

# Appraisal of Mineral Properties

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# Appraisal of Mineral Properties

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- Certified General Appraiser:
  - ▶ Pennsylvania
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  - ▶ Virginia
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  - ▶ Indiana
  - ▶ Alabama
  - ▶ Ohio
  - ▶ Illinois
  - ▶ Alaska
  - ▶ West Virginia
  - ▶ Kentucky
  - ▶ New Jersey
  - ▶ New York
  - ▶ North Carolina
  
- Pennsylvania Certified Evaluator
- Member
  - American Institute of Mineral Appraisers
  - American Society of Appraisers
  - International Association of Assessing Officers
  - Institute of Business Appraisers
  - Minerals Economics and Management Society

# Drag Line and Dozer



# Minerals to be Valued

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## What is a mineral?

- Coal – Anthracite, Bituminous, Lignite
- Clay
- Crushed Stone
- Dimension Stone (Granite, Limestone, Slate)
- Gypsum
- Iron Ore
- Natural Gas
- Oil
- Phosphate
- Sand and Gravel
- Other Mineral Commodities

# Minerals Defined

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Minerals are defined in terms of economics.

Given legal, environmental, and political factors, can the material  
or commodity

be:

- Identified and processed,
- Extracted from the ground,
- Processed for market, and
- Delivered to market

At a competitive price ?

# Why Appraise Mineral Properties ?

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- Sale or Acquisition of Operating Companies or Reserves
- Investment and Operating Decisions
- Tax planning
- Reports to federal agencies (Securities Exchange Commission)
- Financing
- Income, severance, and ad-valorem taxation
- Condemnation

# Mineral Value

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## What is Mineral Value ?

- After processing unit value of a commodity:
  - ▶ Price per processed and delivered ton of coal
  - ▶ Price of delivered gasoline
  - ▶ Price of a diamond ring
- FOB Price at the mine site
- In-place value in the ground
- Speculative value for future development

A Mineral Property only has value as it relates to its ability to produce future income

# Sand and Gravel





# Categories of Mineral Property Value

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- Active Extractive Operations

  - Mines

  - Quarries

  - Wells

- Reserve

  - Properties included in active operational control

  - Properties which are situated for future extraction

- Resources

  - Properties which may contain future reserves

# Minerals are Just Like...

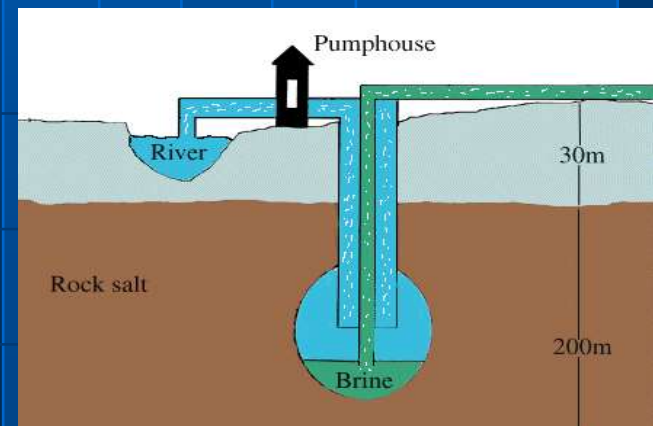
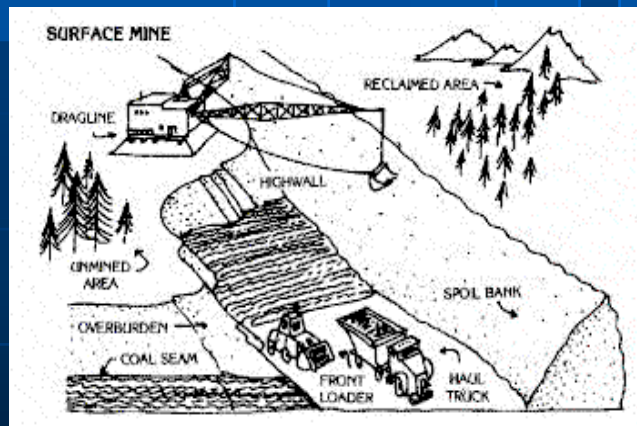
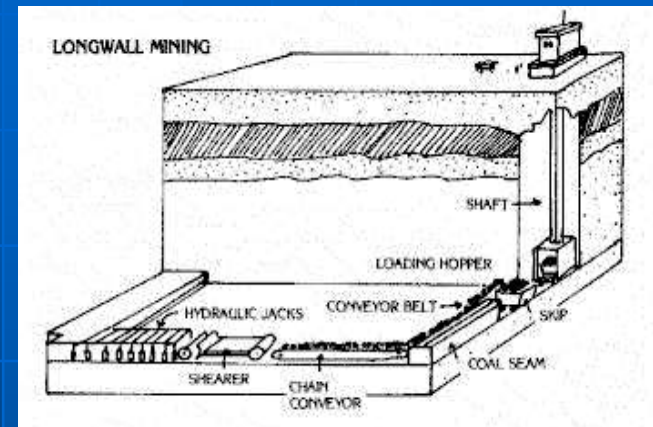
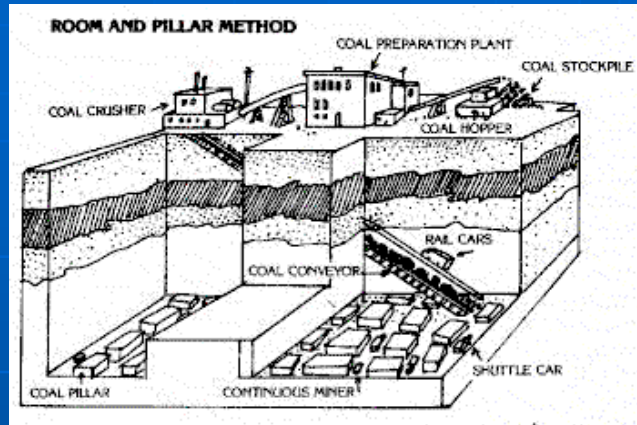
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**Active Mine**      ➔ **Commercial Real Estate**  
➔ **Industrial property**

**Active Reserve**      ➔ **Undeveloped parcel in a growing industrial or commercial area**

**Reserve**      ➔ **Undeveloped parcel which may have future developmental possibilities**

# Typical Mining Methods



# Highest and Best Use

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Just like any other property

- **Possible:**

- Does the asset exist, is there a sufficient quantity of the appropriate quality of resource, and is it technically possible to use it?

- **Legal:**

- Is it legal or permissible to exploit the asset?

- **Feasible:**

- Can the asset be utilized or exploited in a realistic manner? Is there appropriate access (in mineral properties, this may include rights to mine, rights of ingress and egress, wheelage rights, air shaft, and water control rights)?

- **Economic:**

- Can the resource be exploited in such a way as to return a positive economic return on the investment necessary to exploit the resource? Is there a potential profit in the present or foreseeable market place?

# Ownership

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## Ownership Defines Use and Availability

- **Fee Ownership** — complete mineral and surface rights
- **Surface Lease** — control by lease of surface rights
- **Mineral Lease** — control by lease of mineral rights
- **Surface Only** — ownership of surface rights
- **Mineral Only** — ownership of mineral rights
- **Adverse** — properties not owned or leased

# Whitney Benefits Facts

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- Whitney Benefits' land of 1327 acres which were irrigated and subirrigated by the Tongue River alluvial valley floor.
- The land was leased to PKS in 1974, and advanced royalties were paid to Whitney.
- PKS expended exploration costs of \$1 million in 1976
- PKS filed a permit application with the Wyoming Department of Environmental Quality (DEQ).

# Whitney Benefits Facts

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- A year later, SMCRA was enacted.
  - » No permit or application shall be approved if it should "interrupt, discontinue or preclude farming on alluvial valley floors that are irrigated or subirrigated
  - » Thus, Whitney's right to mine the coal on its property was invalidated by the enacted legislation of SMCRA and was the basis for the alleged taking in 1983.

# Whitney Benefits Exchange Failed

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- SMCRA provided for an exchange mechanism as a "method for ascertaining and paying just compensation"
- 1981: PKS had requested an exchange for federal lands to the BLM:
  - BLM offered Ash Creek PKS spent \$130,000 on exploration costs on it.
- BLM also offered the Hidden Water tract, which PKS refused *as it had mined it in the late 40s to early 50s and was not interested in the remaining coal.*
- PKS and Whitney proceeded with their 1983 claim under the Tucker Act for a 5th Amendment regulatory taking



# Whitney

## Is it a Taking?

Consider three factors:

### 1 The economic impact of the restriction

The Court found that:

- There was a market for Whitney coal
- The coal was economically and technologically mineable
- SMCRA had a "devastating economic impact on the property"

### 2 The restriction's interference with investment expectations

- Investors could reasonably expect the returns on investments as projected.
- In-place assigned reserves were valued at \$1.01/ton, and residual reserves at \$.20/ton.

### 3 The character of the government's action

- There were no economically viable alternative uses for the property.

Court's Conclusion: "... the substantial public interest at stake does not outweigh the private interest so that plaintiffs must bear the full burden imposed by the government action".

# Whitney Findings

The Court established a final sum of \$60,296,000 for the total 1977 value of recoverable Whitney Coal assuming:

- An annual production rate of 2.5 million tons
- Cost of \$2 million for backfilling.
- Interest was payable to Whitney from Aug. 3, 1977 to date of payment.

The amount was intended to represent what a willing purchaser would have paid Whitney as a willing seller, to mine the Whitney Coal after calculating all mining related costs.

*The Court held that:*

- *the enactment of SMCRA totally eliminated economic value of plaintiffs' coal and constituted a taking under the Fifth Amendment;*
- *the taking occurred at the time SMCRA became effective;*
- *the valuation method incorporating discounted cash flow approach offered reliable method for determining the fair market value of the coal on the day of the taking*
- *the plaintiffs were entitled to pre-judgment interest*

# Specific Legal Valuation Requirements

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In addition to the prices paid in sales of similar lands, due regard must be given to the **physical features of the property to be valued**. The formation of the coal strata should be taken into account as well as:

- **number of veins**
- **depth**
- **thickness**
- **pitch**
- **basins**
- **proximity to outcrop**
- **character of the separating rock formation**
- **quality of the coal**
- **gaseous or nongaseous nature**
- **kind of overlying surface**
- **availability of the coal**
- **difficulty in mining it**
- **probable quantity of the merchantable coal in the ground with allowance for loss in mining**
- **demand for the product**
- **all elements which a prudent purchaser would take into consideration**

# Factors to be Investigated

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- Resource / Reserves
- Quality and Processing
- Environmental Considerations
- Current Operations
- Mining Plans
- Production Costs
- Markets and Transportation
- Valuation Techniques

# Resources / Reserves

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- Resources

- ▶ Naturally occurring concentration or deposit
- ▶ Economic extraction is potentially feasible

- Reserves

- ▶ Only Potentially Recoverable Mineral
- ▶ Economic exploitation probable
- ▶ Classified as:
  - Inferred
  - Indicated
  - Measured

- Active

- ▶ Current extraction occurring in definable deposit

# Reserve Classifications

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- IRS

- ▶ Proven Reserves
- ▶ Probable Reserves
- ▶ Possible Reserves
- ▶ Property

- Recoverable Reserves

- Geophysical

- ▶ Proven Reserves
- ▶ Probable Reserves
- ▶ Possible Reserves
- ▶ Speculative Reserves

# Reserve Classification (SEC)

## Proven Reserves

- "Reasonably Certain" to be producible:
  - ▶ Current technology
  - ▶ Current prices
  - ▶ Current commercial terms
  - ▶ Current government consent
- P90, having a 90% certainty of being produced.
- Proven reserves are usually applied to:
  - producing wells
  - single offset wells from the actively producing well

# Reserve Classification (SEC)

## Probable Reserves

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- "Reasonably Probable" of being produced:
  - ▶ current or likely technology
  - ▶ current prices
  - ▶ current commercial terms
  - ▶ government consent:
    - P50., having a 50% certainty of being produced.
    - Probable reserves are generally applied to single well offsets from Proven Reserves as long as the offset follow known production trends.



# Reserve Classification (SEC)

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- Possible Reserves :
  - ▶ "having a chance of being developed"
  - ▶ under favorable circumstances (3P):
    - P10., having a 10% certainty of being produced.
    - Possible reserves are generally applied to single well offsets from Probable Reserves as long as the offset follow known production trends.
- Speculative (Prospective) Reserves
  - ▶ less than a 10% probability that reserves will be discovered and developed.

# Sand and Gravel Dredge

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# Reserves

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The ore body defines the future use of the deposit

- Geology
  - ▶ Thickness and consistency of deposit
  - ▶ Overlying strata (roof or overburden)
  - ▶ Geologic disturbances or anomalies
- Topography
- Surface features
  - ▶ Flood plains
  - ▶ Drainage areas
  - ▶ Aquifers

# Surface Mine Reserves

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- **Overburden ratio (stripping ratio)**
  - ▶ Volume of overlying material which must be removed to extract a ton of coal (cu ft / ton)
  - ▶ Difficulty in removing overburden
    - Hard rock
    - Difficult access
    - Water
    - Disposal Problems
- **Dilution**
  - ▶ Contamination of ore with overburden during the mining process
- **Multiple Seam Mining (e.g. Mountain Top Removal)**
  - ▶ Improving ratio
  - ▶ Able to retrieve otherwise “non-economic” seams

# Bucket Wheel Loader



# Deep Mine Reserves

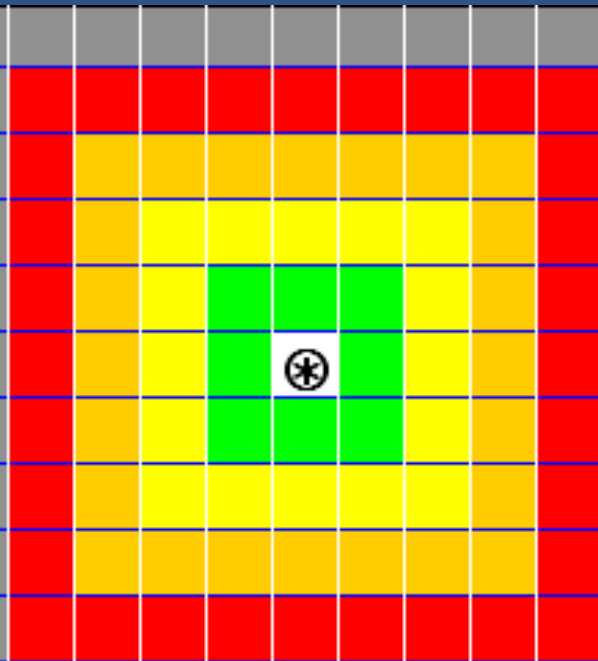
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- Roof Rock
  - ▶ Types of control measures required
  - ▶ Control not possible
- Floor Rock
  - ▶ Mining equipment moves freely
  - ▶ Condition pose problems to movement
- Water
  - ▶ Seam above drainage can be mined with water controls
  - ▶ Seam below drainage requiring significant water control and treatment
  - ▶ Seam can not be mined without significant water drainage problems

# Long Wall Mining Machine



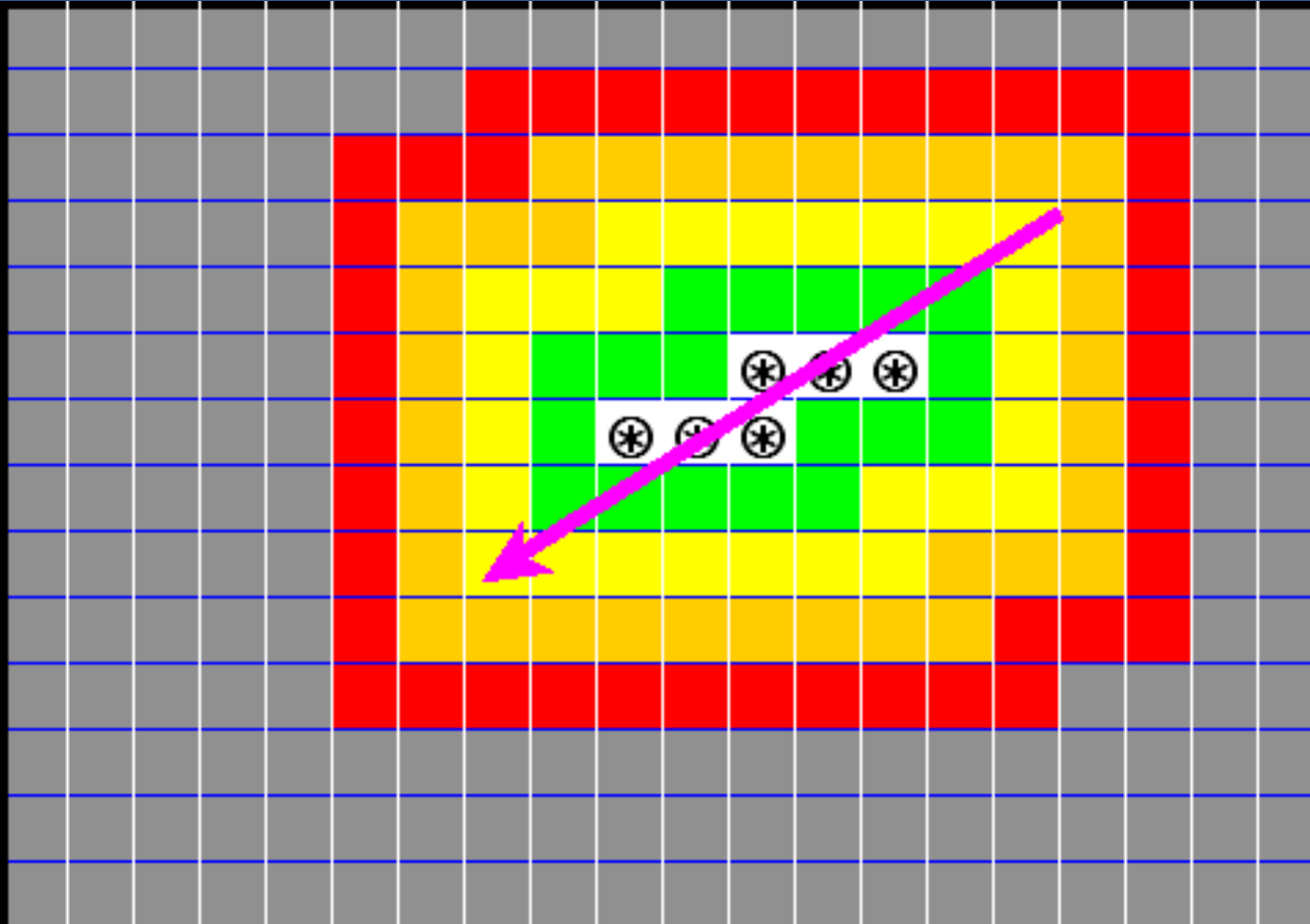
# Well Spacing



|   |      |     |      |
|---|------|-----|------|
| ⊛ |      | 1   | 0%   |
| ■ | p90  | 8   | 3%   |
| ■ | p50  | 16  | 6%   |
| ■ | p10  | 24  | 9%   |
| ■ | p10- | 32  | 11%  |
| ■ | p0+  | 199 | 71%  |
|   |      | 280 | 100% |

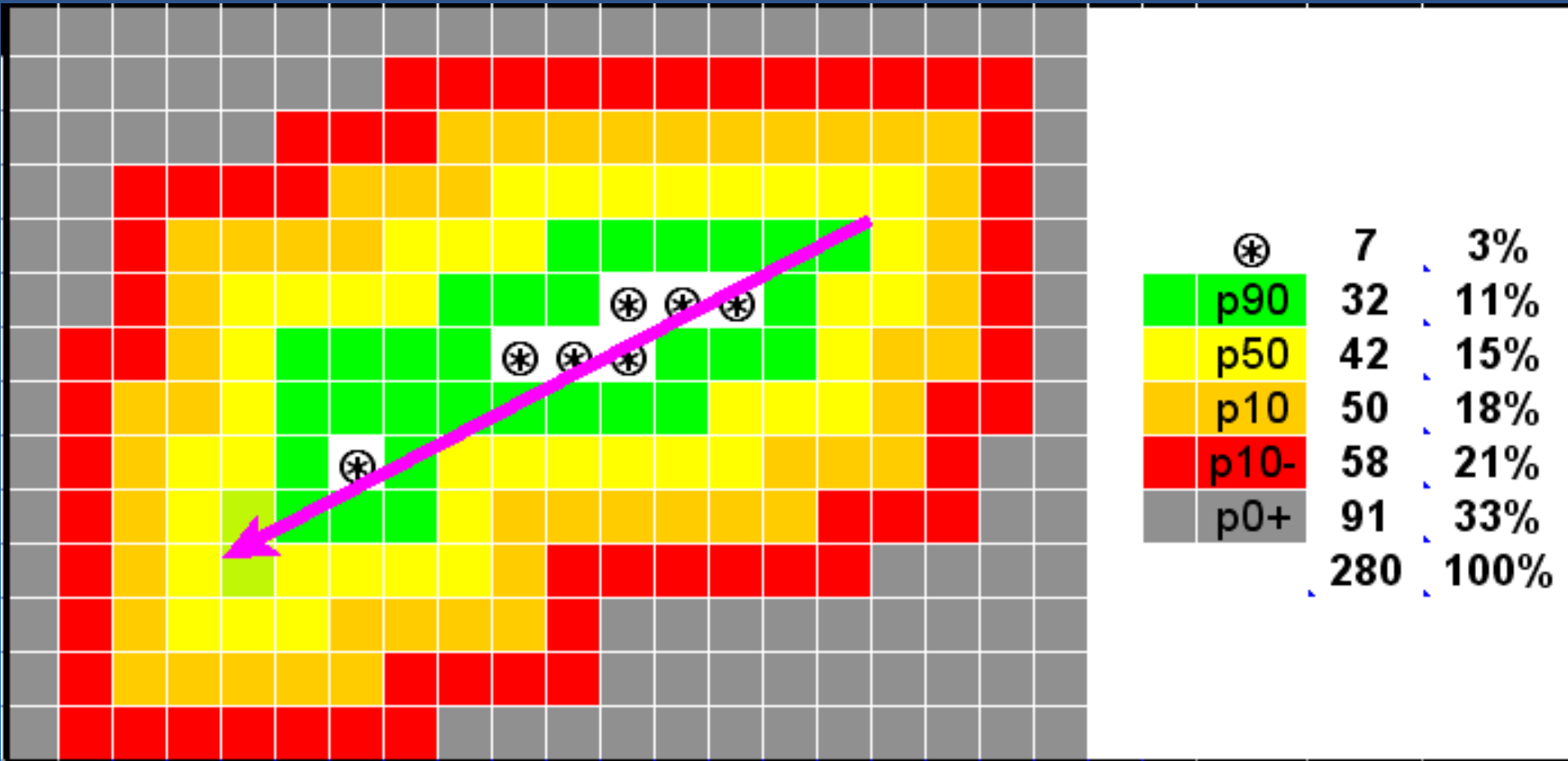


# Well Spacing / Offset Interpretation:



|  |      |     |      |
|--|------|-----|------|
|  | ⊗    | 6   | 2%   |
|  | p90  | 18  | 6%   |
|  | p50  | 26  | 9%   |
|  | p10  | 34  | 12%  |
|  | p10- | 42  | 15%  |
|  | p0+  | 154 | 55%  |
|  |      | 280 | 100% |

# Well Spacing / Offset Interpolation



# Reserves: Data Sources

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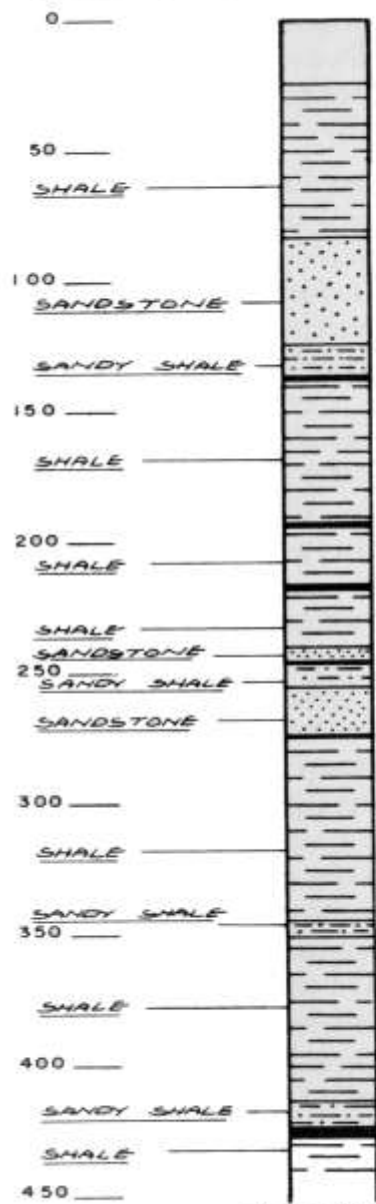
- Geologic maps and Data
  - ▶ USGS
  - ▶ State Geologic Survey
- Topographic maps
- Permit Data
  - ▶ DEP/DNR Offices
  - ▶ Court House records
- Public Reports
- Confidential Mining Company Maps and Reports

DRILL HOLE NO. 6

COLLAR ELEVATION 2062'

DEPTH (FT.)

STRATA



COAL - 0.20'  
 SANDY SHALE - 0.60'  
 COAL - 0.55'  
 SANDY SHALE - 2.75'  
 COAL - 0.10'  
 SANDY SHALE - 1.15'  
 COAL - 0.85'

} PEERLESS SEAM

COAL - 1.75'

} EAGLE SEAM

COAL - 1.60'  
 GRAY SHALE - 3.00'  
 COAL - 1.00'

COAL - 1.10'  
 COAL - 0.60'

COAL - 5.40'  
 BONY COAL - 0.50'

} SEWELL SEAM

-  COAL
-  SANDSTONE
-  LIMESTONE
-  SHALE
-  SANDY SHALE
-  CLAY
-  SILTSTONE
-  BONY COAL
-  SHALE/COAL
-  FIRECLAY
-  UNCONSOLIDATED SURFACE MATERIAL
-  SHALY SANDSTONE
-  CLAYSTONE
-  DOLOMITE
-  CONGLOMERATE
-  SANDY LIMESTONE

7/23/2014 BOTTOM OF HOLE  
ELEVATION 1640 FT.

# Ownership Data Sources

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- Deeds – **may or may not show considerations**
- Leases – **may or may not show royalty amounts**
- Memoranda – **never shows any \$\$\$**
- Permit files – **will provide details**
- SEC files – **will provide details**
- Assessment files – ???

# Quality

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- **Market Identification**
  - ▶ What market will the commodity serve?
- **Price Estimation**
  - ▶ What price will the commodity fetch?
- **Absorption**
  - ▶ How much can be sold annually?
- **Production Costs**
  - ▶ What is the cost to produce (process)?

# Quality and Processing

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## Coal

- Ash %
- Moisture %
- Heating Value – Btu per pound
- Sulfur %
- Volatile Matter
- Friability
- Grindability
- Fixed Carbon

# Sand and Gravel Stackers

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# Quality and Processing

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Aggregate: Crushed Stone, Sand Gravel

- Absorption
- Hardness/Integrity
- Color
- PH
- Fracture
- Skid resistance

# Dimension Stone Mine

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# Dimension Stone Saw Shop

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# Environmental Considerations

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- Air Pollution
- Water Pollution
- Noise and Vibration
- Waste Disposal
- Physical Appearance
- Subsidence
- Reclamation

# Environmental Controls

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## Permits required

- **Mine Drainage**
- **Mining**
  - **Surface Mine**
  - **Underground Mine**
  - **Auger Mine**
- **Pollution**
  - **NPDES**
- **Safety**
  - **MSHA**
- **Specific Mining Modules**
  - **Subsidence**
  - **Coal Waste Disposal**
  - **Blasting**
  - **Sedimentation and Erosion**

# Current Operations

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## A key to assessing the future

- Identify likely market
- Furnish insight into operational characteristics
- Provide information concerning resources
- Contribute information concerning location and transportation
- Provide comparative basis for estimating:
  - ▶ Absorption // production rates
  - ▶ Royalty and discount rates
  - ▶ Valuation
    - per acre
    - per unit
    - per operation

# Current Operations

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## Information Sources

- DEP records:
  - ▶ **Regulatory Files:**
    - Inspection reports
    - Permit Files
    - Annual Production reports
  - ▶ **Environmental Information:**
    - Geologic Studies
    - Annual reports
- Industry sources:
  - ▶ **Keystone Coal Manual/ Coal Outlook**
  - ▶ **Aggregates Manager**
- Operator records

# Drag Line





# Mining Plans

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## A KEY TO PREDICTING THE FUTURE

- Pre Mine Development
- Mine Life
- Annual production
- Equipment
- Capital Costs
- Production Costs
- Reclamation Procedures

**Filed with the state prior to start-up, and periodically during operation**

# Long Mining Machine

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# Production Costs

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- LABOR COSTS
- SUPPLIES / MATERIALS
- POWER
- ROYALTIES
- PROPERTY TAXES
- INCOME TAXES
- DEPRECIATION
- PENALTIES AND FINES

# Transportation

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- Transport is a significant cost
- Transport costs can preclude economic viability of a deposit
- The higher the unit value the longer the transport distance:
  - ▶ Gold is transported world wide
  - ▶ Crushed stone is transported 30 ± miles
- Transport cost relate to methods
  - ▶ Conveyor – \$0.07 to 0.13 ± per ton mile
  - ▶ Barge – \$0.09 to 0.20 ± per ton mile
  - ▶ Rail – \$0.12 to 0.25 ± per ton mile
  - ▶ Truck – \$0.17 to 0.30 ± per ton mile

# Market

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- Reliability of Supplier (Supply)
- Reliability demand by purchaser
- Quantity of Reserve
- Quality of Reserve
- Production Cost vs. Market Price
- Transport Cost
- Delivered Price

# Market Prices

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- Contract
  - ▶ Specific needs of supplier and purchaser
  - ▶ May include other factors
- Spot
  - ▶ Open market bidding
- Sources of Information
  - ▶ Industry Publications
    - Coal Outlook
  - ▶ Public Utility Commissions
  - ▶ Energy Information Agency (US DOE)
  - ▶ UGSS
    - Commodity Surveys

# Valuation Methods

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Valuing the Property, not the Business

- Comparative Sales
- Royalty Analysis
- Operational Analysis (Residual)
- Mass Appraisal

# Comparative Sales

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## Pros and cons

### ▪ Advantages

- ▶ Government agencies generally prefer
- ▶ Direct comparison easiest to present

### ▪ Disadvantages

- ▶ Almost never any really comparable properties – particularly active mines or active reserves
- ▶ Sufficient data may not be available
- ▶ While some properties resemble others in some aspects, they may be extremely dissimilar in other aspects



# Operational Analysis (Residual)

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- Mine Life
- Annual Production
- Cash Flow
- Depreciation
- Gross Profit before Income tax
- Federal Taxes
- Net Income after Tax
- Capital Expenditures
- Sales per Year
- Sales Revenue

# Operational Analysis (Residual)

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## Pros and Cons

- Advantages
  - ▶ Method used by most companies
  - ▶ Generally considered the preferred method of valuation
- Disadvantages
  - ▶ Requires significant information
    - Confidential company data
    - Many business assumptions
  - ▶ Time Consuming
  - ▶ Subject to considerable interpretation

# Continuous Mining Machine

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# Royalty Analysis

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## Modified Operational Analysis

- Seams (deposit)
- Terms
- Selling Prices
- Royalty Payments
  - ▶ Advance Minimum royalty
  - ▶ Production royalty
- Monthly Production Reports/Estimates

# Royalty Analysis

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## Advantages and Disadvantages

- Advantages
  - ▶ Market Driven
  - ▶ Comparisons easier
  - ▶ Relatively easy to compute
  - ▶ Based on common economic and appraisal principles
  - ▶ Focuses on resource in-place, not the business
  - ▶ Approximates the in-place value of the resource (represents what a will buyer pays a willing seller)
- Disadvantages
  - ▶ Not as property specific as operational analysis
  - ▶ Requires access to lease royalty comparisons

# \$5.00 Royalty



# Basic Valuation Principles

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- Dollar today is worth more than a dollar tomorrow
- Principle of substitution appropriate
- Production will approximate optimal market absorption rate

|                          |                  |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
|--------------------------|------------------|----------------------------------|--------------------|------------------|------------------|------------------|------------------|------------------|--------------------|-----------------|----------------|
| <b>Thick</b>             | <b>25</b>        |                                  | <b>2013</b>        | <b>2014</b>      | <b>2015</b>      | <b>2016</b>      | <b>2017</b>      | <b>2018</b>      | <b>Total</b>       |                 |                |
| <b>Weight</b>            | <b>2100</b>      |                                  |                    |                  |                  |                  |                  |                  |                    | <b>Per Acre</b> | <b>Per Ton</b> |
| <b>Acres</b>             | <b>12.0</b>      | <b>Mining</b>                    | <b>100,000</b>     | <b>100,000</b>   | <b>100,000</b>   | <b>100,000</b>   | <b>100,000</b>   |                  | <b>500,000</b>     |                 |                |
| <b>Acres Mineable</b>    | <b>11.2</b>      | <b>Gross Income</b>              | <b>\$750,000</b>   | <b>\$750,000</b> | <b>\$750,000</b> | <b>\$750,000</b> | <b>\$750,000</b> | <b>\$250,000</b> | <b>\$4,000,000</b> |                 |                |
| <b>Tons in Place</b>     | <b>588,235</b>   |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Recovery Rate</b>     | <b>0.85</b>      | <b>Royalty</b>                   | <b>\$37,500</b>    | <b>\$37,500</b>  | <b>\$37,500</b>  | <b>\$37,500</b>  | <b>\$37,500</b>  |                  | <b>\$187,500</b>   |                 |                |
| <b>Tons Producidble</b>  | <b>500,000</b>   |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
|                          |                  | <b>Cost</b>                      | <b>\$1,072,500</b> | <b>\$322,500</b> | <b>\$322,500</b> | <b>\$322,500</b> | <b>\$322,500</b> | <b>\$25,935</b>  | <b>\$2,362,500</b> |                 |                |
| <b>Price</b>             | <b>\$7.50</b>    |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Royalty %</b>         | <b>5%</b>        | <b>Net Operating Income</b>      | <b>-\$360,000</b>  | <b>\$390,000</b> | <b>\$390,000</b> | <b>\$390,000</b> | <b>\$390,000</b> | <b>\$224,065</b> | <b>\$1,200,000</b> |                 |                |
| <b>Royalty \$</b>        | <b>\$0.38</b>    |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
|                          |                  | <b>Present worth Calculation</b> |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Start up Cost</b>     | <b>\$750,000</b> | <b>Royalty</b>                   | <b>\$35,576</b>    | <b>\$32,018</b>  | <b>\$28,816</b>  | <b>\$25,935</b>  | <b>\$23,341</b>  | <b>\$0</b>       | <b>\$145,686</b>   | <b>\$12,140</b> | <b>\$0.248</b> |
|                          |                  |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Operating Cost</b>    | <b>43%</b>       | <b>Business</b>                  | <b>-\$331,904</b>  | <b>\$305,628</b> | <b>\$259,784</b> | <b>\$220,816</b> | <b>\$187,694</b> | <b>\$91,660</b>  | <b>\$642,018</b>   | <b>\$53,501</b> | <b>\$1.091</b> |
|                          | <b>\$3.23</b>    |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Equipment resale</b>  | <b>\$250,000</b> | <b>Total</b>                     | <b>-\$296,328</b>  | <b>\$337,646</b> | <b>\$288,600</b> | <b>\$246,751</b> | <b>\$211,035</b> | <b>\$91,660</b>  | <b>\$787,704</b>   | <b>\$65,642</b> | <b>\$1.339</b> |
| <b>Annual Production</b> | <b>100,000</b>   |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Discount Land</b>     | <b>0.1</b>       |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |
| <b>Discount Business</b> | <b>0.15</b>      |                                  |                    |                  |                  |                  |                  |                  |                    |                 |                |



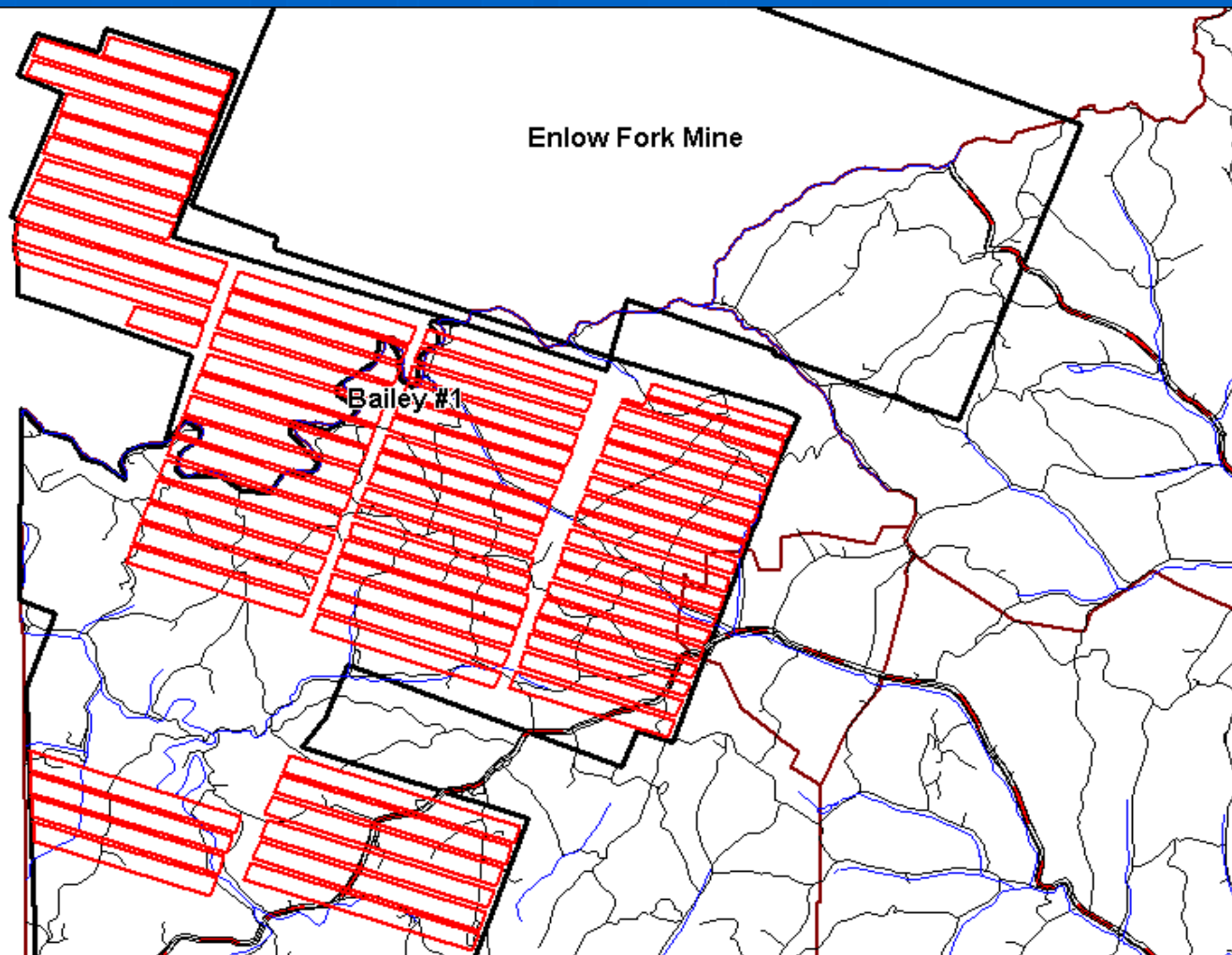
# Present Worth of Future Income

## \$5.00 Royalty



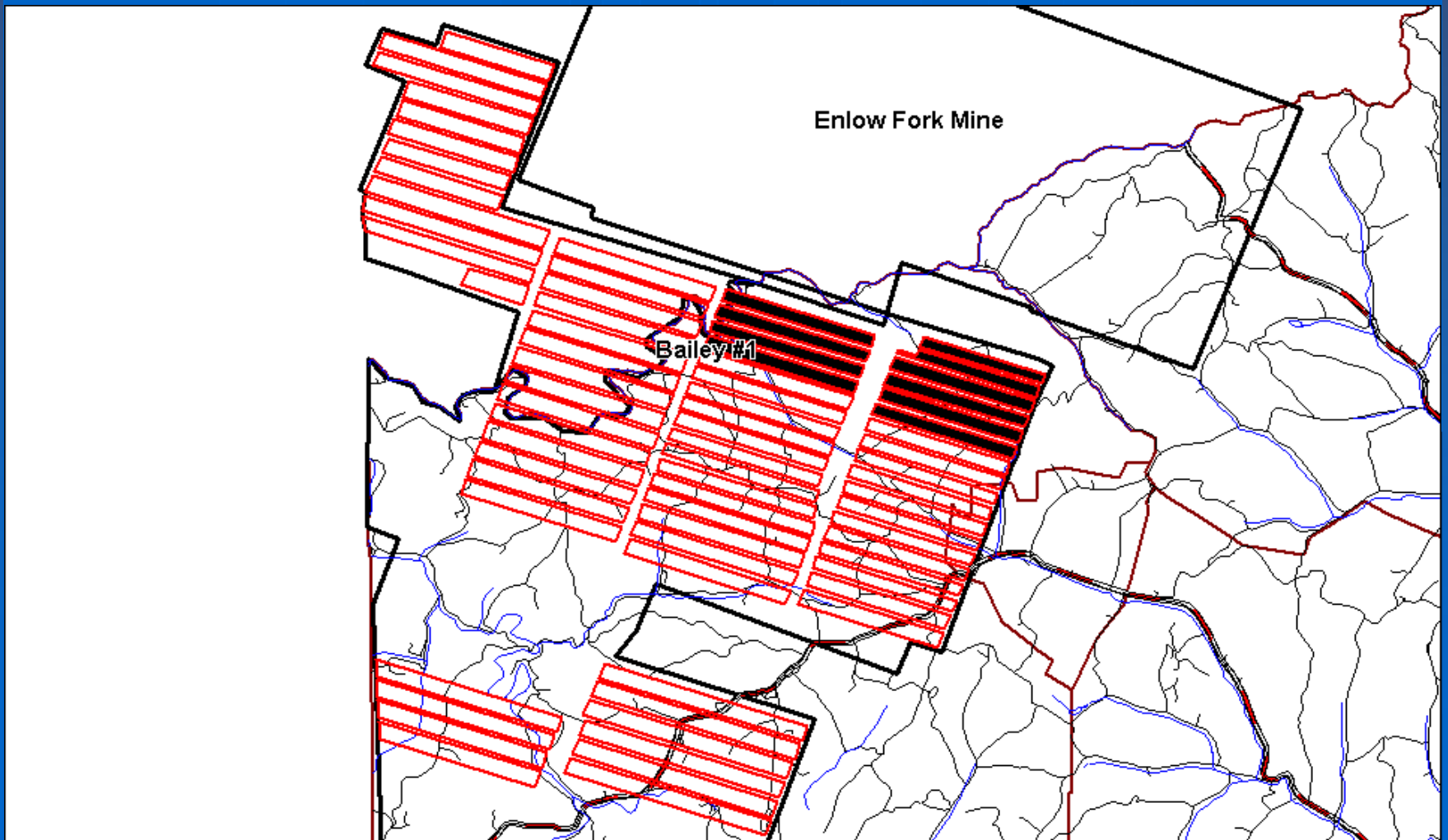
# Greene County: Bailey Mine

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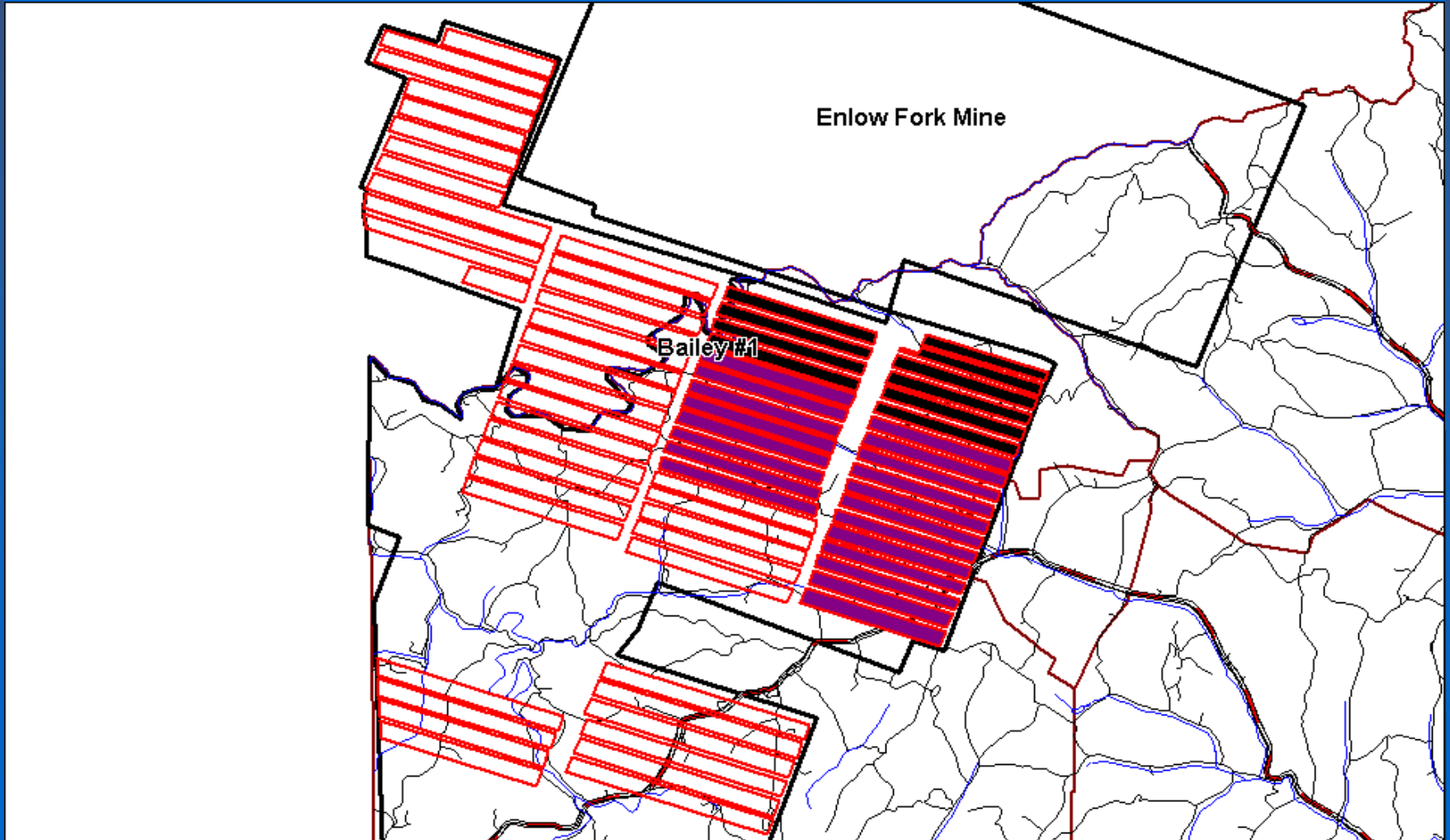
# Greene County: Bailey Mine pre 1990

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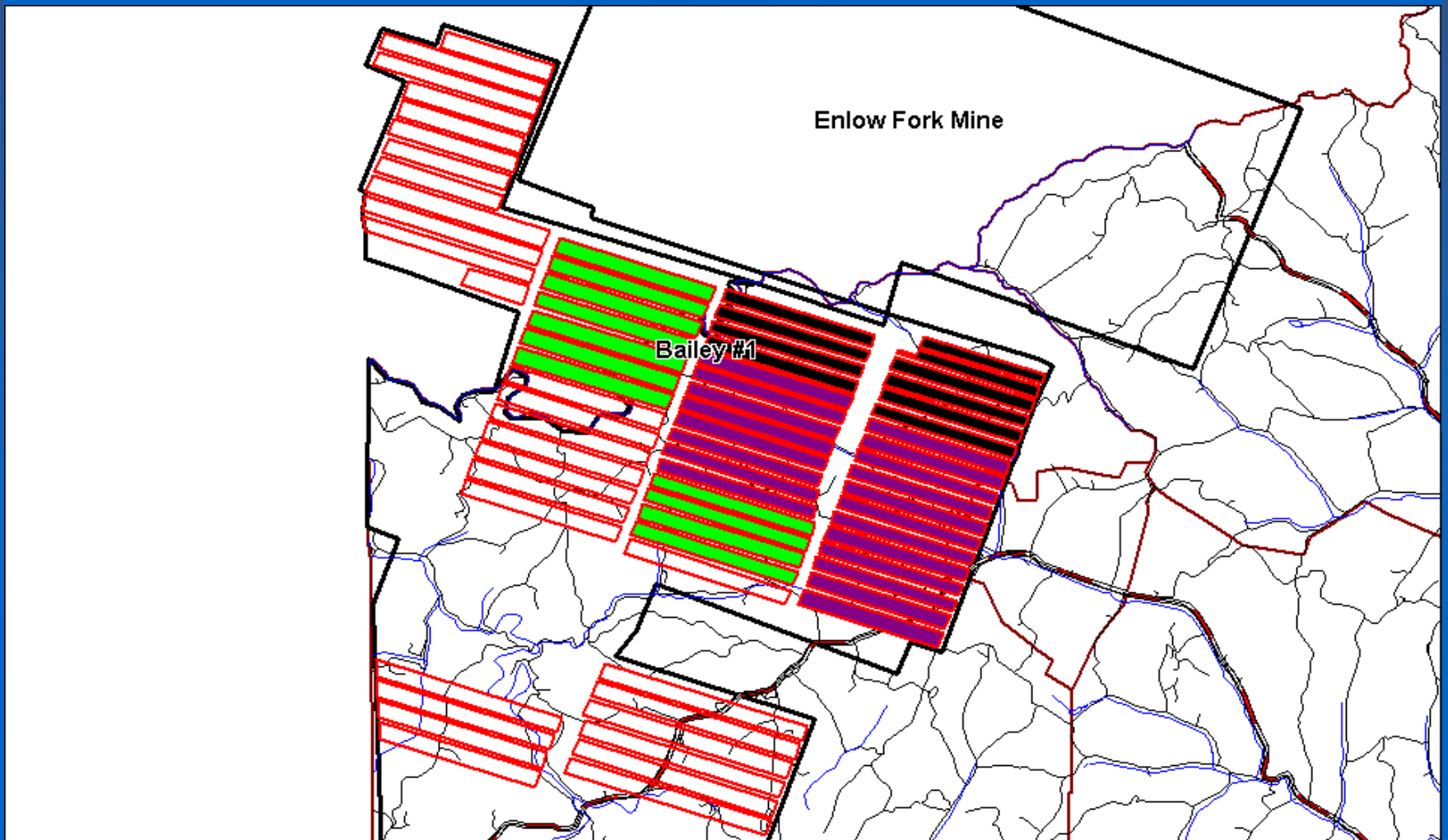
# Greene County: Bailey Mine pre 1995

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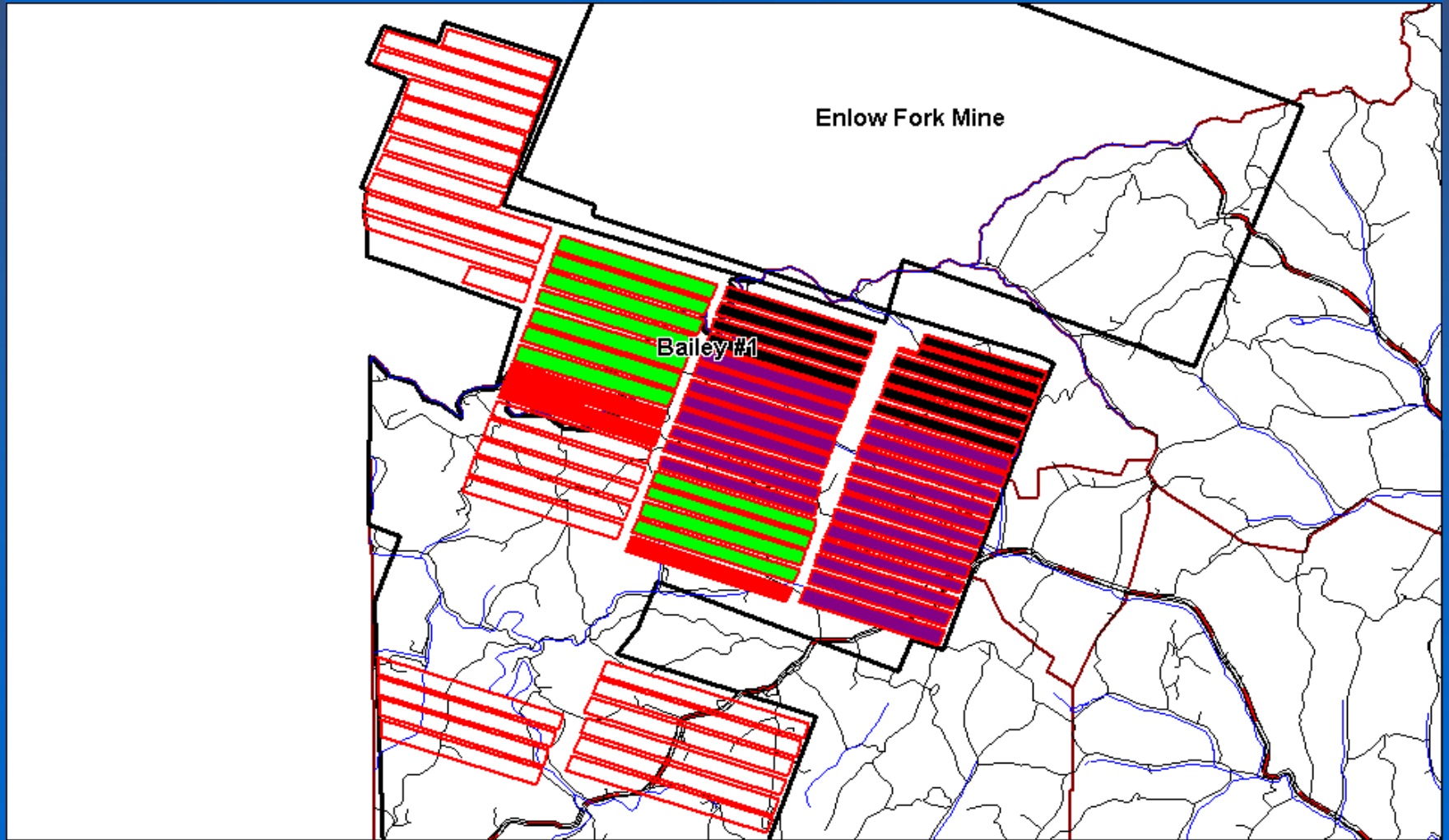


# Greene County: Bailey Mine pre 1999

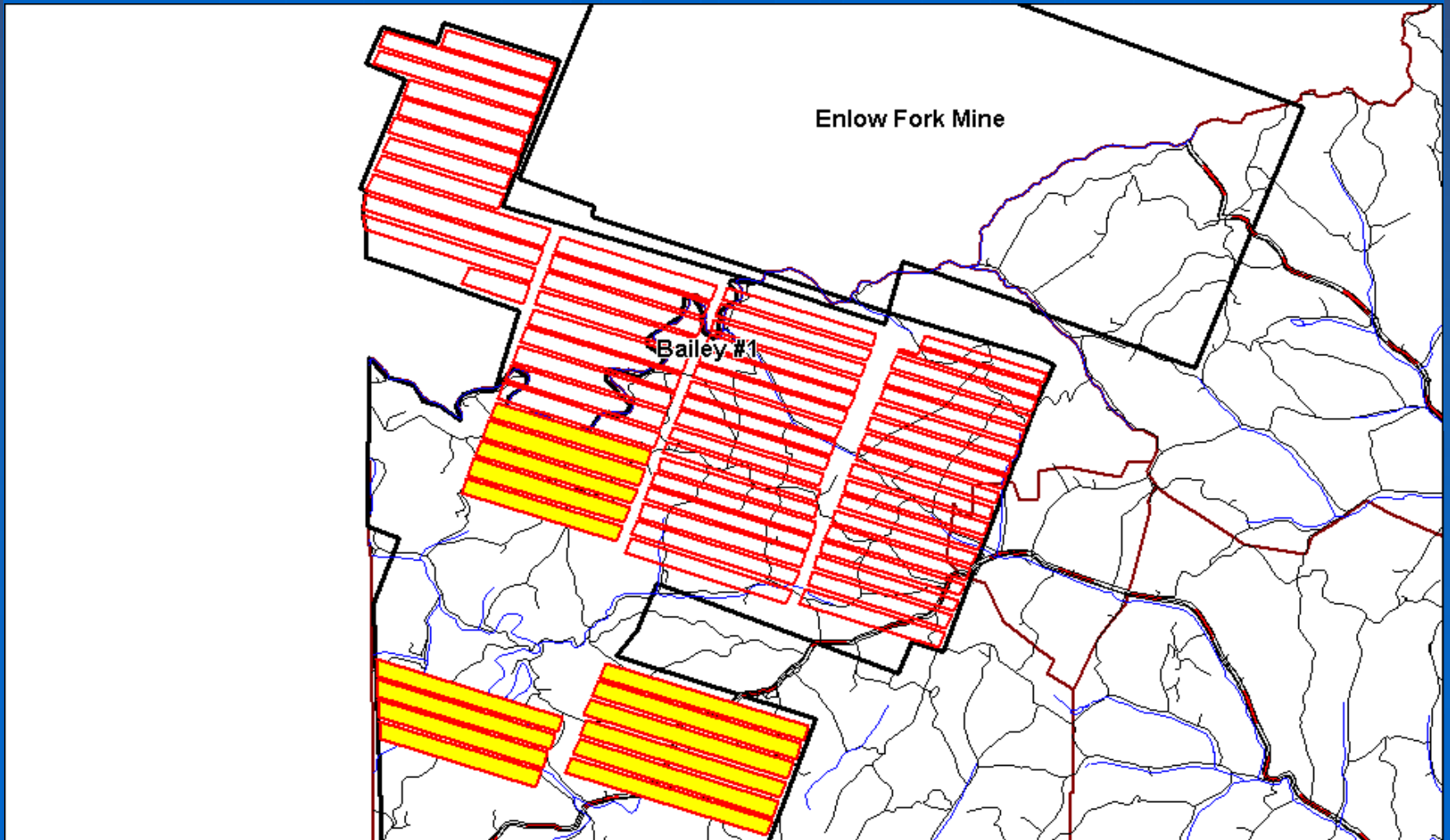
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# Greene County: Bailey Mine pre 2000



# Greene County: Bailey Mine to be completed

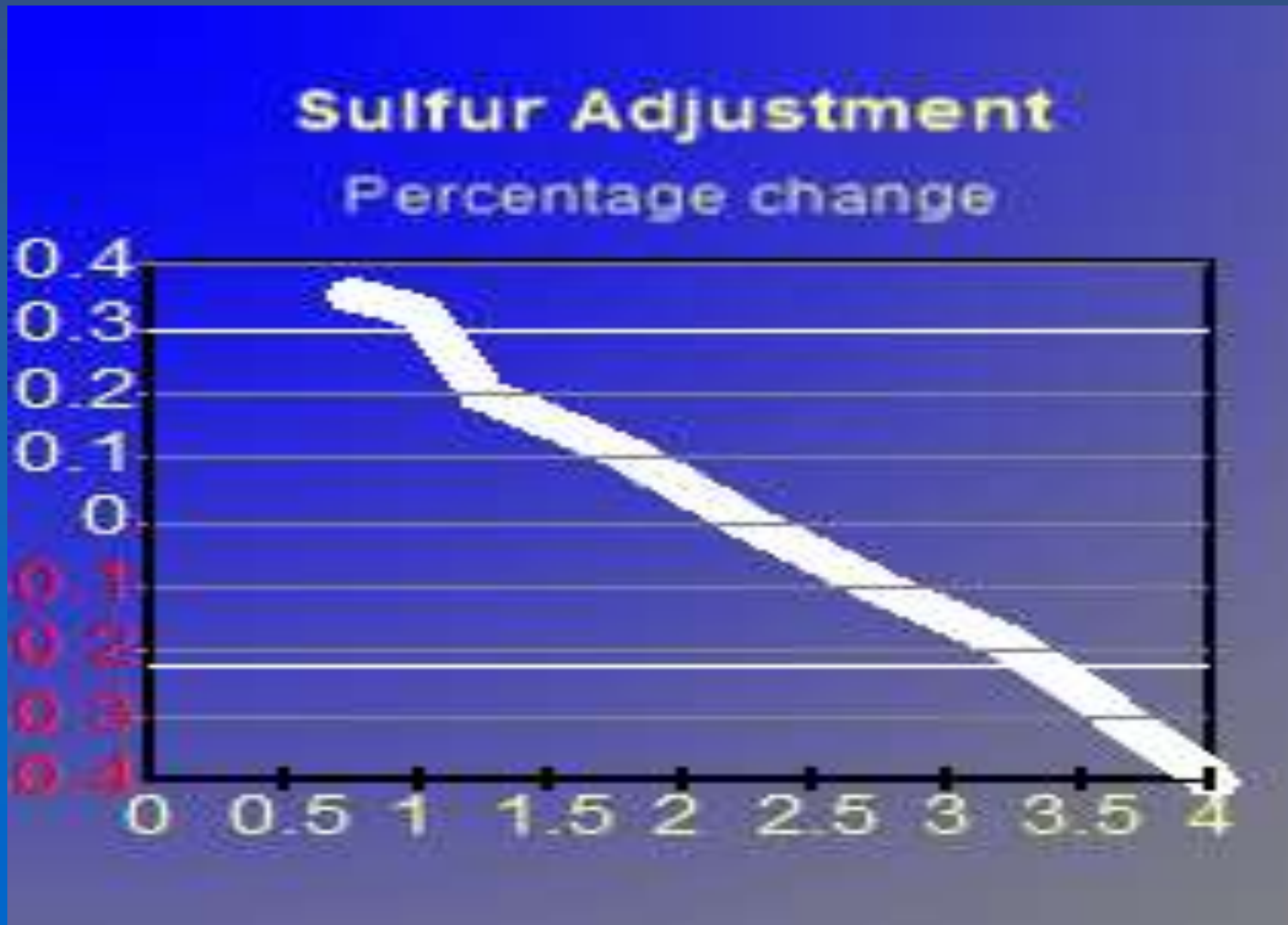


# Basic Value Parameters

|               |  |
|---------------|--|
| 15,000        | Acres  |
| 6             | Thickness (average)                            |
| 1,800         | Tons per acre foot                             |
| 162,000,000   | Tons in place                                  |
| 70            | % Overall Recovery (Mining & Preparation Loss) |
| 113,400,000   | Tons producible                                |
| 10,000,000    | Annual Production (Historic / Planned)         |
| 11.34         | Life   |
| \$29.50       | Market Price                                   |
| \$30.00       | Modified Price Price FOB                       |
| 5             | % Market Royalty                               |
| \$125,000,000 | Start-up Cost                                  |
| \$17.00       | Operating Cost to Mine                         |
| \$1.00        | Selling Expenses                               |
| \$1.50        | Administrative Expenses                        |
| \$75,000,000  | Closure (reclamation)                          |
| 6             | % Safe Rate                                    |
| 14.2          | % Discount                                     |



# Example: Price Adjustments



# Example: Depletion



# Calculation of Discount Rate Eastern Coal 2003

| 2003 Equity Portion             |                                  | 1999          | 2000 | 2001 | 2002   |      |
|---------------------------------|----------------------------------|---------------|------|------|--------|------|
| Risk-Free Rate                  | 20 year t bill                   | 5.4           | 6.8  | 5.6  | 5.8    |      |
|                                 | 5 year t bill                    | 4.7           | 6.5  | 5.1  | 4.4    |      |
| 1.6 Equity Risk                 | 30 day t bill                    | 4.5           | 4.9  | 4.7  |        |      |
| Premia                          | Equity Market vs Government Bond | 8.0           | 8.1  | 7.8  | 8.0    |      |
| Size Premia                     | 3.7 Submicro cap                 | 2.5           | 2.6  | 3.3  |        |      |
| 9.2 Industry                    | Micro cap                        | 7.0           | 7.0  | 8.4  |        |      |
| Premia                          | Coal (bituminous)                | -5.0          | -7.3 | -2.8 | -6.5   |      |
| Financial Debt Portion          |                                  | Weighted Rate | 13.1 | 12.4 | 16.5   | 13.7 |
|                                 | Interest Rate                    |               |      |      |        |      |
| Industrial long term mo (10yr+) | rtgage rates                     | 8.2           | 8.8  | 8.0  | 7.3    |      |
| Annual Discount Rate            |                                  | 11.7          | 11.3 | 14.0 | 11.8   |      |
| Cost of Capital                 | 3-yr forward weighted average    |               |      |      | 12.7   |      |
| Adjusted Equity Rate            |                                  |               |      |      | 0.1914 |      |
| 16.96 WAAC                      |                                  |               |      |      | 0.7    |      |
| 7.8 WAAC                        |                                  |               |      |      | 0.3    |      |
|                                 |                                  |               |      |      | 14.2   |      |

# Discount Rate Procedures

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- In order to dampen the effects of market spikes, all measures are based on 3-year forward weighted averaging.
- Ratio of equity to finance is based on Ibbotson surveys.
- The safe rate is based on the 20 year t-bill.
- Equity risk is based on the Ibbotson survey for each year.
- The size premia is based on averaging the micro and sub-micro cap.
- The industry adjustment is based on the Ibbotson calculation based on an examination of industry-specific betas.
- The tax rate is based on the Ibbotson data set for actual taxes paid over a 5-year period.
- The finance rate is based on the information contained in the ACLI quarterly publication concerning relatively high risk industrial loans with long terms: 10-20 years.

## **Yield (Risk-free Rate)<sup>1</sup>**

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*Long-term (20-year) U.S. Treasury Coupon Bond Yield* 3.67%

## **Equity Risk Premium<sup>2</sup>**

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*Long-horizon expected equity risk premium (historical): large company stock total returns minus long-term government bond income returns* 6.96

*Long-horizon expected equity risk premium (supply-side): historical equity risk premium minus price-to-earnings ratio calculated using three-year average earnings* 6.18

*Duff & Phelps recommended equity risk premium (conditional): The Duff & Phelps recommended ERP was developed in relation to (and should be used in conjunction with) a 4.0% "normalized" risk-free rate.<sup>3</sup>* 5.00

## CRSP Deciles Size Premium<sup>4</sup>

| Decile         | Market Capitalization<br>of Smallest Company<br>(in millions) |   | Market Capitalization<br>of Largest Company<br>(in millions) | Size Premium<br>(Return in<br>Excess of CAPM) |
|----------------|---|---|--|---|
| Mid-Cap 3-5    | \$2,432.888   | - | \$9,196.480  | 1.11%   |
| Low-Cap 6-8    | 636.747   | - | 2,431.229  | 1.98  |
| Micro-Cap 9-10 | 2.395   | - | 632.770  | 3.87  |

### Breakdown of CRSP Deciles 1-10

|             |              |   |               |        |
|-------------|--------------|---|---------------|--------|
| 1-Largest   | \$21,753.411 | - | \$428,699.798 | -0.37% |
| 2           | 9,196.656    | - | 21,739.006    | 0.75   |
| 3           | 5,572.648    | - | 9,196.480     | 0.86   |
| 4           | 3,581.547    | - | 5,569.840     | 1.16   |
| 5           | 2,432.888    | - | 3,573.079     | 1.75   |
| 6           | 1,626.386    | - | 2,431.229     | 1.86   |
| 7           | 1,056.204    | - | 1,621.792     | 1.94   |
| 8           | 636.747      | - | 1,055.320     | 2.36   |
| 9           | 339.987      | - | 632.770       | 2.81   |
| 10-Smallest | 2.395        | - | 338.829       | 5.99   |

### Breakdown of CRSP 10th Decile

|     |           |   |           |       |
|-----|-----------|---|-----------|-------|
| 10a | \$184.928 | - | \$338.829 | 4.40% |
| 10w | 250.656   | - | 338.829   | 3.52  |
| 10x | 184.928   | - | 250.532   | 5.67  |
| 10b | \$2.395   | - | \$184.865 | 8.99% |
| 10y | 100.933   | - | 184.865   | 7.55  |
| 10z | 2.395     | - | 100.821   | 12.12 |

<sup>1</sup> As of December 31, 2013.

<sup>2</sup> See Chapter 3 for complete methodology.

<sup>3</sup> See Exhibit 3.9.

<sup>4</sup> See Chapter 7 for complete methodology.

**Note:** Examples on how these variables can be used are found in Chapter 8.

**Sources of underlying data:** 1.) CRSP U.S. Stock Database and CRSP U.S. Indices Database © 2014 Center for Research in Security Prices (CRSP®), University of Chicago Booth School of Business. 2.) Morningstar EnCorr database. Used with permission. All rights reserved. Calculations performed by Duff & Phelps LLC.

**Exhibit 5.7: Industry Risk Premium (RP)  
Through Year-end 2013**

| SIC Code                                  | Short Description  | Number of Companies* | Full-Information Beta (FIB) | Industry Risk Premia (%) using:  |                                   |  |
|---|--|----------------------|-----------------------------|----------------------------------|-----------------------------------|--|
|   |  |                      |                             | Long-term Historical ERP (6.98%) | Long-term Supply-Side ERP (6.18%) | Duff & Phelps Recommended ERP (5.00%) <sup>†</sup> |
| <b>Agriculture, Forestry, And Fishing</b> |  |                      |                             |                                  |                                   |  |
| 01  | Agricultural Production Crops  | 13                   | 1.04                        | 0.30                             | 0.27                              | 0.22   |
| <b>Mining</b>                             |  |                      |                             |                                  |                                   |  |
| 10  | Metal Mining   | 21                   | 1.37                        | 2.57                             | 2.28                              | 1.84   |
| 12  | Coal Mining  | 23                   | 1.29                        | 2.02                             | 1.79                              | 1.45   |
| 122                                       | Bituminous Coal and Lignite Mining                                     | 23                   | 1.42                        | 2.93                             | 2.60                              | 2.10   |
| 13  | Oil and Gas Extraction   | 189                  | 1.31                        | 2.17                             | 1.92                              | 1.56   |
| 131                                       | Crude Petroleum and Natural Gas  | 160                  | 1.28                        | 1.96                             | 1.74                              | 1.41   |
| 138                                       | Oil and Gas Field Services   | 42                   | 1.44                        | 3.08                             | 2.73                              | 2.21   |
| 1381                                      | Drilling Oil and Gas Wells   | 19                   | 1.35                        | 2.44                             | 2.16                              | 1.75   |
| 1389                                      | Oil and Gas Field Services, Not Elsewhere Classified                   | 19                   | 1.62                        | 4.31                             | 3.83                              | 3.10   |
| 14  | Mining and Quarrying Of Nonmetallic Minerals, Except Fuels             | 13                   | 1.16                        | 1.09                             | 0.97                              | 0.78   |
| <b>Construction</b>                       |  |                      |                             |                                  |                                   |  |
| 15  | Building Construction General Contractors and Operative Builders       | 21                   | 1.55                        | 3.81                             | 3.39                              | 2.74   |
| 153                                       | Operative Builders   | 15                   | 1.46                        | 3.18                             | 2.83                              | 2.29   |
| 16  | Heavy Construction Other Than Building Construction Contractors        | 27                   | 1.41                        | 2.84                             | 2.52                              | 2.04   |
| 162                                       | Heavy Construction, Except Highway and Street                          | 22                   | 1.40                        | 2.82                             | 2.50                              | 2.02   |
| 1623                                      | Water, Sewer, Pipeline, and Communications and Power Line Construction | 14                   | 1.25                        | 1.74                             | 1.55                              | 1.25   |
| 17  | Construction Special Trade Contractors                                 | 25                   | 1.06                        | 0.40                             | 0.36                              | 0.29   |
| 173                                       | Electrical Work  | 10                   | 0.85                        | -1.03                            | -0.92                             | -0.74  |
| <b>Manufacturing</b>                      |  |                      |                             |                                  |                                   |  |
| 20  | Food and Kindred Products  | 99                   | 0.50                        | -3.45                            | -3.07                             | -2.48  |
| 203                                       | Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties | 13                   | 0.49                        | -3.52                            | -3.13                             | -2.53  |
| 204                                       | Grain Mill Products  | 16                   | 0.52                        | -3.36                            | -2.98                             | -2.41  |
| 208                                       | Beverages  | 29                   | 0.49                        | -3.58                            | -3.18                             | -2.57  |
| 2086                                      | Bottled and Canned Soft Drinks and Carbonated Waters                   | 16                   | 0.47                        | -3.69                            | -3.28                             | -2.65  |

# Industry Report

## Growth Over Last 5 Years (%)

|                 | Net Sales | Operating Income | Net Income |
|-----------------|-----------|------------------|------------|
| Median          | 17.96     | 29.43            | 36.56      |
| SIC Composite   | 21.04     | 33.40            | 60.77      |
| Large Composite | 22.29     | 31.61            | 50.06      |
| Small Composite | 9.13      | NMF              | NMF        |

## Capital Structure Ratios (%)

| Debt/Total Capital |            | Debt/MV Equity |            |
|--------------------|------------|----------------|------------|
| Latest             | 5-Year Avg | Latest         | 5-Year Avg |
| 40.89              | 49.11      | 69.17          | 96.51      |
| 43.51              | 45.89      | 77.03          | 84.82      |
| 52.76              | 50.07      | 111.71         | 100.30     |
| 12.53              | 12.32      | 14.32          | 14.05      |

## Distribution of Sales & Total Capital (million\$)

|                 | Distribution of Sales |            | Total Capital |            |
|-----------------|-----------------------|------------|---------------|------------|
|                 | Latest                | 5-Year Avg | Latest        | 5-Year Avg |
| 90th Percentile | 4,562.3               | 3285.6     | 4564.7        | 2,622.4    |
| 75th Percentile | 2,523.5               | 1838.4     | 2267.9        | 1,186.4    |
| Median          | 1,180.6               | 937.0      | 664.9         | 332.2      |
| 25th Percentile | 178.9                 | 163.1      | 93.1          | 87.1       |
| 10th Percentile | 56.1                  | 36.9       | 46.0          | 68.0       |

## Margins (%)

|                 | Operating Margin |            | Net Margin |            | Asset Turnover |            | Return on Inv. Cap. |            | Return on Assets |            | Return on Equity |            |
|-----------------|------------------|------------|------------|------------|----------------|------------|---------------------|------------|------------------|------------|------------------|------------|
|                 | Latest           | 5-Year Avg | Latest     | 5-Year Avg | Latest         | 5-Year Avg | Latest              | 5-Year Avg | Latest           | 5-Year Avg | Latest           | 5-Year Avg |
| Median          | 10.50            | 9.22       | 4.96       | 4.06       | 144.10         | 149.43     | 8.68                | 7.35       | 7.33             | 6.29       | 12.19            | 15.17      |
| SIC Composite   | 11.49            | 9.90       | 5.88       | 4.72       | 139.68         | 146.56     | 9.23                | 8.07       | 8.21             | 6.92       | 12.08            | 11.77      |
| Large Composite | 11.67            | 10.47      | 5.54       | 4.77       | 119.58         | 133.10     | 7.21                | 7.28       | 6.62             | 6.35       | 12.32            | 11.69      |
| Small Composite | 12.46            | 8.49       | 15.01      | -16.11     | 42.79          | 32.13      | 6.81                | -6.20      | 6.42             | -5.18      | 16.19            | -12.17     |

## Equity Valuation Ratios (Multiples)

|                 | Price/Earnings |            | Market/Book |            | Price/Sales |            | Price/Cash Flow |            | Price/Operating Income |            | Dividend Yield (% of Price) |            |
|-----------------|----------------|------------|-------------|------------|-------------|------------|-----------------|------------|------------------------|------------|-----------------------------|------------|
|                 | Latest         | 5-Year Avg | Latest      | 5-Year Avg | Latest      | 5-Year Avg | Latest          | 5-Year Avg | Latest                 | 5-Year Avg | Latest                      | 5-Year Avg |
| Median          | 8.20           | 6.59       | 1.61        | 1.15       | 0.47        | 0.31       | 9.18            | 6.69       | 4.54                   | 3.12       | 0.00                        | 0.00       |
| SIC Composite   | 8.28           | 4.83       | 1.86        | 1.64       | 0.49        | 0.40       | 8.20            | 8.26       | 4.24                   | 4.05       | 0.37                        | 0.47       |
| Large Composite | 8.12           | 5.13       | 1.69        | 1.66       | 0.45        | 0.41       | 7.77            | 7.92       | 3.85                   | 3.90       | 0.31                        | 0.48       |
| Small Composite | 6.18           | 6.48       | 0.45        | 0.55       | 0.93        | 1.32       | 4.80            | NMF        | 7.44                   | 15.60      | 0.00                        | 0.00       |

## Growth Rates (%)

## Cost of Equity Capital (%)

## Weighted Average Cost of Capital (%)

## Levered Betas

## Unlevered Betas

|                 | Analysts' Estimate | CAPM             |             | 3-Factor | Discounted Cash Flow |                  | CAPM        |         | 3-Factor | Discounted Cash Flow |       | Raw Beta | Adjusted Beta | Adjusted Beta |
|-----------------|--------------------|------------------|-------------|----------|----------------------|------------------|-------------|---------|----------|----------------------|-------|----------|---------------|---------------|
|                 |                    | CAPM + Size Prem | Fama-French | 1-Stage  | 3-Stage              | CAPM + Size Prem | Fama-French | 1-Stage | 3-Stage  | Beta                 | Beta  | Beta     |               |               |
| Median          | 13.51              | 10.71            | 12.01       | 14.76    | 13.51                | 12.40            | 11.52       | 12.98   | 14.16    | 13.59                | 12.57 | 0.78     | 0.80          | 0.41          |
| SIC Composite   | 13.51              | 11.14            | 11.86       | 15.28    | 13.54                | 21.30            | 12.98       | 13.42   | 15.50    | 14.44                | 19.17 | 0.87     | 0.86          | 0.57          |
| Large Composite | 12.93              | 11.10            | 11.10       | 14.60    | 13.56                | 23.10            | 12.93       | 12.93   | 14.69    | 14.16                | 18.97 | 0.89     | 0.85          | 0.49          |
| Small Composite | 13.51              | 7.55             | 10.85       | 10.55    | 13.51                | 6.50             | 7.87        | 10.72   | 10.45    | 13.01                | 6.96  | 0.15     | 0.37          | 0.34          |

## Cost of Capital



| Riskfree rate in US dollars =                 |                        | 3.04%                 |                                  |                               |                        |                               |  |                                      |  |                                |                             |                               |                              |
|---|------------------------|-----------------------|----------------------------------|-------------------------------|------------------------|-------------------------------|--|--------------------------------------|--|--------------------------------|-----------------------------|-------------------------------|------------------------------|
| Mature market ERP =                           |                        | 5.00%                 |                                  |                               |                        |                               |  |                                      |  |                                |                             |                               |                              |
| Marginal tax rate =                           |                        | 40.00%                |                                  |                               |                        |                               |  |                                      |  |                                |                             |                               |                              |
| <u>Company Name</u>                           | <u>Exchange:Ticker</u> | <u>Industry Group</u> | <u>Bottom up Beta for sector</u> | <u>Bottom up levered beta</u> | <u>ERP for Country</u> | <u>Cost of equity in US\$</u> | <u>Total Default Spread for cost of debt (Company + Country)</u> | <u>Pre-tax cost of debt in US \$</u> | <u>After-tax cost of debt in US \$</u> | <u>Cost of capital in US\$</u> | <u>ROE - Cost of Equity</u> | <u>ROIC - Cost of Capital</u> | <u>Market Cap (in US \$)</u> |
| Peabody Energy Corp. (NYSE:BTU)               | NYSE:BTU               | Coal & Related Energy | 0.7348                           | 1.6501                        | 5.00%                  | 11.29%                        | 3.00%  | 6.04%                                | 3.62%                                  | 7.04%                          | -27.53%                     | -3.20%                        | \$5,269.80                   |
| Alpha Natural Resources, Inc. (NYSE:ANR)      | NYSE:ANR               | Coal & Related Energy | 0.7348                           | 2.4006                        | 5.00%                  | 15.04%                        | 4.00%  | 7.04%                                | 4.22%                                  | 7.54%                          | -32.35%                     | -12.53%                       | \$1,577.60                   |
| CONSOL Energy Inc. (NYSE:CNX)                 | NYSE:CNX               | Coal & Related Energy | 0.7348                           | 0.8883                        | 5.00%                  | 7.48%                         | 2.00%  | 5.04%                                | 3.02%                                  | 6.17%                          | -5.58%                      | -2.23%                        | \$8,709.00                   |
| Arch Coal Inc. (NYSE:ACI)                     | NYSE:ACI               | Coal & Related Energy | 0.7348                           | 4.7599                        | 5.00%                  | 26.84%                        | 4.00%  | 7.04%                                | 4.22%                                  | 7.72%                          | -44.72%                     | -8.02%                        | \$944.60                     |
| Alliance Resource Partners LP (NasdaqGS:ARLP) | NasdaqGS:ARLP          | Coal & Related Energy | 0.7348                           | 0.9392                        | 5.00%                  | 7.74%                         | 1.50%  | 4.54%                                | 2.72%                                  | 6.65%                          | 20.93%                      | 19.27%                        | \$2,846.20                   |
| Alliance Holdings GP, L.P. (NasdaqGS:AHGP)    | NasdaqGS:AHGP          | Coal & Related Energy | 0.7348                           | 0.9006                        | 5.00%                  | 7.54%                         | 1.50%  | 4.54%                                | 2.72%                                  | 6.66%                          | 46.70%                      | 31.06%                        | \$3,509.80                   |
| Cloud Peak Energy Inc. (NYSE:CLD)             | NYSE:CLD               | Coal & Related Energy | 0.7348                           | 1.0513                        | 5.00%                  | 8.30%                         | 2.00%  | 5.04%                                | 3.02%                                  | 6.19%                          | -0.99%                      | 3.46%                         | \$1,089.40                   |
| USEC Inc. (NYSE:USU)                          | NYSE:USU               | Coal & Related Energy | 0.7348                           | 16.2922                       | 5.00%                  | 84.50%                        | 4.00%  | 7.04%                                | 4.22%                                  | 7.84%                          | -264.12%                    | -6.66%                        | \$32.80                      |
| James River Coal Co. (NasdaqGS:JRCC)          | NasdaqGS:JRCC          | Coal & Related Energy | 0.7348                           | 7.4328                        | 5.00%                  | 40.20%                        | 4.00%  | 7.04%                                | 4.22%                                  | 7.78%                          | -67.08%                     | -26.74%                       | \$47.40                      |
| Westmoreland Coal Co. (NasdaqGM:WLB)          | NasdaqGM:WLB           | Coal & Related Energy | 0.7348                           | 1.6684                        | 5.00%                  | 11.38%                        | 4.00%  | 7.04%                                | 4.22%                                  | 7.38%                          | NA                          | 12.23%                        | \$281.50                     |
| Oxford Resource Partners, L.P. (NYSE:OXF)     | NYSE:OXF               | Coal & Related Energy | 0.7348                           | 5.7568                        | 5.00%                  | 31.82%                        | 4.00%  | 7.04%                                | 4.22%                                  | 7.75%                          | -163.25%                    | -11.09%                       | \$26.10                      |
| Natural Resource Partners LP (NYSE:NRP)       | NYSE:NRP               | Coal & Related Energy | 0.7348                           | 1.1202                        | 5.00%                  | 8.64%                         | 2.00%  | 5.04%                                | 3.02%                                  | 6.71%                          | 22.12%                      | 7.78%                         | \$2,189.70                   |

<http://pages.stern.nyu.edu/~adamodar/>

| Company Name  | Peabody Energy Corp. (NYSE:BTU) | Alpha Natural Resources, Inc. (NYSE:ANR) | CONSOL Energy Inc. (NYSE:CNX) |
|---|---------------------------------|--|-------------------------------|
| Exchange:Ticker   | NYSE:BTU                        | NYSE:ANR                                 | NYSE:CNX                      |
| Industry Group  | Coal & Related Energy           | Coal & Related Energy                    | Coal & Related Energy         |
| Bottom up Beta for sector                                 | 0.7348                          | 0.7348                                   | 0.7348                        |
| Bottom up levered beta                                    | 1.6501                          | 2.4006                                   | 0.8883                        |
| ERP for Country   | 0.05                            | 0.05                                     | 0.05                          |
| Cost of equity in US\$                                    | 0.1129                          | 0.1504                                   | 0.0748                        |
| Total Default Spread for cost of debt (Company + Country) | 0.03                            | 0.04                                     | 0.02                          |
| Pre-tax cost of debt in US \$                             | 0.0604                          | 0.0704                                   | 0.0504                        |
| After-tax cost of debt in US \$                           | 0.0362                          | 0.0422                                   | 0.0302                        |
| Cost of capital in US\$                                   | 0.0704                          | 0.0754                                   | 0.0617                        |
| ROE - Cost of Equity                                      | -0.2753                         | -0.3235                                  | -0.0558                       |
| ROIC - Cost of Capital                                    | -0.032                          | -0.1253                                  | -0.0223                       |
| Market Cap (in US \$)                                     | \$5,269.80                      | \$1,577.60                               | \$8,709.00                    |
| PV of lease debt  | 557.47                          | 202.84                                   | 363.27                        |
| Total Debt  | \$6,007.50                      | \$3,373.80                               | \$3,276.50                    |
| Total Debt incl leases (in US \$)                         | \$6,564.97                      | \$3,576.64                               | \$3,639.77                    |
| Firm Value (in US \$)                                     | \$11,834.77                     | \$5,154.24                               | \$12,348.77                   |
| Cash  | 551.3                           | 668.1                                    | 21.1                          |
| Enterprise Value (in US \$)                               | \$11,283.47                     | \$4,486.14                               | \$12,327.67                   |
| Cash/ Firm Value  | 0.0466                          | 0.1296                                   | 0.0017                        |
| Liquidity Ratio (Daily trading volume/Shrs outs)          | 0.03                            | 0.05                                     | 0.01                          |
| Book Debt to capital ratio                                | 0.5914                          | 0.4499                                   | 0.4791                        |
| Market Debt to capital ratio                              | 0.5547                          | 0.6939                                   | 0.2947                        |
| Book Debt to Equity Ratio                                 | 1.4477                          | 0.8179                                   | 0.9198                        |
| Market Debt to Equity ratio                               | 1.2458                          | 2.2671                                   | 0.4179                        |
| Stock price (Dec 31, 2012)in US\$                         | 19.53                           | 7.14                                     | 38.04                         |
| Beta  | 1.41                            | 1.49                                     | 1.06                          |
| Correlation with market                                   | 0.4254                          | 0.2898                                   | 0.3114                        |
| Standard deviation in stock price                         | 0.9402                          | 1.3801                                   | 0.7955                        |
| HiLo Risk Measure (Hi- lo)/ (Hi+Lo)                       | 0.32                            | 0.38                                     | 0.2                           |
| Interest coverage ratio                                   | 0.79                            | NA                                       | 1.09                          |
| Current PE  | NA                              | NA                                       | 22.42                         |
| Trailing PE   | NA                              | NA                                       | 120.62                        |
| Forward PE  | 152.58                          | NA                                       | 42.13                         |
| PEG   | NA                              | NA                                       | 1.4                           |
| PBV   | 1.16                            | 0.36                                     | 2.2                           |
| PS  | 0.65                            | 0.23                                     | 1.73                          |
| EV/EBIT   | 24.04                           | NA                                       | 43.89                         |
| EV/EBITDA   | 6.58                            | 4.34                                     | 12.83                         |
| EV/Invested Capital                                       | 1.07                            | 0.64                                     | 1.63                          |
| EV/Sales  | 1.4                             | 0.64                                     | 2.44                          |

<http://pages.stern.nyu.edu/~adamodar/>

| Company Name                                   | Peabody Energy Corp. (NYSE:BTU) | Alpha Natural Resources, Inc. (NYSE:ANR) | CONSOL Energy Inc. (NYSE:CNX) |
|--|---------------------------------|--|-------------------------------|
| Exchange:Ticker                                | NYSE:BTL                        | NYSE:ANR                                 | NYSE:CNX                      |
| Payout ratio                                   | NA                              | NA                                       | 1.5817                        |
| Dividend Yield                                 | 0.0174                          | 0  | 0.0131                        |
| Historical growth in Net Income - Last 3 years | NA                              | NA                                       | -0.428                        |
| Historical growth in Net Income - Last 5 years | NA                              | NA                                       | -0.234                        |
| Historical growth in Revenues - Last 3 years   | 0.0338                          | 0.127                                    | -0.0102                       |
| Historical growth in Revenues - Last 5 years   | 0.0455                          | 0.178                                    | 0.0315                        |
| Expected growth rate in EPS- Next 5 years      | 0.075                           | 0.04                                     | 0.16                          |
| Expected growth in revenues - Next 2 years     | -0.0333                         | -0.179                                   | -0.147                        |
| Return on Equity                               | -0.1624                         | -0.1731                                  | 0.019                         |
| Return on Capital (ROC or ROIC)                | 0.0384                          | -0.0499                                  | 0.0394                        |
| Net Profit Margin                              | -0.1324                         | -0.1623                                  | 0.0147                        |
| Pre-tax Operating Margin                       | 0.0644                          | -0.0661                                  | 0.0573                        |
| Effective Tax Rate                             | 0                               | 0  | 0.5                           |
| % held by institutions                         | 0.8596                          | 0.7894                                   | 1.031                         |
| Net Income                                     | -585.7                          | -\$2,437.10                              | 388.5                         |
| Trailing Net Income                            | -965.2                          | -882.3                                   | 72.2                          |
| Operating Income                               | 333.4                           | -399.7                                   | 234.5                         |
| Trailing Operating Income (adj for leases)     | 469.41                          | -359.27                                  | 280.85                        |
| Revenues                                       | \$8,077.50                      | \$6,974.90                               | \$5,046.50                    |
| Trailing Revenues                              | \$7,287.80                      | \$5,437.30                               | \$4,897.30                    |
| EBITDA   | \$1,713.60                      | \$1,032.50                               | 961                           |
| Trailing EBITDA                                | \$1,095.80                      | 552.8                                    | 886.9                         |
| EBIT(1-t)                                      | 469.41                          | -359.27                                  | 140.42                        |
| Net Debt issued (Debt issued - repaid)         | 305.3                           | -357.9                                   | -81.3                         |
| Change in non-cash Working capital             | 187.2                           | -202.7                                   | 40.1                          |
| Net Cap Ex                                     | -239.7                          | -460.4                                   | 984.3                         |
| Reinvestment Rate                              | -0.1118                         | NA                                       | 7.2951                        |
| FCFF   | 521.91                          | 303.83                                   | -883.98                       |
| FCFE   | -\$1,218.00                     | 138.7                                    | -870.9                        |
| FCFE without debt                              | -912.7                          | -219.2                                   | -952.2                        |
| Book Value of Equity - 4 qtrs ago              | \$5,944.60                      | \$5,097.80                               | \$3,796.70                    |
| Invested Capital - 4 qtr ago                   | \$12,217.17                     | \$7,197.14                               | \$7,130.07                    |
| Current Book Value of Equity                   | \$4,534.90                      | \$4,372.70                               | \$3,957.20                    |

# Beta

## Company Beta Analysis

Ticker: CNX  
Company Name: CONSOL ENERGY INC

### CAPM: Ordinary Least Squares

| <i>Levered</i> |        |       |             |               | <i>Unlevered</i> |               |  |
|----------------|--------|-------|-------------|---------------|------------------|---------------|--|
| Raw Beta       | t-Stat | R-sqr | Pr Grp Beta | Ibbotson Beta | Raw Beta         | Ibbotson Beta |  |
| 0.19           | 0.40   | 0.00  | 0.12        | 0.18          | 0.14             | 0.12          |  |

### Fama-French Three-Factor Model

| FF Beta | FF t-Stat | SMB Prem | SMB t-Stat | HML Prem | HML t-Stat | FF R-Sqr |
|---------|-----------|----------|------------|----------|------------|----------|
| 0.22    | 0.48      | 1.68     | 3.03       | 1.87     | 4.43       | 0.04     |

CAPM: Ordinary Least Squares

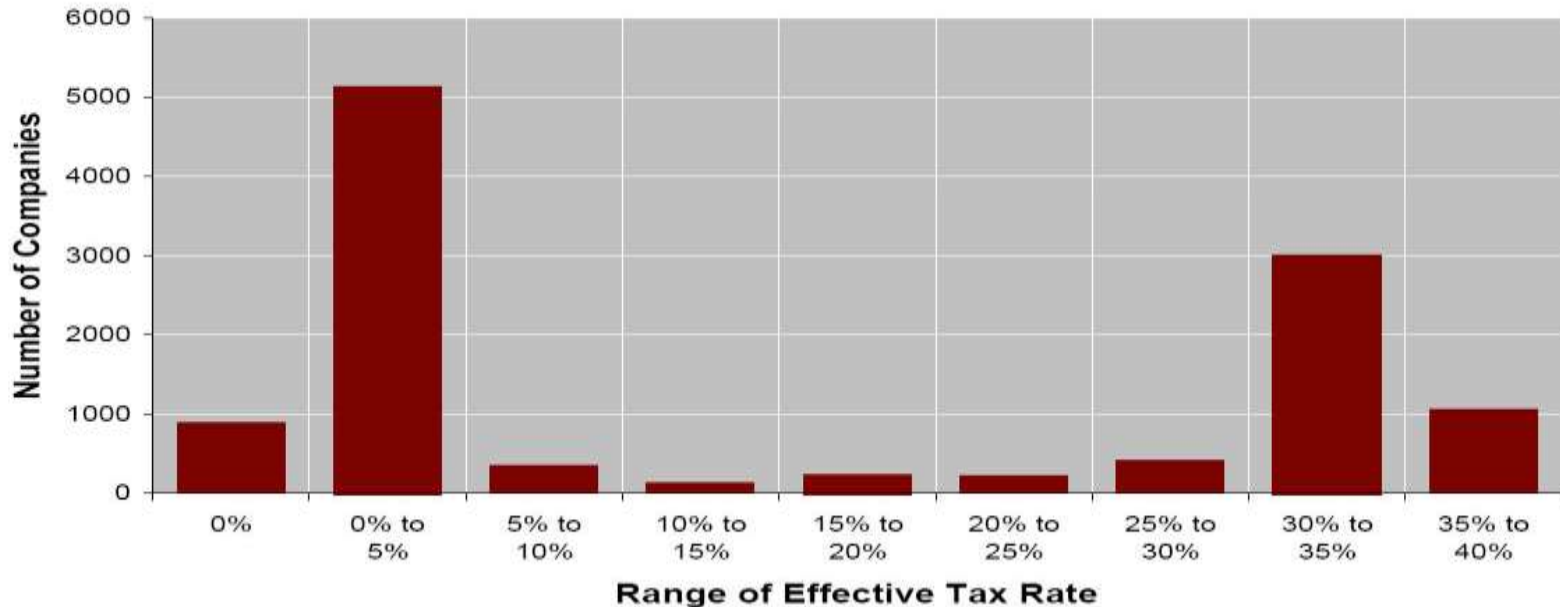
# Tax Rates

## Tax Rate Analysis

| Ticker | Company Name      | Year | Most Recent Tax Rate | Five Year Moving Average |
|--------|-------------------|------|----------------------|--------------------------|
| CNX    | CONSOL ENERGY INC | 2001 | 18.77%               | 26.90%                   |

### Effective Tax Rate Distribution

Fiscal Year 2001

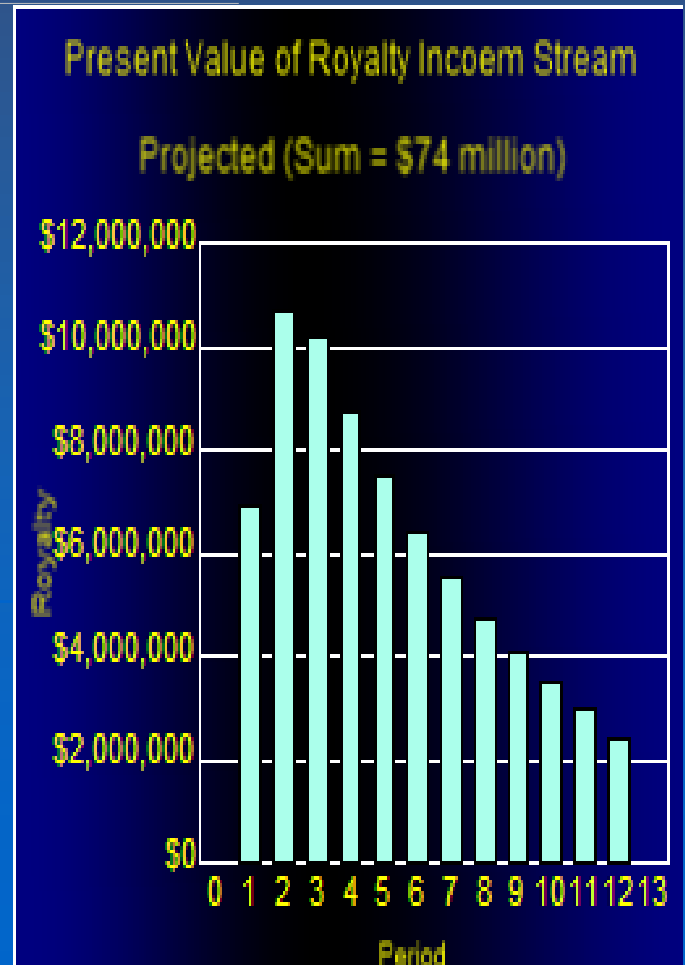


# Production & Income Generation

| YEAR | Production         | Remaining Tons | Remaining Acres | Gross Income           | Royalty Income       |
|------|--------------------|----------------|-----------------|------------------------|----------------------|
|      | 0                  | 162,000,000    | 15,000          |                        | 0                    |
| 1    | 5,000,000          | 154,857,100    | 14,000          | \$150,000,000          | \$7,500,000          |
| 2    | 9,000,000          | 142,000,000    | 13,000          | \$270,000,000          | \$13,500,000         |
| 3    | 10,000,000         | 127,714,300    | 12,000          | \$300,000,000          | \$15,000,000         |
| 4    | 10,000,000         | 113,428,600    | 11,000          | \$300,000,000          | \$15,000,000         |
| 5    | 10,000,000         | 99,142,900     | 9,000           | \$300,000,000          | \$15,000,000         |
| 6    | 10,000,000         | 84,857,100     | 8,000           | \$300,000,000          | \$15,000,000         |
| 7    | 10,000,000         | 70,571,400     | 7,000           | \$300,000,000          | \$15,000,000         |
| 8    | 10,000,000         | 56,285,700     | 5,000           | \$300,000,000          | \$15,000,000         |
| 9    | 10,000,000         | 42,000,000     | 4,000           | \$300,000,000          | \$15,000,000         |
| 10   | 10,000,000         | 27,714,300     | 3,000           | \$300,000,000          | \$15,000,000         |
| 11   | 10,000,000         | 13,428,600     | 1,000           | \$300,000,000          | \$15,000,000         |
| 12   | 9,400,000          |                |                 | \$282,000,000          | \$14,100,000         |
| 13   |                    |                |                 | \$00                   | \$0                  |
| 14   |                    |                |                 | \$00                   |                      |
| 15   |                    |                |                 | 0                      | \$0                  |
| 16   |                    |                |                 | 0                      |                      |
| 17   |                    |                |                 | 0                      | \$0                  |
| 18   |                    |                |                 | 0                      |                      |
| 19   |                    |                |                 | 0                      | \$0                  |
| 20   |                    |                |                 | 0                      |                      |
| 21   |                    |                |                 | 0                      | \$0                  |
| 22   |                    |                |                 | 0                      |                      |
| 23   |                    |                |                 | 0                      | \$0                  |
| 24   |                    |                |                 | 0                      |                      |
|      | <b>113,400,000</b> |                |                 | <b>\$3,402,000,000</b> | <b>\$170,100,000</b> |

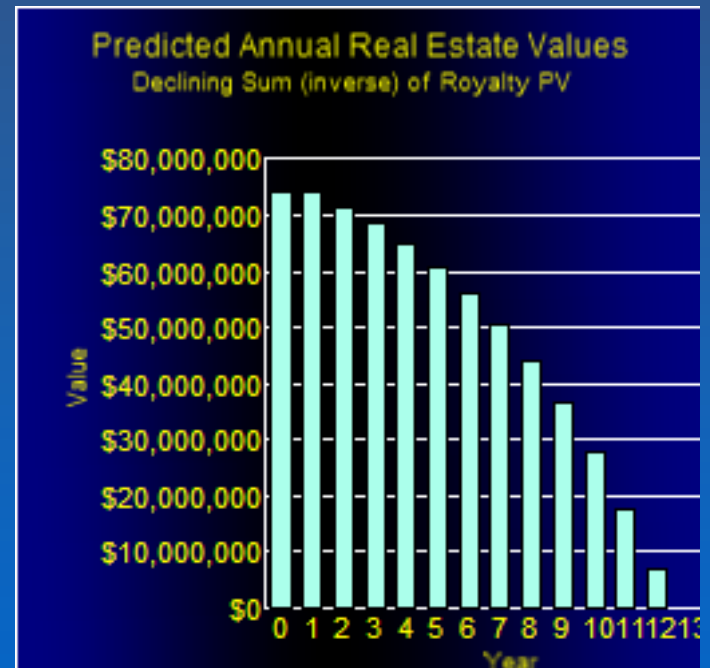
# PV: Royalty Income Stream

| YEAR | Production | Royalty Income | PV Royalty   |
|------|------------|----------------|--------------|
|      |            | 0              | \$0          |
| 1    | 5,000,000  | \$7,500,000    | \$6,947,122  |
| 2    | 9,000,000  | \$13,500,000   | \$10,729,135 |
| 3    | 10,000,000 | \$15,000,000   | \$10,228,442 |
| 4    | 10,000,000 | \$15,000,000   | \$8,776,003  |
| 5    | 10,000,000 | \$15,000,000   | \$7,529,811  |
| 6    | 10,000,000 | \$15,000,000   | \$6,460,578  |
| 7    | 10,000,000 | \$15,000,000   | \$5,543,176  |
| 8    | 10,000,000 | \$15,000,000   | \$4,756,045  |
| 9    | 10,000,000 | \$15,000,000   | \$4,080,686  |
| 10   | 10,000,000 | \$15,000,000   | \$3,501,229  |
| 11   | 10,000,000 | \$15,000,000   | \$3,004,054  |
| 12   | 9,400,000  | \$14,100,000   | \$2,422,830  |
| 13   | 0          |                | \$0          |



# Declining Value

| YEAR | Production | Remaining Tons | PV Royalty   | RE Value     |
|------|------------|----------------|--------------|--------------|
|      | 0          | 162,000,000    | \$0          | \$73,979,109 |
| 1    | 5,000,000  | 154,857,100    | \$6,947,122  | \$73,979,109 |
| 2    | 9,000,000  | 142,000,000    | \$10,729,135 | \$71,556,279 |
| 3    | 10,000,000 | 127,714,300    | \$10,228,442 | \$68,552,225 |
| 4    | 10,000,000 | 113,428,600    | \$8,776,003  | \$65,050,996 |
| 5    | 10,000,000 | 99,142,900     | \$7,529,811  | \$60,970,310 |
| 6    | 10,000,000 | 84,857,100     | \$6,460,578  | \$56,214,265 |
| 7    | 10,000,000 | 70,571,400     | \$5,543,176  | \$50,671,090 |
| 8    | 10,000,000 | 56,285,700     | \$4,756,045  | \$44,210,512 |
| 9    | 10,000,000 | 42,000,000     | \$4,080,686  | \$36,680,701 |
| 10   | 10,000,000 | 27,714,300     | \$3,501,229  | \$27,904,698 |
| 11   | 10,000,000 | 13,428,600     | \$3,004,054  | \$17,676,256 |
| 12   | 9,400,000  | 0              | \$2,422,830  | \$6,947,122  |
| 13   |            |                | \$0          |              |





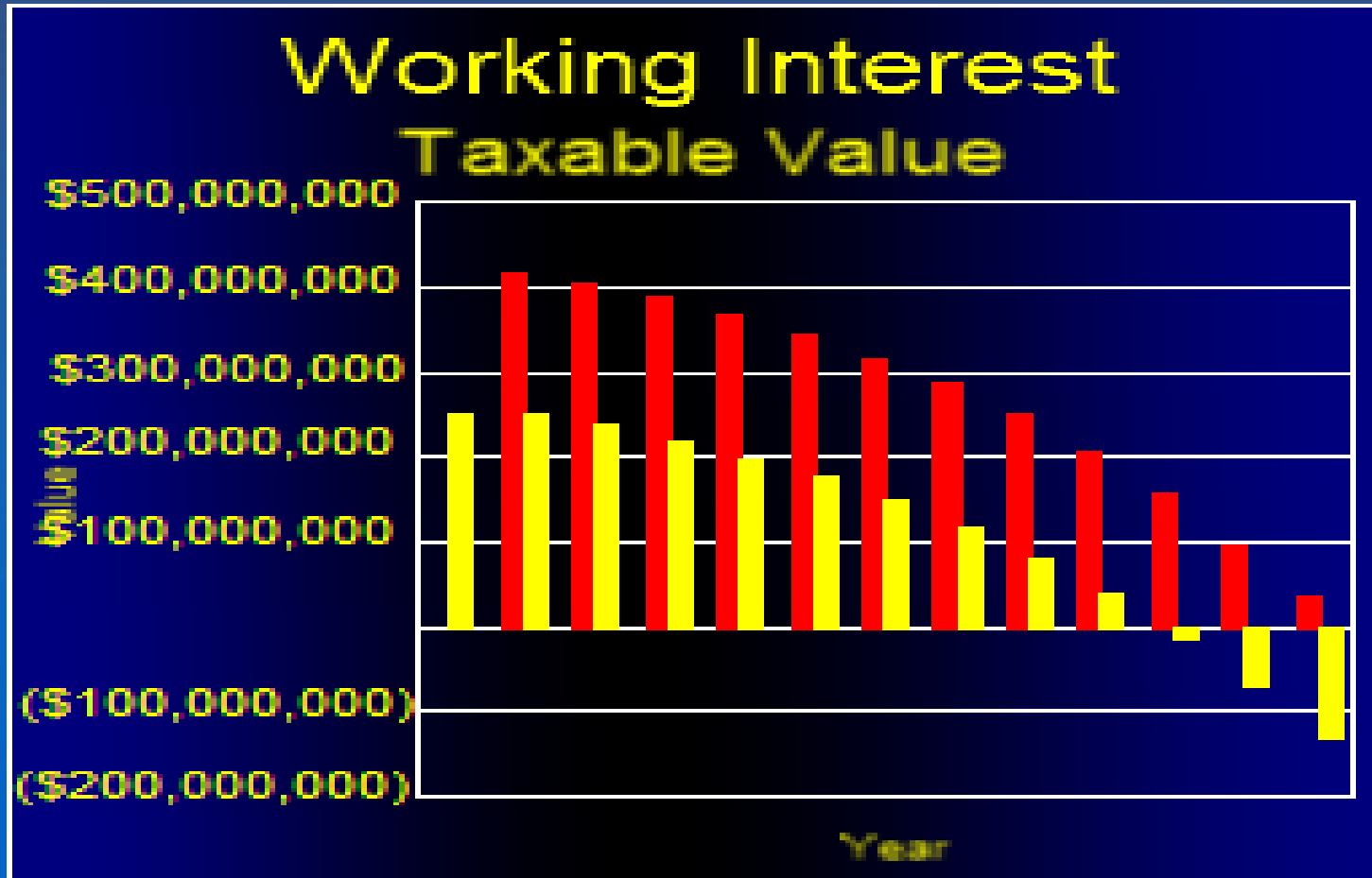
# Valuation/Recalculation Pattern

| Year 1  |              |              | Year 2  |              |              | Year 3  |              |              |
|---------|--------------|--------------|---------|--------------|--------------|---------|--------------|--------------|
| Periods | Income       | PV           | Periods | Income       | PV           | Periods | Income       | PV           |
| 1       | \$15,000,000 | \$13,870,000 | 1       | \$15,000,000 | \$13,870,000 | 1       | \$15,000,000 | \$13,870,000 |
| 2       | \$15,000,000 | \$11,859,000 | 2       | \$15,000,000 | \$11,859,000 | 2       | \$15,000,000 | \$11,859,000 |
| 3       | \$15,000,000 | \$10,139,000 | 3       | \$15,000,000 | \$10,139,000 | 3       | \$15,000,000 | \$10,139,000 |
| 4       | \$15,000,000 | \$8,669,000  | 4       | \$15,000,000 | \$8,669,000  | 4       | \$15,000,000 | \$8,669,000  |
| 5       | \$15,000,000 | \$7,412,000  | 5       | \$15,000,000 | \$7,412,000  | 5       | \$15,000,000 | \$7,412,000  |
| 6       | \$15,000,000 | \$6,337,000  | 6       | \$15,000,000 | \$6,337,000  | 6       | \$15,000,000 | \$6,337,000  |
| 7       | \$15,000,000 | \$5,418,000  | 7       | \$15,000,000 | \$5,418,000  | 7       | \$15,000,000 | \$5,418,000  |
| 8       | \$15,000,000 | \$4,633,000  | 8       | \$15,000,000 | \$4,633,000  | 8       | \$15,000,000 | \$4,633,000  |
| 9       | \$15,000,000 | \$3,961,000  | 9       | \$15,000,000 | \$3,961,000  | Value   |              | \$68,337,000 |
| 10      | \$15,000,000 | \$3,387,000  | Value   |              | \$72,298,000 |         |              |              |
| Value   |              | \$75,685,000 |         |              |              |         |              |              |

# Mining Cost

| YEAR | Mining Expenses        | Selling Expenses     | Administrative Expenses | Reclamation Set-Aside | Net Pre Tax          |
|------|------------------------|----------------------|-------------------------|-----------------------|----------------------|
| 0    | \$125,000,000          | \$10,000,000         | \$20,000,000            | \$0                   | -\$155,000,000       |
| 1    | \$85,000,000           | \$5,000,000          | \$7,500,000             | \$4,810,000           | \$40,190,000         |
| 2    | \$153,000,000          | \$9,000,000          | \$13,500,000            | \$4,810,000           | \$76,190,000         |
| 3    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 4    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 5    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 6    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 7    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 8    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 9    | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 10   | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 11   | \$170,000,000          | \$10,000,000         | \$15,000,000            | \$4,810,000           | \$85,190,000         |
| 12   | \$159,800,000          | \$9,400,000          | \$14,100,000            | \$4,810,000           | \$79,790,000         |
| 13   |                        |                      |                         |                       | \$0                  |
| 14   |                        |                      |                         |                       | \$0                  |
| 24   |                        |                      |                         |                       | \$0                  |
|      | <b>\$2,052,800,000</b> | <b>\$123,400,000</b> | <b>\$190,100,000</b>    | <b>\$57,720,000</b>   | <b>\$807,880,000</b> |

# Example: Closure



# When The Appeal Happens



# Processing

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Coal Preparation

Lime Kiln



# Night Ops



7/23/2014

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# Questions and Answers

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