



FINGAL TIER COAL PROJECT

REVIEW OF SULFUR AND CHLORINE CONTENT

MAY 2018

Paul Wootton BSc F.AusIMM, M.ASEG



Introduction:

This report reviews the laboratory test results of Sulfur and Chlorine.

The two most significant contaminants in coals used in electricity generation and cement making are Sulfur and Chlorine. By both Australian and International standards, Coals of the Fingal Tier project contain extremely low quantities of both these elements. The average for Sulfur for coal is 0.39%. All results for Chlorine are less than 0.01%

Sulfur

595 tests were carried out on drill core samples from the Fingal Tier project these results are summarized in Table 1 below. Distribution of Sulfur test data is shown on Figure 1. Sulfur content is graphed against ash in Figure 2. Results are reported on an air dried basis (adb).

<i>Description</i>	<i>Ash%</i>	<i>Number</i>	<i>Average</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Standard Deviation</i>
All Samples	11.6-97.3	595	0.22	0.00	3.66	0.23
Coal	11.6-45.0	241	0.39	0.11	0.94	0.11
Carbonaceous	45.0-65.0	97	0.27	0.00	3.66	0.38
Stone	65.0-97.3	257	0.05	0.00	0.44	0.06

Table 1: Summary of Sulfur Test Results

The value of 3.66 is anomalous in the sample set. This result is from testing of Seam sub-section (D1) from drill hole VR13. This sample was retested. The sample was tested for "Forms of Sulfur" and was also float/sink tested and sulfur content tested for each density sample.

The objectives were to identify the nature of the concentration of sulfur and secondly to show that the sulfur content would be reduced in the coal preparation process.

Results of Forms of Sulfur test -

Total Sulphur	Pyritic Sulphur	Sulfate Sulphur	Organic Sulphur
2.63	1.95	0.06	0.62

Note that two thirds of the sulfur content is made up of Pyritic Sulfur. As the term implies, Pyritic sulfur occurs as Pyrite and due to its high relative density (4.8 to 5.1 g/cc) it is expected to be significantly reduced by standard coal preparation methods. Float/Sink testing demonstrates that this scenario is the case in this instance. Pyrite is considered

to be accumulate after coalification and is migratory from external sources. The low Sulfate Sulfur content is typical of most coals and forms from the oxidation of other sulfur forms. Organic sulfur, as the term implies originates from coal swamp organic material and is likely to be higher in coals formed in a reducing environment. These coals are generally higher in vitrinite and are geologically described as bright coals. These coals are used for metallurgical processes. Dull coals, typical of the Fingal area are considered to have experienced oxidation during or shortly after, their formation, e.g. shallower water resulting in lower sulfur content.

Results from Float/Sink testing –

Sink Density	Float Density	Incremental			Cumulative		
		Mass	Ash	Total Sulfur	Mass	Ash	Total Sulfur
g/cc	g/cc	%	%	%	%	%	%
	1.40	1.7	13.0	0.50	1.7	13.0	0.50
1.40	1.50	6.1	20.2	0.46	7.8	18.6	0.47
1.50	1.60	15.6	35.1	0.41	23.4	29.6	0.43
1.60	1.70	28.0	41.9	0.31	51.5	36.3	0.36
1.70	1.80	10.2	51.1	0.32	61.7	38.7	0.36
1.80		38.3	63.5	5.39	100.0	48.2	2.29

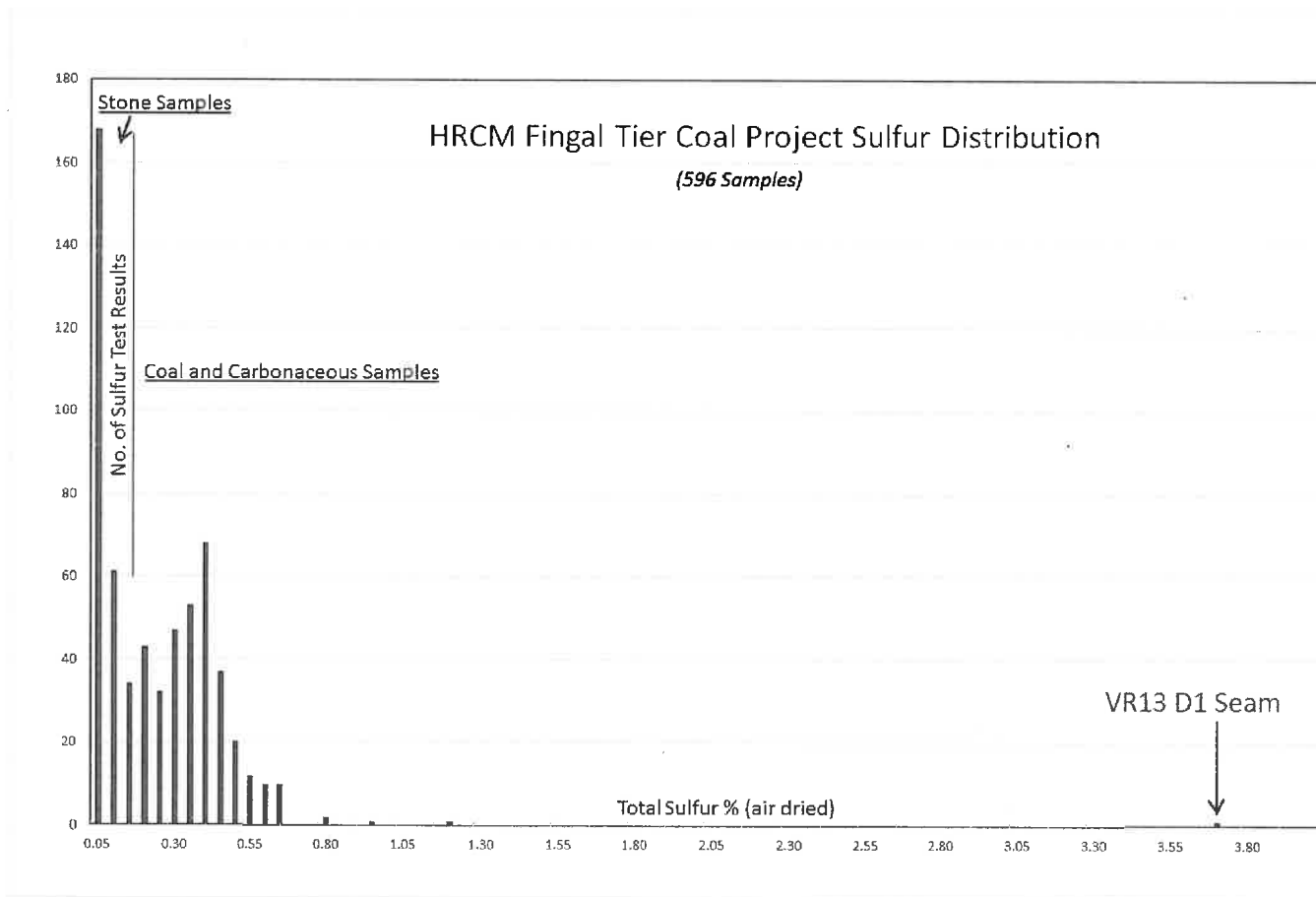


Figure 1

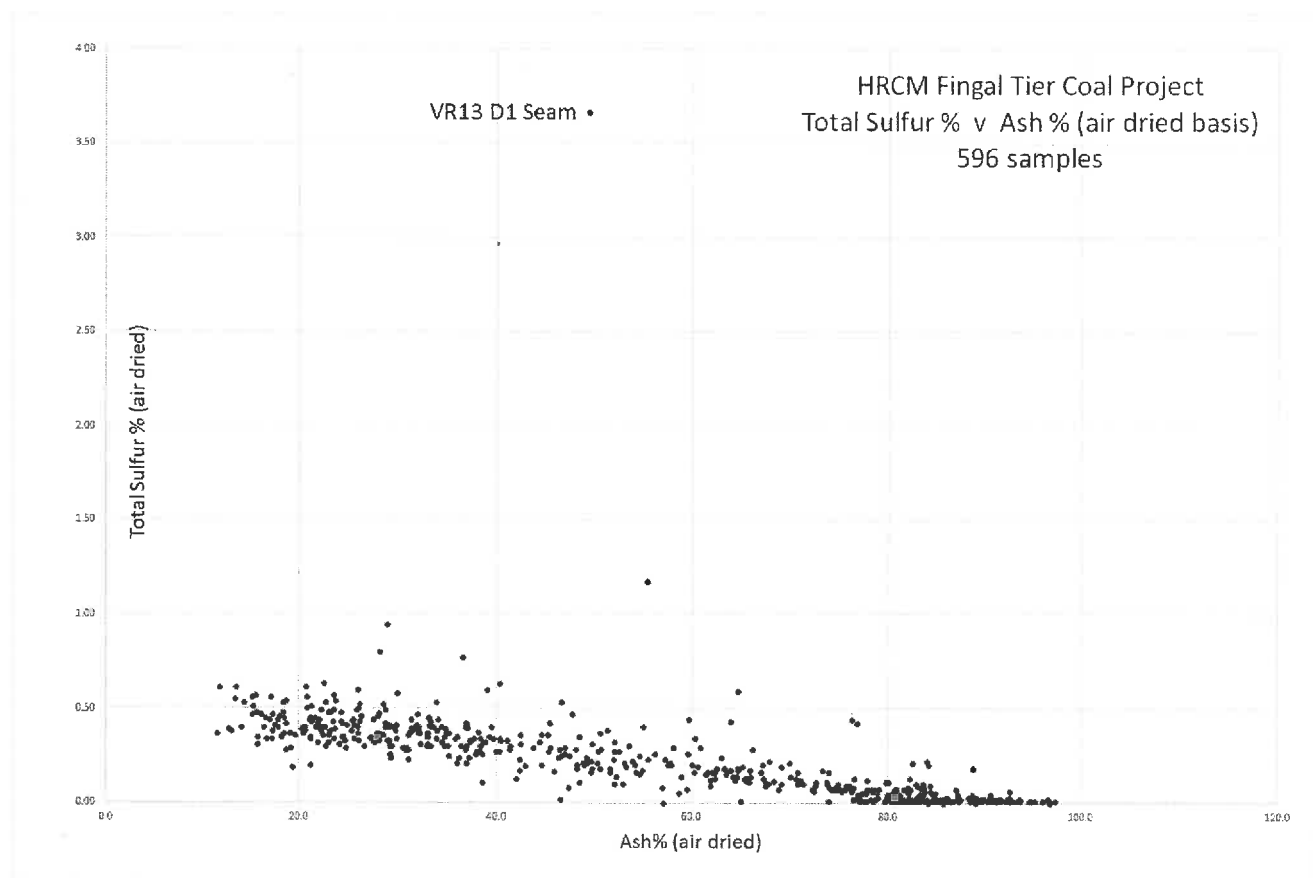


Figure 2

Chlorine

Chlorine content was tested on 29 raw coal composite samples. Chlorine testing on raw coal samples rather than float/sink samples is standard practice. Float/sink testing utilises carbon tetrachloride as a dense media in which to separate density coal fractions and thus contaminates the coal samples. The Chlorine test method can not measure Chlorine content below 0.01%. No sample from the Fingal Tier project was above this threshold.

P. Wootton

Paul Wootton, BSc, F AusIMM

30th May 2018