



# Recent Trends in United States Coal Mining Activity



Kentucky Professional Engineers in Mining in Seminar  
Marriott Griffin Gate Hotel  
August 19, 2022  
Lexington, KY

Presented by:  
Scott Peterson, Senior Principal Geologist  
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Justin Douthat, Executive Vice President  
Marshall Miller & Associates



## Marshall Miller & Associates

- > Company started in 1975 by Marshall Miller
- > Expanded to 150 employees
  - > Mining (Geology, Engineering, Processing, Permitting, Environmental)
  - > Environmental & Civil Engineering services outside of mining/energy sector
  - > Wireline geophysics
- > Sold to Cardno July 2012 (10,000 employee international engineering firm HQ in Brisbane Aus)
- > Mining sector repurchased from Cardno in December 2016
  - > All mining related services (Geology, Engineering, Permitting, Environmental, & Wireline Geophysics)
  - > Cardno retained services **not** related to mining
- > MM&A ~40 full-time employees plus 10 senior coal industry “Associates”

# Services



## Geology

- > Mineral Resource and Reserve Estimation and Public Reporting including S-K1300; Canadian NI 43-101; and Australasian; JORC; Britain AIM standards and requirements;
- > Wireline Geophysical Logging Services;
- > Field Exploration Project Design & Management;
- > Core Description;
- > Geotechnical Logging;
- > Database management



## Hydrogeology

- > Surface and Groundwater Monitoring and Data Management
- > Water Supply Development
- > Mine Inflow and Control
- > Monitoring of Mine, Quarry or Construction Impact
- > Mitigation of Hydrogeologic Impact
- > Acid or Metal-Rich Drainage Prevention and Mitigation
- > Mine Stream and Wetland Mitigation/Restoration



## Oil & Gas

- > Resource Assessment - shale gas and coalbed methane
- > Reserve Reporting
- > Economic Analysis and Valuation
- > Due Diligence Support
- > Expert Witness



## Mineral Processing

- > New Plant Design
- > Plant Circuit Monitoring Services
- > General Troubleshooting Services
- > Plant Modification Services
- > Product Blending Optimization Services



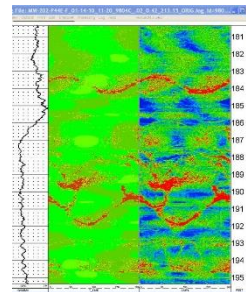
## Mining Engineering

- > Open Pit and Underground Mine Design
- > Valuation Services including Mineral Reserves, Property, Plant and Equipment, and Enterprise Value
- > Mine Costing and Cash Flow Analysis; Mine Operations Assessment
- > Mine Feasibility Studies; Due Diligence Services; Independent Engineer; and Advisory Services
- > Geotechnical and Ventilation Engineering including Subsidence Prediction; Pillar Design; Ground Control and Roof Support; Mine Ventilation; and Mine Seals
- > Coal Preparation Plant Design; Plant Optimization Studies; Coal Quality Optimization
- > Impoundment and Embankment Design, Permitting, Inspection, Operations & Monitoring Capabilities



## Mine Environmental Services

- > Environmental Site Assessments and Impact Studies
- > Environmental Compliance Monitoring and Reporting; Third Party Audits
- > Property Acquisition Due Diligence
- > Mine Closure and Reclamation Liability Determination in accordance with GAAP (TOPIC 410); Management of Idle Mine Properties
- > Permitting (SMCRA; NPDES; CWA; CAA); Mitigation Plans and Implementation
- > Carbon Capture & Storage; Carbon Footprint; Mandatory Reporting Rules



## Geophysical Logging

- > Acoustic Televiwer
- > Borehole Deviation (Gyroscopic and magnetically oriented available)
- > Borehole Video Camera
- > Caliper
- > EM Flowmeter
- > Fluid Conductivity and Fluid Temperature
- > Gamma-Gamma Density (High Resolution or Compensated)
- > Induction
- > Natural Gamma Ray
- > Neutron
- > Full Waveform Sonic, CBL - Cement Bond
- > Fluid Sampler
- > Various Resistivity Logs

## Part 1--Reserves



## Why Report Reserves?

- > **Publicly traded companies**—booked asset tonnages represent substantial value and require standardized formats for apples-to-apples comparison amongst peers
- > **Fundraising/IPO**—investor assurance that long-term mine plans are based on sound geological data that suggest profitability
- > **Internal Tracking**—for production forecasting, budgeting, and strategic short-term and long-term planning
- > **Multiple Reporting Standards** include US SEC S-K1300 and CRIRSCO (JORC, NI-43101 & others)



## New SEC Rules for Property Disclosure & Reserve/Resource Reporting

- > MM&A's project resume includes strong background in Guide 7, JORC, 43-101, & S-K1300 reporting.
- > We have also recently published new SEC S-K1300 reports for coal & lithium companies
- > In late 2018, the SEC Released its New Rulings that Rescind Industry Guide 7 and Require Substantial Additional Documentation of Coal Reserves and Resources
- > New Requirements Meet/Exceed JORC (Australian/Asian) and National Instruments 43-101 (Canadian) Standards

# MM&A's History of Reserve Reporting



Reserve Standard	Company	Location	Report Year
SK1300 SEC	Coronado Global	USA: VA, WV, PA	2021
SK1300 SEC	Alpha Metallurgical Resources	USA: VA, WV, PA	2021
SK1300 SEC	Warrior Met Coal	USA: AL	2021
SK1300 SEC	Piedmont Lithium	USA: NC	2021
SK1300 SEC	Confidential Client	USA: OH/WV	2021
43-101	Corsa Coal	USA: PA	2021
43-101	Corsa Coal	USA: PA	2020
43-101	Corsa Coal	USA: PA	2019
43-101	Corsa Coal	USA: PA	2018
JORC/CRIRSCO	Ben's Creek	USA: WV	2021
JORC	Coronado Global	USA: VA, WV, PA	2020
JORC	Coronado Global	USA: VA, WV, PA	2020
JORC	Coronado Global	USA: VA, WV, PA	2019
Guide 7 SEC	Contura Energy	USA: WY, WV, PA	2020
Guide 7 SEC	Coronado Global	USA: VA, WV, PA	2020
Guide 7 SEC	Warrior Met Coal	USA: AL	2020
Guide 7 SEC	Contura Energy	USA: WY, WV, PA	2019
Guide 7 SEC	Coronado Global	USA: VA, WV, PA	2019
Guide 7 SEC	Warrior Met Coal	USA: AL	2019
Guide 7 SEC	Contura Energy	USA: WY, WV, PA	2018
Guide 7 SEC	Warrior Met Coal	USA: AL	2018

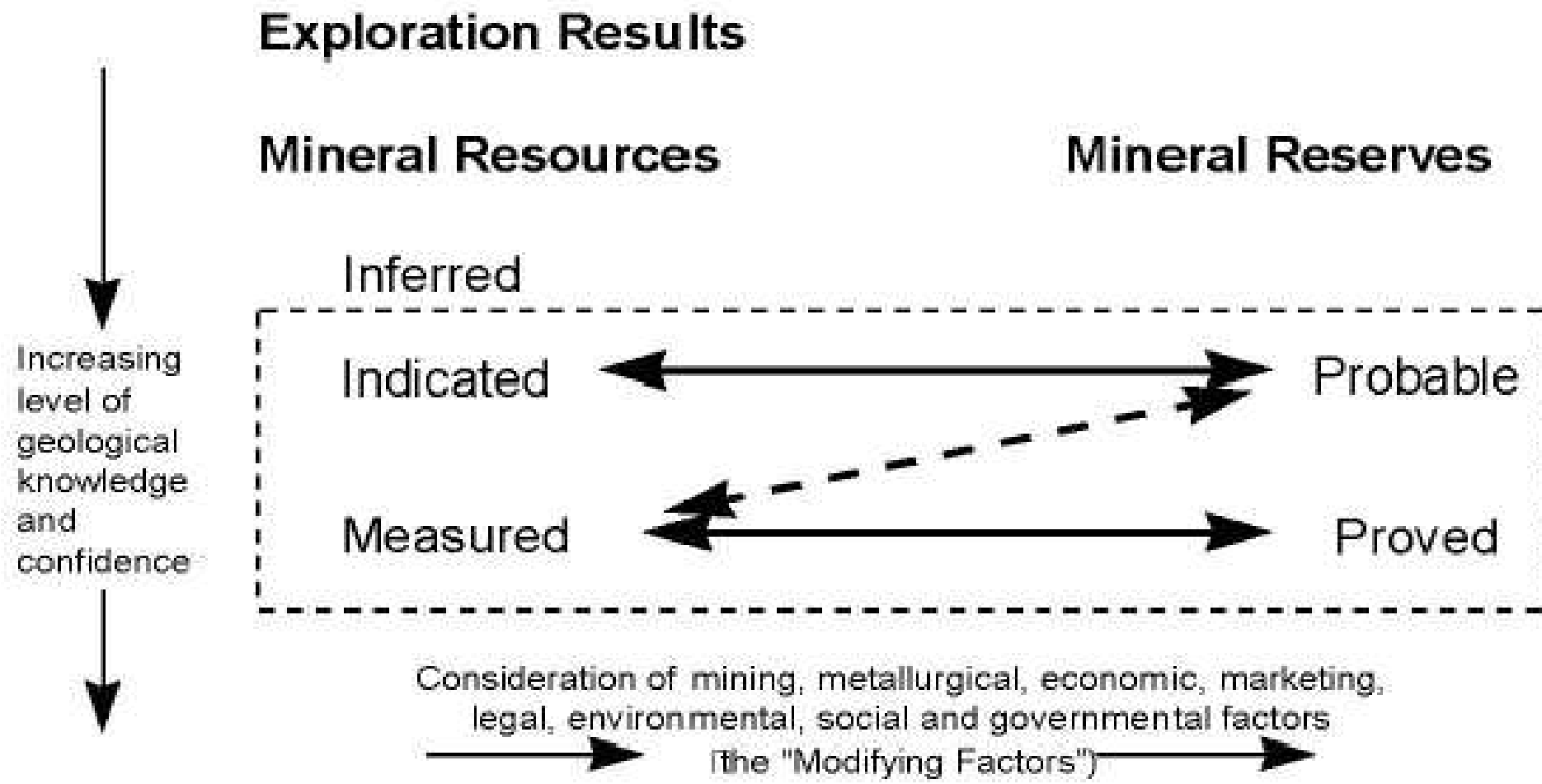


## Definition of Resources & Reserves

- > **Resources**: estimate of in-situ tonnage and grade based on exploration data with reasonableness to be economically extractable based on assumed and justifiable technical & economic conditions
- > **Reserves**: estimate of tonnage and grade which can be extracted and delivered to market under assumed modifying factors, including mining, processing, economic, marketing, legal, environmental, social & government factors



# Elevation of Mineral Resources to Reserves

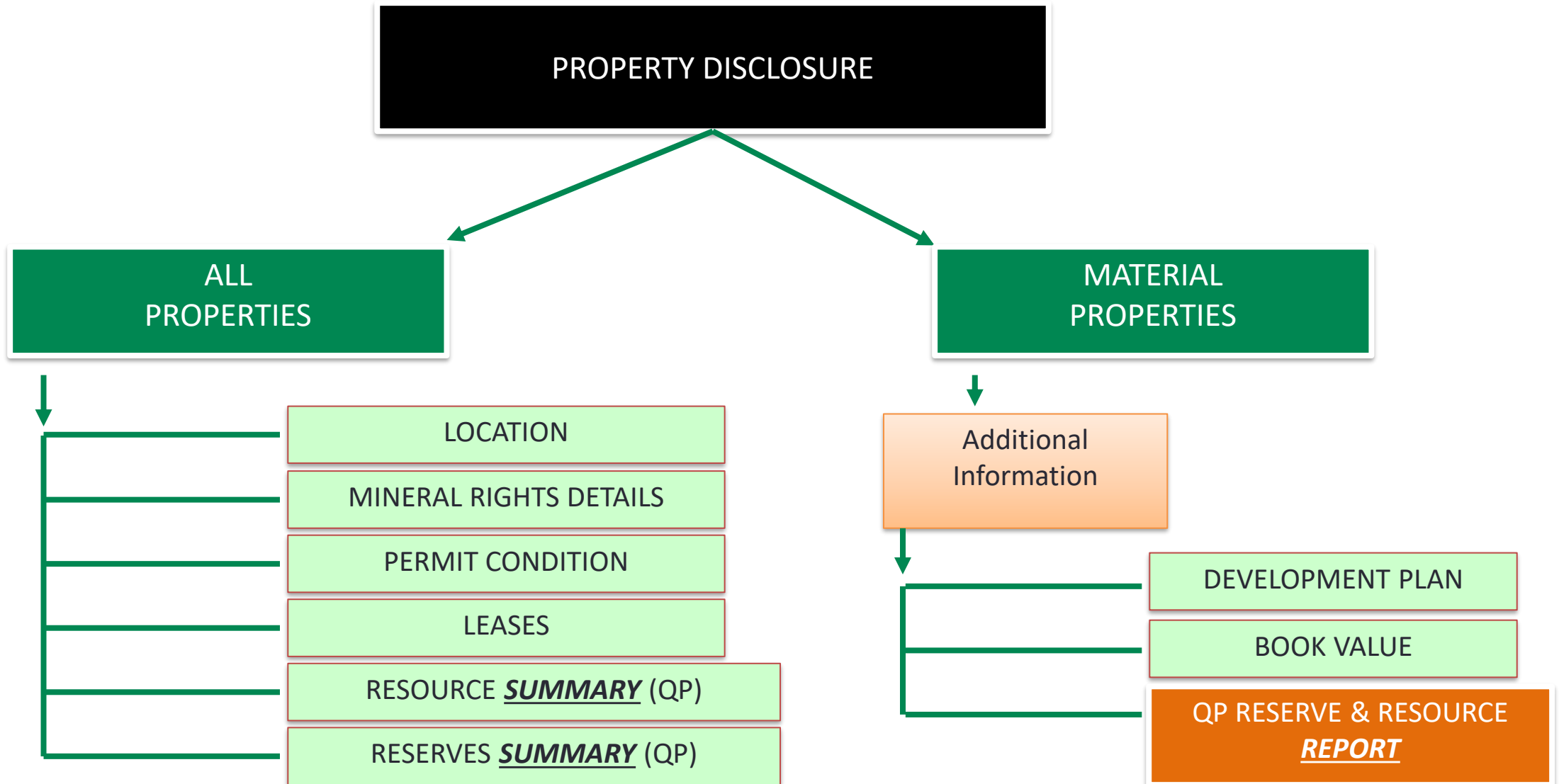


# Previous US SEC vs Current Reporting



Previous US SEC Guide-7 Standards	SEC S-K1300 & International Standards (JORC, NI 43-101, etc.)
Standards for Reserves Only	Standards for Reserves, Resources and Exploration Results
Generally, Reference 2-3 Year Historical Sales Prices	Generally, Reference Forward Looking Price Curves
Scoping Level Proforma Economics	Pre-Feasibility Level Economic Analysis
Does Not Require Competent Person Credentials	Requires Competent/Qualified Person

# New SEC Property Disclosure, Reserve & Resources





## New SEC Reserves, Resources & Materiality

- > When determining if operations/properties are material, registrant must....
  - *Consider both quantitative and qualitative factors, assessed in the context of the registrant's overall business and financial condition;*
  - *Aggregate mining operations on all of its mining properties, regardless of the stage of the mining property, and size or type of commodity produced, including coal, metalliferous minerals, industrial materials, and mineral brines; and*
  - *Include, for each property, as applicable, all related activities from exploration through extraction to the first point of material external sale, including processing, transportation, and warehousing*



## What is a Competent Person?

- > “A ‘Competent Person’ is a minerals industry professional who is a Member or Fellow of The Australasian Institute of Mining and Metallurgy, or of the Australian Institute of Geoscientists, or of a ‘Recognized Professional Organization’ (RPO), as included in a list available on the JORC and ASX websites. These organizations have enforceable disciplinary processes including the powers to suspend or expel a member. *Note—S-K1300 does not provide a list of RPO’s, but requires you are a member of an RPO to be a QP.*
- > A Competent Person must have a **minimum of five years relevant experience** in the style of mineralization or type of deposit under consideration and in the activity which that person is undertaking.
- > If the Competent Person is preparing documentation on Exploration Results, the relevant experience must be in exploration. If the Competent Person is estimating, or supervising the estimation of Mineral Resources, the relevant experience must be in the estimation, assessment and evaluation of Mineral Resources. If the Competent Person is estimating, or supervising the estimation of Ore Reserves, the relevant experience must be in the estimation, assessment, evaluation and economic extraction of Ore Reserves.”

# Current List of RPOs 25 September 2014 <http://www.jorc.org/competent.asp>



Recognized Professional Organization	Minimum Membership Class Required
Institute of Materials, Minerals and Mining	Member (MIMMM) or Fellow (FIMMM)
Geological Society of London	Chartered Geologist (CGeol), Chartered Scientist (CSci) or European Geologist (EurGeol)
Institute of Geologists of Ireland	Professional Geologist (PGeo)
European Federation of Geologists	European Geologist (EurGeol)
Mining and Metallurgical Society of America	Qualified Professional (QP)
<b>American Institute of Professional Geologists</b>	<b>Certified Professional Geologist (CPG)</b>
<b>Society for Mining, Metallurgy &amp; Exploration</b>	<b>SME Registered Member</b>
Engineering Council of South Africa	Professional Engineer (Pr Eng)
South African Council for Natural Scientific Professions	Professional Natural Scientist (Pr.Sci.Nat.)
Geological Society of South Africa	Member or Fellow
The Southern African Institute of Mining and Metallurgy	Member or Fellow
South African Council for Professional and Technical Surveyors	Mine Surveyors and Professional Mine Surveyors
Professional Engineers Ontario	P.Eng.
Association of Professional Engineers and Geoscientists of British Columbia	P.Ge., or P.Eng,
Association of Professional Engineers and Geoscientists of Manitoba	P.Ge., or P.Eng,
Association of Professional Geoscientists of Ontario	P.Ge., P.Ge.(limited), P.Ge.(Temporary)
Association of Professional Engineers and Geoscientists of Newfoundland and Labrador	P.Eng., P.Ge.
Association of Professional Engineers, Geologists and Geophysicists of the Northwest Territories	P.Eng, P.Ge (or P.Geol., P.Geoph.)
Association of Professional Geoscientists of Nova Scotia	P.Ge.
Association of Professional Engineers and Geoscientists of New Brunswick	P.Ge., P.Eng.
Association of Professional Engineers, Geologists and Geophysicists of Alberta	P.Eng., P.Ge., P.Geoph.
Association of Professional Engineers and Geoscientists of Saskatchewan	P.Ge. or P.Eng.
Ordre des Geologues du Québec	P.Ge., géo.
Ordre des Ingénieurs du Québec	P. Eng. or ing.
Comisión Calificadora de Competencias en Recursos y Reservas Mineras (Chilean Mining Commission or Comisión Minera)	Registered Member
Russian Society of Subsoil Use Experts (OERN)	Expert



## Additional S-K1300 Details

- > **Resources (Coal)**: Qualified Persons must consider economic extraction over a period of ~50 years when delineating resources. Resources must be supported by an initial technical assessment
- > **Goodbye Circular 891**: Measured/Indicated (& Proven/Probable) Classifications can no longer be supported directly by Circular 891's  $\frac{1}{4}$  &  $\frac{3}{4}$  mile arcs. S-K1300 suggests geostatistical methods be utilized
- > **Uncertainty/Risk**: Significant expansion of required disclosures of risk and uncertainty beyond international reporting requirements.
- > **Section 11 Liability**: QP's are subject to securities claims/class action lawsuits for material omissions of fact or mis-statements
- > **Inclusion on 10K Filings**: TRS (Technical Report Summary) is now included as part of registrant's 10K filing.



# Table of Contents, TRS

## **1 Executive Summary**

- 1.1 Property Description
- 1.2 Ownership
- 1.3 Geology
- 1.4 Exploration Status
- 1.5 Operations and Development

- 1.6 Mineral Resource
- 1.7 Mineral Reserve
- 1.8 Capital Summary
- 1.9 Operating Costs

- 1.1 Permitting
- 1.11 Conclusion and Recommendations

## **2 Introduction**

- 2.1 Registrant and Terms of Reference
- 2.2 Information Sources
- 2.3 Personal Inspections

## **3 Property Description**

- 3.1 Location
- 3.2 Titles, Claims or Leases
- 3.3 Mineral Rights
- 3.4 Encumbrances
- 3.5 Other Risks

## **4 Accessibility, Climate, Local Resources, Infrastructure and Physiography**

- 4.1 Topography, elevation and Vegetation
- 4.2 Access and Transport
- 4.3 Proximity to Population Centers
- 4.4 Climate and Length of Operating Season
- 4.5 Infrastructure

## **5 History**

- 5.1 Previous Operation
- 5.2 Previous Exploration

## **6 Geological Setting, Mineralization and Deposit**

- 6.1 Regional, Local and Property Geology
- 6.2 Mineralization
- 6.3 Deposits

## **7 Exploration**

- 7.1 Nature and Extent of Exploration
- 7.2 Non-Drilling Procedures and Parameters
- 7.3 Drilling Procedures
- 7.4 Hydrology
- 7.5 Geotechnical Data

## **8 Sample Preparation Analyses and Security**

- 8.1 Prior to Sending to the Lab
- 8.2 Lab Procedures

## **9 Data Verification**

- 9.1 Procedures of Qualified Person
- 9.2 Limitations

- 9.3 Opinion of Qualified Person

## **10 Mineral Processing and Metallurgical Testing**

- 10.1 Testing Procedures
- 10.2 Relationship of Tests to the Whole
- 10.3 Lab Information
- 10.4 Relevant Results

## **11 Mineral Resource Estimates**

- 11.1 Assumptions, Parameters and Methodology
  - 11.1.1 Statistical Analysis
- 11.2 Qualified Person's Estimates
- 11.3 Qualified Person's Opinion

## **12 Mineral Reserve Estimates**

- 12.1 Assumptions, Parameters and Methodology
- 12.2 Qualified Person's Estimates
- 12.3 Qualified Person's Opinion





# Table of Contents, TRS

## **13 Mining Methods**

- 13.1 Geotech and Hydrology
- 13.2 Production Rates
- 13.3 Mining Related Requirements
  - 13.3.1 Underground
  - 13.3.2 Surface Mine
  - 13.3.3 Auger/HWM
- 13.4 Required Equipment and Personnel
  - 13.4.1 Underground Mines
    - 13.4.1.1 Mine 1
    - 13.4.1.2 Mine 2
  - 13.4.2 Surface Mines and Highwall Miners
    - 13.4.2.1 Mine 1
    - 13.4.2.2 Mine 2

## **14 Processing and Recovery Methods**

- 14.1 Description or Flowsheet
- 14.2 Requirements for Energy, Water, Material and Personnel

## **15 Infrastructure**

## **16 Market Studies**

- 16.1 Market Description
- 16.2 Price Forecasts
- 16.3 Contract Requirements

## **17 Environmental Studies, Permitting and Plans, Negotiations or Agreements with Local Individuals**

- 17.1 Results of Studies
- 17.2 Requirements and Plans for Waste Disposal
- 17.3 Permit Requirements and Status
- 17.4 Local Plans, Negotiations or Agreements
- 17.5 Mine Closure Plans
- 17.6 Qualified Person's Opinion

## **18 Capital and Operating Costs**

- 18.1 Capital Cost Estimate
- 18.2 Operating Cost Estimate

## **19 Economic Analysis**

- 19.1 Assumptions, Parameters and Methods
- 19.2 Results
- 19.3 Sensitivity

## **20 Adjacent Properties**

- 20.1 Information used

## **21 Other Relevant Data and Information**

## **22 Interpretation and Conclusions**

- 22.1 Conclusion
- 22.2 Risk Factors
  - 22.1.1. Governing Assumptions
  - 22.1.2. Limitations
  - 22.1.3. Methodology
  - 22.1.4. Development of the Risk Matrix
    - 22.1.4.1 Probability Level Table

## **22.1.4.2 Consequence Level Table**

- 22.1.5. Categorization of Risk Levels and Color Code Convention
- 22.1.6. Description of the Coal Property
- 22.1.7. Summary of Residual Risk Ratings
- 22.1.8. Risk Factors
  - 22.1.8.1 Geological and Coal Resource
  - 22.1.8.2 Environmental
  - 22.1.8.3 Regulatory Requirements
  - 22.1.8.4 Market and Transportation
  - 22.1.8.5 Mining Plan

## **23 Recommendations**

## **24 References**

## **25 Reliance on Information Provided by Registrant**



## Impact of S-K1300

	Reserves (x 1,000) YE 2020	Reserves (x 1,000) YE 2021	Percent Reduction	Notes
WARRIOR	210,418	162,800	23%	Majority Associated with Conversion of Some Tons to Resource
RAMACO	262,000	39,160	85%	Significant Reductions Across All Properties
CONSOL	2,200,000	1,166,500	47%	2021 Figure Includes ~500-million tons of non-material resources + reserves
ARCH	1,607,000	998,900	38%	Significant Reductions with Exception of Northern App Properties
ALPHA	623,543	351,099	44%	Property Re-Allocation
ALLIANCE	1,652,800	547,100	67%	Elimination of Various Properties from Reserves and Reductions on Others
CORONADO	398,000	341,000	14%	Divestiture of Property

## Part 2--Markets



## Commentary on Markets (Thermal)

### > Domestic Thermal Markets

- > Domestically Consumed Thermal Coal Currently Being Sold at +/- \$190-\$175/ton (FOB Mine).
- > Compares to Typical 5-Year lookback of \$40-\$60/ton
- > Most forecasters predict a sharp decline to +/- \$75 over the short term, but this same sharp decline has been predicted for months despite continually rising prices.

### > Domestic Export Markets

- > Realized prices (FOB-Mine) in range of +/- \$275-300/ton, largely fueled by European/Ukraine Crisis and elimination of Russian supply.
- > Major constraints on export infrastructure in US shrink capacity for export thermal market placement.
- > Likely suppression in market forthcoming, but timing is majorly questionable. Ukraine situation, global economy, etc. will drive export market demand and pricing.

### > Notes on Natural Gas

- > Natural gas prices currently in the +/- \$8-9/dekatherm range vs 5-year lookback of +/- \$2. Current prices are at highest since 2008.



## Commentary on Markets (Coking)

### > Seaborne Indices are Raging

- > Queensland Coking Coal, \$/tonne FOB vessel has dropped from +/- \$500/ton (March/April) to \$230 per ton. Conversion to FOB Mine = FOB Vessel x 90% (metric -> short) minus \$25-\$40
- > While indices are raging, mining companies are generally locked into long-term contracts and do not realize the full upside of the index. While still very profitable, +/- \$200/ton FOB mine realized prices are more typical of operators currently.

### > China/Australia

- > Freeze on Australian coal exports to China is ongoing, currently boosting attractiveness of low-volatile CAPP exports to China. While this plays into prices, AU/China's trade situation has been ongoing.

### > Long-Term Outlook

- > Operators and market experts are expecting a decrease, the timing of which is unpredictable. Long-term balance at +/- \$130/ton FOB mine is roughly typical for outlooks.



**Thank You**

> QUESTIONS OR COMMENTS?