

Whitehaven Coal Limited Narrabri Underground Operations

Gas Drainage Practices and Experiences

Gas and Coal Outburst Committee Seminar
Wollongong
24th June 2015



About Whitehaven Coal



- Established in 1999 by proven coal developers and operators
- Listed on the ASX in June 2007 with 323 million shares on issue, currently a total of 1,025 million shares on issue and a market capitalisation of about \$1.5 billion
- Whitehaven currently operates five mines Narrabri underground mine and four open cuts Tarrawonga,
 Rocglen, Werris Creek and Maules Creek
- Production of 10.3Mt in FY2014 will double to over 23Mt by FY2018
- The largest operator in the Gunnedah Basin, producing high quality thermal and metallurgical coals
- Founding shareholder of the NCIG coal terminal in Newcastle



Where we operate

WHITEHAVEN COAL

Maules Creek (75%)

- Reserves to support ~ 30 years
- Permitted & Planned : 13 Mtpa ROM
- SSCC, PCI and high energy thermal

Narrabri North (70%)

- Reserves to support ~ 25 years
- Permitted: 8 Mtpa ROM
- Planned: 6 Mtpa ROM
- PCI & low ash thermal coals

Tarrawonga (70%)

- Reserves to support > 20 years
- Permitted: 3 Mtpa ROM
- Planned: 2 Mtpa ROM
- SSCC, PCI and high energy thermal

Rocglen (100%)

- Reserves to support ~ 3 years
- Permitted & Planned to 1.5 Mtpa ROM
- Mainly thermal coals

Vickery (100%)

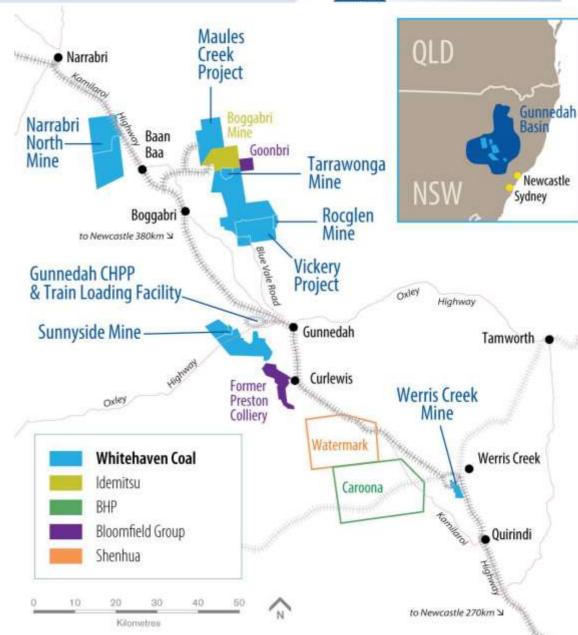
- Reserves to support ~ 30 years
- SSCC, PCI and high energy thermal
- Approved for 4.5 Mtpa ROM

Gunnedah CHPP (100%)

Permitted to 4 Mtpa

Werris Creek Mine (100%)

- Reserves to support ~ 8 years
- Permitted & Planned to 2.5 Mtpa
- PCI and thermal coals



Gunnedah Basin



MULLALEY SUB-BASIN

- Blackjack formation
- Hoskissons seam

Mining has been conducted at

- Narrabri Underground Mine
- Sunnyside open cut
- Former Gunnedah Colliery

MAULES CREEK SUB-BASIN

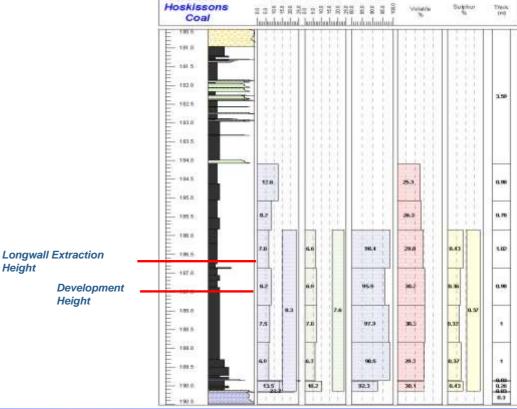
- Rocglen Open Cut
- Tarrawonga Open Cut
- Maules Creek Open Cut



Hoskissons Seam



- Raw Ash 11 %
- Volatiles 28 30 %
- Sulphur 0.37 %
- Calorific Value (gad) of 6,950 kcal/kg
- Full Seam Thickness 9m
- Seam Working Section 3.5-4.2m
- 4.3m longwall mining section
- Producing PCI and low-ash thermal product



NC-005



Height

Narrabri Coal Operations

- Located 28km south of Narrabri
- Narrabri is producing a high energy export thermal coal and a low ash, low sulphur, low phosphorus, mid volatile PCI coal.
- First development coal was produced in FY2011 with full commercial production from the longwall achieved in October 2012.
- Production for FY2014 was 5.6Mt
- Production for FY2015 is forecast at 7.0Mt







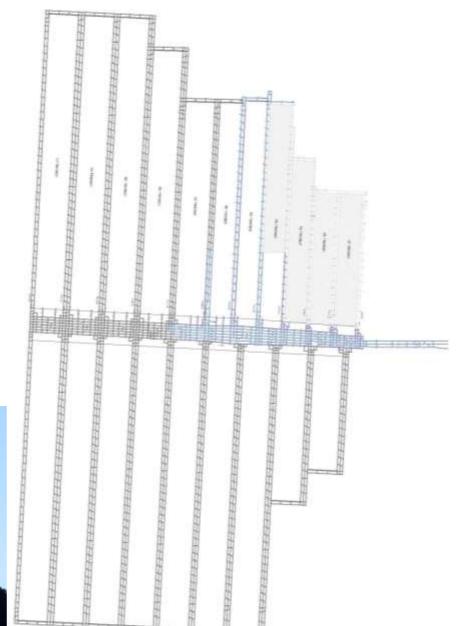


Mine Plan



- 20 Longwall block design
- Currently mining 300m wide LW panels
- LW107 will be first 400m LW face
- MG106 is first 3 heading gateroad
- Production parameters;
 - ROM 7 to 8Mtpa
 - Up to 100m pw retreat on LW
 - 20 to 22km development pa





Mine Equipment



- Fully automated CAT longwall
 - 146 x 1,370t shields
 - CAT EL 3000 shearer
 - 3,500tph nominal face capacity
- 4 x Joy Development kits (3 running any one time)
 - 12CM12 Continuous Miner
 - 10SC32 Shuttle cars
 - Joy Feeder / Breakers





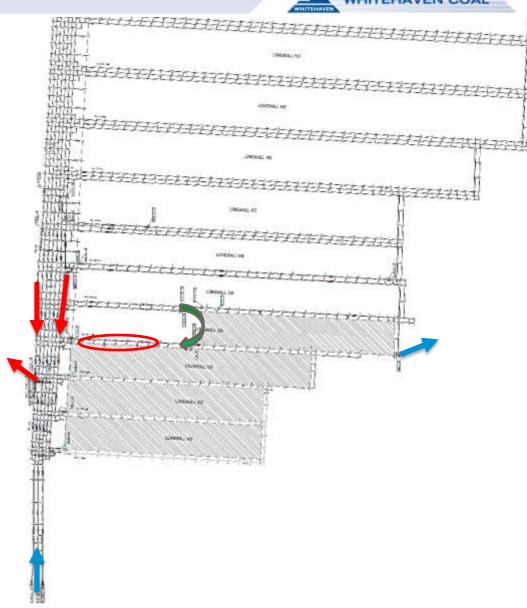
Ventilation



- Single upcast shaft 450m3/s
- Flanking Main returns
- Bleeder surface fan 15m3/s exhaust
- Simple "U" ventilation 125m3/s
- Aux TG blower fan additional 15-20m3/s into TG

Goaf drainage plant utilised – capacity 1,800lps

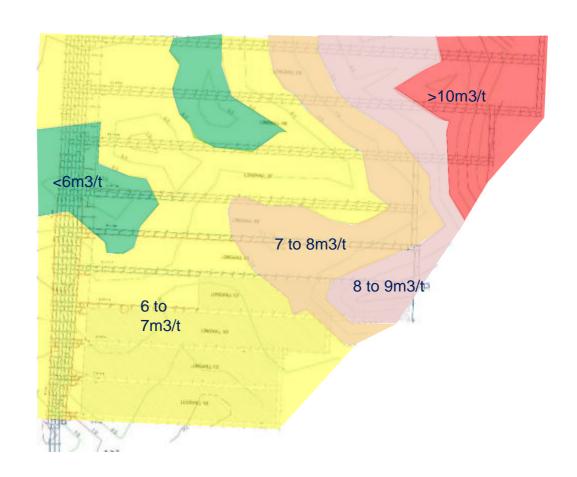
3 x liquid ring pump central gas extraction plan utilised for pre drainage (1,500lps)



Gas Contents



- The Hoskissons Seam is potentially outburst prone. The seam gas content is predominantly carbon dioxide (CO2) (approximately 90%).
- Insitu gas contents in current mining areas range from 5m3/t CO2 to 9m3/t.
- Future mining areas have insitu contents >10m3/t
- Seam is liable to spontaneous combustion
- Permeability is 3 to 7 mD
- Issues;
 - Outburst risk
 - Gas emissions in LW return



Outburst Thresholds



Level 1 DTV is 6.20 m3/t

Normal mining

- Cores at 100m spacing
- Cores at 50m spacing's if content > 5.35 m3/t or anomalies
- Cores at 5m intervals around known faults
- Cores at 10m intervals around predicted faults
- Coring at upper and lower horizons in the seam

CO2 Threshhold Limit Values Level 2 - Non normal mining Level 1 Mining Conditions CO2 Content (m3/t) Normal Mining Normal Mining Reduced sampling

Outburst Thresholds



Level 1 DTV is 7.05 m3/t

Controlled mining will be allowed between 6.20 m3/t and 7.05 m3/t

 Increased drilling is required, boreholes must be no more than 20m apart

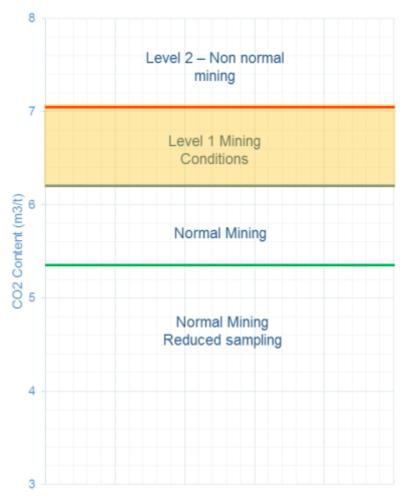
Where structure is known, or can not be disproven, face advance is limited to:

2m per cutting hour

Prior to working in Level 1 DTV conditions all persons working within those conditions must be trained at intervals of no more than 6 months in;

- Outburst Mining Procedure;
- Outburst awareness and indicators;
- SCSR Use; and
- CABA Use

CO2 Threshhold Limit Values



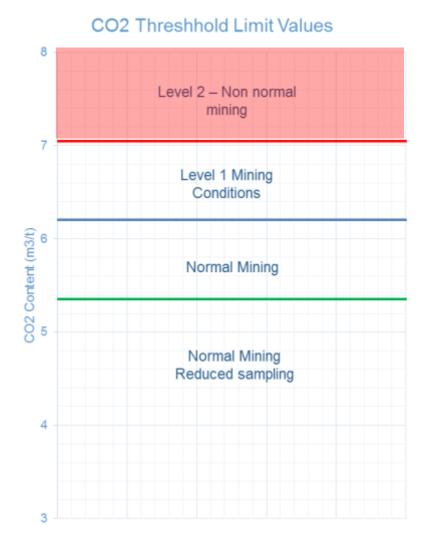
Outburst Thresholds



NO NORMAL MINING ABOVE 7.05 m3/t

No mining where people are present at the face while winning coal will be allowed

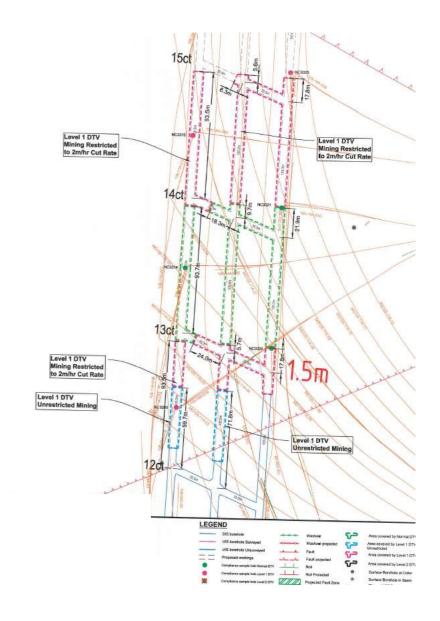
Any remote mining in areas above 7.05 m3/t will be addressed on a case by case basis and require formal risk assessment



Authority to Mine



- No mining will take place in any development or longwall panel except in accordance with the current Authority To Mine
- The Outburst Risk Review Committee administer the ATM process
- Each Authority To Mine must include the following information:
 - a plan of the area showing existing and proposed workings
 - all UIS, SIS and vertical drill holes
 - an indication of all sections of boreholes that are not surveyed
 - the location of drilling anomalies along each hole
 - the location of core samples and subsequent gas analysis results
 - details of any lost drilling equipment
 - known and projected geological structures
 - distances of authorised drivages

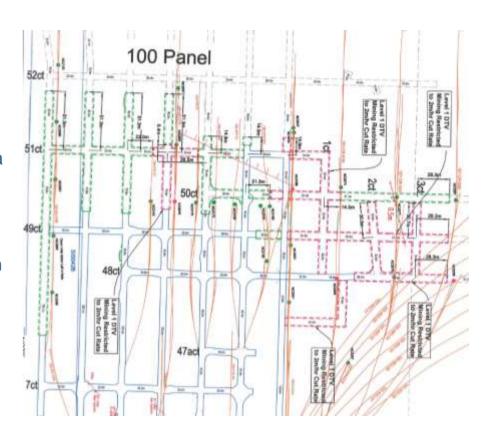


Authority to Mine



In addition, a Gas Drainage and Geological Checklist completed and signed as correct by the Gas Drainage Coordinator and Mine Geologist must accompany every ATM. The checklist must contain the following information:

- whether pre-drainage of the area has been conducted
- if pre-drainage has been conducted, the time for which the area has been pre-drained
- identify any in seam holes that have not been surveyed
- confirm that all in seam holes that are to be intersected by mining have been inspected for blockage and the result of such inspections
- whether gas flow monitoring of each drainage hole has indicated any possible blockage or other anomaly during its drainage life
- identify any anomalous data based on content, composition, DRI, IRD30 or any other factor
- a description of projected geological structures
- status of surface to seam vertical bore holes
- identification of possible inrush sources



UIS Drilling



- Contract services provided through ADS
- 3 Drill rigs
- 46 personnel
- Drilling 17 to 22km per month total (180km in last 12 months)

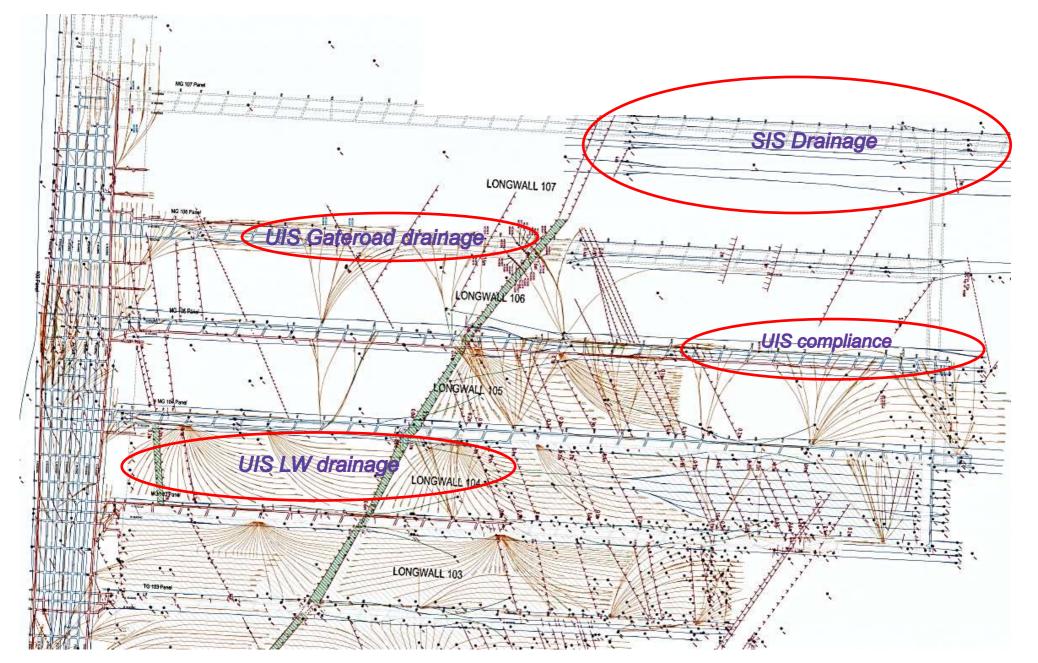






Drainage Design

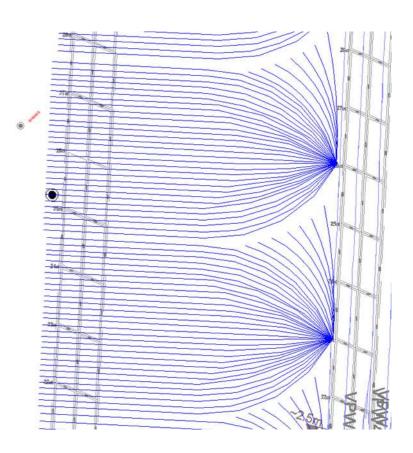




Challenges



- Extensive drilling program in seam liable to spontaneous combustion
 - Management of boreholes post-intersection
- Rapid mine advance rates vs capability of drilling/ drainage program lead time requirements
- UIS compliance coring for 400m wide faces
 - initially restricted to 400m due to core retrieval time
 - currently recovering cores up to 650m for ATM sampling
 - cores retrieved up to 1100m for exploration
- Outburst potential in thick seam does it present the same hazard as the Bulli seam?



Thank you

