other	Inactive	-	-	0.00%	-	7.62%	-	-	135.00	1	-

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Permit Issue Year	Mine Type	Mine Status	2023								Avg recl Cost per Acre	Adjustment Factor Permit Status	Gross Cost
			Current Bonded Acres	Adjusted Acres	Forfeiture Rate	Adjustment Factor Permit Bond Size	Release Rate	Forfeited Acres	Released Acres				
			(4)	(13)	(14)	(15)	(16)	(17)	(18)				
(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	
1963	Other	Phased Released	-	-	0.81%	-	6.88%	-	-	135.00	1	-	
1964	Other	Phased Released	-	-	0.81%	-	6.88%	-	-	135.00	1	-	
1965	Other	Phased Released	-	-	0.81%	-	6.81%	-	-	135.00	1	-	
1966	Other	Phased Released	-	-	0.81%	-	6.74%	-	-	135.00	1	-	
1967	Other	Phased Released	-	-	0.81%	-	6.67%	-	-	135.00	1	-	
1968	Other	Phased Released	-	-	0.81%	-	6.60%	-	-	135.00	1	-	
1969	Other	Phased Released	-	-	0.81%	-	6.54%	-	-	135.00	1	-	
1970	Other	Phased Released	-	-	0.81%	-	6.47%	-	-	135.00	1	-	
1971	Other	Phased Released	-	-	0.81%	-	6.40%	-	-	135.00	1	-	
1972	Other	Phased Released	-	-	0.81%	-	6.33%	-	-	135.00	1	-	
1973	Other	Phased Released	9.00	8.44	0.81%	-	6.26%	-	0.53	135.00	1	-	
1974	Other	Phased Released	-	-	0.81%	-	6.19%	-	-	135.00	1	-	
1975	Other	Phased Released	-	-	0.81%	-	6.13%	-	-	135.00	1	-	
1976	Other	Phased Released	27.88	26.21	0.81%	-	6.06%	-	1.59	135.00	1	-	
1977	Other	Phased Released	-	-	0.81%	-	5.99%	-	-	135.00	1	-	
1978	Other	Phased Released	12.76	12.01	0.81%	-	5.92%	-	0.71	135.00	1	-	
1979	Other	Phased Released	58.69	55.30	0.81%	-	5.85%	-	3.24	135.00	1	-	
1980	Other	Phased Released	7.91	7.46	0.81%	-	5.78%	-	0.43	135.00	1	-	
1981	Other	Phased Released	475.54	448.69	0.81%	-	5.72%	-	25.64	135.00	1	-	
1982	Other	Phased Released	201.26	190.03	0.81%	-	5.65%	-	10.73	135.00	1	-	
1983	Other	Phased Released	158.90	150.14	0.81%	-	5.58%	-	8.38	135.00	1	-	
1984	Other	Phased Released	75.79	71.67	0.81%	-	5.51%	-	3.95	135.00	1	-	
1985	Other	Phased Released	43.00	40.69	0.81%	-	5.44%	-	2.21	135.00	1	-	
1986	Other	Phased Released	-	-	0.81%	-	5.37%	-	-	135.00	1	-	
1987	Other	Phased Released	50.95	48.28	0.81%	-	5.31%	-	2.56	135.00	1	-	
1988	Other	Phased Released	-	-	0.81%	-	5.24%	-	-	135.00	1	-	
1989	Other	Phased Released	38.00	36.06	0.81%	-	5.17%	-	1.86	135.00	1	-	
1990	Other	Phased Released	-	-	0.81%	-	5.10%	-	-	135.00	1	-	
1991	Other	Phased Released	-	-	0.81%	-	5.03%	-	-	135.00	1	-	
1992	Other	Phased Released	-	-	0.81%	-	4.96%	-	-	135.00	1	-	
1993	Other	Phased Released	48.00	47.50	0.81%	-	4.90%	-	2.33	135.00	1	-	
1994	Other	Phased Released	-	-	0.81%	-	1.05%	-	-	135.00	1	-	
1995	Other	Phased Released	-	-	0.81%	-	1.62%	-	-	135.00	1	-	
1996	Other	Phased Released	-	-	0.81%	-	2.19%	-	-	135.00	1	-	
1997	Other	Phased Released	31.16	30.12	0.81%	-	2.76%	-	0.83	135.00	1	-	
1998	Other	Phased Released	-	-	0.81%	-	3.33%	-	-	135.00	1	-	
1999	Other	Phased Released	179.00	171.01	1.11%	-	3.90%	-	6.66	135.00	1	-	
2000	Other	Phased Released	-	-	1.40%	-	4.46%	-	-	135.00	1	-	
2001	Other	Phased Released	-	-	1.70%	-	5.03%	-	-	135.00	1	-	
2002	Other	Phased Released	-	-	2.00%	-	5.60%	-	-	135.00	1	-	
2003	Other	Phased Released	-	-	2.29%	-	6.17%	-	-	135.00	1	-	
2004	Other	Phased Released	-	-	2.59%	-	6.74%	-	-	135.00	1	-	
2005	Other	Phased Released	-	-	2.88%	-	7.31%	-	-	135.00	1	-	
2006	Other	Phased Released	-	-	3.18%	-	7.88%	-	-	135.00	1	-	
2007	Other	Phased Released	-	-	3.48%	-	8.45%	-	-	135.00	1	-	
2008	Other	Phased Released	-	-	3.77%	-	9.01%	-	-	135.00	1	-	
2009	Other	Phased Released	-	-	4.07%	-	9.58%	-	-	135.00	1	-	
2010	Other	Phased Released	-	-	4.36%	-	10.15%	-	-	135.00	1	-	
2011	Other	Phased Released	-	-	4.66%	-	10.72%	-	-	135.00	1	-	
2012	Other	Phased Released	-	-	4.96%	-	12.90%	-	-	135.00	1	-	
2013	Other	Phased Released	-	-	5.21%	-	26.45%	-	-	135.00	1	-	
2014	Other	Phased Released	-	-	4.47%	-	40.01%	-	-	135.00	1	-	
2015	Other	Phased Released	-	-	3.73%	-	53.57%	-	-	135.00	1	-	
2016	Other	Phased Released	-	-	2.99%	-	67.13%	-	-	135.00	1	-	
2017	Other	Phased Released	-	-	2.26%	-	80.69%	-	-	135.00	1	-	
2018	Other	Phased Released	-	-	1.52%	-	116.71%	-	-	135.00	1	-	
2019	Other	Phased Released	-	-	0.78%	-	97.44%	-	-	135.00	1	-	



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 Results of Stochastic Forfeiture Model Simulations

Year	(1) Forfeited Acres				(5) Forfeited Bond Dollars				(9) Forfeited Permits				(13) Remaining Permitted Acres			
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean
2022	2,220	3,026	4,005	3,347	6,680,021	9,572,696	13,979,095	11,077,445	23	26	29	26	298,523	301,230	303,856	301,101
2023	1,481	2,268	3,248	2,538	3,324,367	5,994,468	10,518,711	7,564,943	13	16	19	16	271,269	274,783	278,315	274,725
2024	1,300	2,034	2,978	2,296	2,865,442	5,545,980	9,651,370	6,914,358	11	13	16	14	245,445	249,356	253,310	249,270
2025	1,075	1,754	2,664	2,034	2,473,686	4,930,476	9,167,055	6,397,015	9	11	14	11	222,494	226,676	230,734	226,484
2026	909	1,560	2,401	1,802	2,135,217	4,481,824	8,639,922	5,926,918	7	9	12	10	201,887	206,278	210,584	206,173
2027	736	1,271	2,119	1,580	1,747,260	3,684,996	7,538,730	5,311,966	6	8	10	8	183,665	188,186	192,416	187,976
2028	634	1,114	1,898	1,415	1,433,562	3,261,230	7,086,031	4,879,956	5	7	9	7	166,920	171,663	176,043	171,456
2029	504	937	1,645	1,228	1,117,593	2,741,080	6,401,219	4,337,187	4	6	8	6	152,041	156,465	160,937	156,432
2030	395	812	1,513	1,108	849,570	2,360,382	5,828,008	3,975,465	4	5	7	6	138,328	142,917	147,327	142,832
2031	323	676	1,331	995	657,939	1,918,350	5,282,125	3,650,182	3	4	6	5	125,975	130,453	134,759	130,312
2032	242	558	1,125	854	464,970	1,588,323	4,508,720	3,127,389	2	4	5	4	114,563	118,993	123,250	118,867
2033	207	492	1,003	772	377,700	1,385,637	4,140,480	2,847,424	2	3	5	4	104,186	108,396	112,540	108,306
2034	137	425	870	676	257,300	1,108,968	3,560,562	2,535,582	2	3	4	3	94,753	98,694	102,686	98,662
2035	89	334	708	567	133,970	756,290	2,569,562	2,110,219	1	2	4	3	85,818	89,964	93,798	89,809
2036	54	268	631	513	79,000	556,340	2,255,290	1,929,457	1	2	3	2	77,894	81,685	85,585	81,689
2037	35	224	530	443	51,780	429,440	1,827,670	1,675,308	1	2	3	2	70,459	74,249	78,073	74,232
2038	17	167	458	396	24,700	299,040	1,510,260	1,473,916	1	1	2	2	63,666	67,396	70,966	67,351
2039	5	115	392	329	10,000	192,000	1,162,190	1,241,337	1	1	2	2	57,489	61,029	64,571	61,030
2040	-	81	351	297	-	123,000	917,042	1,096,928	-	1	2	1	51,976	55,409	58,687	55,343
2041	-	50	284	255	-	75,000	656,880	928,606	-	1	2	1	46,903	50,221	53,547	50,253

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 Comparison of Stochastic Simulation to Deterministic Model

Year	(1) Forfeited Acres			(4) Bond Revenue			(7) Forfeited Permits			(9)
	Simulated	Simulated	Deterministic	Simulated	Simulated	Deterministic	Simulated	Simulated	Deterministic	
	Mean	Median	Mean	Mean	Median	Mean	Mean	Median	Mean	
2022	3,347	3,026	1,093	11,077,445	9,572,696	2,675,265	26	26		7
2023	2,538	2,268	1,056	7,564,943	5,994,468	2,604,576	16	16		7
2024	2,296	2,034	1,022	6,914,358	5,545,980	2,545,991	14	13		7
2025	2,034	1,754	989	6,397,015	4,930,476	2,473,609	11	11		6
2026	1,802	1,560	952	5,926,918	4,481,824	2,381,918	10	9		6
2027	1,580	1,271	912	5,311,966	3,684,996	2,292,362	8	8		6
2028	1,415	1,114	874	4,879,956	3,261,230	2,205,105	7	7		5
2029	1,228	937	836	4,337,187	2,741,080	2,124,771	6	6		5
2030	1,108	812	802	3,975,465	2,360,382	2,047,172	6	5		5
2031	995	676	762	3,650,182	1,918,350	1,957,115	5	4		4
2032	854	558	721	3,127,389	1,588,323	1,854,024	4	4		4
2033	772	492	678	2,847,424	1,385,637	1,754,954	4	3		4
2034	676	425	640	2,535,582	1,108,968	1,663,524	3	3		4
2035	567	334	604	2,110,219	756,290	1,578,753	3	2		4
2036	513	268	571	1,929,457	556,340	1,498,700	2	2		3
2037	443	224	535	1,675,308	429,440	1,413,353	2	2		3
2038	396	167	499	1,473,916	299,040	1,337,305	2	1		3
2039	329	115	466	1,241,337	192,000	1,264,288	2	1		3
2040	297	81	433	1,096,928	123,000	1,193,973	1	1		3
2041	255	50	405	928,606	75,000	1,132,168	1	1		3
Total	23,446	18,164	14,849	79,001,605	51,005,520	37,998,926	134	125		92

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 Simulated Forfeited Acres by Type

Year	Surface				Underground				Other (Incl. Prospects)				Total			
	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean
2022	771	1,433	2,403	1,774	389	589	891	738	598	754	978	835	2,220	3,026	4,005	3,347
2023	665	1,256	2,122	1,560	185	401	701	562	148	325	580	416	1,481	2,268	3,248	2,538
2024	549	1,127	1,937	1,401	118	322	598	477	142	319	568	418	1,300	2,034	2,978	2,296
2025	401	904	1,670	1,187	89	281	563	457	117	285	544	390	1,075	1,754	2,664	2,034
2026	287	757	1,468	1,014	64	244	522	427	95	252	496	361	909	1,560	2,401	1,802
2027	190	566	1,195	861	46	211	482	380	82	236	467	339	736	1,271	2,119	1,580
2028	123	460	1,079	745	30	183	471	367	61	195	429	303	634	1,114	1,898	1,415
2029	52	315	875	613	22	146	435	335	50	177	390	280	504	937	1,645	1,228
2030	0	228	752	541	15	106	402	305	34	150	372	262	395	812	1,513	1,108
2031	0	179	647	488	8	78	365	269	23	129	343	238	323	676	1,331	995
2032	0	108	485	401	0	47	282	239	16	104	303	213	242	558	1,125	854
2033	0	60	424	355	0	37	274	222	6	93	285	195	207	492	1,003	772
2034	0	0	314	302	0	21	228	197	0	76	253	177	137	425	870	676
2035	0	0	228	246	0	13	183	170	0	51	205	151	89	334	708	567
2036	0	0	166	224	0	5	119	148	0	39	182	141	54	268	631	513
2037	0	0	123	183	0	0	99	137	0	23	152	124	35	224	530	443
2038	0	0	68	166	0	0	46	111	0	18	145	118	17	167	458	396
2039	0	0	0	129	0	0	33	98	0	5	114	101	5	115	392	329
2040	0	0	0	127	0	0	16	78	0	0	94	92	0	81	351	297
2041	0	0	0	110	0	0	11	67	0	0	75	78	0	50	284	255

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Land Reclamation Costs

Year	Surface				Underground				Other (Incl. Prospects)				Total			
	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean
2022	2,070,256	3,846,330	6,452,397	4,762,289	1,045,385	1,582,230	2,392,248	1,981,540	1,605,885	2,023,523	2,624,735	2,241,731	5,961,599	8,124,823	10,754,633	8,985,560
2023	1,786,022	3,372,749	5,696,684	4,188,504	497,094	1,077,262	1,880,876	1,507,900	398,407	873,511	1,558,468	1,118,116	3,976,633	6,088,452	8,719,544	6,814,520
2024	1,474,636	3,026,854	5,201,463	3,760,604	317,307	865,268	1,606,744	1,281,570	380,639	856,743	1,526,208	1,122,867	3,491,816	5,460,928	7,996,433	6,165,041
2025	1,076,262	2,427,039	4,484,004	3,187,045	239,522	754,713	1,511,944	1,227,152	315,145	765,077	1,460,808	1,048,426	2,885,751	4,708,335	7,151,524	5,462,624
2026	771,293	2,033,377	3,942,788	2,722,979	170,873	654,818	1,400,798	1,147,264	253,981	675,788	1,332,203	968,223	2,439,900	4,187,996	6,447,182	4,838,465
2027	511,170	1,518,368	3,208,441	2,310,728	124,799	566,642	1,293,552	1,020,997	218,928	634,707	1,252,586	910,733	1,975,334	3,412,299	5,689,663	4,242,458
2028	329,288	1,234,644	2,897,243	1,999,724	80,718	491,825	1,265,326	985,657	164,040	524,125	1,151,650	813,383	1,702,196	2,992,204	5,096,976	3,798,764
2029	138,848	845,520	2,350,691	1,647,110	60,198	391,648	1,168,029	900,092	134,317	474,614	1,047,150	751,221	1,353,005	2,515,684	4,417,933	3,298,423
2030	0	612,556	2,019,852	1,452,323	39,470	283,429	1,079,900	818,971	91,585	403,287	998,766	704,345	1,060,797	2,181,495	4,062,398	2,975,639
2031	0	480,776	1,737,920	1,309,815	20,755	209,967	979,240	723,221	60,896	345,841	920,364	639,205	866,537	1,814,899	3,572,775	2,672,241
2032	0	288,906	1,302,044	1,076,663	0	126,880	758,385	642,514	42,423	278,730	812,320	572,932	650,710	1,497,666	3,021,840	2,292,108
2033	0	160,858	1,137,124	953,898	0	99,654	736,952	596,638	16,647	249,906	765,547	522,538	555,365	1,319,718	2,692,088	2,073,074
2034	0	0	844,298	809,694	0	56,090	611,583	530,151	0	203,966	680,507	475,708	367,892	1,140,481	2,335,963	1,815,553
2035	0	0	612,556	661,718	0	34,663	490,281	455,731	0	137,660	550,203	405,212	239,556	897,220	1,900,785	1,522,662
2036	0	0	444,891	600,703	0	13,479	318,441	397,641	0	104,715	488,106	378,198	145,386	718,748	1,693,376	1,376,541
2037	0	0	329,288	490,417	0	0	264,929	367,038	0	60,681	408,523	333,262	94,069	602,138	1,422,896	1,190,718
2038	0	0	183,144	446,876	0	0	123,456	297,499	0	48,330	388,822	317,802	45,585	447,133	1,229,139	1,062,176
2039	0	0	0	347,651	0	0	87,605	264,231	0	12,620	306,090	272,164	13,344	309,446	1,051,580	884,047
2040	0	0	0	341,107	0	0	42,047	210,771	0	0	251,994	246,239	0	216,411	942,489	798,118
2041	0	0	0	294,762	0	0	29,535	181,233	0	0	200,959	208,307	0	135,243	763,104	684,302

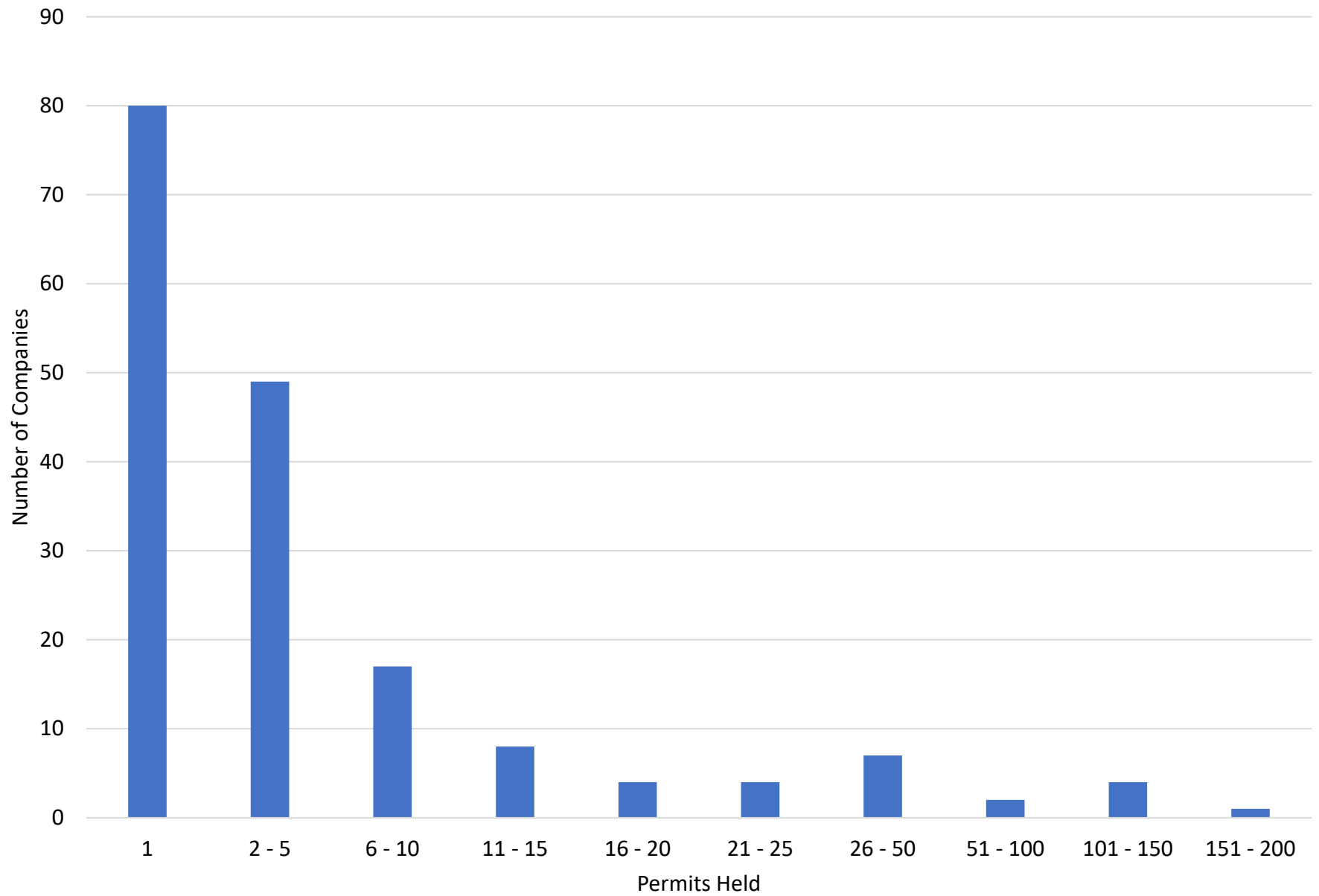
West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water Capital Costs

Year	Surface				Underground				Other (Incl. Prospects)				Total			
	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean
2022	2,690,947	4,999,512	8,386,915	6,190,089	1,358,805	2,056,605	3,109,477	2,575,633	2,087,352	2,630,204	3,411,667	2,913,833	7,748,969	10,560,757	13,979,021	11,679,555
2023	2,321,496	4,383,946	7,404,628	5,444,275	646,130	1,400,240	2,444,789	1,959,989	517,855	1,135,402	2,025,718	1,453,343	5,168,882	7,913,854	11,333,784	8,857,607
2024	1,916,752	3,934,347	6,760,933	4,888,085	412,439	1,124,687	2,088,468	1,665,802	494,760	1,113,607	1,983,786	1,459,518	4,538,710	7,098,189	10,393,874	8,013,406
2025	1,398,940	3,154,698	5,828,370	4,142,566	311,334	980,987	1,965,245	1,595,069	409,630	994,458	1,898,778	1,362,759	3,750,939	6,119,959	9,295,650	7,100,394
2026	1,002,537	2,643,012	5,124,891	3,539,365	222,104	851,141	1,820,777	1,491,229	330,128	878,398	1,731,616	1,258,510	3,171,415	5,443,615	8,380,136	6,289,104
2027	664,426	1,973,595	4,170,376	3,003,516	162,215	736,530	1,681,377	1,327,106	284,566	825,001	1,628,129	1,183,784	2,567,567	4,435,354	7,395,502	5,514,406
2028	428,014	1,604,807	3,765,876	2,599,269	104,918	639,281	1,644,689	1,281,171	213,222	681,265	1,496,931	1,057,246	2,212,538	3,889,308	6,625,119	4,937,686
2029	180,477	1,099,018	3,055,460	2,140,937	78,246	509,069	1,518,220	1,169,952	174,587	616,910	1,361,100	976,447	1,758,655	3,269,921	5,742,490	4,287,335
2030	0	796,209	2,625,431	1,887,749	51,303	368,404	1,403,669	1,064,510	119,044	524,198	1,298,210	915,517	1,378,838	2,835,538	5,280,361	3,867,776
2031	0	624,919	2,258,972	1,702,516	26,978	272,918	1,272,829	940,052	79,153	449,529	1,196,302	830,847	1,126,336	2,359,031	4,643,942	3,473,415
2032	0	375,524	1,692,414	1,399,462	0	164,920	985,759	835,148	55,142	362,297	1,055,865	744,704	845,802	1,946,687	3,927,829	2,979,314
2033	0	209,086	1,478,050	1,239,890	0	129,531	957,900	775,519	21,638	324,832	995,069	679,202	721,872	1,715,387	3,499,214	2,694,610
2034	0	0	1,097,431	1,052,452	0	72,906	794,943	689,098	0	265,118	884,532	618,331	478,191	1,482,412	3,036,317	2,359,881
2035	0	0	796,209	860,110	0	45,056	637,274	592,366	0	178,932	715,162	526,700	311,378	1,166,218	2,470,667	1,979,176
2036	0	0	578,276	780,802	0	17,520	413,914	516,859	0	136,110	634,447	491,586	188,975	934,238	2,201,073	1,789,248
2037	0	0	428,014	637,451	0	0	344,358	477,082	0	78,874	531,004	433,179	122,272	782,667	1,849,499	1,547,712
2038	0	0	238,053	580,856	0	0	160,470	386,693	0	62,820	505,396	413,083	59,251	581,190	1,597,652	1,380,631
2039	0	0	0	451,882	0	0	113,870	343,452	0	16,403	397,860	353,763	17,345	402,223	1,366,859	1,149,097
2040	0	0	0	443,376	0	0	54,653	273,963	0	0	327,545	320,065	0	281,294	1,225,060	1,037,404
2041	0	0	0	383,136	0	0	38,390	235,569	0	0	261,209	270,760	0	175,791	991,893	889,466

West Virginia Department of Environmental Protection Office of Special Reclamation  
 Actuarial Reserve Study as of June 30, 2021  
 Water O&M Costs

Year	Surface				Underground				Other (Incl. Prospects)				Total			
	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean	25%	50%	75%	Mean
2022	69,394	128,927	216,281	159,630	35,041	53,036	80,187	66,420	53,829	67,828	87,980	75,142	199,830	272,340	360,490	301,192
2023	129,261	241,980	407,232	300,027	51,703	89,145	143,233	116,964	67,183	97,107	140,219	112,621	333,125	476,423	652,766	529,612
2024	178,690	343,439	581,582	426,080	62,339	118,148	197,091	159,922	79,942	125,825	191,377	150,259	450,169	659,470	920,803	736,261
2025	214,766	424,792	731,884	532,909	70,368	143,446	247,770	201,056	90,505	151,470	240,343	185,401	546,898	817,292	1,160,519	919,366
2026	240,619	492,950	864,045	624,182	76,095	165,395	294,724	239,511	99,019	174,122	284,997	217,856	628,683	957,672	1,376,625	1,081,549
2027	257,753	543,845	971,590	701,636	80,279	184,389	338,084	273,735	106,357	195,397	326,984	248,383	694,895	1,072,050	1,567,340	1,223,754
2028	268,791	585,230	1,068,705	768,666	82,984	200,875	380,497	306,774	111,856	212,966	365,586	275,647	751,952	1,172,348	1,738,188	1,351,087
2029	273,445	613,571	1,147,499	823,877	85,002	214,002	419,649	336,944	116,358	228,875	400,686	300,828	797,304	1,256,672	1,886,276	1,461,649
2030	273,445	634,104	1,215,203	872,558	86,325	223,503	455,846	364,396	119,428	242,393	434,165	324,437	832,861	1,329,795	2,022,445	1,561,391
2031	273,445	650,219	1,273,457	916,462	87,021	230,541	488,670	388,638	121,469	253,985	465,015	345,863	861,907	1,390,630	2,142,203	1,650,963
2032	273,445	659,903	1,317,101	952,551	87,021	234,794	514,091	410,175	122,891	263,328	492,243	365,068	883,719	1,440,831	2,243,494	1,727,794
2033	273,445	665,295	1,355,217	984,526	87,021	238,134	538,793	430,174	123,449	271,705	517,904	382,583	902,334	1,485,067	2,333,732	1,797,282
2034	273,445	665,295	1,383,518	1,011,666	87,021	240,014	559,293	447,944	123,449	278,541	540,714	398,528	914,666	1,523,295	2,412,032	1,858,139
2035	273,445	665,295	1,404,050	1,033,847	87,021	241,176	575,727	463,220	123,449	283,156	559,157	412,111	922,696	1,553,370	2,475,745	1,909,178
2036	273,445	665,295	1,418,963	1,053,982	87,021	241,628	586,401	476,549	123,449	286,666	575,518	424,788	927,569	1,577,462	2,532,507	1,955,319
2037	273,445	665,295	1,430,001	1,070,421	87,021	241,628	595,281	488,852	123,449	288,700	589,212	435,959	930,722	1,597,645	2,580,201	1,995,231
2038	273,445	665,295	1,436,139	1,085,400	87,021	241,628	599,420	498,824	123,449	290,320	602,245	446,611	932,250	1,612,633	2,621,402	2,030,835
2039	273,445	665,295	1,436,139	1,097,053	87,021	241,628	602,356	507,681	123,449	290,743	612,505	455,734	932,697	1,623,006	2,656,650	2,060,468
2040	273,445	665,295	1,436,139	1,108,487	87,021	241,628	603,765	514,746	123,449	290,743	620,951	463,988	932,697	1,630,260	2,688,242	2,087,220
2041	273,445	665,295	1,436,139	1,118,367	87,021	241,628	604,755	520,820	123,449	290,743	627,687	470,970	932,697	1,634,793	2,713,821	2,110,158

Histogram of Number of Permits Held by Individual Companies



## **Appendix E**



COMPANY	PERMIT	DATE REVOKED	COUNTY
3-D COAL CO.	52-72	6/1/77	Mingo
51 SYSTEMS	O-22-83	6/30/93	Marion
A & B THOMAS, INC.	U-50-85	7/12/02	Nicholas
A & B THOMAS, INC.	U-171-83	7/12/02	Nicholas
A & B THOMAS, INC.	UO-131	1/28/03	Nicholas
ACME LEASING, INC.	U-4013-88	9/28/99	McDowell
ALAN BLOSSER	S-1010-87	1/2/02	Monongalia
ALGOMA A & S, INC.	S-4015-90	9/2/93	McDowell
ALTEC ENERGY, INC	P-3010-99	10/22/07	Kanawha
AMANDA NICOLE FUELS, INC.	S-1018-88	6/12/92	Preston
AMERICAN MINERALS CORP.	S-6005-87	11/20/89	Kanawha
AMIGO SMOKELESS COAL CO.	UO-623	10/16/96	Raleigh
AMIGO SMOKELESS COAL CO.	EM-71	10/16/96	Raleigh
ANDERSON COAL COMPANY	U-3049-86	3/30/04	Nicholas
APPALACHIA COAL CORPORATION	P-2056-08	8/16/2018	Preston
APPALACHIAN FUELS LLC	P-5020-07	8/16/2018	Logan
APPALACHIAN FUELS LLC	P-5041-07	8/16/2018	Logan
APPALACHIAN FUELS, INC.	P-3026-08	3/13/2018	Nicholas
APPALACHIAN FUELS, LLC	S-3041-88	7/25/11	Clay
APPALACHIAN FUELS, LLC.	P-3055-06	10/23/12	Fayette
APPALACHIAN FUELS, LLC.	P-3019-08	10/23/12	Fayette
APPALACHIAN FUELS, LLC.	P-3005-09	10/23/12	Fayette
ARARAT COAL CO.	U-4005-90	10/1/91	McDowell
ASSET MINING, LLC.	S-5030-95	12/6/13	Boone
ASSET MINING, LLC.	S-5024-96	12/6/13	Boone
ATLAS COAL LEASING, INC.	S-3021-89	1/10/97	Wyoming
ATWELL HOLDING, INC.	U-4019-88	3/4/02	McDowell
AUTHOR ENTERPRISES, INC.	U-4012-94	10/4/02	McDowell
AUTHOR ENTERPRISES, INC.	U-4017-91	10/4/02	McDowell
B & S CONTRACTING, INC.	S-3031-87	3/9/95	Raleigh
B & S CONTRACTING, INC.	O-3086-87	4/24/95	Nicholas
B & S CONTRACTING, INC.	U-3055-87	4/24/95	Nicholas
B & S CONTRACTING, INC.	P-645	4/24/95	Nicholas
B & S CONTRACTING, INC.	U-3016-86	4/25/95	Nicholas
B & S CONTRACTING, INC.	R-668	7/12/95	Nicholas
B. L. & S. COAL COMPANY	S-1017-86	3/29/2021	Marion
BALDWIN MINING COMPANY	D-75-82	8/22/01	Gilmer
BARBOUR ENTERPRISES, INC.	S-2003-97	10/24/02	Lewis
BARRENSHE COAL CO.	UO-694	8/17/93	McDowell
BARRETT FUEL CORP.	EM-133	3/15/96	Raleigh
BARRETT FUEL CORP.	P-731	3/15/96	Raleigh
BARRETT FUEL CORP.	R-737	3/15/96	Raleigh
BARRETT FUEL CORPORATION	U-82-84	4/10/97	Boone
BARRETT FUEL CORPORATION	U-1-85	4/22/97	Boone
BEECH GROVE COAL CO.	U-85-83	10/28/92	McDowell

BEECH GROVE COAL CO.	UO-439	10/28/92	McDowell
BELL HOLDING, INC.	EM-116	10/4/02	McDowell
BELL HOLDING, INC.	H-290	10/4/02	McDowell
BELVA COAL COMPANY	S-5029-93	8/16/00	Logan
BELVA COAL COMPANY	P-654	1/26/01	Logan
BELVA COAL COMPANY	R-591	1/26/01	Logan
BELVA COAL COMPANY	S-41-80	1/26/01	Logan
BELVA COAL COMPANY	S-94-82	1/26/01	Logan
BENHAM GROUP, LTD.	120-79	1/1/90	Boone
BICKFORD MINING	U-78-85	3/12/97	Raleigh
BICKFORD MINING INC.	U-44-83	2/5/97	Raleigh
BLACK DIAMOND MINING CO.	13-79	4/1/89	Nicholas
BLACKHEART MINING INC	P-5034-90	5/28/08	Boone
BLONDY MINING, INC.	EM-118	5/4/99	Barbour
BOLINGREEN MINING COMPANY	S-1024-88	2/10/00	Preston
BOOMERANG COAL, INC.	S-2015-06	3/8/11	Randolph
BRADY CLINE COAL CO.	EM-97	8/23/94	Nicholas
BUCKEYE COAL COMPANY INC.	U-4007-90	4/24/2019	McDowell
BUFFALO COAL CO., INC.	U-2004-03	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-53-80	9/29/06	Grant
BUFFALO COAL COMPANY, INC.	S-52-80	9/29/06	Grant
BUFFALO COAL COMPANY, INC.	S-122-80	9/29/06	Tucker
BUFFALO COAL COMPANY, INC.	S-2001-86	9/29/06	Grant
BUFFALO COAL COMPANY, INC.	S-2005-95	10/26/06	Tucker
BUFFALO COAL COMPANY, INC.	146-77	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-1048-91	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-74-76	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-100-84	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-32-84	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2023-92	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-7-80	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-61-85	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-2003-03	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2018-88	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-2008-02	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2007-96	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-2018-00	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2011-92	7/10/08	Preston
BUFFALO COAL COMPANY, INC.	O-2006-95	7/10/08	Tucker
BUFFALO COAL COMPANY, INC.	S-2004-02	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2006-86	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2011-87	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2011-95	7/10/08	Grant
BUFFALO COAL COMPANY, INC.	S-2003-88	8/20/08	Tucker
BUFFALO COAL COMPANY, INC.	U-2010-94	10/6/08	Grant
BUFFALO COAL COMPANY, INC.	I-542	12/12/08	Grant
BULL RUN MINING COMPANY, INC.	EM-66	6/9/92	Preston

BURN COAL, INC.	U-2005-97	11/25/08	Upshur
C & D TRUCKING CO.	U-4017-89	11/1/91	McDowell
C & M COAL CONTRACTING, INC.	S-1001-99	4/19/05	Harrison
C. C. CONLEY & SONS, INC.	S-3046-91	12/7/00	Nicholas
C. C. CONLEY & SONS, INC.	S-2002-92	9/10/01	Webster
C. C. CONLEY & SONS, INC.	U-1041-91	9/10/01	Webster
CANION COAL CO.	U-2-85	8/3/90	Clay
CAPITOL FUELS, INC.	O-122-83	9/7/93	Kanawha
CAPPELLARI, INC.	S-78-78	2/21/91	Nicholas
CARSON ONE MINING, LLC	O-4-84	10/1/10	Upshur
CATHERINE ENTERPRISES, INC.	I-544	11/14/89	Nicholas
CENTURY ENTERPRISES	S-58-82	1/6/94	Preston
CHAFIN COAL CO.	U-70-85	7/11/95	Logan
CHAFIN COAL CO.	UO-21	7/11/95	Logan
CHAFIN COAL CO.	U-140-82	7/11/95	Logan
CHAFIN COAL CO.	D-13-82	7/11/95	Logan
CHAFIN COAL CO.	O-69-82	7/11/95	Logan
CHAFIN COAL CO.	D-18-82	7/11/95	Logan
CHAFIN COAL CO.	U-5027-86	7/11/95	Logan
CHEYENNE SALES CO., INC.	S-2009-96	9/22/09	Upshur
CHEYENNE SALES CO., INC.	O-2025-86	9/22/09	Upshur
CHEYENNE SALES COMPANY, INC.	O-11-83	7/9/09	Upshur
CHICOPEE COAL CO. INC.	P-3021-01	3/13/2018	Nicholas
CHICOPEE COAL COMPANY, INC.	O-6013-88	1/31/03	Clay
CHICOPEE COAL COMPANY, INC.	O-6021-89	1/31/03	Clay
CHICOPEE COAL COMPANY, INC.	S-73-85	1/31/03	Clay
CHICOPEE COAL COMPANY, INC.	U-6018-86	1/31/03	Clay
CHICOPEE COAL COMPANY, INC.	U-3010-87	3/28/06	Nicholas
CHICOPEE COAL COMPANY, INC.	UO-223	3/28/06	Nicholas
CHICOPEE COAL COMPANY, INC.	U-3003-86	3/28/06	Nicholas
CHICOPEE COAL COMPANY, INC.	U-55-85	3/28/06	Nicholas
CHICOPEE COAL COMPANY, INC.	S-3036-86	3/28/06	Nicholas
CHICOPEE COAL COMPANY, INC.	S-3006-99	3/28/06	Nicholas
CHICOPEE COAL COMPANY, INC.	U-10-85	6/23/06	Nicholas
CHICOPEE COAL COMPANY, INC.	S-3002-98	6/23/06	Nicholas
CHICOPEE COAL COMPANY, INC.	P-3015-99	2/13/13	Nicholas
CLEARWATER CONSTRUCTION	S-3016-99	5/28/08	Fayette
COAL ENTERPRISES, INC.	D-108-82	3/6/96	McDowell
COAL STRIPPING, INC.	S-1034-90	6/28/96	Monongalia
COAL VALLEY MINING, INC.	O-3062-89	4/12/99	Raleigh
COAL VALLEY MINING, INC.	S-3047-91	4/12/99	Raleigh
COAL VALLEY MINING, INC.	UO-342	4/12/99	Raleigh
COAL VALLEY MINING, INC.	U-26-83	4/12/99	Raleigh
COMBUSTION COAL CO. INC	P-36-81	7/8/2019	Kanawha
COMFORT RUN COAL CO.	S-3028-89	3/10/95	Fayette
COUGAR COAL CO.	P-1029-97	5/1/02	Taylor
COVINGTON COAL COMPANY, LLC	S-5017-02	1/13/2020	Kanawha

CRADDOCK & SON COAL CO.	S-68-83	10/1/92	Nicholas
CRADDOCK & SON COAL CO.	S-3020-88	6/14/93	Fayette
CRANE COAL CO., INC.	S-27-83	1/3/92	Preston
CUB BRANCH DEVELOPMENT	U-5035-87	4/4/95	Mingo
CUB BRANCH DEVELOPMENT	S-5034-87	9/10/97	Mingo
D & A RESOURCES, INC.	U-3042-89	1/30/02	Fayette
DAUGHERTY COAL COMPANY, INC.	40-73	3/9/90	Preston
DAUGHERTY COAL COMPANY, INC.	188-75	5/19/92	Preston
DEAN FUELS, INC.	S-24-83	6/11/01	Monongalia
DEAN FUELS, INC.	U-160-82	8/7/01	Monongalia
DECONDOR COAL CO.	U-1080-86	11/25/08	Preston
DECONDOR COAL CO.	U-147-82	11/25/08	Preston
DEEPGREEN WV, INC.	O-164-83	10/5/15	McDowell
DELTA TERMINALS, INC.	S-42-80	1/30/01	Boone
DELTA TERMINALS, INC.	Z-54-81	1/30/01	Boone
DFM COAL, LLC	S-4004-01	9/28/2020	Mingo
DLM COAL CO.	138-74	9/3/85	Upshur
DLM COAL CO.	2-80	9/13/85	Upshur
DLM COAL CO.	I-239	9/16/85	Upshur
DLM COAL CO.	P-426	9/16/85	Upshur
DLM COAL CO.	I-739	9/16/85	Upshur
DLM COAL CO.	187-77	9/16/85	Upshur
DLM COAL CO.	164-77	9/16/85	Upshur
DLM COAL CO.	UO-231	9/16/85	Upshur
DLM COAL CO.	135-78	9/16/85	Upshur
DLM COAL CO.	R-423	9/16/85	Upshur
DLM COAL CO.	1-78	9/16/85	Upshur
DLM COAL CO.	12-78	9/16/85	Upshur
DLM COAL CO.	58-77	9/16/85	Upshur
DLM COAL CO.	H-232	10/1/85	Upshur
DLM COAL CO.	23-76	10/1/85	Upshur
DLM COAL CO.	71-75	10/1/85	Upshur
DOUBLE H MINING CO. INC.	U-1004-94	12/5/13	Preston
DOUBLE N MINING CO.	S-3055-88	8/9/94	Greenbrier
DREAMLAND LTD.	I-650	7/29/94	Fayette
DUSTY COALS, INC.	S-119-85	8/10/87	Nicholas
DVR MINING INC.	U-4009-88	5/24/94	McDowell
E & A COAL CO.	D-10-81	4/13/95	Raleigh
E. J. & L. CO., INC.	P-3051-88	5/1/90	Raleigh
E. J. & L. CO., INC.	S-3041-87	5/9/90	Raleigh
EAGLE ENERGY, INC.	U-200-83	5/1/90	Mingo
EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3018-93	6/22/16	Fayette
EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3027-05	6/22/16	Fayette
EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3003-06	6/22/16	Fayette
EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3016-08	6/22/16	Fayette
EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3035-07	6/22/16	Nicholas
EAGLE RIDGE DEVELOPMENT GROUP, LLC	P-3031-09	8/16/2018	Nicholas

EASTERN ENERGY INVEST.	U-6030-86	7/29/93	Kanawha
EASTERN ENERGY INVEST.	U-6012-88	1/28/94	Boone
EASTERN ENERGY INVEST.	S-6029-86	5/2/94	Kanawha
EASTERN LEASING & EQUIPMENT COMPANY	U-2037-86	2/9/00	Webster
ED-E DEVELOPMENT CO., INC.	S-10-81	1/23/93	Monongalia
ED-E DEVELOPMENT CO., INC.	S-1032-86	3/29/93	Preston
ELK RIVER SEWELL COAL CO.	S-1021-90	8/3/94	Webster
ELK RIVER SEWELL COAL CO.	O-127-83	8/12/94	Webster
ELMINA COAL COMPANY	U-4012-86	1/8/01	McDowell
ENERGY LEASING, INC.	I-750	10/24/96	Fayette
ENERGY MARKETING CO. INC	O-26-84	2/27/13	Barbour
ENERGY MARKETING CO. INC.	UO-885	2/27/13	Barbour
ENERGY MARKETING CO. INC.	UO-520	2/27/13	Barbour
ENERGY MARKETING CO. INC.	U-72-83	2/27/13	Barbour
ENERGY MARKETING CO. INC.	U-74-83	3/4/13	Barbour
ENERGY MARKETING CO., INC.	U-16-83	2/27/13	Barbour
ENERGY MARKETING COMPANY INC	U-24-84	5/24/10	Barbour
ENERGY MARKETING COMPANY INC	O-44-83	6/7/10	Barbour
ENVIROSERVE, INC. dba BETCON, INC.	P-4001-02	3/19/15	Mercer
EPLING COAL ENTERPRISES, INC.	S-67-85	10/25/00	Nicholas
ERLON COAL CO.	D-5-82	4/16/91	Fayette
ERP ENVIRONMENTAL FUND, INC.	R-747	7/13/2020	Marion
ERP ENVIRONMENTAL FUND, INC.	O-1001-87	7/13/2020	Marion
ERP ENVIRONMENTAL FUND, INC.	EM-125	7/13/2020	Marion
ERP ENVIRONMENTAL FUND, INC.	R-746	7/13/2020	Marion
F & M COAL CO.	S-1026-87	4/30/92	Preston
F & M COAL CO.	46-79	9/24/92	Preston
F & M COAL CO.	S-1006-88	9/24/92	Preston
F.G.M. ENERGY, INC.	S-5023-88	10/1/89	Logan
FALCON LAND COMPANY, INC.	P-656	4/5/05	Nicholas
FALCON LAND COMPANY, INC.	P-664	5/9/05	Nicholas
FALCON LAND COMPANY, INC.	P-5023-01	7/2/09	Logan
FIRST BIG MOUNTAIN MINING CO. INC.	P-22-83	7/8/2019	Kanawha
FIRST BIG MTN. MINING CO.	U-6017-88	7/27/92	Kanawha
FITZPATRICK INDUSTRIES	S-3018-89	7/18/96	Fayette
FLAGGY MEADOW COAL COMPANY	U-1012-93	3/16/00	Monongalia
FLEX DEVELOPMENT CORPORATION	S-1013-91	1/11/05	Harrison
FOSSIL FUELS, INC.	P-3020-02	3/14/07	Nicholas
FREEPORT MINING CORPORATION	S-1005-95	7/8/03	Preston
FREEPORT MINING CORPORATION	S-1004-88	7/8/03	Preston
FREEPORT MINING CORPORATION	S-1019-87	8/18/03	Preston
G & L COAL CO.	S-86-83	10/1/91	Raleigh
G & L COAL CO.	S-3035-87	5/21/96	Fayette
G & L COAL CO.	U-3036-87	5/21/96	Fayette
G.L.X. DEVELOPMENT CORP.	UO-675	4/6/98	Kanawha
GARY COAL SALES, INC.	U-58-84	8/30/94	McDowell
GARY COAL SALES, INC.	S-4030-89	8/30/94	McDowell

GAULEY COAL SALES CO.	O-43-84	8/23/94	Nicholas
GLADY FORK MINING, INC.	D-35-82	6/7/04	Upshur
GLADY FORK MINING, INC.	U-60-83	5/23/05	Upshur
GLADY FORK MINING, INC.	P-2012-00	6/21/05	Upshur
GOLD RESOURCES, LLC	S-1003-97	9/8/14	Harrison
GOLDEN FALCON RESOURCES, INC.	U-61-84	10/4/02	McDowell
GRACE ENTERPRISES, INC.	S-2007-01	3/15/04	Harrison
GRACE ENTERPRISES, INC.	S-1008-97	3/15/04	Marion
GRACE ENTERPRISES, INC.	P-2016-02	10/6/08	Harrison
GREAT MTN. COAL CO.	160-77	7/19/91	Fayette
GREAT MTN. COAL CO.	114-79	7/19/91	Fayette
GREEN MOUNTAIN ENERGY	O-3032-91	8/8/96	Raleigh
GREEN MOUNTAIN ENERGY	U-154-83	10/29/96	Raleigh
GREEN MOUNTAIN ENERGY	U-4012-90	11/15/96	Wyoming
GREEN MOUNTAIN ENERGY	U-3053-88	1/10/97	Raleigh
GREEN MOUNTAIN ENERGY	U-4013-91	3/19/97	Wyoming
GREEN MOUNTAIN ENERGY, INC.	U-4007-91	11/15/96	Wyoming
GREENDALE COALS, INC.	U-63-84	2/10/89	Clay
GRINDSTONE MINING CORP.	U-3078-87	6/30/93	Fayette
H & D COAL CO.	S-3033-87	4/28/93	Greenbrier
H & D COAL COMPANY	U-69-85	7/2/93	Greenbrier
HAROLD KITZMILLER	O-2008-07	3/30/11	Grant
HAROLD KITZMILLER	P-2031-08	11/14/14	Grant
HARVEY ENERGY CORP.	S-3025-88	9/5/91	Fayette
HARVEY ENERGY CORP.	S-33-81	9/16/91	Fayette
HARVEY ENERGY CORP.	S-35-81	9/16/91	Fayette
HARVEY ENERGY CORP.	S-3030-89	9/16/91	Fayette
HARVEY ENERGY CORP.	S-3081-87	9/16/91	Fayette
HARVEY ENERGY CORP.	S-54-84	9/25/91	Fayette
HARVEY ENERGY CORP.	S-3070-86	9/16/92	Fayette
HARVEY ENERGY CORP.	P-3029-89	1/27/94	Fayette
HARVEY ENERGY CORP.	P-3053-88	1/27/94	Fayette
HAWKS NEST MINING CO.	O-1-81	12/7/93	Kanawha
HIDDEN VALLEY ESTATES GOLF COURSE, INC.	S-1003-98	8/20/13	Marion
HILO ENERGY CORP.	U-4019-92	10/20/97	McDowell
IAEGER ENERGY CORP.	UO-155	3/8/96	McDowell
IAEGER ENERGY CORP.	U-231-83	2/3/97	McDowell
ILLUSION COAL COMPANY	U-61-83	2/1/99	Wyoming
INDUSTRIAL ENERGY, INC.	U-101-83	11/21/02	Nicholas
INTERLAND RESOURCES, INC.	S-4009-91	7/8/92	McDowell
INTERLAND RESOURCES, INC.	S-4016-90	10/26/92	McDowell
J & D COAL CO.	S-44-84	3/12/97	Monongalia
J & N PROCESSING COMPANY, LLC	O-58-83	6/29/01	Raleigh
J. C. B. MINING, INC.	U-2006-88	12/30/02	Lewis
J.A.L. COAL CO., INC.	S-23-82	3/12/97	Monongalia
JERICOH CONSTR. AUGERING	S-4026-88	7/17/91	McDowell
JIM DANDY COALS INC.	U-77-85	2/27/96	Lewis

JINKS MINING COMPANY	S-113-85	2/24/00	Nicholas
JINKS MINING COMPANY	U-3031-93	2/24/00	Nicholas
JOHN GALT	O-40-82	8/29/91	Logan
JOHN GALT	O-45-82	8/29/91	Logan
JOHN GALT	D-76-82	8/29/91	Logan
JO-LEE COAL COMPANY	UO-380	9/17/97	Harrison
K & B COAL CO.	U-3054-86	11/15/93	Nicholas
K. C. & M. COAL COMPANY, INC.	S-1023-88	3/8/00	Preston
KANAWHA DEVELOPMENT CORPORATION	H-631	11/29/12	Fayette
KANAWHA DEVELOPMENT CORPORATION	O-14-81	1/17/13	Fayette
KANAWHA DEVELOPMENT CORPORATION	O-38-84	1/17/13	Fayette
KAYDEE CONSTRUCTION CO.	S-3019-87	11/11/91	Fayette
KEENCO COAL CO.	U-106-83	6/28/94	Mingo
KELLEY COAL CO.	S-68-82	10/21/92	Harrison
KESS COALS, INC.	O-39-85	2/1/92	Boone
KESSLER COALS, INC.	S-131-82	8/30/91	Boone
KESSLER COALS, INC.	U-36-85	11/1/91	Boone
KEYSTONE COAL, INC.	U-5058-87	3/17/98	Mingo
KEYSTONE COAL, INC.	S-101-85	3/17/98	Mingo
KEYSTONE COAL, INC.	S-84-83	3/17/98	Mingo
KEYSTONE COAL, INC.	U-5057-87	3/17/98	Mingo
KEYSTONE COAL, INC.	U-186-83	3/17/98	Mingo
KEYSTONE COAL, INC.	S-5059-87	3/17/98	Mingo
KEYSTONE COAL, INC.	O-56-85	3/17/98	Mingo
KEYSTONE COAL, INC.	U-5044-87	7/17/98	Mingo
KIDD'S ENERGY SALES	UO-383	12/10/96	McDowell
KIDD'S ENERGY SALES, INC.	U-4011-88	10/13/98	McDowell
KMADER ENTERPRISES, INC.	U-3020-90	1/9/95	Clay
KODIAK LAND CO., INC.	S-3052-87	5/19/92	Fayette
K-STEELE CORP.	S-6-83	5/19/92	Fayette
K-STEELE CORP.	S-121-82	9/8/92	Fayette
K-STEELE CORP.	P-47-83	1/27/94	Fayette
L & R EQUIPMENT CO.	S-3058-86	8/19/94	Nicholas
LAKE ENERGY, INC	U-133-83	2/15/07	Logan
LANDMARK CORPORATION	S-34-82	1/30/01	Boone
LANDMARK CORPORATION	S-5069-88	1/30/01	Boone
LAROSA FUEL CO., INC.	S-39-84	11/25/08	Upshur
LAROSA FUEL CO., INC.	S-1051-86	7/24/09	Marion
LAWSON ENTERPRISES	U-4011-90	7/10/92	McDowell
LAYLAND COAL COMPANY	O-20-85	7/28/06	Fayette
LEVEL LAND CONSTRUCTION COMPANY, INC.	S-3026-88	8/8/07	Nicholas
LEVEL LAND CONSTRUCTION COMPANY, INC.	S-3007-89	8/8/07	Nicholas
LEVEL LAND CONSTRUCTION COMPANY, INC.	S-3027-90	8/8/07	Nicholas
LEVEL LAND MINING CORPORATION	S-3031-90	11/8/06	Fayette
LID ENTERPRISES, INC.	P-4008-04	11/16/06	McDowell
LILLYBROOK COAL CO.	S-86-85	6/1/90	Raleigh
LINN MINING COMPANY	U-1008-92	6/30/03	Harrison

LITTLE HOPE MINING INC.	U-63-85	3/21/06	Mingo
LITWAR ENERGY, INC.	U-4002-94	6/22/99	McDowell
LOBO CAPITOL, INC.	UO-204	8/7/85	Preston
LODESTAR ENERGY, INC.	S-3016-92	1/13/04	Raleigh
LODESTAR ENERGY, INC.	S-3006-89	1/21/04	Nicholas
LODESTAR ENERGY, INC.	S-3083-86	1/21/04	Nicholas
LODESTAR ENERGY, INC.	S-19-85	1/21/04	Nicholas
LODESTAR ENERGY, INC.	O-172-83	1/30/04	Fayette
LODESTAR ENERGY, INC.	R-5-84	5/24/04	Wyoming
LOGAN COAL & EXP.	D-122-82	8/18/93	Kanawha
LOGAN COALS, INC.	UO-353	1/26/99	Logan
LO-MING COAL CORPORATION	U-5036-88	9/17/02	Logan
LO-MING COAL CORPORATION	O-5092-87	9/17/02	Logan
LO-MING COAL CORPORATION	U-5049-87	9/17/02	Logan
LO-MING COAL CORPORATION	O-5035-88	9/17/02	Logan
LO-MING COAL CORPORATION	U-5018-98	1/28/03	Logan
LO-MING COAL CORPORATION	U-5023-97	1/28/03	Logan
LO-MING COAL CORPORATION	U-5084-88	1/28/03	Logan
LO-MING COAL CORPORATION	U-5085-88	1/28/03	Logan
LOW ASH COAL CO.	UO-389	2/1/85	Wyoming
LOYAL G. FORMAN & SON	S-2009-01	6/23/06	Preston
LOYAL G. FORMAN & SON	S-1002-99	6/23/06	Preston
M & H COAL CO.	UO-406	7/13/95	Logan
M & H COAL CO.	U-144-83	7/13/95	Logan
M & T MINING CO.	S-3026-89	2/9/94	Nicholas
M & T MINING CO.	P-3032-90	1/31/96	Nicholas
MABEN ENERGY CORPORATION	UO-727	1/10/97	Wyoming
MANGUS COAL, INC.	S-1036-91	3/14/08	Preston
MAPLE COAL COMPANY LLC	P-3016-12	8/16/2018	Fayette
MAPLE COAL COMPANY LLC	P-3031-11	8/16/2018	Fayette
MAPLE COAL COMPANY LLC	P-3025-14	8/16/2018	Fayette
MARK A. SOUTHERN GENERAL CONTRACTOR	S-1006-92	10/20/99	Harrison
MARK POWELL CONSTRUCTION COMPANY	P-1018-00	4/24/06	Monongalia
MARK POWELL CONSTRUCTION COMPANY	P-1013-00	4/24/06	Monongalia
MARROWBONE DEVELOPMENT CO.	P-5035-99	12/5/13	Mingo
MARSON COAL COMPANY, INC.	S-2052-86	10/12/99	Randolph
MARSON COAL COMPANY, INC.	U-2005-88	10/12/99	Randolph
MARSON COAL COMPANY, INC.	U-2029-87	10/12/99	Webster
MARSON COAL COMPANY, INC.	O-2044-88	4/13/00	Randolph
MARSON COAL COMPANY, INC.	S-2021-87	9/11/00	Randolph
MARSON COAL COMPANY, INC.	EM-44	2/8/01	Webster
MARSON COAL COMPANY, INC.	EM-91	2/8/01	Randolph
MARSON COAL COMPANY, INC.	I-608	2/8/01	Randolph
MARSON COAL COMPANY, INC.	U-90-84	2/8/01	Webster
MARTIN COUNTY LAND CO., LLC	P-3030-10	8/9/2019	Kanawha
MARTIN SALES & PROCESSING	U-5024-90	8/1/94	Mingo
MARY RUTH CORPORATION	S-1015-88	1/17/13	Preston



MATE CREEK LOADING, INC.	O-5059-86	7/14/01	Mingo
MAURICE JENNINGS	S-61-83	11/30/04	Preston
MAURICE JENNINGS	53-78	12/10/04	Preston
MCALPIN PROCESSING, INC.	S-3013-89	11/1/89	Raleigh
MCALPIN PROCESSING, INC.	R-3050-87	11/1/89	Raleigh
MERIDAN OF VIRGINIA, INC.	S-4034-89	2/28/92	McDowell
MERIDAN OF VIRGINIA, INC.	S-4002-90	2/28/92	McDowell
MERIDAN OF VIRGINIA, INC.	S-4015-89	3/4/92	McDowell
MERIDAN OF VIRGINIA, INC.	S-4005-89	9/14/92	McDowell
MERIDAN OF VIRGINIA, INC.	S-4010-88	9/14/92	McDowell
MERIT COAL COMPANY	U-4008-94	9/23/96	Mingo
METCO MINING CO.	P-730	5/23/90	Logan
METCO MINING CO.	UO-581	5/23/90	Logan
METCO MINING CO.	UO-463	5/23/90	Logan
MID-ATLANTIC RESOURCE CORPORATION	U-3040-87	1/2/01	Raleigh
MID-ATLANTIC RESOURCE CORPORATION	U-3045-86	1/2/01	Raleigh
MID-ATLANTIC RESOURCE CORPORATION	U-3067-86	1/2/01	Raleigh
MID-ATLANTIC RESOURCE CORPORATION	D-73-82	1/2/01	Raleigh
MID-ATLANTIC RESOURCE CORPORATION	O-23-85	1/2/01	Raleigh
MORGANTOWN ENERGY EXPORT COMPANY	S-8-84	11/2/99	Monongalia
MOUNTAIN CARBON, INC.	O-137-83	12/10/96	Fayette
MOUNTAIN LAUREL RES.	R-734	1/19/94	Summers
MOUNTAIN LAUREL RES.	P-751	9/8/94	Summers
MOUNTAIN LAUREL RES.	D-60-82	12/1/94	Fayette
MOUNTAIN LAUREL RESOURCES	D-54-82	12/1/94	Fayette
MOUNTAIN MINERALS, INC.	U-225-83	2/19/97	Fayette
MOUNTAIN MINERALS, INC.	O-169-83	2/19/97	Fayette
MOUNTAIN TOP FUEL CO., INC.	Z-87-81	6/26/96	Lewis
MOUNTAINEER FUELS, INC.	U-3083-87	1/30/98	Nicholas
NELLIS CORP.	U-5008-90	4/7/92	Boone
NELLIS CORP.	U-5009-90	4/7/92	Boone
OAK HILL EXCAVATING	S-3059-88	8/9/94	Nicholas
OAK HILL EXCAVATING	S-3011-87	8/9/94	Nicholas
OKEMO CORP.	U-5016-87	4/3/98	Logan
OKEMO CORP.	U-5078-86	4/3/98	Logan
OKEMO CORP.	O-16-85	4/3/98	Logan
OKEMO CORP.	O-16-82	4/3/98	Logan
OKEMO CORP.	D-20-82	4/3/98	Logan
OMEGA MINING CO. INC.	D-79-82	10/7/94	Monongalia
OMEGA MINING COMPANY	S-15-84	1/11/2018	Monongalia
PAULEY LEASING CO., INC.	U-4029-89	7/3/96	McDowell
PEACHTREE RIDGE MINING, INC.	U-18-83	1/29/04	Raleigh
PHOENIX RESOURCES, INC.	S-462	5/12/95	Randolph
PINE CREEK MINING INC	U-51-84	2/27/06	Logan
PINE CREEK MINING INC	U-5056-88	2/27/06	Logan
PINNACLE CREEK MINING CORP.	69-81	12/7/94	Wyoming
PINNACLE CREEK MINING CORP.	R-721	12/7/94	Wyoming

PINNACLE MINING COMPANY OF NORTHERN WV	S-62-85	9/12/94	Monongalia
PINNACLE MINING COMPANY OF NORTHERN WV	S-1028-86	9/12/94	Monongalia
PLUM TREE MINERALS LLC.	S-3010-98	12/2/03	Raleigh
PLUM TREE MINERALS LLC.	P-3035-01	1/30/04	Raleigh
POCAHONTAS RESOURCES, INC.	S-3012-92	9/6/07	Nicholas
POLARIS COAL JOINT VENTURE	P-2007-00	5/28/08	Clay
POWDER MILL PROCESSING INC.	S-5027-08	10/12/2021	Wayne
POWDER MILL PROCESSING INC.	O-5008-07	10/12/2021	Wayne
POWELLTON CO.	P-5005-88	7/13/95	Mingo
PREMIUM ROCK COAL COMPANY, INC.	P-3027-99	10/24/02	Raleigh
PRESTON ENERGY, INC.	UO-235	3/18/94	Preston
PRESTON ENERGY, INC.	UO-429	5/5/94	Preston
PRESTON ENERGY, INC.	O-86-82	5/25/94	Preston
PRESTON ENERGY, INC.	U-103-83	9/29/94	Preston
PRESTON ENERGY, INC.	U-43-84	9/29/94	Preston
PRIMROSE COAL, INC.	7-81	3/23/11	Preston
PRINCESS CINDY MINING, INC.	30-79	5/26/87	Fayette
PRINCESS SUSAN COAL CO.	S-6-85	12/7/93	Kanawha
PRINCESS SUSAN COAL CO.	S-32-83	12/7/93	Kanawha
PRINCESS SUSAN COAL CO.	S-6002-87	12/7/93	Kanawha
PRINCESS SUSAN COAL CO.	S-6033-86	12/7/93	Kanawha
PRINCESS SUSAN COAL CO.	S-76-82	10/4/94	Kanawha
PROSPERITY ENERGY, INC.	S-6001-88	5/26/93	Clay
PUPS CREEK COALS, INC.	S-3006-94	12/6/99	Raleigh
PUPS CREEK COALS, INC.	S-3002-92	7/18/00	Raleigh
QUINTAIN DEVELOPMENT, INC.	P-5013-96	11/3/03	Wayne
QUINTAIN DEVELOPMENT, INC.	P-5036-98	11/3/03	Wayne
QUINTAIN DEVELOPMENT, INC.	P-5007-98	11/3/03	Wayne
QUINTAIN DEVELOPMENT, INC.	P-5038-97	11/3/03	Wayne
QUINTAIN DEVELOPMENT, LLC	S-5033-96	1/24/00	Mingo
R & C LEASING, INC.	U-59-84	2/1/95	McDowell
RALEIGH APPALACHIAN REMINING, INC.	P-3038-97	3/29/01	Raleigh
RALEIGH COMMERCIAL DEVEVELOPMENT	S-23-77	1/16/87	Fayette
RALEIGH COMMERCIAL DEVEVELOPMENT	187-74	1/16/87	Fayette
RALEIGH COMMERCIAL DEVEVELOPMENT	149-79	1/21/87	Fayette
RALEIGH COMMERCIAL DEVEVELOPMENT	P-61-83	4/1/87	Fayette
RALPH KNICELEY CONSTRUCTION	S-2006-93	4/3/96	Randolph
RAVEN HOCKING COAL CORP	O-6003-87	7/14/14	Mason
REGENCY FINANCIAL SERVICES	P-723	7/7/94	McDowell
REGENCY FINANCIAL SERVICES	U-93-84	11/17/94	Wyoming
REGENCY LAND COMPANY	U-5069-87	9/7/04	Logan
RESOURCES DEVEVELOPMENT CORPORATION	R-4030-86	4/19/96	McDowell
RHINO COAL, LLC	U-4027-88	3/6/01	McDowell
RIDGEWAY DEV.	U-3037-89	10/12/95	Raleigh
RIFFE ENTERPRISES, INC.	O-3012-07	2/3/09	Raleigh
ROARING RIVER HOLDING COMPANY	P-3006-07	8/20/13	Fayette
ROBLEE COAL COMPANY	O-1009-93	11/9/09	Upshur

ROBLEE COAL COMPANY	U-1001-91	1/11/10	Upshur
ROBLEE COAL COMPANY	U-2026-87	3/16/10	Barbour
ROBLEE COAL COMPANY	D-49-82	3/16/10	Barbour
ROBLEE COAL COMPANY	U-2001-00	4/22/10	Upshur
ROCKVILLE MINING CO.	S-65-82	1/12/94	Preston
ROCKVILLE MINING CO.	65-78	1/12/94	Preston
ROCKVILLE MINING CO.	S-105-82	5/24/94	Preston
RODNEY RIDDLE	P-3041-05	12/12/08	Nicholas
ROYAL COAL CO.	P-688	1/1/90	Fayette
ROYAL SCOT MINERALS, INC.	31-72	4/28/99	Greenbrier
ROYAL SCOT MINERALS, INC.	S-3050-86	4/26/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-3076-86	4/26/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-65-85	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-682	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-3017-87	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-3046-88	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	D-125-82	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	O-103-83	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	O-104-83	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	56-81	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-40-85	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	D-32-81	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-3074-87	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	32-81	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-107-83	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-3062-87	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-3020-86	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-90-82	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-99-83	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	O-1-82	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	U-3066-88	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	O-71-83	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-176-75	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-3012-93	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	O-67-82	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-3070-88	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-3011-88	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-47-83	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-3009-89	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	UO-571	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	R-3078-86	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-65-76	4/27/00	Greenbrier
ROYAL SCOT MINERALS, INC.	S-60-83	4/27/00	Greenbrier
SAN SUE COAL CO.	19-75	1/13/89	Nicholas
SANDRIDGE COAL CO.	S-1084-86	11/2/99	Monongalia
SANDRIDGE COAL, LLC	UO-401	7/1/08	Barbour
SHAFER BROTHER CONSTRUCTION, INC,	S-2008-09	5/11/15	Monongalia

SHAFER BROTHER CONSTRUCTION, INC.	S-2002-12	5/11/15	Monongalia
SHAFER BROTHER CONSTRUCTION, INC.	S-2006-02	5/11/15	Monongalia
SHAFER BROTHER CONSTRUCTION, INC.	S-2011-10	5/11/15	Monongalia
SHAFER BROTHER CONSTRUCTION, INC.	S-2004-04	5/11/15	Monongalia
SHAFER BROTHER CONSTRUCTION, INC.	S-2012-06	5/11/15	Monongalia
SHARON COAL CO.	S-1028-87	3/23/11	Preston
SHELL ENERGY COMPANY, INC.	U-1007-90	10/28/97	Harrison
SLAB FORK COAL CO.	U-10-83	3/1/84	Raleigh
SLAB FORK COAL COMPANY	UO-556	4/1/84	Raleigh
SLATE CREEK ENERGY, INC.	U-4018-86	4/24/96	McDowell
SOUTHEAST LEASING, INC.	U-3003-89	10/24/96	Raleigh
SOUTHEAST LEASING, INC.	U-3023-87	10/24/96	Raleigh
SOUTHEAST LEASING, INC.	S-3024-87	10/24/96	Raleigh
SPRING RIDGE COAL CO.	U-138-83	9/12/97	Webster
SPRING RIDGE COAL CO.	O-68-82	9/12/97	Webster
SPRING RIDGE COAL CO.	R-722	9/12/97	Webster
SPRING RIDGE COAL CO.	S-2034-88	9/12/97	Webster
SPRING RIDGE COAL COMPANY	U-2016-88	9/12/97	Webster
STAR INDUSTRIES, INC.	R-3-81	5/27/87	Raleigh
STARCO ENERGY, INC.	R-7-81	4/25/00	McDowell
STARCO ENERGY, INC.	O-36-84	4/25/00	McDowell
STONE COAL COMPANY	D-109-82	8/8/96	Wyoming
STONE COAL COMPANY	U-3024-88	8/26/96	Wyoming
STONE COAL COMPANY	U-3028-86	8/26/96	Raleigh
STONE COAL COMPANY	U-42-85	11/15/96	Raleigh
STONE COAL COMPANY	R-3025-87	11/15/96	Raleigh
STONE COAL COMPANY	UO-252	1/10/97	Wyoming
SUMMERSVILLE FIVE BLOCK	S-3051-88	11/1/94	Nicholas
SUMMERSVILLE FIVE BLOCK	O-100-83	11/1/94	Clay
SUMMERSVILLE FIVE BLOCK	O-66-82	2/15/95	Clay
T & T FUELS, INC.	EM-113	10/31/95	Preston
T & T FUELS, INC.	U-125-83	12/4/95	Preston
TERRA CONTRACTORS	P-1022-88	6/3/93	Marion
THE MASTELLER COAL COMPANY	S-10-85	12/10/03	Mineral
THE MASTELLER COAL COMPANY	S-125-82	5/3/04	Mineral
THE MASTELLER COAL COMPANY	P-741	6/7/04	Mineral
THE NEW RIVER MINING COMPANY, INC.	P-3011-03	8/16/2018	Greenbrier
TRIPLE A COALS, INC.	S-96-85	12/17/98	Nicholas
TRIPLE A COALS, INC.	U-3046-87	12/17/98	Nicholas
TRIPLE A COALS, INC.	S-3028-87	12/17/98	Nicholas
TRIPLE A COALS, INC.	U-22-85	1/24/00	Nicholas
TRIPLE A COALS, INC.	U-3006-87	2/24/00	Nicholas
TRIPLE A COALS, INC.	O-3077-87	2/24/00	Nicholas
TYGART VALLEY MINING, INC.	U-2002-95	2/28/07	Barbour
TYPICAL ENTERPRISES	U-5006-95	4/5/01	Lincoln
TYPICAL ENTERPRISES	P-5009-91	5/28/08	Lincoln
TYPICAL ENTERPRISES	P-5013-91	5/28/08	Lincoln

UNITED COALS, INC.	U-2015-87	9/8/14	Barbour
UNITED COALS, INC.	S-2008-00	9/8/14	Barbour
UPCO COAL, INC.	S-1059-91	11/18/98	Upshur
UPCO COAL, INC.	S-197-75	4/17/01	Upshur
UPCO COAL, INC.	S-2009-89	4/17/01	Upshur
UPCO COAL, INC.	S-2010-87	4/17/01	Upshur
USE COAL, INC.	S-2016-86	10/2/92	Lewis
VALLEY CARBON, INC.	S-3030-90	5/6/94	Kanawha
VALLEY MINING CO., INC.	S-64-83	6/12/92	Monongalia
VICKIE ENERGY, INC.	U-53-85	1/11/95	Pocahontas
VICKIE ENERGY, INC.	S-3038-86	1/11/95	Nicholas
VIKING COAL COMPANY	UO-519	1/18/01	Preston
VIRGIN COAL SALES, INC.	U-4028-92	5/2/95	McDowell
VMS, LTD.	S-1045-87	4/4/94	Monongalia
WAR EAGLE CONSTRUCTION CO.	S-5046-88	5/28/98	Logan
WEST VIRGINIA ENERGY, INC.	O-32-83	10/25/95	Brooke
WEST VIRGINIA ENERGY, INC.	S-41-84	10/25/95	Brooke
WEST VIRGINIA ENERGY, INC.	S-20-83	10/17/96	Ohio
WEST VIRGINIA ENERGY, INC.	S-69-82	10/17/96	Ohio
WEST VIRGINIA ENERGY, INC.	S-1012-87	12/4/96	Ohio
WEST VIRGINIA ENERGY, INC.	S-29-80	1/23/97	Ohio
WEST VIRGINIA ENERGY, INC.	S-1071-86	1/23/97	Brooke
WEST VIRGINIA ENERGY, INC.	S-72-84	1/23/97	Ohio
WEST VIRGINIA ENERGY, INC.	S-55-85	1/23/97	Brooke
WESTSIDE RIVER TERMINAL, INC.	O-46-85	3/23/98	Monongalia
WESTSIDE RIVER TERMINAL, INC.	O-46-84	8/5/99	Monongalia
WHITE HORSE MINING INC.	U-4020-87	2/1/99	Wyoming
WILLIAMS CONSTRUCTION	S-3061-88	4/6/98	Nicholas
WILLIAMS CONSTRUCTION CO.	S-3079-86	1/21/94	Fayette
WILLIAMS CONSTRUCTION CO.	P-3015-91	8/29/94	Fayette
WILLIAMS CONSTRUCTION CO.	S-3028-90	5/22/95	Nicholas
WILLIAMS CONSTRUCTION CO.	S-3003-92	5/22/95	Nicholas
WINCHESTER COALS, INC.	O-52-83	12/7/93	Logan
WINCHESTER COALS, INC.	O-10-81	12/7/93	Lincoln
WINCHESTER COALS, INC.	D-23-81	12/7/93	Logan
X W CORP.	S-6013-87	4/20/89	Clay
ZY COAL CO.	70-79	12/12/91	Clay
ZY COAL CO.	91-79	12/12/91	Clay
ZY COAL CO.	S-30-80	12/12/91	Clay

OFFICE	COMPANY	PERMIT	DATE_REVOKED	WATER STATUS	CURRENT WATER OP MAIN COST
N	A S & K, INC.	S-1011-89	8/23/1991	TBC	\$0.00
N	ALAN BLOSSER	S-1010-87	1/2/2002	TBC	\$0.00
N	AMANDA NICOLE FUELS, INC.	S-1018-88	6/12/1992	ACT	\$48,465.00
C	APPALACHIAN FUELS, LLC	S-3041-88	7/25/2011	P	\$0.00
C	ASSET MINING, LLC.	S-5030-95	12/6/2013	TBC	\$0.00
S	B & S CONTRACTING, INC.	O-3086-87	4/24/1995	NA	\$0.00
S	B & S CONTRACTING, INC.	R-668	7/12/1995	P	\$5,648.76
C	B & S CONTRACTING, INC.	U-3055-87	4/24/1995	TBRT	\$7,912.08
N	BALDWIN MINING COMPANY	D-75-82	8/22/2001	P	\$0.00
S	BARRENSHE COAL CO.	UO-694	8/17/1993	P	\$10,084.58
S	BARRETT FUEL CORP.	R-737	3/15/1996	P2	\$3,901.07
C	BELLE CONTRACTING, INC.	S-6020-87	11/14/1989	P	\$11,719.14
C	BENHAM GROUP, LTD.	120-79	1/1/1990	P	\$6,021.06
N	BJORKMAN MINING CO.	S-37-81	9/23/1992	P	\$3,634.99
C	BLACK DIAMOND MINING CO.	13-79	4/1/1989	P	\$3,673.12
N	BOLINGREEN MINING COMPANY	S-1024-88	2/10/2000	ACT	\$12,216.40
N	BOOMERANG COAL, INC.	S-2015-06	3/8/2011	P	\$0.00
N	BORGMAN COAL CO.	EM-32	10/1/1991	ACT2	\$15,370.39
C	BRADY CLINE COAL CO.	EM-97	8/23/1994	TBRT	\$33,525.12
S	BRENKEE COAL CO.	UO-435	11/12/1986	NA	\$0.00
N	BUFFALO COAL COMPANY, INC.	S-122-80	9/29/2006	TBRT	\$9,808.26
N	BUFFALO COAL COMPANY, INC.	S-2001-86	9/29/2006	TBC	\$0.00
N	BUFFALO COAL COMPANY, INC.	S-2003-03	7/10/2008	TBC	\$0.00
N	BUFFALO COAL COMPANY, INC.	S-2003-88	8/20/2008	RT	\$544,218.09
N	BUFFALO COAL COMPANY, INC.	S-2006-86	7/10/2008	P	\$57,400.00
N	BUFFALO COAL COMPANY, INC.	S-2011-92	7/10/2008	P	\$0.00
N	BUFFALO COAL COMPANY, INC.	S-52-80	9/29/2006	TBRT	\$0.00
N	BUFFALO COAL COMPANY, INC.	S-53-80	9/29/2006	TBC	\$0.00
C	C. C. CONLEY & SONS, INC.	S-3046-91	12/7/2000	P	\$45,586.42
N	CARSON ONE MINING, LLC	O-4-84	10/1/2010	TBC	\$0.00
C	CHAFIN COAL CO.	O-69-82	7/11/1995	P	\$3,815.16
N	CHESTNUT RIDGE COAL CORP.	S-28-83	11/15/1993	TBRT	\$64,517.26
N	CHEYENNE SALES CO., INC.	S-2009-96	9/22/2009	NA	\$0.00
N	CHEYENNE SALES COMPANY, INC.	O-11-83	7/9/2009	P	\$0.00
C	CHICOPEE COAL COMPANY, INC.	O-6013-88	1/31/2003	P	\$5,299.00
C	CHICOPEE COAL COMPANY, INC.	S-3002-98	6/23/2006	P	\$0.00
C	CHICOPEE COAL COMPANY, INC.	S-3006-99	3/28/2006	P	\$0.00
S	CLASSIC RES., INC.	S-55-81	5/12/1986	TBC	\$0.00
C	COAL X, INC.	UO-396	1/1/1986	ACT	\$3,657.21
C	COWACO, INC.	R-3022-87	1/22/1992	P	\$2,997.49
C	CRADDOCK & SON COAL CO.	S-68-83	10/1/1992	P	\$3,079.83
N	CRANE COAL CO., INC.	S-27-83	1/3/1992	P	\$3,309.59
N	DAUGHERTY COAL COMPANY, INC.	124-79	8/18/1989	NA	\$0.00
N	DAUGHERTY COAL COMPANY, INC.	17-81	4/1/1989	NA	\$0.00
N	DAUGHERTY COAL COMPANY, INC.	192-77	7/1/1989	ACT	\$0.00
N	DAUGHERTY COAL COMPANY, INC.	246-74	8/1/1989	NA	\$0.00
N	DAUGHERTY COAL COMPANY, INC.	65-77	7/12/1989	TBRT	\$75,622.00
N	DAUGHERTY COAL COMPANY, INC.	S-1009-86	7/17/1989	ACT	\$22,961.51
N	DAUGHERTY COAL COMPANY, INC.	S-73-83	7/17/1989	NA	\$0.00
N	DECONDOR COAL CO.	U-147-82	11/25/2008	TBRT	\$0.00
S	DEEPGREEN WV, INC.	O-164-83	10/5/2015	P	\$0.00
N	DELTA MINING, INC.	U-2024-87	3/18/1993	ACT	\$6,297.00
N	DLM COAL CO.	Jan-78	9/16/1985	TBRT	\$36,312.94
N	DLM COAL CO.	Dec-78	9/16/1985	TBRT	\$33,771.76
N	DLM COAL CO.	Feb-80	9/13/1985	ACT	\$58,156.58
N	DLM COAL CO.	135-78	9/16/1985	RT	\$45,498.70

N	DLM COAL CO.	138-74	9/3/1985	RT	\$82,104.64
N	DLM COAL CO.	164-77	9/16/1985	RT	\$14,357.91
N	DLM COAL CO.	23-76	10/1/1985	RT	\$109,173.72
N	DLM COAL CO.	58-77	9/16/1985	RT	\$44,174.23
N	DLM COAL CO.	71-75	10/1/1985	TBRT	\$28,633.13
N	DLM COAL CO.	P-426	9/16/1985	NA	\$0.00
N	DLM COAL CO.	R-423	9/16/1985	ACT	\$0.00
S	DUSTY COALS, INC.	S-119-85	8/10/1987	TBRT	\$44,882.10
S	E. J. & L. CO., INC.	S-3041-87	5/9/1990	P	\$8,418.12
C	EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3016-08	6/22/2016	TBC	\$0.00
C	EASTERN ENERGY INVEST.	S-6029-86	5/2/1994	ACT	\$12,972.71
C	EASTERN ENERGY INVEST.	U-6012-88	1/28/1994	P	\$3,357.00
N	ED-E DEVELOPMENT CO., INC.	S-1032-86	3/29/1993	ACT	\$17,714.28
N	ED-E DEVELOPMENT CO., INC.	S-10-81	1/23/1993	ACT	\$99,949.21
N	EDWARD E. THOMPSON	S-1041-89	2/15/1994	ACT2	\$61,140.00
N	ENERGY MARKETING CO. INC.	U-72-83	2/27/2013	P	\$0.00
N	ENERGY MARKETING COMPANY INC	O-44-83	6/7/2010	NA	\$0.00
N	F & M COAL CO.	46-79	9/24/1992	P	\$3,608.85
N	F & M COAL CO.	S-1026-87	4/30/1992	P	\$3,077.22
N	F & M COAL CO.	S-1044-87	4/30/1992	ACT2	\$200,749.45
N	F & M COAL CO.	S-1073-86	3/13/1992	NA	\$0.00
N	F & M COAL CO.	S-57-84	3/13/1992	ACT2	\$105,816.55
S	FALCON LAND COMPANY, INC.	P-656	4/5/2005	ACT2	\$62,483.77
N	FARKAS COAL CO.	34-81	7/1/1988	ACT	\$23,673.13
N	FREEPORT MINING CORPORATION	S-1005-95	7/8/2003	ACT	\$135,042.00
N	FRUSH ENTERPRISES, INC.	S-1008-89	11/10/1992	ACT2	\$23,702.00
S	GAULEY COAL SALES CO.	O-43-84	8/23/1994	P	\$4,502.48
N	GLADE RUN MINING CO.	Mar-72	10/3/1983	P	\$3,115.53
N	GLADY FORK MINING, INC.	D-35-82	6/7/2004	ACT	\$24,312.00
N	GLORY COAL CO., INC.	UO-744	12/1/1985	P	\$3,128.60
C	GOLD STAR MINING CORP.	S-121-85	7/15/1987	NA	\$0.00
N	GOLDEN PRODUCTS CO.	S-1009-88	3/1/1991	P	\$4,156.94
S	GREEN MOUNTAIN ENERGY	U-4013-91	3/19/1997	P	\$3,422.94
C	GREENDALE COALS, INC.	S-75-83	4/1/1987	ACT	\$0.00
N	HALLELUJAH MINING	40-81	9/24/1992	ACT	\$18,932.49
S	HARVEY ENERGY CORP.	S-11-82	9/16/1991	TBRT	\$7,174.52
S	HARVEY ENERGY CORP.	S-3030-89	9/16/1991	P	\$7,082.01
S	HARVEY ENERGY CORP.	S-35-81	9/16/1991	TBRT	\$15,008.67
C	HAWKS NEST MINING CO.	O-1-81	12/7/1993	ACT	\$5,928.97
N	HIDDEN VALLEY COAL CO.	S-60-84	8/29/1989	ACT	\$12,392.98
C	HUNT COAL, INC.	U-5071-86	6/14/1989	ACT	\$10,651.64
N	INTER-STATE LUMBER COMPANY, INC.	176-77	7/31/1995	ACT	\$20,480.75
N	INTER-STATE LUMBER COMPANY, INC.	S-112-80	7/31/1995	P	\$25,536.74
N	INTER-STATE LUMBER COMPANY, INC.	S-39-82	7/31/1995	TBC	\$0.00
N	INTER-STATE LUMBER COMPANY, INC.	S-52-83	7/31/1995	ACT	\$3,772.83
N	INTER-STATE LUMBER COMPANY, INC.	S-96-82	7/31/1995	P	\$2,539.39
S	J & N PROCESSING COMPANY, LLC	O-58-83	6/29/2001	P	\$37,223.62
N	J. C. B. MINING, INC.	U-2006-88	12/30/2002	TBC	\$0.00
N	J. E. B., INC.	S-1063-86	11/1/1991	ACT	\$9,795.78
N	J. E. B., INC.	S-61-82	11/1/1991	ACT	\$8,881.06
N	J.A.L. COAL CO., INC.	S-23-82	3/12/1997	P	\$29,311.54
S	JINKS MINING COMPANY	U-3031-93	2/24/2000	P	\$5,579.41
N	JONES COAL INC	S-1030-86	7/24/1992	P	\$3,817.65
N	JONES COAL INC	S-9-83	11/17/1992	P	\$0.00
N	KEISTER COAL COMPANY, INC.	184-77	9/1/1983	ACT	\$10,354.93
C	KEYSTONE COAL, INC.	S-84-83	3/17/1998	TBC	\$0.00
C	KEYSTONE COAL, INC.	U-186-83	3/17/1998	TBC	\$0.00
S	KODIAK LAND CO., INC.	S-3052-87	5/19/1992	P	\$9,313.24
N	LAKEVIEW COAL COMPANY	S-55-84	1/23/1997	P	\$6,065.44

C	LANDMARK CORPORATION	S-34-82	1/30/2001	P	\$0.00
C	LANDMARK CORPORATION	S-5069-88	1/30/2001	P	\$0.00
N	LAROSA FUEL CO., INC.	S-1051-86	7/24/2009	ACT	\$0.00
S	LEVEL LAND MINING CORPORATION	S-3031-90	11/8/2006	P	\$5,582.73
S	LILLYBROOK COAL CO.	S-86-85	6/1/1990	TBRT	\$20,732.50
N	LOBO CAPITOL, INC.	UO-204	8/7/1985	NA	\$0.00
S	LODESTAR ENERGY, INC.	R-5-84	5/24/2004	TBRT	\$16,987.01
S	LODESTAR ENERGY, INC.	S-19-85	1/21/2004	P	\$4,968.06
C	LODESTAR ENERGY, INC.	S-3006-89	1/21/2004	P	\$0.00
C	LODESTAR ENERGY, INC.	S-3083-86	1/21/2004	P	\$0.00
C	LO-MING COAL CORPORATION	U-5049-87	9/17/2002	C	\$11,000.00
S	LOW ASH COAL CO.	UO-389	2/1/1985	TBRT	\$5,666.99
C	M & T MINING CO.	S-3026-89	2/9/1994	P	\$18,577.06
N	MANGUS COAL, INC.	S-1036-91	3/14/2008	NA	\$0.00
N	MARTINKA WATER TREATMENT COMPLEX	MAR1-2020	7/13/2020	ACT	\$0.00
N	MARY RUTH CORPORATION	S-1015-88	1/17/2013	NA	\$0.00
N	MAURICE JENNINGS	53-78	12/10/2004	NA	\$0.00
N	MAURICE JENNINGS	S-61-83	11/30/2004	NA	\$0.00
S	MERIDAN OF VIRGINIA, INC.	S-4005-89	9/14/1992	TBC	\$0.00
N	MOHIGAN MINING CO.	U-109-83	6/30/1992	P	\$35,676.70
N	MORGANTOWN ENERGY EXPORT COMPANY	U-8-83	6/14/1994	P	\$5,332.33
S	MOUNTAINEER FUELS, INC.	U-3083-87	1/30/1998	P	\$6,723.61
N	NATIONAL CONSTRUCTION COMPANY, INC.	S-2004-86	12/7/1998	P	\$8,515.60
N	OMEGA MINING CO. INC.	D-79-82	10/7/1994	ACT2	\$395,162.20
S	PEACHTREE RIDGE MINING, INC.	U-18-83	1/29/2004	NA	\$0.00
N	PIERCE COAL & CONSTRUCTION, INC.	252-76	12/1/1982	NA	\$0.00
N	PIERCE COAL & CONSTRUCTION, INC.	71-80	12/1/1982	ACT	\$3,171.88
S	PINNACLE CREEK MINING CORP.	R-721	12/7/1994	TBRT	\$6,054.25
N	PRESTON ENERGY, INC.	O-1035-87	5/5/1994	ACT	\$51,997.59
N	PRESTON ENERGY, INC.	O-43-85	5/24/1994	ACT	\$9,896.40
N	PRESTON ENERGY, INC.	O-86-82	5/25/1994	ACT	\$2,788.47
N	PRESTON ENERGY, INC.	UO-235	3/18/1994	NA	\$0.00
N	PRIMROSE COAL, INC.	Jul-81	3/23/2011	TBRT	\$0.00
S	PRINCESS CINDY MINING, INC.	30-79	5/26/1987	P2	\$4,668.63
C	PRINCESS SUSAN COAL CO.	S-6033-86	12/7/1993	P	\$6,844.48
C	PRINCESS SUSAN COAL CO.	S-6-85	12/7/1993	P	\$6,492.64
C	PRINCESS SUSAN COAL CO.	S-76-82	10/4/1994	P	\$0.00
S	PUPS CREEK COALS, INC.	S-3006-94	12/6/1999	P	\$0.00
S	RALEIGH COMMERCIAL DEVELOPMENT	149-79	1/21/1987	P	\$3,218.49
N	ROBLEE COAL COMPANY	O-1009-93	11/9/2009	P	\$0.00
N	ROBLEE COAL COMPANY	U-1001-91	1/11/2010	P	\$0.00
N	ROBLEE COAL COMPANY	U-2001-00	4/22/2010	P	\$0.00
N	ROBLEE COAL COMPANY	U-2026-87	3/16/2010	P	\$0.00
N	ROCKVILLE MINING CO.	237-76	1/12/1994	ACT	\$18,192.14
N	ROCKVILLE MINING CO.	65-78	1/12/1994	ACT	\$49,418.92
N	ROCKVILLE MINING CO.	S-1035-86	1/12/1994	ACT	\$13,902.35
N	ROCKVILLE MINING CO.	S-65-82	1/12/1994	ACT	\$52,736.00
N	ROCKVILLE MINING CO.	S-91-85	1/12/1994	NA	\$0.00
S	ROYAL COAL CO.	P-688	1/1/1990	TBC	\$0.00
S	ROYAL COAL CO.	R-676	11/1/1989	TBC	\$0.00
S	ROYAL SCOT MINERALS, INC.	31-72	4/28/1999	RT	\$433,754.17
S	ROYAL SCOT MINERALS, INC.	56-81	4/27/2000	RT	\$7,430.46
S	ROYAL SCOT MINERALS, INC.	D-32-81	4/27/2000	TBRT	\$11,360.00
S	ROYAL SCOT MINERALS, INC.	R-3078-86	4/27/2000	P	\$31,031.99
S	ROYAL SCOT MINERALS, INC.	S-65-76	4/27/2000	TBC	\$0.00
S	ROYAL SCOT MINERALS, INC.	S-90-82	4/27/2000	P2	\$4,311.14
S	ROYAL SCOT MINERALS, INC.	S-99-83	4/27/2000	TBRT	\$5,041.88
S	ROYAL SCOT MINERALS, INC.	U-3046-88	4/27/2000	TBC	\$0.00
S	ROYAL SCOT MINERALS, INC.	U-40-85	4/27/2000	P	\$7,413.96



N	S. KELLY INDUSTRIES	51-78	6/13/1985	RT	\$76,093.09
C	SAN SUE COAL CO.	19-75	1/13/1989	P	\$6,007.63
N	SHAFER BROTHER CONSTRUCTION, INC.	S-2002-12	5/11/2015	TBC	\$0.00
N	SHARON COAL CO.	S-1028-87	3/23/2011	P	\$0.00
S	SMITH & STOVER	EM-29	5/17/1984	TBC	\$0.00
S	SOLITAIRE COAL CORPORATION, INC.	S-87-85	6/23/1989	P	\$0.00
N	SOUTHERN EAGLE MINING CORPORATION	U-32-84	2/6/1985	P	\$3,066.30
S	STAR INDUSTRIES, INC.	R-3-81	5/27/1987	ACT	\$43,999.65
N	STEWARTOWN COAL CORP.	67-78	6/28/1988	ACT	\$5,016.55
C	SUMMERSVILLE FIVE BLOCK	S-3051-88	11/1/1994	TBC	\$0.00
N	T & J COAL, INC.	P-177-85	5/29/1987	ACT	\$41,315.00
N	T & T FUELS, INC.	EM-113	10/31/1995	ACT	\$348,097.64
N	T & T FUELS, INC.	U-125-83	12/4/1995	ACT	\$25,101.32
N	THE MASTELLER COAL COMPANY	S-10-85	12/10/2003	P	\$0.00
N	THE MASTELLER COAL COMPANY	S-125-82	5/3/2004	ACT	\$0.00
S	TRIPLE A COALS, INC.	S-3028-87	12/17/1998	P2	\$9,771.52
S	TRIPLE A COALS, INC.	S-96-85	12/17/1998	P	\$12,685.06
S	TRIPLE A COALS, INC.	U-3046-87	12/17/1998	P	\$4,234.82
N	VALLEY MINING CO., INC.	S-17-82	9/24/1992	ACT	\$9,061.44
N	VALLEY MINING CO., INC.	S-64-83	6/12/1992	ACT2	\$32,145.05
S	VICKIE ENERGY, INC.	U-53-85	1/11/1995	TBRT	\$6,567.13
N	VIKING COAL COMPANY	UO-519	1/18/2001	NA	\$73,463.27
N	VMS, LTD.	S-1045-87	4/4/1994	TBRT	\$11,075.07
S	W & E LOGGING & COAL	S-20-82	5/5/1986	P	\$4,044.34
N	WERNER MINING CO., INC.	S-2003-86	5/20/1992	P	\$3,410.85
N	WETER CO.	S-71-79	7/10/1995	P	\$2,844.21
C	WINCHESTER COALS, INC.	O-52-83	12/7/1993	P	\$0.00
N	WOCAP ENERGY RESOURCES, INC.	S-26-85	12/14/1993	ACT3	\$27,753.86
C	X W CORP.	S-6013-87	4/20/1989	P	\$3,589.26
N	Z & F DEVELOPMENT CO.	S-21-84	11/6/1985	ACT	\$61,096.40
N	ZINN COAL CO.	60-79	4/16/1991	P	\$4,106.44
C	ZY COAL CO	S-6028-88	12/12/1991	P	\$0.00

## Mine Drainage Treatment Prioritization

COMPANY	PERMIT	Acid Loading TPY
ASSET MINING, LLC.	S-5030-95	44.11
ROYAL COAL CO.	P-688	32.035
KEYSTONE COAL, INC.	U-186-83	21.98
CARSON ONE MINING, LLC	O-4-84	17.53
INTER-STATE LUMBER COMPANY, INC.	S-39-82	17.3
SMITH & STOVER	EM-29	11.44
BUFFALO COAL COMPANY, INC.	S-53-80	8.47
LODESTAR ENERGY, INC.	S-3006-89	6.21
BUFFALO COAL COMPANY, INC.	S-2001-86	4.96
SUMMERSVILLE FIVE BLOCK	S-3051-88	3.81
SHAFER BROTHER CONSTRUCTION, INC.	S-2002-12	2.97
A S & K, INC.	S-1011-89	2.36
BUFFALO COAL COMPANY, INC.	S-2003-03	1.34
J. C. B. MINING, INC.	U-2006-88	0.7527
MERIDAN OF VIRGINIA, INC.	S-4005-89	0.284
CLASSIC RES., INC.	S-55-81	0.1836
EAGLE RIDGE DEVELOPMENT GROUP, LLC	S-3016-08	0.155
KEYSTONE COAL, INC.	S-84-83	0.08
ROYAL COAL CO.	R-676	0.0189
ROYAL SCOT MINERALS, INC.	S-65-76	0.0022