



# **Mine Life Analysis: Data and Methodology**

**August  
2016**

## **Acronyms and Abbreviations**

HVAU: Hunter Valley Access Undertaking

WAML: Weighted Average Mine Life

ARTC: Australian Rail and Track Corporation

RML: Remaining Mine Life

JORC: Joint Ore Resources Committee

NSW: New South Wales

HRATF: Hunter Rail Access Taskforce

ROM: Run Of Mine

ACCC: Australian Competition and Consumer Commission

IPART: Independent Pricing and Regulatory Tribunal

Mt: Million Tonnes

Mtpa: Million Tonnes Per Annum

## Table of Contents

Executive Summary	i
<b>1 Introduction</b>	<b>1</b>
<b>2 Previous Calculations of RML</b>	<b>2</b>
2.1 Methodology	<b>Error! Bookmark not defined.</b>
2.2 Data Sources	3
2.3 Definitions	3
2.3.1 Marketable Reserves:	3
2.3.2 Production:	3
2.3.3 Internal Estimates	<b>Error! Bookmark not defined.</b>
2.3.4 Adjustments to Current Period	3
2.3.5 Prospective Mines	4
<b>3 Our Approach and Methodology</b>	<b>4</b>
<b>4 Results</b>	<b>5</b>

## Appendices

Appendix A : HVAU Mines	6
Appendix B : Mine Production and ROM	7
Appendix C: Data Sources	8

## Tables

Table 6.1: Weighted Average Mine Life Calculations	5
Table A: Mines to Be Included in 2016 HVAU	
Table B: Mine Statistics	
Table C: Mine Data Sources	

## Boxes

Box 2.1: Weighted Average Mine Life Formula	2
---------------------------------------------	---

## **Executive Summary**

The 2011 HVAU set out the methodology for calculating the Remaining Mine Life (RML). The 2011 calculation used variety of data sources, but mainly relied on the 2006 NSW Coal Industry Profile.

For the 2016 HVAU, ARTC have proposed to roll forward this approach using data from the 2014 NSW Coal Industry Profile.

The 2014 NSW Coal Industry Profile is substantially out of date, relying on data from 2012 or earlier. Significant developments have taken place since then.

This report follows the data gathering methodology adopted by the NSW Coal Industry Profile, but updates for the latest available information. We use the same mix of public and private data that informed previous NSW Coal Industry Profile reports and apply the same definitions for “Marketable Reserves” and “Current Production”.

Our database shows RML of 30.1 years including prospective mines. A conservative calculation excluding prospective mines also produces 30.1 years.

The main reason for the increase in RML from previous estimates is a significant increase in marketable reserves at a number of sites following investment in the development of those sites.

# **1 Introduction**

We were asked to update the database of all operating and prospective mines which are to be included in the Hunter Valley Access Undertaking (HVAU).

The relevant categories for the database are Marketable Reserves and Current Production. The implied mine life is derived from the simple division of Marketable Reserves by the Current Production.

In this report we show:

- Previous Calculations of RML
- Data Sources used in the NSW Industry Profile
- Definitions
- Our Approach and Methodology
- Results

## 2 Previous Calculations of RML

The methodology used in 2011 was based largely on a report by Booz & Co published in 2009. This set out the methodology for calculation of RML. The approach was to calculate a Weighted Average of Remaining Mine Life, with the weighting being determined by the ratio of individual reserves to total reserves.

This methodology was accepted in 2011 both by ARTC and the ACCC.

In previous HVAU's and the Booz & Co study, data were sourced from the NSW Coal Industry Profile, which provides detailed statistics on mines in the Hunter Valley Region. The Industry Profile sourced data primarily from public sources and secondly from individual mine operators. The key pieces of data contained were the Run of Mine (ROM) Production rates and Marketable Reserves.

The formula for the calculation of RML is shown in Box 2.1 below. This then gives a value of the Weighted Average Mine Life (WAML) for all the mines in the region.

Box 2.1 details our approach.

**Box 2.1: Weighted average mine life**

$$WA_{minelife}(years) = \sum (Weighted\ mine\ reserve_i \times Implied\ mine\ life_i)$$

$$Weighted\ Mine\ Reserve_i(\%) = \frac{Net\ proven\ JORC\ Reserve_i}{Total\ Hunter\ Valley\ proven\ reserves}$$

$$Implied\ mine\ life_i(years) = \frac{Net\ Measurable\ Proven\ JORC\ Reserves_i}{Current\ year\ production_i}$$

**Where**

$WA_{minelife}$  = Average mine life of Hunter Valley Region coalfields

$i$  = Coalfield

$Current\ year\ production_i$  = Mining company actual production 2015-2016 (MT)

For the Booz & Co 2008 study, marketable coal reserves were primarily drawn from 4 sources:

- New South Wales Coal Industry Profile 2006 supplied the marketable reserves at a number of coal mines.
- Public information on mine reserves from company websites.
- AME Mineral Economics supplied the marketable coal reserves at a number of mines.
- The study team made estimates based on potential resources being converted into marketable reserves for a number of "Prospective mines".

### **3 Data Sources**

The NSW Coal Industry Profile is no longer being published, with the last edition having been released in 2014. This makes the data in the report substantially out of date as mines have responded to changing market condition. Reserve and production values have undergone significant changes since the last publication. In this study we aim to replicate the methodology of the Industry Profile to provide the most up to date information.

We have gathered individual mine data from both public sources and individual companies which operate mines in the region. The data for Marketable Reserves and Current Production were mainly sourced from publicly available information. The key sources for this were annual reports, JORC reports and production reports. For publicly listed companies, this data was required to be submitted to the Australian Securities Exchange (ASX), and released in annual reports. For private companies, this data was provided by individual companies upon request. Publicly listed companies comprise the majority of those operating in the hunter valley.

### **4 Definitions**

In this section we define key terms such as Marketable Reserves and ROM production and our justification for using these metrics over others.

#### **4.1 Marketable Reserves**

The 2012 JORC Code defines Marketable Reserves as representing beneficiated or otherwise enhanced coal product where modifications due to mining, dilution and processing have been considered, must be publicly reported in conjunction with, but not instead of, reports of Coal Reserves. The basis of the predicted yield to achieve Marketable Coal Reserves must be stated. The code then gives this explanation: since investors need to be informed on the products intended to be sold, reporting of Marketable Coal Reserves is required.

In other words, Marketable Reserves represent the combination of Proven and Probable reserves after beneficiation has been considered. In this database we have used Marketable Coal Reserves as these are the most relevant to what is actually sold. The coal industry Profile and the Booz & Co study also used this definition.

#### **4.2 Production**

Production refers to the gross tonnages per year (in million tonnes), which are extracted from a given mine. The metric we have used in this report is Run Of Mine (ROM) production as this is the most common publicly reported statistic. ROM is also the most conservative approach (i.e. leads to shorter mine life estimates) as it does not account for any adjustments that are made post extraction. This is opposed to Saleable Production which is infrequently reported and refers to the ROM production minus any adjustments needed to prepare the coal for sale, for example washing or breaking it up.

This study, the coal industry profile and the Booz & Co study use the same definition of production.

#### **4.3 Adjustments to Current Period**

In rare instances we needed to undertake Adjustments to the Current Period refers to the process of converting non-current data to period appropriate data. This involves adjusting prior reserve information by production so that it accurately reflects current

reserves. An example of this is the Bloomfield Mine. For this mine the most current information was a 2014 JORC report, which included production and reserve information. To make this current to 2016 took the 2014 reserve value and subtracted two years' worth of production from it. This means the level of reserve is not overstated and is accurate as of 2016. We note that these adjustments were carried out on a minority of mines in the study.

#### **4.4 Prospective Mines**

Prospective Mines are mines within the Hunter Valley Region that have undergone the necessary regulatory approvals, however have yet to begin production. In order to be included as a prospective mine, we have a set of three requirements, one of these requirements must be met. These are:

1. All reasonably necessary project approvals have been obtained
2. Contracts have been executed for Network Exit Capacity (i.e. port/terminal capacity) sufficient to provide for the delivery and export of any coal forecast to be produced over the remaining term or any further term
3. Reasonable expectation that the mine will commence operations and coal will be produced within five years of the review date.

For a number of prospective mines, the current production plans result in expected mine life in excess of 40 years. As a conservative assumption, we have followed the practice of the earlier reports and have set the expected life for prospective mines at 30 years.

We have also now excluded Caroonia from the list of prospective mines following the announced buy-out of the lease by the NSW Government.

## **5 Our Approach and Methodology**

In order to replicate the methodology for the Coal Industry Profile as closely as possible, we derive the majority of our data from the most current public information available about individual mines.

Typically, this information will be contained in:

- Current Annual Reports
- Current Quarterly Production Reports
- JORC Compliant Resource Statements
- JORC Reports

Where public information is unavailable, we have sourced our data directly from individual producers.

Our database sets out verifiable sources of data. In this respect, our approach was to present a data base as close as possible to the NSW Coal Industry Profile and we aim to replicate the standards of the report. The data is found in Appendix A.

Prospective Mines are treated in this report as having a 30-year mine life. Unless specified otherwise the data is correct for the calendar year 2015. That is to say our data is correct as of 31/12/2015. This makes it a more valid source than the Coal Report which is correct as of July 2014.



## 6 Results

Table 6.1: Weighted Average Mine Life Calculations

---

Zone	Including Prospective Mines	Excluding Prospective Mines
1	30.7	30.9
2	24.1	22.7
3	32.3	33.2
WAML	30.1	30.1

---

## Appendix A: HVAU Mines

**Table A: Mines to Be Included in 2016 HVAU**

Zone 1	Zone 2	Zone 3
Abel/Donaldson (Care and Maintenance)	Mangoola	Boggabri
Ashton	Moolarben	Maules Creek
Austar	Ulan	Narrabri
Bengalla	Wilpingjong	Rocglen (Belmont)
Bloomfield	Bylong (Prospective)	Tarrawonga
Bulga Complex		Werris Creek
Drayton (Care and Maintenance)		Vickery (Prospective)
Duralie & Stratford/Gloucester		Watermark (Prospective)
Hunter Valley Operations		
Liddell		
Mount Arthur		
Mount Thorley Warkworth		
Mt Owen		
Muswellbrook		
Rixs Creek North		
Ravensworth Narama & North		
Rixs Creek		
Wambo		
Mount Pleasant (Prospective)		

## Appendix B: Mine Production and ROM

**Table B: Mine Statistics**

Mine Name	Marketable Reserves (Mt)	Current Production (Mtpa)	Implied Mine Life (Years)
<b>Zone 1</b>			
Abel/Donaldson (Care and Maintenance)	71.0		
Ashton	26.8	1.4	19.5
Austar	40.4	0.7	56.0
Bengalla	208.0	8.3	25.1
Bloomfield	11.7	1.2	9.8
Bulga Complex	225.0	9.9	22.7
Drayton (Care and Maintenance)	5.1		
Duralie & Stratford/Gloucester	29.3	1.4	20.4
Hunter Valley Operations	629.0	13.0	48.4
Liddell	27.0	4.1	6.6
Mount Arthur	785.0	25.3	31.0
Mount Thorley Warkworth	230.0	11.5	20.0
Mt Owen	80.0	8.1	9.9
Muswellbrook	8.4	1.6	5.3
Rixs Creek North	13.8	1.2	11.5
Ravensworth Narama & North	167.0	6.5	25.7
Rixs Creek	53.9	2.8	19.3
Wambo	98.0	6.0	16.3
Mount Pleasant (Prospective)	474.0	8.0	30.0
<b>Zone 2</b>			
Mangoola	90.0	9.3	9.6
Moolarben	247.0	6.9	35.8
Ulan	163.0	11.6	14.0
Wilpingjong	66.0	5.0	13.2
Bylong (Prospective)	127.0	4.2	30.0
<b>Zone 3</b>			
Boggabri	129.0	7.9	16.3

Maules Creek	349.0	7.8	44.7
Narrabri	204.0	6.8	30.0
Rocglen (Belmont)	3.5	1.2	2.9
Tarrawonga	37.0	2.4	15.4
Werris Creek	17.0	2.1	8.1
Caroona (Prospective)	300.0	NSW government buy out announced	
Vickery (Prospective)	178.0	4.75	30.0
Watermark (Prospective)	100.0	3.3	30.0

## Appendix C: Data Sources of Mines

Table C: Mine Data Sources

Mine Name	Majority Shareholder	Reserve Source	Production Source
<b>Zone 1</b>			
Abel/Donaldson (Care and Maintenance)	Yancoal	<a href="http://www.yancoal.com.au/page/assets/reserves-and-resources/">http://www.yancoal.com.au/page/assets/reserves-and-resources/</a>	
Ashton	Yancoal	<a href="http://www.yancoal.com.au/page/assets/reserves-and-resources/">http://www.yancoal.com.au/page/assets/reserves-and-resources/</a>	Q4 2015 Quarterly Production Report (Page 3)
Austar	Yancoal	<a href="http://www.yancoal.com.au/page/assets/reserves-and-resources/">http://www.yancoal.com.au/page/assets/reserves-and-resources/</a>	Q4 2015 Quarterly Production Report (Page 3)
Bengalla	New Hope/Wesfarmers	RTAR Reserves Table 2015 (Page 1)	Q4 Production Report 2015 (Page 19-20)
Bloomfield	Bloomfield	Bloomfield Colliery Open Cut Coal Resources Estimate Competent Persons Report January 2014 SRK Consulting + Adjusted to Current period	Bloomfield Colliery Open Cut Coal Resources Estimate Competent Persons Report January 2014 SRK Consulting + Adjusted to Current period
Bulga Complex	Glencore	Reserves and Resources Report	<a href="http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx">http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx</a>
Drayton (Care and Maintenance)			
Duralie & Stratford/Gloucester	Yancoal	<a href="http://www.yancoal.com.au/page/assets/reserves-and-resources/">http://www.yancoal.com.au/page/assets/reserves-and-resources/</a>	Q4 2015 Quarterly Production Report (Page 3)
Hunter Valley	Rio Tinto	RTAR Reserves Table 2015 (Page 1)	Q4 Production Report 2015 (Page 19-20)

*Confidential*

Operations			
Liddell	Glencore	Reserves and Resources Report	<a href="http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx">http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx</a>
Mount Arthur	BHP Billiton	BHP Annual Report 2015 (page 118)	BHP Annual Report 2015
Mount Thorley Warkworth	Rio Tinto	RTAR Reserves Table 2015 (Page 1)	Q4 Production Report 2015 (Page 19-20)
Mt Owen	Glencore	Reserves and Resources Report	<a href="http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx">http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx</a>
Muswellbrook	Idemitsu	JORC Report	Internally Produced
Rixs Creek North	Bloomfield	Integra Open Cut Mine Coal Resources as at 30th June 2010 JB Mining Services September 2010 + Adjusted to Current period	Integra Open Cut Mine Coal Resources as at 30th June 2010 JB Mining Services September 2010 + Adjusted to Current period
Ravensworth Narama & North	Glencore	Reserves and Resources Report	<a href="http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx">http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx</a>
Rixs Creek	Bloomfield	Rixs's Creek Colliery Open Cut Coal Resource Estimate Competent Persons Report SRK Consulting November 2015	Rixs's Creek Colliery Open Cut Coal Resource Estimate Competent Persons Report SRK Consulting November 2015
Wambo	Peabody	Internally produced and based on BTUUQ Annual Report and ARTC Contracts	Internally produced and based on BTUUQ Annual Report and ARTC Contracts
Mount Pleasant (Prospective)	Rio Tinto	RTAR Reserves Table 2015 (Page 1)	Internally Produced + 30-year ML Assumed
<b>Zone 2</b>			
Mangoola	Glencore	Reserves and Resources Report	<a href="http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx">http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx</a>
Moolarben	Yancoal	<a href="http://www.yancoal.com.au/page/assets/reserves-and-resources/">http://www.yancoal.com.au/page/assets/reserves-and-resources/</a>	Q4 2015 Quarterly Production Report (Page 3)
Ulan	Glencore	Reserves and Resources Report	<a href="http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx">http://www.glencore.com.au/EN/who-we-are/Pages/Coal.aspx</a>
Wilpingjong	Peabody	Internally produced and based on BTUUQ Annual Report and ARTC Contracts	Internally produced and based on BTUUQ Annual Report and ARTC Contracts
Bylong (Prospective)	Kepeco		
<b>Zone 3</b>			
Boggabri	Idemitsu	Internally Produced	Internally Produced
Maules Creek	Whitehaven	<a href="http://www.whitehavennews.com.au/maules-creek-mine/">http://www.whitehavennews.com.au/maules-creek-mine/</a>	June 2016 Quarterly Report

*Confidential*

Narrabri	Whitehaven	<a href="http://www.whitehavennews.com.au/narrabri-north-mine/">http://www.whitehavennews.com.au/narrabri-north-mine/</a>	June 2016 Quarterly Report
Rocglen (Belmont)	Whitehaven	August 2015 Coal Resources and Reserves Report – Update	June 2016 Quarterly Report
Tarrowonga	Whitehaven	August 2015 Coal Resources and Reserves Report – Update	June 2016 Quarterly Report
Werris Creek	Whitehaven	August 2015 Coal Resources and Reserves Report – Update	June 2016 Quarterly Report
Caroona (Prospective)	BHP Billiton	Government buy-out announced	
Vickery (Prospective)	Whitehaven	August 2015 Coal Resources and Reserves Report – Update plus internal production plan	Assumed 30-year ML
Watermark (Prospective)	Shenhua		

---



T: +1 (202) 466-6790  
F: +1 (202) 466-6797  
1747 Pennsylvania Avenue  
NW 12th Floor  
WASHINGTON DC 20006  
United States of America

T: +1 (646) 632-3770  
F: +1 (212) 682-0278  
200 Park Avenue Suite 1744  
NEW YORK NY 10166  
United States of America

T: +61 (2) 9231 6862  
Level 1, 27-31 Macquarie Place  
SYDNEY NSW 2000  
Australia

T: +64 (4) 913 2800  
F: +64 (4) 913 2808  
Level 2, 88 The Terrace  
PO Box 10-225  
WELLINGTON 6143  
New Zealand

T: +57 (1) 646 6626  
F: +57 (1) 646 6850  
Calle 100 No. 7-33  
Torre 1, Piso 14  
BOGOTÁ  
Colombia

T: +33 (1) 73 44 26 97  
F: +33 (1) 73 44 26 01  
6, Rue Duret  
PARIS 75116  
France

----- [www.castalia-advisors.com](http://www.castalia-advisors.com)