DOE/PC/95154--T5

PRECOMBUSTION REMOVAL OF HAZARDOUS AIR POLLUTANT PRECURSORS

Quarterly Technical Progress Report

Reporting Period:

Report for the Fifth Quarter
October 1, 1996 – December 31, 1996

Submitted by:

G. H. Luttrell, G. T. Adel and R.-H. Yoon

Date Submitted:

January 26, 1997

DOE Award Number:

DE-AC22-95PC95154

Prime Contractor:

Department of Mining and Minerals Engineering
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061-0239

Subcontractors:

Clark-Atlanta University
Southern Illinois University at Carbondale
Electric Power Research Institute
Consol Inc.

DISCLAIMER

ABSTRACT

This project involves the development of an optimized, bench-scale processing circuit capable of efficiently removing trace elements from run-of-mine coals. The optimized circuit will be developed using characterization data obtained from detailed washability studies and release analyses tests conducted with several eastern U.S. coals. The optimized circuit will incorporate a variety of conventional and advanced coal cleaning processes which are believed to be the most cost-effective and commercially viable. The coal products from the optimized circuit will be further treated with complexing agents specifically designed to extract organometallic trace elements that are difficult to remove by physical cleaning operations. Finally, innovative bioremediation schemes will be investigated as a means of controlling the release of trace elements from the process waste streams. Emphasis has been placed on the development of a processing circuit which (i) maximizes the rejection of trace elements, (ii) minimizes the production of coal fines which are costly to process and less marketable, and (iii) minimizes the downstream impacts of the process waste streams on the environment.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

Several project work elements were completed during the past quarter. Preliminary coal analyses and detailed float-sink tests were completed for all three of the base coal samples, i.e., Pittsburgh No. 8, Coalburg and Illinois No. 6 seams. Also completed were most of the flotation release analyses tests and the SEM/Image Analysis characterization work. Results of these tests will be reported after the laboratory coal analyses and trace element analyses have been completed. All of the bench-scale heavy media work was also completed during the past quarter using coal from the Pittsburgh No. 8 seam. Unfortunately, all column flotation tests conducted to date are presently being repeated because of problems associated with a biased feeding system. Due to limited manpower, this problem has delayed the completion of both the column flotation and enhanced gravity separation test work. Finally, a refuse leach column was constructed and water samples drained from the column were collected over a period of several weeks. These solutions, as well as those obtained from the characterization studies and bench-scale tests, are presently being subjected to trace element analyses. Additional manpower has been allocated to all subtasks involving coal analyses in order to complete this work in a timely fashion.

INTRODUCTION

Coal preparation is widely regarded a cost-effective method for reducing the amounts of potentially hazardous air pollutant precursors (HAPPs) which occur as trace elements in run-of-mine coals. Unfortunately, many existing coal preparation plants are inefficient in removing trace elements because of poor circuit design and inadequate liberation of coal and mineral matter. These shortcomings are often difficult to correct in the absence of characterization data regarding the mineralogical association and washability of trace elements in run-of-mine coals.

In the present work, detailed trace element characterization studies will be conducted using samples from three different coal producing regions in the U.S. Using the characterization data, size classes, density fractions, etc., will be identified that are capable of meeting the desired trace element cleanup levels using low-cost conventional technologies such as heavy media bath, cyclones, spirals, etc. Composite particles not meeting these criteria will be pulverized to improve liberation and subjected to a second series of characterization studies. This information will be used to determine whether additional clean coal can be recovered from the middlings fractions.

Based on input provided by the industrial participants, one of the three base coal samples will be selected and subjected to a series of bench-scale tests using a wide variety of advanced physical separation processes. Processes evaluated in the bench-scale study will include column flotation cells and enhanced centrifugal gravity separators. These processes are believed to have the highest overall probability of gaining industrial acceptance. Data obtained from the bench-scale tests will be used to design optimum circuit configurations for the removal of trace elements. The various types of fine coal processing technologies may be combined in series to achieve high rejections of trace elements without ultrafine grinding.

To further enhance the removal of trace elements, the clean coal products from the bench-scale tests will be treated using complexing agents. These reagents are designed to combine with specific elements and increase their effective solubility range. This "polishing" step will allow for the incremental removal of organically bound or poorly liberated trace elements that cannot be rejected by physical cleaning. In addition, some of the waste streams from the bench-scale tests will be subjected to a variety of laboratory tests to formulate strategies for controlling the release of trace elements discarded into refuse impoundments. Finally, the data obtained from the characterization studies and bench-scale tests will be used to develop a conceptual design for a proof-of-concept (POC) plant which maximizes coal recovery and trace element rejection.

PROJECT OBJECTIVES

The primary objective of this project is to develop and evaluate an advanced coal cleaning circuit that is capable of removing hazardous air pollutant precursors from run-of-mine coals in an efficient and cost-effective manner. Specific objectives of Phase I activities are (i) to determine the types and relative amounts of trace elements present in several eastern U.S. coals, (ii) to devise and test bench-scale circuits capable of maximizing the recovery of coal and the rejection of trace elements, (iii) to develop reliable performance data, operating guidelines and scale-up criteria for the proposed circuits, and (iv) to formulate strategies which minimize the downstream impact of trace elements on the effluent streams from the refuse impoundment.

RESULTS AND DISCUSSION

Task 1 - Project Planning

Subtask 1.2 - Project Reporting

All status, management and technical reports for the past quarter have been submitted in a timely fashion to DOE. No delays are currently anticipated in meeting future reporting requirements.

Task 3 - Characterization

Subtask 3.1 - Preliminary Analyses

Preliminary analyses (proximate and ultimate) of the three base coal samples were conducted at off-campus laboratories. The results of these analyses are summarized in Table 3.1. As shown, the run-of-mine sample from the Pittsburgh No. 8 seam contained the lowest ash content of approximately 23%, while the Coalburg and Illinois No. 6 seams each had similar ash contents of approximately 34-35%. The run-of-mine Coalburg sample contained only 0.47% total sulfur and was the only low-sulfur coal tested. Both the feed samples of Pittsburgh No. 8 and Illinois No. 6 seam coals were found to contain significantly greater amounts of sulfur (i.e., 3.0% and 4.1%, respectively).

Table 3.1 - Head analyses (dry basis) of the coal samples used in the present work..

Reporting Base	Pittsburgh No. 8	Coalburg	Illinois No. 6
Proximate Analysis:			
Ash	22.76	34.27	34.96
Volatile Matter	32.39	23.49	29.83
Fixed Carbon	44.85	42.24	35.21
Ultimate Analysis:			
Ash	22.76	34.27	34.96
Hydrogen	4.26	3.59	3.36
Carbon	63.62	53.13	49.38
Nitrogen	1.19	0.90	0.81
Sulfur	2.98	0.47	4.08
Oxygen	5.18	7.63	7.40

Subtask 3.2 - Washability Analyses

During the past quarter, float-sink (density partitioning) tests were completed for the run-of-mine samples acquired from the Coalburg seam. As indicated in previous reports, this particular coal seam was known to be difficult to upgrade by traditional coal preparation circuits due to the large percentage of middlings particles that are present in the coarser size fractions (i.e., >50 mm). As a result, characterization tests were undertaken to determine whether the coarse middlings particles could be crushed to liberate additional mineral matter and associated trace elements.

Figure 3.1 provides an overview of the particle size classes that were subjected to float-sink testing for the sample obtained from the Coalburg seam. In this case, the sample was subdivided into six size fractions, i.e., +50 mm, 50 x 10 mm, 10 mm x 28 mesh 28 x 100 mesh, 100 x 270 mesh and 270 mesh x 0. Float-sink tests were performed on all but the finest size fraction of the run-of-mine coal. In order to define the population of middlings particles, a wide range of specific gravity classes were used for the float-sink testing of the Coalburg seam sample, i.e., float 1.40 SG, 1.40 x 1.55 SG, 1.55 x 1.65 SG, 1.65 x 2.00 SG and sink 2.00 SG. After completing these tests, the +50 mm fraction was crushed to below 50 mm and subdivided into 50 x 10 mm, 10 mm x 28 mesh, 28 x 100 mesh, 100 x 270 mesh and 270 mesh x 0 size fractions. Float-sink tests were again performed on all but the finest size fraction using the same range of specific gravity classes, i.e., float 1.40 SG, 1.40 x 1.55 SG, 1.55 x 1.65 SG, 1.65 x 2.00 SG and sink 2.00 SG.

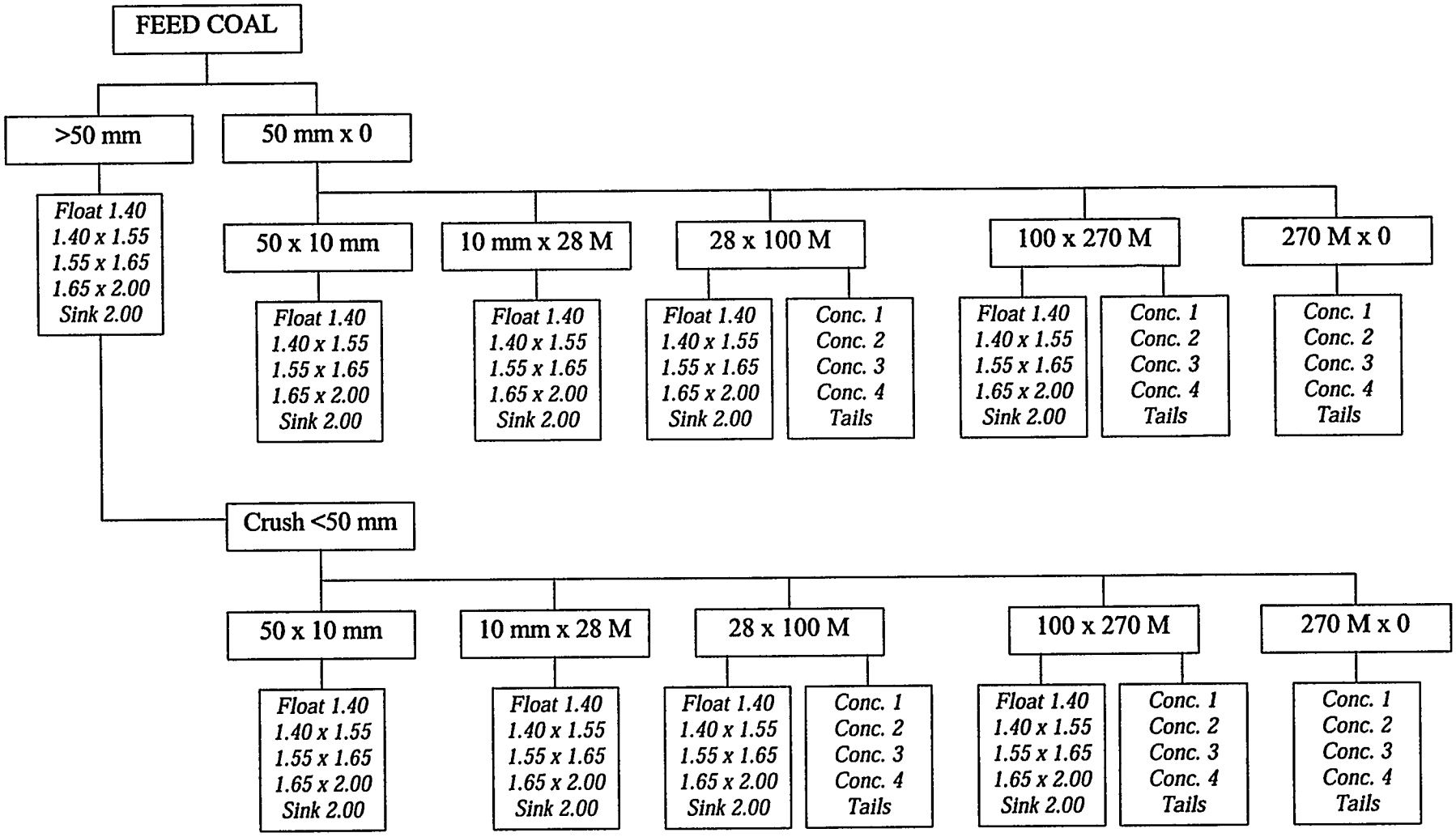

Figure 3.1 - Overview of washability and flotation release analysis tests conducted on the Coalburg seam coal.

The density distributions obtained from the float-sink testing of the run-of-mine sample of Coalburg seam coal are summarized in Table 3.2. As expected, very little low density material was present in the coarser size fractions of the run-of-mine sample. The amount of 1.40 SG material in the +50 mm size fraction represents only 0.26% of the mass in the +50 mm size fraction and approximately 0.04% of the total mass of run-of-mine feed coal.

Table 3.3 provides a summary of the density distributions obtained for the +50 mm size fraction after crushing to below 50 mm. After crushing, the total mass of sample having a density less than 1.40 SG increased from approximately 0.26% to 4.89%. This value was calculated by adding the total mass of 1.40 SG material in the size fractions between 50 mm and 270 mesh (i.e., 0.23% + 3.98% + 0.64% + 0.04% = 4.89%). This estimate is conservative since it assumes that none of the material in the -270 mesh size fraction would be recovered. In fact, the total mass of sample having a density less than 1.40 SG would still increase from 0.26% to 4.85% (0.23% + 3.98% + 0.64% = 4.85%) even if none of the material in the size fractions finer than 100 mesh were recovered. In terms of run-of-mine feed coal, this material represents an increase of approximately 0.72% (i.e, from 0.04% to 0.76%) in the mass recovery of high-quality, low-density material. Trace element analyses are presently underway for all of the coal products generated from the washability tests.

Float-sink tests were also completed during the past quarter for the run-of-mine sample of Illinois No. 6 seam coal. An overview of the particle size classes that were subjected to float-sink testing are provided in Figure 3.2. As shown, the feed coal was subdivided into 50 x 10 mm, 10 mm x 28 mesh, 28 x 100 mesh and 270 mesh x 0 size fractions. Each of these size fractions were separated into the following specific gravity classes: float 1.40 SG, 1.40 x 1.55 SG, 1.55 x 1.65 SG, 1.65 x 2.00 SG and sink 2.00 SG. The results of these tests are summarized in Table 3.4. The 1.4 x 2.0 SG middlings product from the 50 x 10 mm size class was recovered and dried, crushed to below 10 mm, and wet-sieved into 10 mm x 28 mesh, 28 x 100 mesh, 100 x 270 mesh and 270 mesh x 0 size fractions. The density separations on the crushed middling fractions have recently been completed, but the data from these tests have not been tabulated and cannot be included in this report. Trace element analyses are presently underway for all of the coal products generated by the washability tests.

Table 3.2 - Density partition for the uncrushed run-of-mine Coalburg sample.

Specific Gravity		Mass (gms of Sample)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	374.87	26081.56	11589.50	54.67	8.04
1.40	1.55	24267.20	70533.61	7404.50	57.69	16.58
1.55	1.65	52438.00	90718.50	4926.50	32.37	73.20
1.65	2.00	67419.50	137665.30	8333.50	61.43	100.54
2.00		372.95	7026.15	1017.50	14.31	3.26
		144872.52	332025.12	33271.50	220.47	201.62

Specific Gravity		Mass (% of Sample)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	0.26	7.86	34.83	24.80	3.99
1.40	1.55	16.75	21.24	22.25	26.17	8.22
1.55	1.65	36.20	27.32	14.81	14.68	36.31
1.65	2.00	46.54	41.46	25.05	27.86	49.87
2.00		0.26	2.12	3.06	6.49	1.62
		100.00	100.00	100.00	100.00	100.00

Size Distribution (%)	15.53	43.48	27.51	2.91	0.92

Specific Gravity		Mass (% of ROM Feed)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	0.04	3.42	9.58	0.72	0.04
1.40	1.55	2.60	9.24	6.12	0.76	0.08
1.55	1.65	5.62	11.88	4.07	0.43	0.33
1.65	2.00	7.23	18.03	6.89	0.81	0.46
2.00		0.04	0.92	0.84	0.19	0.01
		15.53	43.48	27.51	2.91	0.92

Table 3.3 - Density partition for the crushed +50 mm Coalburg sample.

Specific Gravity		Mass (gms of Sample)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	**	73.00	2403.00	41.57	11.84
1.40	1.55	**	4987.00	5155.50	53.77	54.90
1.55	1.65	**	6261.50	5693.00	19.44	20.75
1.65	2.00	**	3810.00	13027.50	84.20	93.70
2.00		**	811.00	834.00	38.69	19.70
		**	15942.50	27113.00	237.67	200.89

Specific Gravity		Mass (% of Sample)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	**	0.46	8.86	17.49	5.89
1.40	1.55	**	31.28	19.01	22.62	27.33
1.55	1.65	**	39.28	21.00	8.18	10.33
1.65	2.00	**	23.90	48.05	35.43	46.64
2.00		**	5.09	3.08	16.28	9.81
		**	100.00	100.00	100.00	100.00

Size Distribution:	0.00	49.26	44.96	3.67	0.73

Specific Gravity		Mass (% of +50 mm Feed)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	**	0.23	3.98	0.64	0.04
1.40	1.55	**	15.41	8.55	0.83	0.20
1.55	1.65	**	19.35	9.44	0.30	0.08
1.65	2.00	**	11.77	21.60	1.30	0.34
2.00		**	2.51	1.38	0.60	0.07
		**	49.26	44.96	3.67	0.73

Specific Gravity		Mass (% of ROM Feed)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	**	0.04	0.62	0.10	0.01
1.40	1.55	**	2.39	1.33	0.13	0.03
1.55	1.65	**	3.00	1.47	0.05	0.01
1.65	2.00	**	1.83	3.35	0.20	0.05
2.00		**	0.39	0.21	0.09	0.01
		**	7.65	6.98	0.57	0.11

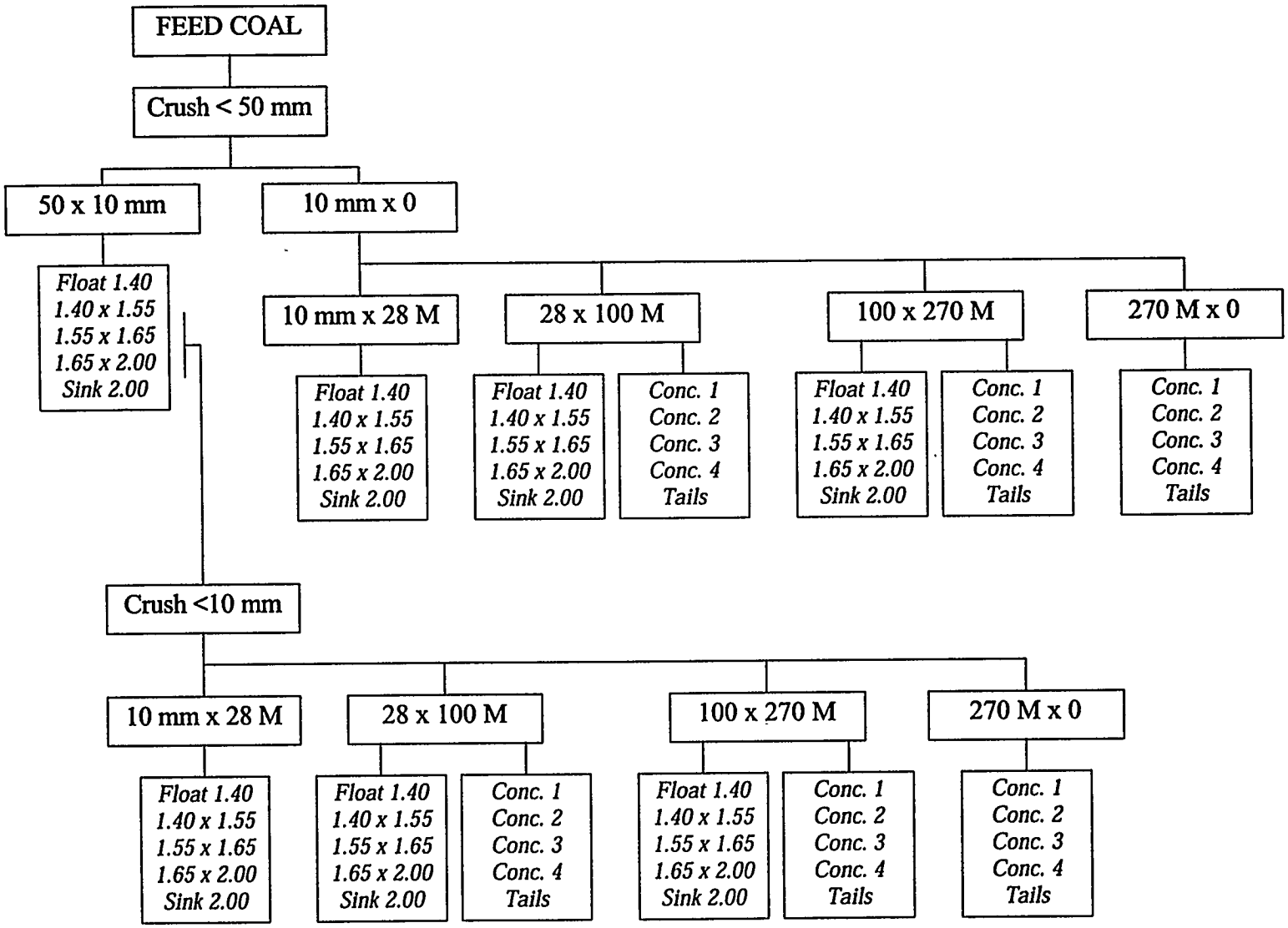

Figure 3.2 - Overview of washability and flotation release analysis tests conducted on the Illinois No. 6 seam coal.

Table 3.4 - Density partition for the uncrushed run-of-mine Illinois No. 6 sample.

Specific Gravity		Mass (gms of Sample)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	0.00	387.77	22.74	91.79	5.84
1.40	1.55	0.00	47.26	3.97	53.87	49.78
1.55	1.65	0.00	13.19	0.83	13.81	17.33
1.65	2.00	0.00	41.63	1.55	42.14	112.20
2.00		0.00	222.97	4.24	39.30	33.65
		0.00	712.82	33.33	240.91	218.80

Specific Gravity		Mass (% of Sample)				
Sink	Float	+50 mm	50 x 10 mm	10 mm x 28 M	28 x 100 M	100 x 270 M
	1.40	**	54.40	68.23	38.10	2.67
1.40	1.55	**	6.63	11.92	22.36	22.75
1.55	1.65	**	1.85	2.48	5.73	7.92
1.65	2.00	**	5.84	4.66	17.49	51.28
2.00		**	31.28	12.71	16.31	15.38
		**	100.00	100.00	100.00	100.00

Subtask 3.3 - Release Analyses

Flotation release analysis tests have now been completed for the 28 x 100 mesh, 100 x 270 mesh and 270 mesh x 0 size fractions of all three run-of-mine coals, i.e., Pittsburgh, Coalburg and Illinois No. 6 seams. In addition, release analyses tests have been completed on the 28 x 100 mesh, 100 x 270 mesh and 270 mesh x 0 size fractions of the recrushed middlings for the Pittsburgh No. 8 coal. Similar tests are presently underway for both the Coalburg and Illinois No. 6 seam samples. All experimental work associated with this subtask will be finished after completing these six flotation tests (3 sizes x 2 coals). The test data obtained with the Pittsburgh No. 8 sample were summarized in the last technical progress report. Data collected using the samples from the Coalburg and Illinois No. 6 seams will be reported after completing the proximate analyses and mass balancing procedures.

Subtask 3.4 - SEM/Image Analyses

As discussed in the last progress report, various density fractions of 65 x 100 mesh Pittsburgh No. 8 coal were characterized using scanning electron spectroscopy (SEM) coupled with image analysis (IA). During the past quarter, these density fractions were submitted to the laboratory for trace element analyses. Preliminary results from this work are listed in Table 3.5. As shown, the trace element concentrations tended to increase with increasing specific gravity. This implies that the trace elements in these coals are associated with inorganic materials. One noteworthy exception to this trend appears for chromium which decreases for the last two density classes, i.e., 2.25 x 2.50 SG and sink 2.50 SG. The SEM data (presented in the last technical progress report) showed that these two density fractions were very high in pyrite content. This suggests that chromium may not have a strong

association with pyrite. Likewise, the large jump in the concentrations of arsenic suggests a correlation between pyrite content and this particular trace element. Detailed statistical evaluations of the mineralogical data will be conducted after completing the laboratory trace element analyses.

Table 3.5 - Preliminary results of trace element determinations for various density fractions.

SG Class	Ash %	Sulfur %	Sb (ppm)	As (ppm)	Be (ppm)	Cd (ppm)	Cr (ppm)	Co (ppm)	Pb (ppm)	Mn (ppm)	Ni (ppm)	Se (ppm)
Float 1.29	1.74	1.35	<1.0	<1.0	0.18	0.01	5.41	0.72	0.16	15.58	2.38	<1.0
1.29x1.30	2.91	1.34	<1.0	1.43	0.39	0.04	6.15	0.94	0.21	21.85	2.37	<1.0
1.30x1.40	6.20	1.50	<1.0	2.51	0.61	0.01	9.17	1.16	1.44	39.00	5.30	<1.0
1.40x1.50	12.76	2.14	<1.0	8.60	0.94	0.08	13.28	2.53	3.16	67.80	8.12	<1.0
1.50x1.60	13.45	2.18	<1.0	11.02	0.76	0.36	12.72	2.44	4.84	197.8	7.54	<1.0
1.60x1.70	28.10	4.45	<1.0	41.44	1.04	0.25	21.60	5.32	14.55	204.1	16.78	<1.0
1.70x1.80	36.18	5.59	<1.0	70.76	0.75	0.29	25.47	6.93	16.67	282.0	20.95	<1.0
1.80x2.00	45.75	6.97	1.45	102.2	0.47	0.46	28.45	9.63	24.34	436.4	31.36	0.74
2.00x2.25	78.01	3.96	<1.0	75.84	0.00	0.28	42.51	14.67	26.72	6982	39.69	<1.0
2.25x2.50	64.62	40.20	6.34	357.6	0.19	0.78	3.72	24.60	90.92	2004	105.9	17.73
Sink 2.50	65.77	47.45	27.03	347.7	0.10	1.23	1.55	33.41	239.5	2210	108.7	13.69

Task 4 - Bench-Scale Testing

Subtask 4.1 - Dense Media

As stated in the last technical progress report, all tasks associated with the setup and operation of the primary dense media separator have been successfully completed using the Pittsburgh No. 8 coal. During the past quarter, decommissioning of the circuitry was initiated and steps were taken to prepare all samples for laboratory analyses. All samples collected from the circuit are in the process of being properly dried, stored, pulverized and blended. Due to the large number of samples, a considerable lag time is expected before the laboratory analyses and mass balancing procedures are complete for the dense media circuit.

One of the tasks performed during the past quarter was the recovery and analysis of the magentite slurry generated during the dense media separations. Due to the relatively large volume of media, the slurry was collected into one large holding tank and allowed to air dry for one month. The holding tank was double-lined with plastic to minimize contamination due to contact with the holding tank itself. A plastic sheet was also positioned a few feet above the tank to minimize the possibility of contamination by airborne dust or dirt. The dried media in the holding tank has been representatively sampled and analyzed to determine the amount of magnetite, coal and rock (and associated trace elements) present in the dense media.

Analysis of the magnetite/reject slurry which passed through the reject drain-and-rinse screen was performed during the past quarter. Data obtained using a standard Davis Tube indicate that a large amount of non-magnetic material was washed from the sink 2.0 SG reject as it crossed the drain-and-rinse screen. In fact, of the 67.45 lbs of dry solids in the stream, 43.31 lbs of this material was non-magnetic. The misplaced non-magnetic material is presently being analyzed so that the misplaced material may be included in the circuit mass balance.

Subtask 4.2 - Froth Flotation

A 2.5-cm diameter flotation column was designed and fabricated for use in the bench-scale froth flotation test program. The column was designed with three interchangeable sparging systems, i.e., porous diffuser, Microcel and Turbo-Air. The use of the small test column allowed a larger percentage of the 28 x 100 mesh and 100 mesh x 0 material from the bench-scale screening steps to be set aside for use in test programs involving the enhanced gravity concentrators, i.e., Multi-Gravity Separator and Falcon Concentrator.

The original configuration for the column test circuit is shown in Figure 4.1. As shown, feed slurry was pumped directly from the mixed sump into the column using this arrangement. The first series of tests were performed to determine the central operating point for a Box-Behnken test matrix. These preliminary tests were performed by varying the feed and frother flow rates until the combustible recovery and the product yield was maximized. Air and wash water flow rates were held constant at 311 ml/min and 111 ml/min, respectively. Table 4.1 provides a summary of the preliminary column flotation operating conditions and test results.

Table 4.1 - Preliminary column flotation test runs for the -100 mesh Pittsburgh No. 8 coal.

Test Run	Feed Rate (ml/min)	Frother Rate (ml/min)	Product Ash (%)	Reject Ash (%)	Product Yield (%)	Comb. Recovery (%)
A	90.64	14.56	6.0	73.8	43.5	73.4
B	50.37	14.56	4.6	75.6	44.0	75.5
C	130.90	14.56	5.1	70.6	40.1	68.3
D	90.64	21.95	6.2	78.3	47.1	79.3
E	90.64	29.34	6.5	78.2	47.2	79.3
F	50.37	14.56	4.5	75.4	43.8	75.2

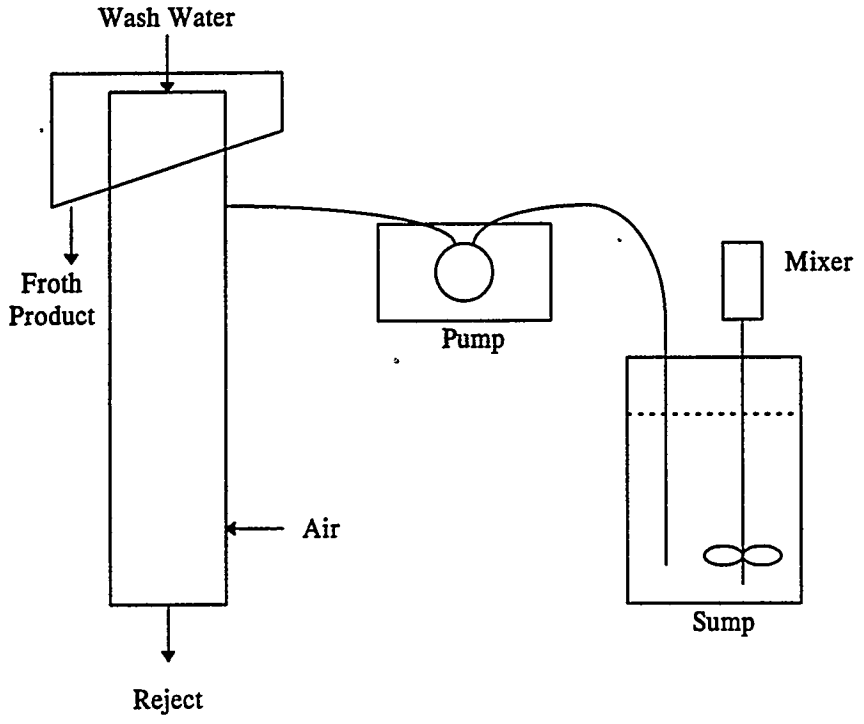

Figure 4.1 - Schematic of the original configuration used to feed slurry to the 2.5-cm diameter flotation column.

According to the data given in Table 4.1, the highest separation efficiency was obtained for test series "E". Using this set of operating conditions as a center point, a Box-Behnken parametric test matrix was then developed using the Design Expert™ software package. Three parameters were varied (i.e., feed flow rate, air flow rate, frother flow rate) to create a fifteen point test program for each sparging system. The lower, middle and upper settings for each of these parameters are summarized in Table 4.2. The rinse water rate was held constant at 111 ml/min, but the reject flow rate was adjusted during each test to hold the pulp level stationary at a level height just above the feed injection point.

Table 4.2 - Box-Behnken test matrix for the -100 mesh Pittsburgh No. 8 coal.

Operating Parameter	Lower Setting	Middle Setting	Upper Setting
Feed Rate (ml/min)	20	95	170
Air Rate (ml/min)	140	330	520
Frother Rate (ml/min)	10	20	30

As reported in previous status reports, nearly all of the bench-scale column flotation tests were completed during the past two quarters. Table 4.3 shows the results of the first set of experiments testing the porous diffuser sparger. At first, the ash results from this test looked promising. However, a sampling bias was discovered when the sulfur analyses were back-

calculated and compared for each of the fifteen tests. As shown, all of the sulfur measurements for the feed head samples vary tremendously. The results obtained from mass balancing indicated that the bias problem was due to improper sampling of the feed slurry. In fact, a linear relationship was found to exist between pump speed and sulfur content (see Figure 4.2). This finding suggests that the pyrite particles either settled out in the feed line or were never pumped out of the sump at the lower feed rates.

Table 4.3 - Results of preliminary column flotation tests showing feed sampling bias.

Feed Stream			Clean Coal Stream			Reject Stream		
Mass Rate (g/min)	Calc. Ash (%)	Calc. Sulfur (%)	Mass Rate (g/min)	Exp. Ash (%)	Exp. Sulfur (%)	Mass Rate (g/min)	Exp. Ash (%)	Exp. Sulfur (%)
5.00	35.22	1.70	2.75	4.71	1.83	2.25	72.51	1.54
9.88	38.88	3.10	3.88	5.18	3.19	6.00	60.66	3.05
5.25	32.61	1.72	2.75	4.37	1.88	2.50	63.68	1.55
10.33	39.85	3.75	5.33	7.77	4.32	5.00	74.07	3.15
0.37	40.26	--	0.20	10.89	--	0.17	75.50	--
0.39	40.26	4.40	0.14	4.32	1.89	0.25	60.80	5.83
5.40	37.07	1.77	2.88	4.86	1.92	2.53	73.73	1.61
4.93	35.93	1.75	2.60	4.64	1.95	2.33	70.80	1.54
5.00	34.94	1.93	3.00	6.27	2.25	2.00	77.94	1.45
0.31	40.26	--	0.20	15.23	--	0.11	85.31	--
9.67	39.72	3.5	5.33	9.15	4.08	4.33	77.36	2.79
9.50	39.33	2.77	3.50	5.26	2.55	6.00	59.21	2.90
4.50	50.06	1.46	1.50	3.35	1.73	3.00	73.42	1.33
0.28	40.26	4.40	0.03	3.36	1.46	0.25	45.18	4.79
5.00	27.25	1.72	2.75	4.83	1.83	2.25	54.66	1.59

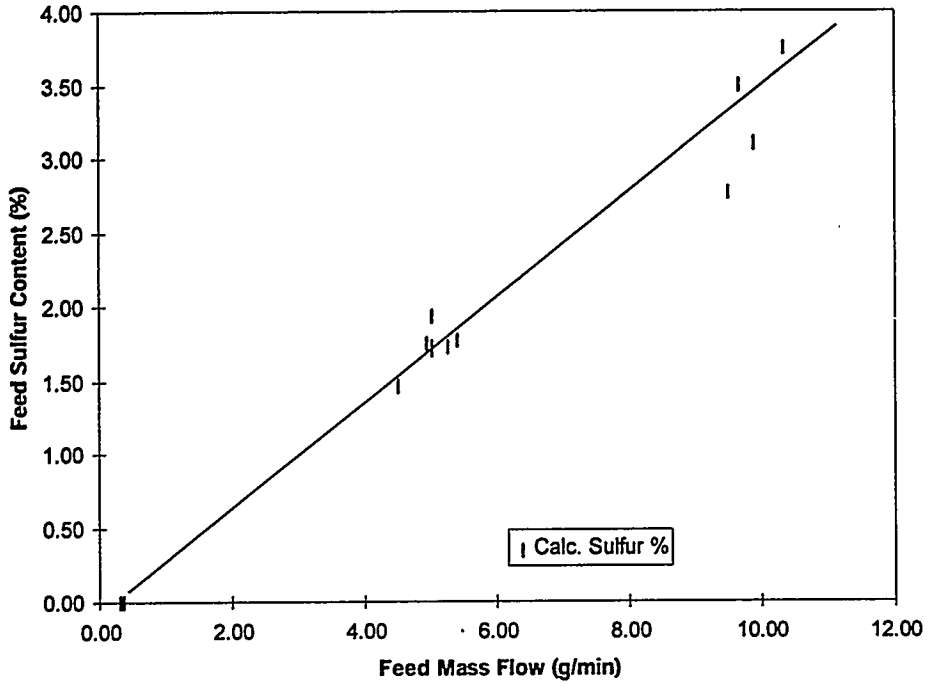

Figure 4.2 - Plot of column feed rate versus back-calculated feed sulfur content showing the bias in the feed sampling system.

In an effort to resolve this sampling problem, agitation was increased within the sump and a circulation loop was added as shown in Figure 4.3. A small centrifugal pump was used to cycle the coal slurry out and back into the sump. The sump was also raised to a point above the column to facilitate gravity-flow pumping. A small tee-fitting was placed in the outer circulatory loop through which a small peristaltic pump siphoned feed for the column flotation unit using the least amount of flexible tubing possible. The tee-fitting was also equipped with a removable glass-elbow insert that was utilized in an attempt to more accurately secure a representative feed sample (see Figure 4.4). Unfortunately, the data summarized in Table 4.4 suggests that none of these modifications solved the problem of obtaining an unbiased feed sample. Almost without exception, the sulfur content values obtained from these configurations were never consistent with the actual composition of the the coal slurry in the feed sump. At this time, a new feeding system has is being setup to correct the bias problem.

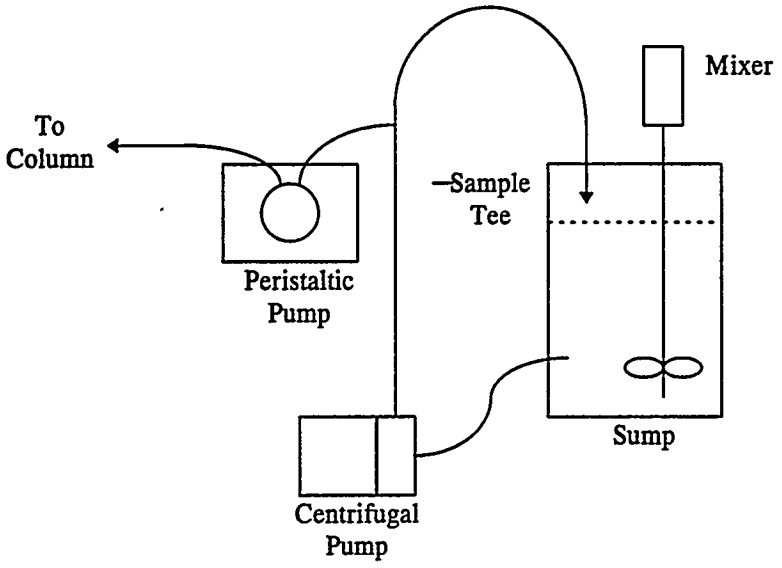

Figure 4.3 - Modified column feeding system equipped with a centrifugal pump circulation loop and tee-fitting sampler.

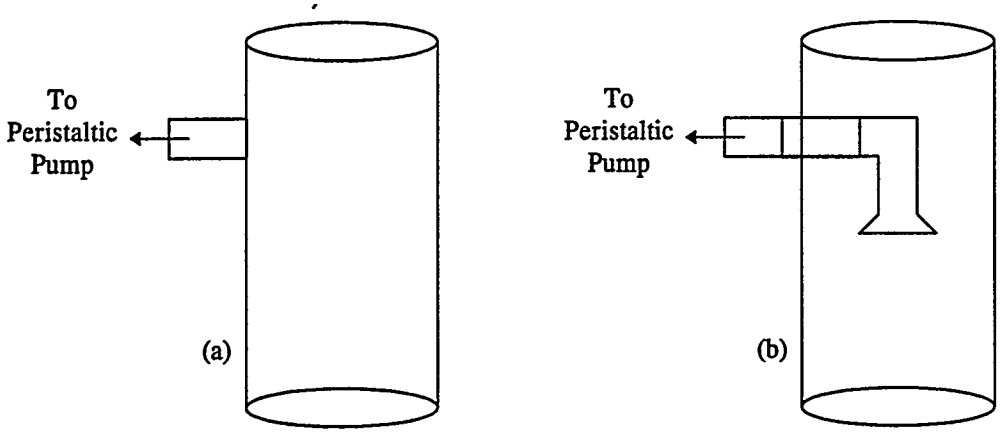

Figure 4.4 - Schematic of (a) tee-fitting sampler and (b) tee-fitting elbow insert sampler.

Table 4.4 - Sulfur values measured using different sampling systems.

Sampling System	Pump Setting	Measured Sulfur (%)
Modified Tee-Fitting	3	1.78
	4	1.80
	5	1.85
	6	1.81
	7	1.82
	8	1.90
	9	1.87
	10	1.97
Tee-Fitting with Elbow	0.75	2.41
	1	2.55
	2	4.09
	3	3.91
	4	3.87

* Actual sulfur content = 3.67%

Because of the problems associated with biased feed samples, all of the column flotation tests with each of the three sparging systems must now be repeated. As a result, this subtask is now well behind schedule (despite the fact that all of the tests have been run). Testing of the column is expected to resume after the feed sampling problems have been resolved near the end of January 1997. The column test work is not expected to be completed until late February or early March 1997. Additional manpower has been assigned to this subtask to ensure that this delay does not impact the ending date for the project.

Subtask 4.3 - Enhanced Gravity Separation

Tests are presently underway to evaluate the performance of the Falcon Concentrator in upgrading the 28 x 100 mesh and 100 mesh x 0 slurry samples from the bench-scale tests. Similar tests conducted using the Multi-Gravity Separator are presently on hold until a reliable, unbiased feeding system can be constructed and tested. The problems associated with biased feeding systems have been discussed under Subtask 4.2 - Froth Flotation. This problem may require that Subtask 4.3 - Gravity Separation be extended one month and Subtask 4.4 - Combined Circuits be shortened one month. This rescheduling is not expected to adversely impact the ending date for the project.

Task 6 - Toxic Fate Studies

Subtask 6.1 - Analysis of Pond Toxics

As stated in the previous technical report, a sample of Pittsburgh No. 8 coal refuse was prepared at Virginia Tech and shipped to Clark Atlanta University (CAU) for use in their studies related to the release and control of trace metals from coal refuse impoundments. However, the results obtained from these tests are difficult to interpret since the release of trace metals are highly time dependent. Therefore, a second series of test samples were prepared to supplement the data collected at Clark Atlanta University. In these tests, a simple leaching column was constructed using a 4-inch diameter PVC pipe that was capped on one end. The pipe was mounted vertically on a flex-frame with the capped end downward. A ballcock valve was then tapped into the capped end and was allowed to act as a drain. The pipe was filled with 10 mm x 28 mesh reject material and then covered with a plastic sheet. On a weekly basis, one liter of water was poured through the top of the column and collected as it exited through the ballcock drain valve. The water was recovered, filtered, and weighed. The test column has now run for eight consecutive weeks and the resultant water samples have been provided to the laboratory for trace element determinations. The results of these analyses will be reported as they become available from the laboratory.

Subtask 6.2 - Control Method Evaluation

Several series of MAT tests were continued during the past quarter. However, none of the test series were completed at the time this report was prepared.

Task 9 - Sample Analyses

Subtask 9.1 - Coal Analyses

A current listing of samples that have been generated by the project are provided in Appendix I. It is presently estimated that a total of 3 ultimate analyses, 709 proximate analyses, 709 sulfur form determinations and 39 heating value measurements will be required to complete the laboratory work. The specific analyses that each sample will be subjected to are identified in Appendix I. All analyses are being conducted using ASTM procedures.

At present, the coal analyses are running slightly behind schedule. Delays have resulted from a mechanical failure associated with the proximate analyzer and an electronic problem with the isothermal bomb calorimeter. The sulfur analyzer was also unavailable for a brief period of time due to difficulties associated with the gas train and combustion tube. Most of these problems have now been corrected. Considerable effort is presently underway complete the coal analyses and to clear the large backlog of samples generated by the characterization studies and bench-scale test work.

Subtask 9.2 - Trace Element Analyses

In addition to the standard coal analyses, it is presently estimated that a total of 373 trace element analyses are required to complete the project. Samples which require trace element analyses are identified in Appendix I.

The first step in the trace element analyses involves the digestion of the coal sample. To improve accuracy and speed analyses, several different methods have been investigated for the digestion step. Of these, complete digestion of the organic matrix occurred only when the EPA digestion method (EPA Method 3052) was employed. In this procedure, coal samples were digested using a CEM Corporation MDS 2000 microwave oven equipped with heavy duty Teflon vessels. These specially-designed vessels allow for temperature and pressure controlled heating in a microwave oven. Approximately 0.3 grams of -60 mesh sample was weighed into the Teflon vessels and 15 ml of concentrated nitric acid was added. The vessels were then sealed and placed in the microwave oven. A five step heating program was used to prevent strong exothermic reactions and over pressurization of the vessels. The program included heating increments to 125, 140, 165, 180 and 200 C. The temperatures were held for 5 minutes during the first two steps, 10 minutes for the 3rd and 4th steps and 20 minutes for the final step. Maximum pressures obtained were 450 to 475 psi. After running the program to completion, the vessels were allowed to cool (to permit all vapor species to condensate) and were then vented and opened. Concentrated hydrofluoric acid and hydrochloric acid (3 ml each) were then added and the vessels were resealed. The vessels were placed in the microwave oven and again heated until the internal pressure of the vessels reached 300 psi. Heating at this pressure was continued for 20 minutes, after which the vessels were allowed to cool and were then vented and opened. The solutions were then transferred to 100 ml volumetric flasks, brought up to volume and then placed in sealed polyethylene bottles.

In most cases, the sample solutions were subjected to elemental analyses using graphite furnace atomic adsorption (GFAA) spectroscopy. The unit employed in the present work consists of a Thermo Jerrell Ash Smith-Hieftje 11 atomic absorption spectrophotometer interfaced with a CTF 188 graphite furnace. Solutions were delivered to the graphite cuvettes using an automated aerosol deposition module. The Smith-Hieftje background correction was used for all elements. For lead and cadmium, a 0.1% solution of ammonium phosphate was used as a matrix modifier. A matrix modifier consisting of 200 ppm of magnesium and 100 ppm lead was used for the analysis of arsenic, selenium and antimony. Standard solutions were made up daily from 1000 ppm SPEX plasma grade standards, with acid concentrations in the standards fixed to match those in the unknowns. However, standards prepared in this manner were found to give unreliable results for beryllium, most likely due to this element occurring in a different form in the standards as compared to the unknowns. Analysis of beryllium by the standard addition method was found to overcome this problem. Acids used in the digestion and GFAA work were of redistilled grade, purchased from GFS Chemicals (nitric acid) and Alfa Aesar (hydrofluoric and hydrochloric acids).

Many of the trace element analyses are presently running behind schedule. A larger microwave turntable has been ordered to increase the number of samples digested per run from 6 to 10. This

should help to ensure that the analytical work progresses at a pace adequate to meet the project deadlines. No technical barriers are presently anticipated in completing the trace element analyses.

CONCLUSIONS

Several project work elements were completed during the past quarter. In Task 3 - Characterization, preliminary coal analyses and detailed float-sink tests were completed for all three of the base coal samples, i.e., Pittsburgh No. 8, Coalburg and Illinois No. 6 seams. Most of the flotation release analyses tests have also been completed. All coal products from the characterization tests have been submitted for standard coal analyses and trace element analyses. The washability data for the Coalburg seam indicate that recrushing of the +50 mm size fraction to below 50 mm can improve the coal yield and/or quality. Corresponding improvements in the rejection of trace elements are expected once the laboratory analyses have been completed. Characterization studies conducted under Subtask 3.4 (SEM/Image Analysis) were completed during the past quarter. Statistical analysis of the mineralogical data will be undertaken after the elemental analyses are completed.

All of the bench-scale test work conducted under Subtask 4.1 (Heavy Media Testing) was completed during the past quarter. Analysis of the data are presently underway. Unfortunately, most of the test work conducted to date under Subtask 4.2 (Froth Flotation) must be repeated due to problems associated with biased feed samples and an unreliable sampling system. As a result, work to be conducted under Subtask 4.2 (Froth Flotation) and Subtask 4.3 (Enhanced Gravity Separation) are not expected to be completed until next quarter. In Subtask 6.1 (Analysis of Pond Toxics) samples of water drained from a leaching column containing coal refuse were collected over a period of several weeks. These samples have been provided to the laboratory for trace element analyses.

Finally, laboratory analyses to be conducted under Subtask 9.1 - Coal Analyses and Subtask 9.2 - Trace Element Analyses continue to run behind schedule. This difficulty can be largely attributed to problems associated with the analytical equipment and the resultant backlog of liquid and solid samples recently generated by the characterization work and bench-scale test runs. Additional manpower has been allocated to bring this project activity back on schedule.

===== APPENDIX I =====

SAMPLE ANALYSIS LISTING

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.1-1		Pittsburgh	ROM	Overall Head	Yes	Yes	Yes	Yes	Yes
3.1-2	1HSP	Coalburg	ROM	Overall Head	Yes	Yes	Yes	Yes	Yes
3.1-3	10HSI	Illinois	ROM	Overall Head	Yes	Yes	Yes	Yes	Yes
3.2-A1		Pittsburgh	50 x 10 mm	Head	Yes	No	No	Yes	Yes
3.2-A2		Pittsburgh	50 x 10 mm	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-A3		Pittsburgh	50 x 10 mm	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-A4		Pittsburgh	50 x 10 mm	1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-A5		Pittsburgh	50 x 10 mm	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-A6		Pittsburgh	50 x 10 mm	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-A7		Pittsburgh	10 mm x 28 M	Head	Yes	No	Yes	Yes	Yes
3.2-A8		Pittsburgh	10 mm x 28 M	Float 1.40 SG	Yes	No	Yes	Yes	Yes
3.2-A9		Pittsburgh	10 mm x 28 M	1.40 x 1.55 SG	Yes	No	Yes	Yes	Yes
3.2-A10		Pittsburgh	10 mm x 28 M	1.55 x 1.65 SG	Yes	No	Yes	Yes	Yes
3.2-A11		Pittsburgh	10 mm x 28 M	1.65 x 2.00 SG	Yes	No	Yes	Yes	Yes
3.2-A12		Pittsburgh	10 mm x 28 M	Sink 2.00 SG	Yes	No	Yes	Yes	Yes
3.2-A13		Pittsburgh	28 x 100 M	Head	Yes	No	No	Yes	Yes
3.2-A14		Pittsburgh	28 x 100 M	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-A15		Pittsburgh	28 x 100 M	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-A16		Pittsburgh	28 x 100 M	1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-A17		Pittsburgh	28 x 100 M	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-A18		Pittsburgh	28 x 100 M	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-A19		Pittsburgh	100 x 270 M	Head	Yes	No	No	Yes	Yes
3.2-A20		Pittsburgh	100 x 270 M	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-A21		Pittsburgh	100 x 270 M	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-A22		Pittsburgh	100 x 270 M	1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-A23		Pittsburgh	100 x 270 M	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-A24		Pittsburgh	100 x 270 M	Sink 2.00 SG	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.2-A25		Pittsburgh	10 mm x 28 M	Head, Crushed 50 x 10 mm	Yes	No	No	Yes	Yes
3.2-A26		Pittsburgh	10 mm x 28 M	Crushed 50 x 10 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-A27		Pittsburgh	10 mm x 28 M	Crushed 50 x 10 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-A28		Pittsburgh	10 mm x 28 M	Crushed 50 x 10 mm, 1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-A29		Pittsburgh	10 mm x 28 M	Crushed 50 x 10 mm, 1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-A30		Pittsburgh	10 mm x 28 M	Crushed 50 x 10 mm, Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-A31		Pittsburgh	28 x 100 M	Head, Crushed 50 x 10 mm	Yes	No	No	Yes	Yes
3.2-A32		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-A33		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-A34		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, 1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-A35		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, 1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-A36		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-A37		Pittsburgh	100 x 270 M	Head, Crushed 50 x 10 mm	Yes	No	No	Yes	Yes
3.2-A38		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-A39		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-A40		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, 1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-A41		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, 1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-A42		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Sink 2.00 SG	Yes	No	No	Yes	Yes

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
3.2-B1	2HSP50	Coalburg	+50 mm	Head	Yes	No	No	Yes	Yes
3.2-B2	P5F14	Coalburg	+50 mm	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B3	P51415	Coalburg	+50 mm	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B4	P51516	Coalburg	+50 mm	155 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-B5	P51620	Coalburg	+50 mm	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-B6	P5S20	Coalburg	+50 mm	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-B7	3HSP51	Coalburg	50 x 10 mm	Head	Yes	No	No	Yes	Yes
3.2-B8	P51F14	Coalburg	50 x 10 mm	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B9	P511415	Coalburg	50 x 10 mm	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B10	P511516	Coalburg	50 x 10 mm	155 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-B11	P511620	Coalburg	50 x 10 mm	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-B12	P51S20	Coalburg	50 x 10 mm	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-B13	4HSP12	Coalburg	10 mm x 28 M	Head	Yes	No	Yes	Yes	Yes
3.2-B14	P12F14	Coalburg	10 mm x 28 M	Float 1.40 SG	Yes	No	Yes	Yes	Yes
3.2-B15	P121415	Coalburg	10 mm x 28 M	1.40 x 1.55 SG	Yes	No	Yes	Yes	Yes
3.2-B16	P121516	Coalburg	10 mm x 28 M	155 x 1.65 SG	Yes	No	Yes	Yes	Yes
3.2-B17	P121620	Coalburg	10 mm x 28 M	1.65 x 2.00 SG	Yes	No	Yes	Yes	Yes
3.2-B18	P12S20	Coalburg	10 mm x 28 M	Sink 2.00 SG	Yes	No	Yes	Yes	Yes
3.2-B19	5HSP210	Coalburg	28 x 100 M	Head	Yes	No	No	Yes	Yes
3.2-B20	P21F14	Coalburg	28 x 100 M	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B21	P211415	Coalburg	28 x 100 M	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B22	P211516	Coalburg	28 x 100 M	155 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-B23	P211620	Coalburg	28 x 100 M	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-B24	P21S20	Coalburg	28 x 100 M	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-B25	6HSP127	Coalburg	100 x 270 M	Head	Yes	No	No	Yes	Yes
3.2-B26	P127F14	Coalburg	100 x 270 M	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B27	P1271415	Coalburg	100 x 270 M	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B28	P1271516	Coalburg	100 x 270 M	155 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-B29	P1271620	Coalburg	100 x 270 M	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-B30	P127S20	Coalburg	100 x 270 M	Sink 2.00 SG	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.2-B31	7HSPC551	Coalburg	50 x 10 mm	Head, Crushed +50 mm	Yes	No	No	Yes	Yes
3.2-B32	PC551F14	Coalburg	50 x 10 mm	Crushed +50 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B33	PC5511415	Coalburg	50 x 10 mm	Crushed +50 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B34	PC5511516	Coalburg	50 x 10 mm	Crushed +50 mm, 1.55 X 1.65 SG	Yes	No	No	Yes	Yes
3.2-B35	PC5511620	Coalburg	50 x 10 mm	Crushed +50 mm, 1.65 X 2.00 SG	Yes	No	No	Yes	Yes
3.2-B36	PC551S20	Coalburg	50 x 10 mm	Crushed +50 mm, Sink 2.0	Yes	No	No	Yes	Yes
3.2-B37	8HSPC512	Coalburg	10 mm x 28 M	Head, Crushed +50 mm	Yes	No	No	Yes	Yes
3.2-B38	PC512F14	Coalburg	10 mm x 28 M	Crushed +50 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B39	PC5121415	Coalburg	10 mm x 28 M	Crushed +50 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B40	PC5121516	Coalburg	10 mm x 28 M	Crushed +50 mm, 1.55 X 1.65 SG	Yes	No	No	Yes	Yes
3.2-B41	PC5121620	Coalburg	10 mm x 28 M	Crushed +50 mm, 1.65 X 2.00 SG	Yes	No	No	Yes	Yes
3.2-B42	PC512S20	Coalburg	10 mm x 28 M	Crushed +50 mm, Sink 2.0	Yes	No	No	Yes	Yes
3.2-B43	9HSPC521	Coalburg	28 x 100 M	Head, Crushed +50 mm	Yes	No	No	Yes	Yes
3.2-B44	PC521F14	Coalburg	28 x 100 M	Crushed +50 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B45	PC5211415	Coalburg	28 x 100 M	Crushed +50 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B46	PC5211516	Coalburg	28 x 100 M	Crushed +50 mm, 1.55 X 1.65 SG	Yes	No	No	Yes	Yes
3.2-B47	PC5211620	Coalburg	28 x 100 M	Crushed +50 mm, 1.65 X 2.00 SG	Yes	No	No	Yes	Yes
3.2-B48	PC521S20	Coalburg	28 x 100 M	Crushed +50 mm, Sink 2.0	Yes	No	No	Yes	Yes
3.2-B49		Coalburg	100 x 270 M	Head, Crushed +50 mm	-Yes	No	No	Yes	Yes
3.2-B50	PC5127F14	Coalburg	100 x 270 M	Crushed +50 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-B51	PC51271415	Coalburg	100 x 270 M	Crushed +50 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-B52	PC51271516	Coalburg	100 x 270 M	Crushed +50 mm, 1.55 X 1.65 SG	Yes	No	No	Yes	Yes
3.2-B53	PC51271620	Coalburg	100 x 270 M	Crushed +50 mm, 1.65 X 2.00 SG	Yes	No	No	Yes	Yes
3.2-B54	PC5127S20	Coalburg	100 x 270 M	Crushed +50 mm, Sink 2.0	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.2-C1	11HSI51	Illinois	50 x 10 mm	Head	Yes	No	No	Yes	Yes
3.2-C2	I51F14	Illinois	50 x 10 mm	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-C3	I511415	Illinois	50 x 10 mm	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-C4	I511516	Illinois	50 x 10 mm	1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-C5	I511620	Illinois	50 x 10 mm	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-C6	I51S20	Illinois	50 x 10 mm	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-C7	12HSI12	Illinois	10 mm x 28 M	Head	Yes	No	Yes	Yes	Yes
3.2-C8	I12F14	Illinois	10 mm x 28 M	Float 1.40 SG	Yes	No	Yes	Yes	Yes
3.2-C9	I121415	Illinois	10 mm x 28 M	1.40 x 1.55 SG	Yes	No	Yes	Yes	Yes
3.2-C10	I121516	Illinois	10 mm x 28 M	1.55 x 1.65 SG	Yes	No	Yes	Yes	Yes
3.2-C11	I121620	Illinois	10 mm x 28 M	1.65 x 2.00 SG	Yes	No	Yes	Yes	Yes
3.2-C12	I12S20	Illinois	10 mm x 28 M	Sink 2.00 SG	Yes	No	Yes	Yes	Yes
3.2-C13	13HSI21	Illinois	28 x 100 M	Head	Yes	No	No	Yes	Yes
3.2-C14	I21F14	Illinois	28 x 100 M	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-C15	I211415	Illinois	28 x 100 M	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-C16	I211516	Illinois	28 x 100 M	1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-C17	I211620	Illinois	28 x 100 M	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-C18	I21S20	Illinois	28 x 100 M	Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-C19	14HSI127	Illinois	100 x 270 M	Head	Yes	No	No	Yes	Yes
3.2-C20	I127F14	Illinois	100 x 270 M	Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-C21	I1271415	Illinois	100 x 270 M	1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-C22	I1271516	Illinois	100 x 270 M	1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-C23	I1271620	Illinois	100 x 270 M	1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-C24	I127S20	Illinois	100 x 270 M	Sink 2.00 SG	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.2-C25	15HSIC5112	Illinois	10 mm x 28 M	Head, Crushed 50 x 10 mm	Yes	No	No	Yes	Yes
3.2-C26	IC5112F14	Illinois	10 mm x 28 M	Crushed 50 x 10 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-C27	IC51121415	Illinois	10 mm x 28 M	Crushed 50 x 10 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-C28	IC51121516	Illinois	10 mm x 28 M	Crushed 50 x 10 mm, 1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-C29	IC51121620	Illinois	10 mm x 28 M	Crushed 50 x 10 mm, 1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-C30	IC5112S20	Illinois	10 mm x 28 M	Crushed 50 x 10 mm, Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-C31	16HSIC5121	Illinois	28 x 100 M	Head, Crushed 50 x 10 mm	Yes	No	No	Yes	Yes
3.2-C32	IC5121F14	Illinois	28 x 100 M	Crushed 50 x 10 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-C33	IC51211415	Illinois	28 x 100 M	Crushed 50 x 10 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-C34	IC51211516	Illinois	28 x 100 M	Crushed 50 x 10 mm, 1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-C35	IC51211620	Illinois	28 x 100 M	Crushed 50 x 10 mm, 1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-C36	IC5121S20	Illinois	28 x 100 M	Crushed 50 x 10 mm, Sink 2.00 SG	Yes	No	No	Yes	Yes
3.2-C37		Illinois	100 x 270 M	Head, Crushed 50 x 10 mm	Yes	No	No	Yes	Yes
3.2-C38	IC51127F14	Illinois	100 x 270 M	Crushed 50 x 10 mm, Float 1.40 SG	Yes	No	No	Yes	Yes
3.2-C39	IC511271415	Illinois	100 x 270 M	Crushed 50 x 10 mm, 1.40 x 1.55 SG	Yes	No	No	Yes	Yes
3.2-C40	IC511271516	Illinois	100 x 270 M	Crushed 50 x 10 mm, 1.55 x 1.65 SG	Yes	No	No	Yes	Yes
3.2-C41	IC511271620	Illinois	100 x 270 M	Crushed 50 x 10 mm, 1.65 x 2.00 SG	Yes	No	No	Yes	Yes
3.2-C42	IC51127S20	Illinois	100 x 270 M	Crushed 50 x 10 mm, Sink 2.00 SG	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.3-A1		Pittsburgh	28 x 100 M	ROM, Release #1	Yes	No	Yes	Yes	Yes
3.3-A2		Pittsburgh	28 x 100 M	ROM, Release #2	Yes	No	Yes	Yes	Yes
3.3-A3		Pittsburgh	28 x 100 M	ROM, Release #3	Yes	No	Yes	Yes	Yes
3.3-A4		Pittsburgh	28 x 100 M	ROM, Release #4	Yes	No	Yes	Yes	Yes
3.3-A5		Pittsburgh	28 x 100 M	ROM, Release #5	Yes	No	Yes	Yes	Yes
3.3-A6		Pittsburgh	28 x 100 M	ROM, Release Tail	Yes	No	Yes	Yes	Yes
3.3-A7		Pittsburgh	100 x 270 M	ROM, Release #1	Yes	No	No	Yes	Yes
3.3-A8		Pittsburgh	100 x 270 M	ROM, Release #2	Yes	No	No	Yes	Yes
3.3-A9		Pittsburgh	100 x 270 M	ROM, Release #3	Yes	No	No	Yes	Yes
3.3-A10		Pittsburgh	100 x 270 M	ROM, Release #4	Yes	No	No	Yes	Yes
3.3-A11		Pittsburgh	100 x 270 M	ROM, Release #5	Yes	No	No	Yes	Yes
3.3-A12		Pittsburgh	270 M x 0	ROM, Release Tail	Yes	No	No	Yes	Yes
3.3-A13		Pittsburgh	270 M x 0	ROM, Release #1	Yes	No	No	Yes	Yes
3.3-A14		Pittsburgh	270 M x 0	ROM, Release #2	Yes	No	No	Yes	Yes
3.3-A15		Pittsburgh	270 M x 0	ROM, Release #3	Yes	No	No	Yes	Yes
3.3-A16		Pittsburgh	270 M x 0	ROM, Release #4	Yes	No	No	Yes	Yes
3.3-A17		Pittsburgh	270 M x 0	ROM, Release #5	Yes	No	No	Yes	Yes
3.3-A18		Pittsburgh	270 M x 0	ROM, Release Tail	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.3-A19		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Release #1	Yes	No	No	Yes	Yes
3.3-A20		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Release #2	Yes	No	No	Yes	Yes
3.3-A21		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Release #3	Yes	No	No	Yes	Yes
3.3-A22		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Release #4	Yes	No	No	Yes	Yes
3.3-A23		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Release #5	Yes	No	No	Yes	Yes
3.3-A24		Pittsburgh	28 x 100 M	Crushed 50 x 10 mm, Release Tail	Yes	No	No	Yes	Yes
3.3-A25		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Release #1	Yes	No	No	Yes	Yes
3.3-A26		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Release #2	Yes	No	No	Yes	Yes
3.3-A27		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Release #3	Yes	No	No	Yes	Yes
3.3-A28		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Release #4	Yes	No	No	Yes	Yes
3.3-A29		Pittsburgh	100 x 270 M	Crushed 50 x 10 mm, Release #5	Yes	No	No	Yes	Yes
3.3-A30		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release Tail	Yes	No	No	Yes	Yes
3.3-A31		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release #1	Yes	No	No	Yes	Yes
3.3-A32		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release #2	Yes	No	No	Yes	Yes
3.3-A33		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release #3	Yes	No	No	Yes	Yes
3.3-A34		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release #4	Yes	No	No	Yes	Yes
3.3-A35		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release #5	Yes	No	No	Yes	Yes
3.3-A36		Pittsburgh	270 M x 0	Crushed 50 x 10 mm, Release Tail	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.3-B1		Coalburg	28 x 100 M	ROM, Release #1	Yes	No	Yes	Yes	Yes
3.3-B2		Coalburg	28 x 100 M	ROM, Release #2	Yes	No	Yes	Yes	Yes
3.3-B3		Coalburg	28 x 100 M	ROM, Release #3	Yes	No	Yes	Yes	Yes
3.3-B4		Coalburg	28 x 100 M	ROM, Release #4	Yes	No	Yes	Yes	Yes
3.3-B5		Coalburg	28 x 100 M	ROM, Release #5	Yes	No	Yes	Yes	Yes
3.3-B6		Coalburg	28 x 100 M	ROM, Release Tail	Yes	No	Yes	Yes	Yes
3.3-B7		Coalburg	100 x 270 M	ROM, Release #1	Yes	No	No	Yes	Yes
3.3-B8		Coalburg	100 x 270 M	ROM, Release #2	Yes	No	No	Yes	Yes
3.3-B9		Coalburg	100 x 270 M	ROM, Release #3	Yes	No	No	Yes	Yes
3.3-B10		Coalburg	100 x 270 M	ROM, Release #4	Yes	No	No	Yes	Yes
3.3-B11		Coalburg	100 x 270 M	ROM, Release #5	Yes	No	No	Yes	Yes
3.3-B12		Coalburg	270 M x 0	ROM, Release Tail	Yes	No	No	Yes	Yes
3.3-B13		Coalburg	270 M x 0	ROM, Release #1	Yes	No	No	Yes	Yes
3.3-B14		Coalburg	270 M x 0	ROM, Release #2	Yes	No	No	Yes	Yes
3.3-B15		Coalburg	270 M x 0	ROM, Release #3	Yes	No	No	Yes	Yes
3.3-B16		Coalburg	270 M x 0	ROM, Release #4	Yes	No	No	Yes	Yes
3.3-B17		Coalburg	270 M x 0	ROM, Release #5	Yes	No	No	Yes	Yes
3.3-B18		Coalburg	270 M x 0	ROM, Release Tail	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.3-B19		Coalburg	28 x 100 M	Crushed +50 mm, Release #1	Yes	No	No	Yes	Yes
3.3-B20		Coalburg	28 x 100 M	Crushed +50 mm, Release #2	Yes	No	No	Yes	Yes
3.3-B21		Coalburg	28 x 100 M	Crushed +50 mm, Release #3	Yes	No	No	Yes	Yes
3.3-B22		Coalburg	28 x 100 M	Crushed +50 mm, Release #4	Yes	No	No	Yes	Yes
3.3-B23		Coalburg	28 x 100 M	Crushed +50 mm, Release #5	Yes	No	No	Yes	Yes
3.3-B24		Coalburg	28 x 100 M	Crushed +50 mm, Release Tail	Yes	No	No	Yes	Yes
3.3-B25		Coalburg	100 x 270 M	Crushed +50 mm, Release #1	Yes	No	No	Yes	Yes
3.3-B26		Coalburg	100 x 270 M	Crushed +50 mm, Release #2	Yes	No	No	Yes	Yes
3.3-B27		Coalburg	100 x 270 M	Crushed +50 mm, Release #3	Yes	No	No	Yes	Yes
3.3-B28		Coalburg	100 x 270 M	Crushed +50 mm, Release #4	Yes	No	No	Yes	Yes
3.3-B29		Coalburg	100 x 270 M	Crushed +50 mm, Release #5	Yes	No	No	Yes	Yes
3.3-B30		Coalburg	270 M x 0	Crushed +50 mm, Release Tail	Yes	No	No	Yes	Yes
3.3-B31		Coalburg	270 M x 0	Crushed +50 mm, Release #1	Yes	No	No	Yes	Yes
3.3-B32		Coalburg	270 M x 0	Crushed +50 mm, Release #2	Yes	No	No	Yes	Yes
3.3-B33		Coalburg	270 M x 0	Crushed +50 mm, Release #3	Yes	No	No	Yes	Yes
3.3-B34		Coalburg	270 M x 0	Crushed +50 mm, Release #4	Yes	No	No	Yes	Yes
3.3-B35		Coalburg	270 M x 0	Crushed +50 mm, Release #5	Yes	No	No	Yes	Yes
3.3-B36		Coalburg	270 M x 0	Crushed +50 mm, Release Tail	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.3-C1		Illinois	28 x 100 M	ROM, Release #1	Yes	No	Yes	Yes	Yes
3.3-C2		Illinois	28 x 100 M	ROM, Release #2	Yes	No	Yes	Yes	Yes
3.3-C3		Illinois	28 x 100 M	ROM, Release #3	Yes	No	Yes	Yes	Yes
3.3-C4		Illinois	28 x 100 M	ROM, Release #4	Yes	No	Yes	Yes	Yes
3.3-C5		Illinois	28 x 100 M	ROM, Release #5	Yes	No	Yes	Yes	Yes
3.3-C6		Illinois	28 x 100 M	ROM, Release Tail	Yes	No	Yes	Yes	Yes
3.3-C7		Illinois	100 x 270 M	ROM, Release #1	Yes	No	No	Yes	Yes
3.3-C8		Illinois	100 x 270 M	ROM, Release #2	Yes	No	No	Yes	Yes
3.3-C9		Illinois	100 x 270 M	ROM, Release #3	Yes	No	No	Yes	Yes
3.3-C10		Illinois	100 x 270 M	ROM, Release #4	Yes	No	No	Yes	Yes
3.3-C11		Illinois	100 x 270 M	ROM, Release #5	Yes	No	No	Yes	Yes
3.3-C12		Illinois	270 M x 0	ROM, Release Tail	Yes	No	No	Yes	Yes
3.3-C13		Illinois	270 M x 0	ROM, Release #1	Yes	No	No	Yes	Yes
3.3-C14		Illinois	270 M x 0	ROM, Release #2	Yes	No	No	Yes	Yes
3.3-C15		Illinois	270 M x 0	ROM, Release #3	Yes	No	No	Yes	Yes
3.3-C16		Illinois	270 M x 0	ROM, Release #4	Yes	No	No	Yes	Yes
3.3-C17		Illinois	270 M x 0	ROM, Release #5	Yes	No	No	Yes	Yes
3.3-C18		Illinois	270 M x 0	ROM, Release Tail	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.3-C19		Illinois	28 x 100 M	Crushed 50 x 10 mm, Release #1	Yes	No	No	Yes	Yes
3.3-C20		Illinois	28 x 100 M	Crushed 50 x 10 mm, Release #2	Yes	No	No	Yes	Yes
3.3-C21		Illinois	28 x 100 M	Crushed 50 x 10 mm, Release #3	Yes	No	No	Yes	Yes
3.3-C22		Illinois	28 x 100 M	Crushed 50 x 10 mm, Release #4	Yes	No	No	Yes	Yes
3.3-C23		Illinois	28 x 100 M	Crushed 50 x 10 mm, Release #5	Yes	No	No	Yes	Yes
3.3-C24		Illinois	28 x 100 M	Crushed 50 x 10 mm, Release Tail	Yes	No	No	Yes	Yes
3.3-C25		Illinois	100 x 270 M	Crushed 50 x 10 mm, Release #1	Yes	No	No	Yes	Yes
3.3-C26		Illinois	100 x 270 M	Crushed 50 x 10 mm, Release #2	Yes	No	No	Yes	Yes
3.3-C27		Illinois	100 x 270 M	Crushed 50 x 10 mm, Release #3	Yes	No	No	Yes	Yes
3.3-C28		Illinois	100 x 270 M	Crushed 50 x 10 mm, Release #4	Yes	No	No	Yes	Yes
3.3-C29		Illinois	100 x 270 M	Crushed 50 x 10 mm, Release #5	Yes	No	No	Yes	Yes
3.3-C30		Illinois	270 M x 0	Crushed 50 x 10 mm, Release Tail	Yes	No	No	Yes	Yes
3.3-C31		Illinois	270 M x 0	Crushed 50 x 10 mm, Release #1	Yes	No	No	Yes	Yes
3.3-C32		Illinois	270 M x 0	Crushed 50 x 10 mm, Release #2	Yes	No	No	Yes	Yes
3.3-C33		Illinois	270 M x 0	Crushed 50 x 10 mm, Release #3	Yes	No	No	Yes	Yes
3.3-C34		Illinois	270 M x 0	Crushed 50 x 10 mm, Release #4	Yes	No	No	Yes	Yes
3.3-C35		Illinois	270 M x 0	Crushed 50 x 10 mm, Release #5	Yes	No	No	Yes	Yes
3.3-C36		Illinois	270 M x 0	Crushed 50 x 10 mm, Release Tail	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
3.4-1		Pittsburgh	65 x 100 M	Head	Yes	No	No	Yes	Yes
3.4-2		Pittsburgh	65 x 100 M	Float 1.29 SG	Yes	No	No	Yes	Yes
3.4-3		Pittsburgh	65 x 100 M	1.29 x 1.30 SG	Yes	No	No	Yes	Yes
3.4-4		Pittsburgh	65 x 100 M	1.30 x 1.40 SG	Yes	No	No	Yes	Yes
3.4-5		Pittsburgh	65 x 100 M	1.40 x 1.50 SG	Yes	No	No	Yes	Yes
3.4-6		Pittsburgh	65 x 100 M	1.50 x 1.60 SG	Yes	No	No	Yes	Yes
3.4-7		Pittsburgh	65 x 100 M	1.60 x 1.70 SG	Yes	No	No	Yes	Yes
3.4-8		Pittsburgh	65 x 100 M	1.70 x 1.80 SG	Yes	No	No	Yes	Yes
3.4-9		Pittsburgh	65 x 100 M	1.80 x 2.00 SG	Yes	No	No	Yes	Yes
3.4-10		Pittsburgh	65 x 100 M	2.00 x 2.25 SG	Yes	No	No	Yes	Yes
3.4-11		Pittsburgh	65 x 100 M	2.25 x 2.50 SG	Yes	No	No	Yes	Yes
3.4-12		Pittsburgh	65 x 100 M	Sink 2.50 SG	Yes	No	No	Yes	Yes

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
4.1-1	PILE	Pittsburgh	2" x 0	Pile Sample	Yes	No	No	Yes	Yes
4.1-2	VSF	Pittsburgh	2" x 0	Vibratory Screen Feed	Yes	No	No	Yes	Yes
4.1-3	VSOF	Pittsburgh	2" x 10 mm	Vibratory Screen Overflow	Yes	No	No	Yes	Yes
4.1-4	2x10CC	Pittsburgh	2" x 10 mm	2" x 10 mm Clean Coal	Yes	No	No	Yes	Yes
4.1-5	2x10R	Pittsburgh	2" x 10 mm	2" x 10 mm Tail	Yes	No	No	Yes	Yes
4.1-6	VSUF	Pittsburgh	10 mm x 0	Vibratory Screen Underflow	Yes	No	No	Yes	Yes
4.1-7	MIDS	Pittsburgh	2" x 10 mm	Middlings to be Crushed	Yes	No	No	Yes	Yes
4.1-8	10x28SC	Pittsburgh	10 mm x 28 M	10 mm x 28 M Size Class Sample	Yes	No	No	Yes	Yes
4.1-9	10x28CC	Pittsburgh	10 mm x 28 M	10 mm x 28 M Clean Coal	Yes	No	No	Yes	Yes
4.1-10	10x28R	Pittsburgh	10 mm x 28 M	10 mm x 28 M Tail	Yes	No	No	Yes	Yes
4.1-11	28x100SC	Pittsburgh	28 x 100 M	28 x 100 M Size Class Sample	Yes	No	No	Yes	Yes
4.1-12	B1	Pittsburgh	-100 M	Barrel 1, -100 M	Yes	No	No	Yes	Yes
4.1-13	B2	Pittsburgh	-100 M	Barrel 2, -100 M	Yes	No	No	Yes	Yes
4.1-14	B3	Pittsburgh	-100 M	Barrel 3, -100 M	Yes	No	No	Yes	Yes
4.1-15	B4	Pittsburgh	-100 M	Barrel 4, -100 M	Yes	No	No	Yes	Yes
4.1-16	B5	Pittsburgh	-100 M	Barrel 5, -100 M	Yes	No	No	Yes	Yes
4.1-17	B7	Pittsburgh	-100 M	Barrel 7, -100 M	Yes	No	No	Yes	Yes
4.1-18	B8	Pittsburgh	-100 M	Barrel 8, -100 M	Yes	No	No	Yes	Yes
4.1-19	DRM	Pittsburgh	90% -325	Drain and Rinse Magnetite	Yes	No	No	Yes	Yes
4.1-20	DRC	Pittsburgh	N/A	Drain and Rinse Clays and Tail	Yes	No	No	Yes	Yes
4.1-21	DRMW	Pittsburgh	N/A	D&R Water from Magnetite Part	Yes	No	No	Yes	Yes
4.1-22	DRCW	Pittsburgh	N/A	D&R Water from Clay Component	Yes	No	No	Yes	Yes
4.1-23	DTHS	Pittsburgh	N/A	Davis Tube Water Head Sample	Yes	No	No	Yes	Yes
4.1-24	MagSamp	Pittsburgh	90% -325M	Magnetite Stream Sample	Yes	No	No	Yes	Yes

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
4.2-A1	28x100CF	Pittsburgh	28 x 100 M	Column Feed for 28 x 100 M	Yes	No	No	Yes	Yes
4.2-A2	28x100CFW	Pittsburgh	N/A	Column Feed Water for 28 x 100 M	Yes	No	No	Yes	Yes
4.2-A3	28x100CC1	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 1	Yes	No	No	Yes	Yes
4.2-A4	28x100CCW1	Pittsburgh	N/A	28 x 100 M CC Water, Run 1	Yes	No	No	Yes	Yes
4.2-A5	28x100R1	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 1	Yes	No	No	Yes	Yes
4.2-A6	28x100RW1	Pittsburgh	N/A	28 x 100 M Tail Water, Run 1	Yes	No	No	Yes	Yes
4.2-A7	28x100CC2	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 2	Yes	No	No	Yes	Alt
4.2-A8	28x100CCW2	Pittsburgh	N/A	28 x 100 M CC Water, Run 2	Yes	No	No	Yes	Alt
4.2-A9	28x100R2	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 2	Yes	No	No	Yes	Alt
4.2-A10	28x100RW2	Pittsburgh	N/A	28 x 100 M Tail Water, Run 2	Yes	No	No	Yes	Alt
4.2-A11	28x100CC3	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 3	Yes	No	No	Yes	Alt
4.2-A12	28x100CCW3	Pittsburgh	N/A	28 x 100 M CC Water, Run 3	Yes	No	No	Yes	Alt
4.2-A13	28x100R3	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 3	Yes	No	No	Yes	Alt
4.2-A14	28x100RW3	Pittsburgh	N/A	28 x 100 M Tail Water, Run 3	Yes	No	No	Yes	Alt
4.2-A15	28x100CC4	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 4	Yes	No	No	Yes	Alt
4.2-A16	28x100CCW4	Pittsburgh	N/A	28 x 100 M CC Water, Run 4	Yes	No	No	Yes	Alt
4.2-A17	28x100R4	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 4	Yes	No	No	Yes	Alt
4.2-A18	28x100RW4	Pittsburgh	N/A	28 x 100 M Tail Water, Run 4	Yes	No	No	Yes	Alt
4.2-A19	28x100CC5	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 5	Yes	No	No	Yes	Alt
4.2-A20	28x100CCW5	Pittsburgh	N/A	28 x 100 M CC Water, Run 5	Yes	No	No	Yes	Alt
4.2-A21	28x100R5	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 5	Yes	No	No	Yes	Alt
4.2-A22	28x100RW5	Pittsburgh	N/A	28 x 100 M Tail Water, Run 5	Yes	No	No	Yes	Alt
4.2-A23	28x100CC6	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 6	Yes	No	No	Yes	Alt
4.2-A24	28x100CCW6	Pittsburgh	N/A	28 x 100 M CC Water, Run 6	Yes	No	No	Yes	Alt
4.2-A25	28x100R6	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 6	Yes	No	No	Yes	Alt
4.2-A26	28x100RW6	Pittsburgh	N/A	28 x 100 M Tail Water, Run 6	Yes	No	No	Yes	Alt
4.2-A27	28x100CC7	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 7	Yes	No	No	Yes	Alt
4.2-A28	28x100CCW7	Pittsburgh	N/A	28 x 100 M CC Water, Run 7	Yes	No	No	Yes	Alt
4.2-A29	28x100R7	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 7	Yes	No	No	Yes	Alt
4.2-A30	28x100RW7	Pittsburgh	N/A	28 x 100 M Tail Water, Run 7	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.2-A31	28x100CC8	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 8	Yes	No	No	Yes	Alt
4.2-A32	28x100CCW8	Pittsburgh	N/A	28 x 100 M CC Water, Run 8	Yes	No	No	Yes	Alt
4.2-A33	28x100R8	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 8	Yes	No	No	Yes	Alt
4.2-A34	28x100RW8	Pittsburgh	N/A	28 x 100 M Tail Water, Run 8	Yes	No	No	Yes	Alt
4.2-A35	28x100CC9	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 9	Yes	No	No	Yes	Alt
4.2-A36	28x100CCW9	Pittsburgh	N/A	28 x 100 M CC Water, Run 9	Yes	No	No	Yes	Alt
4.2-A37	28x100R9	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 9	Yes	No	No	Yes	Alt
4.2-A38	28x100RW9	Pittsburgh	N/A	28 x 100 M Tail Water, Run 9	Yes	No	No	Yes	Alt
4.2-A39	28x100CC10	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 10	Yes	No	No	Yes	Alt
4.2-A40	28x100CCW10	Pittsburgh	N/A	28 x 100 M CC Water, Run 10	Yes	No	No	Yes	Alt
4.2-A41	28x100R10	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 10	Yes	No	No	Yes	Alt
4.2-A42	28x100RW10	Pittsburgh	N/A	28 x 100 M Tail Water, Run 10	Yes	No	No	Yes	Alt
4.2-A43	28x100CC11	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 11	Yes	No	No	Yes	Alt
4.2-A44	28x100CCW11	Pittsburgh	N/A	28 x 100 M CC Water, Run 11	Yes	No	No	Yes	Alt
4.2-A45	28x100R11	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 11	Yes	No	No	Yes	Alt
4.2-A46	28x100RW11	Pittsburgh	N/A	28 x 100 M Tail Water, Run 11	Yes	No	No	Yes	Alt
4.2-A47	28x100CC12	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 12	Yes	No	No	Yes	Alt
4.2-A48	28x100CCW12	Pittsburgh	N/A	28 x 100 M CC Water, Run 12	Yes	No	No	Yes	Alt
4.2-A49	28x100R12	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 12	Yes	No	No	Yes	Alt
4.2-A50	28x100RW12	Pittsburgh	N/A	28 x 100 M Tail Water, Run 12	Yes	No	No	Yes	Alt
4.2-A51	28x100CC13	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 13	Yes	No	No	Yes	Alt
4.2-A52	28x100CCW13	Pittsburgh	N/A	28 x 100 M CC Water, Run 13	Yes	No	No	Yes	Alt
4.2-A53	28x100R13	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 13	Yes	No	No	Yes	Alt
4.2-A54	28x100RW13	Pittsburgh	N/A	28 x 100 M Tail Water, Run 13	Yes	No	No	Yes	Alt
4.2-A55	28x100CC14	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 14	Yes	No	No	Yes	Alt
4.2-A56	28x100CCW14	Pittsburgh	N/A	28 x 100 M CC Water, Run 14	Yes	No	No	Yes	Alt
4.2-A57	28x100R14	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 14	Yes	No	No	Yes	Alt
4.2-A58	28x100RW14	Pittsburgh	N/A	28 x 100 M Tail Water, Run 14	Yes	No	No	Yes	Alt
4.2-A59	28x100CC15	Pittsburgh	28 x 100 M	28 x 100 M Clean Coal, Run 15	Yes	No	No	Yes	Alt
4.2-A60	28x100CCW15	Pittsburgh	N/A	28 x 100 M CC Water, Run 15	Yes	No	No	Yes	Alt
4.2-A61	28x100R15	Pittsburgh	28 x 100 M	28 x 100 M Tail Material, Run 15	Yes	No	No	Yes	Alt
4.2-A62	28x100RW15	Pittsburgh	N/A	28 x 100 M Tail Water, Run 15	Yes	No	No	Yes	Alt

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
4.2-B1	DF	Pittsburgh	-100 M	Column Diffuser Feed Material	Yes	No	No	Yes	Yes
4.2-B2	DFW	Pittsburgh	N/A	Column Diffuser Feed Water	Yes	No	No	Yes	Yes
4.2-B3	DCC1	Pittsburgh	-100 M	Diffuser Clean Coal, Run 1	Yes	No	No	Yes	Yes
4.2-B4	DCCW1	Pittsburgh	N/A	Diffuser CC Water, Run 1	Yes	No	No	Yes	Yes
4.2-B5	DR1	Pittsburgh	-100 M	Diffuser Tail Material, Run 1	Yes	No	No	Yes	Yes
4.2-B6	DRW1	Pittsburgh	N/A	Diffuser Tail Water, Run 1	Yes	No	No	Yes	Yes
4.2-B7	DCC2	Pittsburgh	-100 M	Diffuser Clean Coal, Run 2	Yes	No	No	Yes	Alt
4.2-B8	DCCW2	Pittsburgh	N/A	Diffuser CC Water, Run 2	Yes	No	No	Yes	Alt
4.2-B9	DR2	Pittsburgh	-100 M	Diffuser Tail Material, Run 2	Yes	No	No	Yes	Alt
4.2-B10	DRW2	Pittsburgh	N/A	Diffuser Tail Water, Run 2	Yes	No	No	Yes	Alt
4.2-B11	DCC3	Pittsburgh	-100 M	Diffuser Clean Coal, Run 3	Yes	No	No	Yes	Alt
4.2-B12	DCCW3	Pittsburgh	N/A	Diffuser CC Water, Run 3	Yes	No	No	Yes	Alt
4.2-B13	DR3	Pittsburgh	-100 M	Diffuser Tail Material, Run 3	Yes	No	No	Yes	Alt
4.2-B14	DRW3	Pittsburgh	N/A	Diffuser Tail Water, Run 3	Yes	No	No	Yes	Alt
4.2-B15	DCC4	Pittsburgh	-100 M	Diffuser Clean Coal, Run 4	Yes	No	No	Yes	Alt
4.2-B16	DCCW4	Pittsburgh	N/A	Diffuser CC Water, Run 4	Yes	No	No	Yes	Alt
4.2-B17	DR4	Pittsburgh	-100 M	Diffuser Tail Material, Run 4	Yes	No	No	Yes	Alt
4.2-B18	DRW4	Pittsburgh	N/A	Diffuser Tail Water, Run 4	Yes	No	No	Yes	Alt
4.2-B19	DCC5	Pittsburgh	-100 M	Diffuser Clean Coal, Run 5	Yes	No	No	Yes	Alt
4.2-B20	DCCW5	Pittsburgh	N/A	Diffuser CC Water, Run 5	Yes	No	No	Yes	Alt
4.2-B21	DR5	Pittsburgh	-100 M	Diffuser Tail Material, Run 5	Yes	No	No	Yes	Alt
4.2-B22	DRW5	Pittsburgh	N/A	Diffuser Tail Water, Run 5	Yes	No	No	Yes	Alt
4.2-B23	DCC6	Pittsburgh	-100 M	Diffuser Clean Coal, Run 6	Yes	No	No	Yes	Alt
4.2-B24	DCCW6	Pittsburgh	N/A	Diffuser CC Water, Run 6	Yes	No	No	Yes	Alt
4.2-B25	DR6	Pittsburgh	-100 M	Diffuser Tail Material, Run 6	Yes	No	No	Yes	Alt
4.2-B26	DRW6	Pittsburgh	N/A	Diffuser Tail Water, Run 6	Yes	No	No	Yes	Alt
4.2-B27	DCC7	Pittsburgh	-100 M	Diffuser Clean Coal, Run 7	Yes	No	No	Yes	Alt
4.2-B28	DCCW7	Pittsburgh	N/A	Diffuser CC Water, Run 7	Yes	No	No	Yes	Alt
4.2-B29	DR7	Pittsburgh	-100 M	Diffuser Tail Material, Run 7	Yes	No	No	Yes	Alt
4.2-B30	DRW7	Pittsburgh	N/A	Diffuser Tail Water, Run 7	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.2-B31	DCC8	Pittsburgh	-100 M	Diffuser Clean Coal, Run 8	Yes	No	No	Yes	Alt
4.2-B32	DCCW8	Pittsburgh	N/A	Diffuser CC Water, Run 8	Yes	No	No	Yes	Alt
4.2-B33	DR8	Pittsburgh	-100 M	Diffuser Tail Material, Run 8	Yes	No	No	Yes	Alt
4.2-B34	DRW8	Pittsburgh	N/A	Diffuser Tail Water, Run 8	Yes	No	No	Yes	Alt
4.2-B35	DCC9	Pittsburgh	-100 M	Diffuser Clean Coal, Run 9	Yes	No	No	Yes	Alt
4.2-B36	DCCW9	Pittsburgh	N/A	Diffuser CC Water, Run 9	Yes	No	No	Yes	Alt
4.2-B37	DR9	Pittsburgh	-100 M	Diffuser Tail Material, Run 9	Yes	No	No	Yes	Alt
4.2-B38	DRW9	Pittsburgh	N/A	Diffuser Tail Water, Run 9	Yes	No	No	Yes	Alt
4.2-B39	DCC10	Pittsburgh	-100 M	Diffuser Clean Coal, Run 10	Yes	No	No	Yes	Alt
4.2-B40	DCCW10	Pittsburgh	N/A	Diffuser CC Water, Run 10	Yes	No	No	Yes	Alt
4.2-B41	DR10	Pittsburgh	-100 M	Diffuser Tail Material, Run 10	Yes	No	No	Yes	Alt
4.2-B42	DRW10	Pittsburgh	N/A	Diffuser Tail Water, Run 10	Yes	No	No	Yes	Alt
4.2-B43	DCC11	Pittsburgh	-100 M	Diffuser Clean Coal, Run 11	Yes	No	No	Yes	Alt
4.2-B44	DCCW11	Pittsburgh	N/A	Diffuser CC Water, Run 11	Yes	No	No	Yes	Alt
4.2-B45	DR11	Pittsburgh	-100 M	Diffuser Tail Material, Run 11	Yes	No	No	Yes	Alt
4.2-B46	DRW11	Pittsburgh	N/A	Diffuser Tail Water, Run 11	Yes	No	No	Yes	Alt
4.2-B47	DCC12	Pittsburgh	-100 M	Diffuser Clean Coal, Run 12	Yes	No	No	Yes	Alt
4.2-B48	DCCW12	Pittsburgh	N/A	Diffuser CC Water, Run 12	Yes	No	No	Yes	Alt
4.2-B49	DR12	Pittsburgh	-100 M	Diffuser Tail Material, Run 12	Yes	No	No	Yes	Alt
4.2-B50	DRW12	Pittsburgh	N/A	Diffuser Tail Water, Run 12	Yes	No	No	Yes	Alt
4.2-B51	DCC13	Pittsburgh	-100 M	Diffuser Clean Coal, Run 13	Yes	No	No	Yes	Alt
4.2-B52	DCCW13	Pittsburgh	N/A	Diffuser CC Water, Run 13	Yes	No	No	Yes	Alt
4.2-B53	DR13	Pittsburgh	-100 M	Diffuser Tail Material, Run 13	Yes	No	No	Yes	Alt
4.2-B54	DRW13	Pittsburgh	N/A	Diffuser Tail Water, Run 13	Yes	No	No	Yes	Alt
4.2-B55	DCC14	Pittsburgh	-100 M	Diffuser Clean Coal, Run 14	Yes	No	No	Yes	Alt
4.2-B56	DCCW14	Pittsburgh	N/A	Diffuser CC Water, Run 14	Yes	No	No	Yes	Alt
4.2-B57	DR14	Pittsburgh	-100 M	Diffuser Tail Material, Run 14	Yes	No	No	Yes	Alt
4.2-B58	DRW14	Pittsburgh	N/A	Diffuser Tail Water, Run 14	Yes	No	No	Yes	Alt
4.2-B59	DCC15	Pittsburgh	-100 M	Diffuser Clean Coal, Run 15	Yes	No	No	Yes	Alt
4.2-B60	DCCW15	Pittsburgh	N/A	Diffuser CC Water, Run 15	Yes	No	No	Yes	Alt
4.2-B61	DR15	Pittsburgh	-100 M	Diffuser Tail Material, Run 15	Yes	No	No	Yes	Alt
4.2-B62	DRW15	Pittsburgh	N/A	Diffuser Tail Water, Run 15	Yes	No	No	Yes	Alt

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
4.2-C1	TAF	Pittsburgh	-100 M	Turbo-Air Sparger Feed Material	Yes	No	No	Yes	Yes
4.2-C2	TAFW	Pittsburgh	N/A	Turbo-Air Sparger Feed Water	Yes	No	No	Yes	Yes
4.2-C3	TACC1	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 1	Yes	No	No	Yes	Yes
4.2-C4	TACCW1	Pittsburgh	N/A	Turbo-Air CC Water, Run 1	Yes	No	No	Yes	Yes
4.2-C5	TAR1	Pittsburgh	-100 M	Turbo-Air Tail Material, Run1	Yes	No	No	Yes	Yes
4.2-C6	TARW1	Pittsburgh	N/A	Turbo-Air Tail Water, Run 1	Yes	No	No	Yes	Yes
4.2-C7	TACC2	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 2	Yes	No	No	Yes	Alt
4.2-C8	TACCW2	Pittsburgh	N/A	Turbo-Air CC Water, Run 2	Yes	No	No	Yes	Alt
4.2-C9	TAR2	Pittsburgh	-100 M	Turbo-Air Tail Material, Run2	Yes	No	No	Yes	Alt
4.2-C10	TARW2	Pittsburgh	N/A	Turbo-Air Tail Water, Run 2	Yes	No	No	Yes	Alt
4.2-C11	TACC3	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 3	Yes	No	No	Yes	Alt
4.2-C12	TACCW3	Pittsburgh	N/A	Turbo-Air CC Water, Run 3	Yes	No	No	Yes	Alt
4.2-C13	TAR3	Pittsburgh	-100 M	Turbo-Air Tail Material, Run3	Yes	No	No	Yes	Alt
4.2-C14	TARW3	Pittsburgh	N/A	Turbo-Air Tail Water, Run 3	Yes	No	No	Yes	Alt
4.2-C15	TACC4	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 4	Yes	No	No	Yes	Alt
4.2-C16	TACCW4	Pittsburgh	N/A	Turbo-Air CC Water, Run 4	Yes	No	No	Yes	Alt
4.2-C17	TAR4	Pittsburgh	-100 M	Turbo-Air Tail Material, Run4	Yes	No	No	Yes	Alt
4.2-C18	TARW4	Pittsburgh	N/A	Turbo-Air Tail Water, Run 4	Yes	No	No	Yes	Alt
4.2-C19	TACC5	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 5	Yes	No	No	Yes	Alt
4.2-C20	TACCW5	Pittsburgh	N/A	Turbo-Air CC Water, Run 5	Yes	No	No	Yes	Alt
4.2-C21	TAR5	Pittsburgh	-100 M	Turbo-Air Tail Material, Run5	Yes	No	No	Yes	Alt
4.2-C22	TARW5	Pittsburgh	N/A	Turbo-Air Tail Water, Run 5	Yes	No	No	Yes	Alt
4.2-C23	TACC6	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 6	Yes	No	No	Yes	Alt
4.2-C24	TACCW6	Pittsburgh	N/A	Turbo-Air CC Water, Run 6	Yes	No	No	Yes	Alt
4.2-C25	TAR6	Pittsburgh	-100 M	Turbo-Air Tail Material, Run6	Yes	No	No	Yes	Alt
4.2-C26	TARW6	Pittsburgh	N/A	Turbo-Air Tail Water, Run 6	Yes	No	No	Yes	Alt
4.2-C27	TACC7	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 7	Yes	No	No	Yes	Alt
4.2-C28	TACCW7	Pittsburgh	N/A	Turbo-Air CC Water, Run 7	Yes	No	No	Yes	Alt
4.2-C29	TAR7	Pittsburgh	-100 M	Turbo-Air Tail Material, Run7	Yes	No	No	Yes	Alt
4.2-C30	TARW7	Pittsburgh	N/A	Turbo-Air Tail Water, Run 7	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.2-C31	TACC8	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 8	Yes	No	No	Yes	Alt
4.2-C32	TACCW8	Pittsburgh	N/A	Turbo-Air CC Water, Run 8	Yes	No	No	Yes	Alt
4.2-C33	TAR8	Pittsburgh	-100 M	Turbo-Air Tail Material, Run8	Yes	No	No	Yes	Alt
4.2-C34	TARW8	Pittsburgh	N/A	Turbo-Air Tail Water, Run 8	Yes	No	No	Yes	Alt
4.2-C35	TACC9	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 9	Yes	No	No	Yes	Alt
4.2-C36	TACCW9	Pittsburgh	N/A	Turbo-Air CC Water, Run 9	Yes	No	No	Yes	Alt
4.2-C37	TAR9	Pittsburgh	-100 M	Turbo-Air Tail Material, Run9	Yes	No	No	Yes	Alt
4.2-C38	TARW9	Pittsburgh	N/A	Turbo-Air Tail Water, Run 9	Yes	No	No	Yes	Alt
4.2-C39	TACC10	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 10	Yes	No	No	Yes	Alt
4.2-C40	TACCW10	Pittsburgh	N/A	Turbo-Air CC Water, Run 10	Yes	No	No	Yes	Alt
4.2-C41	TAR10	Pittsburgh	-100 M	Turbo-Air Tail Material, Run10	Yes	No	No	Yes	Alt
4.2-C42	TARW10	Pittsburgh	N/A	Turbo-Air Tail Water, Run 10	Yes	No	No	Yes	Alt
4.2-C43	TACC11	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 11	Yes	No	No	Yes	Alt
4.2-C44	TACCW11	Pittsburgh	N/A	Turbo-Air CC Water, Run 11	Yes	No	No	Yes	Alt
4.2-C45	TAR11	Pittsburgh	-100 M	Turbo-Air Tail Material, Run11	Yes	No	No	Yes	Alt
4.2-C46	TARW11	Pittsburgh	N/A	Turbo-Air Tail Water, Run 11	Yes	No	No	Yes	Alt
4.2-C47	TACC12	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 12	Yes	No	No	Yes	Alt
4.2-C48	TACCW12	Pittsburgh	N/A	Turbo-Air CC Water, Run 12	Yes	No	No	Yes	Alt
4.2-C49	TAR12	Pittsburgh	-100 M	Turbo-Air Tail Material, Run12	Yes	No	No	Yes	Alt
4.2-C50	TARW12	Pittsburgh	N/A	Turbo-Air Tail Water, Run 12	Yes	No	No	Yes	Alt
4.2-C51	TACC13	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 13	Yes	No	No	Yes	Alt
4.2-C52	TACCW13	Pittsburgh	N/A	Turbo-Air CC Water, Run 13	Yes	No	No	Yes	Alt
4.2-C53	TAR13	Pittsburgh	-100 M	Turbo-Air Tail Material, Run13	Yes	No	No	Yes	Alt
4.2-C54	TARW13	Pittsburgh	N/A	Turbo-Air Tail Water, Run 13	Yes	No	No	Yes	Alt
4.2-C55	TACC14	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 14	Yes	No	No	Yes	Alt
4.2-C56	TACCW14	Pittsburgh	N/A	Turbo-Air CC Water, Run 14	Yes	No	No	Yes	Alt
4.2-C57	TAR14	Pittsburgh	-100 M	Turbo-Air Tail Material, Run14	Yes	No	No	Yes	Alt
4.2-C58	TARW14	Pittsburgh	N/A	Turbo-Air Tail Water, Run 14	Yes	No	No	Yes	Alt
4.2-C59	TACC15	Pittsburgh	-100 M	Turbo-Air Clean Coal, Run 15	Yes	No	No	Yes	Alt
4.2-C60	TACCW15	Pittsburgh	N/A	Turbo-Air CC Water, Run 15	Yes	No	No	Yes	Alt
4.2-C61	TAR15	Pittsburgh	-100 M	Turbo-Air Tail Material, Run15	Yes	No	No	Yes	Alt
4.2-C62	TARW15	Pittsburgh	N/A	Turbo-Air Tail Water, Run 15	Yes	No	No	Yes	Alt

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
4.2-D1	MF	Pittsburgh	-100 M	Microcel Sparger Feed Material	Yes	No	No	Yes	Yes
4.2-D2	MFW	Pittsburgh	N/A	Microcel Sparger Feed Water	Yes	No	No	Yes	Yes
4.2-D3	MCC-1	Pittsburgh	-100 M	Microcel Clean Coal, Run 1	Yes	No	No	Yes	Yes
4.2-D4	MCCW-1	Pittsburgh	N/A	Microcel CC Water, Run 1	Yes	No	No	Yes	Yes
4.2-D5	MR-1	Pittsburgh	-100 M	Microcel Tail Material, Run 1	Yes	No	No	Yes	Yes
4.2-D6	MRW-1	Pittsburgh	N/A	Microcel Tail Water, Run 1	Yes	No	No	Yes	Yes
4.2-D7	MCC-2	Pittsburgh	-100 M	Microcel Clean Coal, Run 2	Yes	No	No	Yes	Alt
4.2-D8	MCCW-2	Pittsburgh	N/A	Microcel CC Water, Run 2	Yes	No	No	Yes	Alt
4.2-D9	MR-2	Pittsburgh	-100 M	Microcel Tail Material, Run 2	Yes	No	No	Yes	Alt
4.2-D10	MRW-2	Pittsburgh	N/A	Microcel Tail Water, Run 2	Yes	No	No	Yes	Alt
4.2-D11	MCC-3	Pittsburgh	-100 M	Microcel Clean Coal, Run 3	Yes	No	No	Yes	Alt
4.2-D12	MCCW-3	Pittsburgh	N/A	Microcel CC Water, Run 3	Yes	No	No	Yes	Alt
4.2-D13	MR-3	Pittsburgh	-100 M	Microcel Tail Material, Run 3	Yes	No	No	Yes	Alt
4.2-D14	MRW-3	Pittsburgh	N/A	Microcel Tail Water, Run 3	Yes	No	No	Yes	Alt
4.2-D15	MCC-4	Pittsburgh	-100 M	Microcel Clean Coal, Run 4	Yes	No	No	Yes	Alt
4.2-D16	MCCW-4	Pittsburgh	N/A	Microcel CC Water, Run 4	Yes	No	No	Yes	Alt
4.2-D17	MR-4	Pittsburgh	-100 M	Microcel Tail Material, Run 4	Yes	No	No	Yes	Alt
4.2-D18	MRW-4	Pittsburgh	N/A	Microcel Tail Water, Run 4	Yes	No	No	Yes	Alt
4.2-D19	MCC-5	Pittsburgh	-100 M	Microcel Clean Coal, Run 5	Yes	No	No	Yes	Alt
4.2-D20	MCCW-5	Pittsburgh	N/A	Microcel CC Water, Run 5	Yes	No	No	Yes	Alt
4.2-D21	MR-5	Pittsburgh	-100 M	Microcel Tail Material, Run 5	Yes	No	No	Yes	Alt
4.2-D22	MRW-5	Pittsburgh	N/A	Microcel Tail Water, Run 5	Yes	No	No	Yes	Alt
4.2-D23	MCC-6	Pittsburgh	-100 M	Microcel Clean Coal, Run 6	Yes	No	No	Yes	Alt
4.2-D24	MCCW-6	Pittsburgh	N/A	Microcel CC Water, Run 6	Yes	No	No	Yes	Alt
4.2-D25	MR-6	Pittsburgh	-100 M	Microcel Tail Material, Run 6	Yes	No	No	Yes	Alt
4.2-D26	MRW-6	Pittsburgh	N/A	Microcel Tail Water, Run 6	Yes	No	No	Yes	Alt
4.2-D27	MCC-7	Pittsburgh	-100 M	Microcel Clean Coal, Run 7	Yes	No	No	Yes	Alt
4.2-D28	MCCW-7	Pittsburgh	N/A	Microcel CC Water, Run 7	Yes	No	No	Yes	Alt
4.2-D29	MR-7	Pittsburgh	-100 M	Microcel Tail Material, Run 7	Yes	No	No	Yes	Alt
4.2-D30	MRW-7	Pittsburgh	N/A	Microcel Tail Water, Run 7	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.2-D31	MCC-8	Pittsburgh	-100 M	Microcel Clean Coal, Run 8	Yes	No	No	Yes	Alt
4.2-D32	MCCW-8	Pittsburgh	N/A	Microcel CC Water, Run 8	Yes	No	No	Yes	Alt
4.2-D33	MR-8	Pittsburgh	-100 M	Microcel Tail Material, Run 8	Yes	No	No	Yes	Alt
4.2-D34	MRW-8	Pittsburgh	N/A	Microcel Tail Water, Run 8	Yes	No	No	Yes	Alt
4.2-D35	MCC-9	Pittsburgh	-100 M	Microcel Clean Coal, Run 9	Yes	No	No	Yes	Alt
4.2-D36	MCCW-9	Pittsburgh	N/A	Microcel CC Water, Run 9	Yes	No	No	Yes	Alt
4.2-D37	MR-9	Pittsburgh	-100 M	Microcel Tail Material, Run 9	Yes	No	No	Yes	Alt
4.2-D38	MRW-9	Pittsburgh	N/A	Microcel Tail Water, Run 9	Yes	No	No	Yes	Alt
4.2-D39	MCC-10	Pittsburgh	-100 M	Microcel Clean Coal, Run 10	Yes	No	No	Yes	Alt
4.2-D40	MCCW-10	Pittsburgh	N/A	Microcel CC Water, Run 10	Yes	No	No	Yes	Alt
4.2-D41	MR-10	Pittsburgh	-100 M	Microcel Tail Material, Run 10	Yes	No	No	Yes	Alt
4.2-D42	MRW-10	Pittsburgh	N/A	Microcel Tail Water, Run 10	Yes	No	No	Yes	Alt
4.2-D43	MCC-11	Pittsburgh	-100 M	Microcel Clean Coal, Run 11	Yes	No	No	Yes	Alt
4.2-D44	MCCW-11	Pittsburgh	N/A	Microcel CC Water, Run 11	Yes	No	No	Yes	Alt
4.2-D45	MR-11	Pittsburgh	-100 M	Microcel Tail Material, Run 11	Yes	No	No	Yes	Alt
4.2-D46	MRW-11	Pittsburgh	N/A	Microcel Tail Water, Run 11	Yes	No	No	Yes	Alt
4.2-D47	MCC-12	Pittsburgh	-100 M	Microcel Clean Coal, Run 12	Yes	No	No	Yes	Alt
4.2-D48	MCCW-12	Pittsburgh	N/A	Microcel CC Water, Run 12	Yes	No	No	Yes	Alt
4.2-D49	MR-12	Pittsburgh	-100 M	Microcel Tail Material, Run 12	Yes	No	No	Yes	Alt
4.2-D50	MRW-12	Pittsburgh	N/A	Microcel Tail Water, Run 12	Yes	No	No	Yes	Alt
4.2-D51	MCC-13	Pittsburgh	-100 M	Microcel Clean Coal, Run 13	Yes	No	No	Yes	Alt
4.2-D52	MCCW-13	Pittsburgh	N/A	Microcel CC Water, Run 13	Yes	No	No	Yes	Alt
4.2-D53	MR-13	Pittsburgh	-100 M	Microcel Tail Material, Run 13	Yes	No	No	Yes	Alt
4.2-D54	MRW-13	Pittsburgh	N/A	Microcel Tail Water, Run 13	Yes	No	No	Yes	Alt
4.2-D55	MCC-14	Pittsburgh	-100 M	Microcel Clean Coal, Run 14	Yes	No	No	Yes	Alt
4.2-D56	MCCW-14	Pittsburgh	N/A	Microcel CC Water, Run 14	Yes	No	No	Yes	Alt
4.2-D57	MR-14	Pittsburgh	-100 M	Microcel Tail Material, Run 14	Yes	No	No	Yes	Alt
4.2-D58	MRW-14	Pittsburgh	N/A	Microcel Tail Water, Run 14	Yes	No	No	Yes	Alt
4.2-D59	MCC-15	Pittsburgh	-100 M	Microcel Clean Coal, Run 15	Yes	No	No	Yes	Alt
4.2-D60	MCCW-15	Pittsburgh	N/A	Microcel CC Water, Run 15	Yes	No	No	Yes	Alt
4.2-D61	MR-15	Pittsburgh	-100 M	Microcel Tail Material, Run 15	Yes	No	No	Yes	Alt
4.2-D62	MRW-15	Pittsburgh	N/A	Microcel Tail Water, Run 15	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.3-A1	28x100 MF	Pittsburgh	28 x 100 M	28 x 100 M MGS Feed	Yes	No	No	Yes	Yes
4.3-A2	28x100 MFW	Pittsburgh	N/A	28 x 100 M MGS Feed Water	Yes	No	No	Yes	Yes
4.3-A3	28x100 MCC-1	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 1	Yes	No	No	Yes	Yes
4.3-A4	28x100 MCCW-1	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 1	Yes	No	No	Yes	Yes
4.3-A5	28x100 MR-1	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 1	Yes	No	No	Yes	Yes
4.3-A6	28x100 MRW-1	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 1	Yes	No	No	Yes	Yes
4.3-A7	28x100 MCC-2	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 2	Yes	No	No	Yes	Alt
4.3-A8	28x100 MCCW-2	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 2	Yes	No	No	Yes	Alt
4.3-A9	28x100 MR-2	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 2	Yes	No	No	Yes	Alt
4.3-A10	28x100 MRW-2	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 2	Yes	No	No	Yes	Alt
4.3-A11	28x100 MCC-3	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 3	Yes	No	No	Yes	Alt
4.3-A12	28x100 MCCW-3	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 3	Yes	No	No	Yes	Alt
4.3-A13	28x100 MR-3	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 3	Yes	No	No	Yes	Alt
4.3-A14	28x100 MRW-3	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 3	Yes	No	No	Yes	Alt
4.3-A15	28x100 MCC-4	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 4	Yes	No	No	Yes	Alt
4.3-A16	28x100 MCCW-4	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 4	Yes	No	No	Yes	Alt
4.3-A17	28x100 MR-4	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 4	Yes	No	No	Yes	Alt
4.3-A18	28x100 MRW-4	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 4	Yes	No	No	Yes	Alt
4.3-A19	28x100 MCC-5	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 5	Yes	No	No	Yes	Alt
4.3-A20	28x100 MCCW-5	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 5	Yes	No	No	Yes	Alt
4.3-A21	28x100 MR-5	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 5	Yes	No	No	Yes	Alt
4.3-A22	28x100 MRW-5	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 5	Yes	No	No	Yes	Alt
4.3-A23	28x100 MCC-6	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 6	Yes	No	No	Yes	Alt
4.3-A24	28x100 MCCW-6	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 6	Yes	No	No	Yes	Alt
4.3-A25	28x100 MR-6	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 6	Yes	No	No	Yes	Alt
4.3-A26	28x100 MRW-6	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 6	Yes	No	No	Yes	Alt
4.3-A27	28x100 MCC-7	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 7	Yes	No	No	Yes	Alt
4.3-A28	28x100 MCCW-7	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 7	Yes	No	No	Yes	Alt
4.3-A29	28x100 MR-7	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 7	Yes	No	No	Yes	Alt
4.3-A30	28x100 MRW-7	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 7	Yes	No	No	Yes	Alt

Sample Information					Prox.	Ultimate	Heat	Sulfur	Trace
Code	Sample Label	Seam	Size	Description	Analysis	Analysis	Value	Forms	Element
4.3-A31	28x100 MCC-8	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 8	Yes	No	No	Yes	Alt
4.3-A32	28x100 MCCW-8	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 8	Yes	No	No	Yes	Alt
4.3-A33	28x100 MR-8	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 8	Yes	No	No	Yes	Alt
4.3-A34	28x100 MRW-8	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 8	Yes	No	No	Yes	Alt
4.3-A35	28x100 MCC-9	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 9	Yes	No	No	Yes	Alt
4.3-A36	28x100 MCCW-9	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 9	Yes	No	No	Yes	Alt
4.3-A37	28x100 MR-9	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 9	Yes	No	No	Yes	Alt
4.3-A38	28x100 MRW-9	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 9	Yes	No	No	Yes	Alt
4.3-A39	28x100 MCC-10	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 10	Yes	No	No	Yes	Alt
4.3-A40	28x100 MCCW-10	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 10	Yes	No	No	Yes	Alt
4.3-A41	28x100 MR-10	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 10	Yes	No	No	Yes	Alt
4.3-A42	28x100 MRW-10	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 10	Yes	No	No	Yes	Alt
4.3-A43	28x100 MCC-11	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 11	Yes	No	No	Yes	Alt
4.3-A44	28x100 MCCW-11	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 11	Yes	No	No	Yes	Alt
4.3-A45	28x100 MR-11	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 11	Yes	No	No	Yes	Alt
4.3-A46	28x100 MRW-11	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 11	Yes	No	No	Yes	Alt
4.3-A47	28x100 MCC-12	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 12	Yes	No	No	Yes	Alt
4.3-A48	28x100 MCCW-12	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 12	Yes	No	No	Yes	Alt
4.3-A49	28x100 MR-12	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 12	Yes	No	No	Yes	Alt
4.3-A50	28x100 MRW-12	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 12	Yes	No	No	Yes	Alt
4.3-A51	28x100 MCC-13	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 13	Yes	No	No	Yes	Alt
4.3-A52	28x100 MCCW-13	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 13	Yes	No	No	Yes	Alt
4.3-A53	28x100 MR-13	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 13	Yes	No	No	Yes	Alt
4.3-A54	28x100 MRW-13	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 13	Yes	No	No	Yes	Alt
4.3-A55	28x100 MCC-14	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 14	Yes	No	No	Yes	Alt
4.3-A56	28x100 MCCW-14	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 14	Yes	No	No	Yes	Alt
4.3-A57	28x100 MR-14	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 14	Yes	No	No	Yes	Alt
4.3-A58	28x100 MRW-14	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 14	Yes	No	No	Yes	Alt
4.3-A59	28x100 MCC-15	Pittsburgh	28 x 100 M	28 x 100 M MGS Clean Coal, Run 15	Yes	No	No	Yes	Alt
4.3-A60	28x100 MCCW-15	Pittsburgh	N/A	28 x 100 M MGS CC Water, Run 15	Yes	No	No	Yes	Alt
4.3-A61	28x100 MR-15	Pittsburgh	28 x 100 M	28 x 100 M MGS Tail, Run 15	Yes	No	No	Yes	Alt
4.3-A62	28x100 MRW-15	Pittsburgh	N/A	28 x 100 M MGS Tail Water, Run 15	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.3-B1	100 MF	Pittsburgh	-100 M	-100 M MGS Feed	Yes	No	No	Yes	Yes
4.3-B2	100 MFW	Pittsburgh	N/A	-100 M MGS Feed Water	Yes	No	No	Yes	Yes
4.3-B3	100 MCC-1	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 1	Yes	No	No	Yes	Yes
4.3-B4	100 MCCW-1	Pittsburgh	N/A	-100 M MGS CC Water, Run 1	Yes	No	No	Yes	Yes
4.3-B5	100 MR-1	Pittsburgh	-100 M	-100 M MGS Tail, Run 1	Yes	No	No	Yes	Yes
4.3-B6	100 MRW-1	Pittsburgh	N/A	-100 M MGS Tail Water, Run 1	Yes	No	No	Yes	Yes
4.3-B7	100 MCC-2	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 2	Yes	No	No	Yes	Alt
4.3-B8	100 MCCW-2	Pittsburgh	N/A	-100 M MGS CC Water, Run 2	Yes	No	No	Yes	Alt
4.3-B9	100 MR-2	Pittsburgh	-100 M	-100 M MGS Tail, Run 2	Yes	No	No	Yes	Alt
4.3-B10	100 MRW-2	Pittsburgh	N/A	-100 M MGS Tail Water, Run 2	Yes	No	No	Yes	Alt
4.3-B11	100 MCC-3	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 3	Yes	No	No	Yes	Alt
4.3-B12	100 MCCW-3	Pittsburgh	N/A	-100 M MGS CC Water, Run 3	Yes	No	No	Yes	Alt
4.3-B13	100 MR-3	Pittsburgh	-100 M	-100 M MGS Tail, Run 3	Yes	No	No	Yes	Alt
4.3-B14	100 MRW-3	Pittsburgh	N/A	-100 M MGS Tail Water, Run 3	Yes	No	No	Yes	Alt
4.3-B15	100 MCC-4	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 4	Yes	No	No	Yes	Alt
4.3-B16	100 MCCW-4	Pittsburgh	N/A	-100 M MGS CC Water, Run 4	Yes	No	No	Yes	Alt
4.3-B17	100 MR-4	Pittsburgh	-100 M	-100 M MGS Tail, Run 4	Yes	No	No	Yes	Alt
4.3-B18	100 MRW-4	Pittsburgh	N/A	-100 M MGS Tail Water, Run 4	Yes	No	No	Yes	Alt
4.3-B19	100 MCC-5	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 5	Yes	No	No	Yes	Alt
4.3-B20	100 MCCW-5	Pittsburgh	N/A	-100 M MGS CC Water, Run 5	Yes	No	No	Yes	Alt
4.3-B21	100 MR-5	Pittsburgh	-100 M	-100 M MGS Tail, Run 5	Yes	No	No	Yes	Alt
4.3-B22	100 MRW-5	Pittsburgh	N/A	-100 M MGS Tail Water, Run 5	Yes	No	No	Yes	Alt
4.3-B23	100 MCC-6	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 6	Yes	No	No	Yes	Alt
4.3-B24	100 MCCW-6	Pittsburgh	N/A	-100 M MGS CC Water, Run 6	Yes	No	No	Yes	Alt
4.3-B25	100 MR-6	Pittsburgh	-100 M	-100 M MGS Tail, Run 6	Yes	No	No	Yes	Alt
4.3-B26	100 MRW-6	Pittsburgh	N/A	-100 M MGS Tail Water, Run 6	Yes	No	No	Yes	Alt
4.3-B27	100 MCC-7	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 7	Yes	No	No	Yes	Alt
4.3-B28	100 MCCW-7	Pittsburgh	N/A	-100 M MGS CC Water, Run 7	Yes	No	No	Yes	Alt
4.3-B29	100 MR-7	Pittsburgh	-100 M	-100 M MGS Tail, Run 7	Yes	No	No	Yes	Alt
4.3-B30	100 MRW-7	Pittsburgh	N/A	-100 M MGS Tail Water, Run 7	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.3-B31	100 MCC-8	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 8	Yes	No	No	Yes	Alt
4.3-B32	100 MCCW-8	Pittsburgh	N/A	-100 M MGS CC Water, Run 8	Yes	No	No	Yes	Alt
4.3-B33	100 MR-8	Pittsburgh	-100 M	-100 M MGS Tail, Run 8	Yes	No	No	Yes	Alt
4.3-B34	100 MRW-8	Pittsburgh	N/A	-100 M MGS Tail Water, Run 8	Yes	No	No	Yes	Alt
4.3-B35	100 MCC-9	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 9	Yes	No	No	Yes	Alt
4.3-B36	100 MCCW-9	Pittsburgh	N/A	-100 M MGS CC Water, Run 9	Yes	No	No	Yes	Alt
4.3-B37	100 MR-9	Pittsburgh	-100 M	-100 M MGS Tail, Run 9	Yes	No	No	Yes	Alt
4.3-B38	100 MRW-9	Pittsburgh	N/A	-100 M MGS Tail Water, Run 9	Yes	No	No	Yes	Alt
4.3-B39	100 MCC-10	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 10	Yes	No	No	Yes	Alt
4.3-B40	100 MCCW-10	Pittsburgh	N/A	-100 M MGS CC Water, Run 10	Yes	No	No	Yes	Alt
4.3-B41	100 MR-10	Pittsburgh	-100 M	-100 M MGS Tail, Run 10	Yes	No	No	Yes	Alt
4.3-B42	100 MRW-10	Pittsburgh	N/A	-100 M MGS Tail Water, Run 10	Yes	No	No	Yes	Alt
4.3-B43	100 MCC-11	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 11	Yes	No	No	Yes	Alt
4.3-B44	100 MCCW-11	Pittsburgh	N/A	-100 M MGS CC Water, Run 11	Yes	No	No	Yes	Alt
4.3-B45	100 MR-11	Pittsburgh	-100 M	-100 M MGS Tail, Run 11	Yes	No	No	Yes	Alt
4.3-B46	100 MRW-11	Pittsburgh	N/A	-100 M MGS Tail Water, Run 11	Yes	No	No	Yes	Alt
4.3-B47	100 MCC-12	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 12	Yes	No	No	Yes	Alt
4.3-B48	100 MCCW-12	Pittsburgh	N/A	-100 M MGS CC Water, Run 12	Yes	No	No	Yes	Alt
4.3-B49	100 MR-12	Pittsburgh	-100 M	-100 M MGS Tail, Run 12	Yes	No	No	Yes	Alt
4.3-B50	100 MRW-12	Pittsburgh	N/A	-100 M MGS Tail Water, Run 12	Yes	No	No	Yes	Alt
4.3-B51	100 MCC-13	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 13	Yes	No	No	Yes	Alt
4.3-B52	100 MCCW-13	Pittsburgh	N/A	-100 M MGS CC Water, Run 13	Yes	No	No	Yes	Alt
4.3-B53	100 MR-13	Pittsburgh	-100 M	-100 M MGS Tail, Run 13	Yes	No	No	Yes	Alt
4.3-B54	100 MRW-13	Pittsburgh	N/A	-100 M MGS Tail Water, Run 13	Yes	No	No	Yes	Alt
4.3-B55	100 MCC-14	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 14	Yes	No	No	Yes	Alt
4.3-B56	100 MCCW-14	Pittsburgh	N/A	-100 M MGS CC Water, Run 14	Yes	No	No	Yes	Alt
4.3-B57	100 MR-14	Pittsburgh	-100 M	-100 M MGS Tail, Run 14	Yes	No	No	Yes	Alt
4.3-B58	100 MRW-14	Pittsburgh	N/A	-100 M MGS Tail Water, Run 14	Yes	No	No	Yes	Alt
4.3-B59	100 MCC-15	Pittsburgh	-100 M	-100 M MGS Clean Coal, Run 15	Yes	No	No	Yes	Alt
4.3-B60	100 MCCW-15	Pittsburgh	N/A	-100 M MGS CC Water, Run 15	Yes	No	No	Yes	Alt
4.3-B61	100 MR-15	Pittsburgh	-100 M	-100 M MGS Tail, Run 15	Yes	No	No	Yes	Alt
4.3-B62	100 MRW-15	Pittsburgh	N/A	-100 M MGS Tail Water, Run 15	Yes	No	No	Yes	Alt

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
4.3-C1	N/A	Pittsburgh	28 x 100 M	28 x 100 M Falcon Feed	Yes	No	No	Yes	Yes
4.3-C2	N/A	Pittsburgh	N/A	28 x 100 M Falcon Feed Water	Yes	No	No	Yes	Yes
4.3-C3	N/A	Pittsburgh	28 x 100 M	28 x 100 M Falcon Clean Coal	Yes	No	No	Yes	Yes
4.3-C4	N/A	Pittsburgh	N/A	28 x 100 M Falcon CC Water	Yes	No	No	Yes	Yes
4.3-C5	N/A	Pittsburgh	28 x 100 M	28 x 100 M Falcon Tail	Yes	No	No	Yes	Yes
4.3-C6	N/A	Pittsburgh	N/A	28 x 100 M Falcon Tail Water	Yes	No	No	Yes	Yes
4.3-D1	N/A	Pittsburgh	-100 M	-100 M Falcon Feed	Yes	No	No	Yes	Yes
4.3-D2	N/A	Pittsburgh	N/A	-100 M Falcon Feed Water	Yes	No	No	Yes	Yes
4.3-D3	N/A	Pittsburgh	-100 M	-100 M Falcon Clean Coal	Yes	No	No	Yes	Yes
4.3-D4	N/A	Pittsburgh	N/A	-100 M Falcon CC Water	Yes	No	No	Yes	Yes
4.3-D5	N/A	Pittsburgh	-100 M	-100 M Falcon Tail	Yes	No	No	Yes	Yes
4.3-D6	N/A	Pittsburgh	N/A	-100 M Falcon Tail Water	Yes	No	No	Yes	Yes
4.4-1		Pittsburgh		Optimum Circuit Sample #1	Yes	No	No	Yes	Yes
4.4-2		Pittsburgh		Optimum Circuit Sample #2	Yes	No	No	Yes	Yes
4.4-3		Pittsburgh		Optimum Circuit Sample #3	Yes	No	No	Yes	Yes
4.4-4		Pittsburgh		Optimum Circuit Sample #4	Yes	No	No	Yes	Yes
4.4-5		Pittsburgh		Optimum Circuit Sample #5	Yes	No	No	Yes	Yes
4.4-6		Pittsburgh		Optimum Circuit Sample #6	Yes	No	No	Yes	Yes
4.4-7		Pittsburgh		Optimum Circuit Sample #7	Yes	No	No	Yes	Yes
4.4-8		Pittsburgh		Optimum Circuit Sample #8	Yes	No	No	Yes	Yes
4.4-9		Pittsburgh		Optimum Circuit Sample #9	Yes	No	No	Yes	Yes
5.2-1		Pittsburgh		Column Chelate, low pH	Yes	No	No	Yes	Yes
5.2-2		Pittsburgh		Column Chelate, mid pH	Yes	No	No	Yes	Yes
5.2-3		Pittsburgh		Column Chelate, high pH	Yes	No	No	Yes	Yes
5.2-4		Pittsburgh		Enhanced Gravity Chelate, low pH	Yes	No	No	Yes	Yes
5.2-5		Pittsburgh		Enhanced Gravity Chelate, mid pH	Yes	No	No	Yes	Yes
5.2-6		Pittsburgh		Enhanced Gravity Chelate, high pH	Yes	No	No	Yes	Yes
5.2-7		Pittsburgh		Combined Chelate, low pH	Yes	No	No	Yes	Yes
5.2-8		Pittsburgh		Combined Chelate, mid pH	Yes	No	No	Yes	Yes
5.2-9		Pittsburgh		Combined Chelate, high pH	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
6.1-1	LTHS	Pittsburgh	N/A	Leech Run Water, Head Sample	Yes	No	No	Yes	Yes
6.1-2	LTW-1	Pittsburgh	N/A	Leech Run Water, Week 1	Yes	No	No	Yes	Yes
6.1-3	LTW-2	Pittsburgh	N/A	Leech Run Water, Week 2	Yes	No	No	Yes	Yes
6.1-4	LTW-3	Pittsburgh	N/A	Leech Run Water, Week 3	Yes	No	No	Yes	Yes
6.1-5	LTW-4	Pittsburgh	N/A	Leech Run Water, Week 4	Yes	No	No	Yes	Yes
6.1-6	LTW-5	Pittsburgh	N/A	Leech Run Water, Week 5	Yes	No	No	Yes	Yes
6.1-7	LTW-6	Pittsburgh	N/A	Leech Run Water, Week 6	Yes	No	No	Yes	Yes
6.1-8	LTW-7	Pittsburgh	N/A	Leech Run Water, Week 7	Yes	No	No	Yes	Yes
6.1-9	LTW-8	Pittsburgh	N/A	Leech Run Water, Week 8	Yes	No	No	Yes	Yes
6.1-10	LTW-9	Pittsburgh	N/A	Leech Run Water, Week 9	Yes	No	No	Yes	Yes
6.1-11	LTW-10	Pittsburgh	N/A	Leech Run Water, Week 10	Yes	No	No	Yes	Yes
6.1-12	LTW-11	Pittsburgh	N/A	Leech Run Water, Week 11	Yes	No	No	Yes	Yes
6.1-13	LTW-12	Pittsburgh	N/A	Leech Run Water, Week 12	Yes	No	No	Yes	Yes
6.1-14	LTW-13	Pittsburgh	N/A	Leech Run Water, Week 13	Yes	No	No	Yes	Yes
6.1-15	LTW-14	Pittsburgh	N/A	Leech Run Water, Week 14	Yes	No	No	Yes	Yes
6.1-16	LTW-15	Pittsburgh	N/A	Leech Run Water, Week 15	Yes	No	No	Yes	Yes
6.2-1	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Control Day 0	Yes	No	No	Yes	Yes
6.2-2	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Control Day 7	Yes	No	No	Yes	Yes
6.2-3	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 1 Day 0	Yes	No	No	Yes	Yes
6.2-4	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 1 Day 7	Yes	No	No	Yes	Yes
6.2-5	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 2, Day 0	Yes	No	No	Yes	Yes
6.2-6	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 2, Day 1	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
6.1-1	LTHS	Pittsburgh	N/A	Leech Run Water, Head Sample	Yes	No	No	Yes	Yes
6.1-2	LTW-1	Pittsburgh	N/A	Leech Run Water, Week 1	Yes	No	No	Yes	Yes
6.1-3	LTW-2	Pittsburgh	N/A	Leech Run Water, Week 2	Yes	No	No	Yes	Yes
6.1-4	LTW-3	Pittsburgh	N/A	Leech Run Water, Week 3	Yes	No	No	Yes	Yes
6.1-5	LTW-4	Pittsburgh	N/A	Leech Run Water, Week 4	Yes	No	No	Yes	Yes
6.1-6	LTW-5	Pittsburgh	N/A	Leech Run Water, Week 5	Yes	No	No	Yes	Yes
6.1-7	LTW-6	Pittsburgh	N/A	Leech Run Water, Week 6	Yes	No	No	Yes	Yes
6.1-8	LTW-7	Pittsburgh	N/A	Leech Run Water, Week 7	Yes	No	No	Yes	Yes
6.1-9	LTW-8	Pittsburgh	N/A	Leech Run Water, Week 8	Yes	No	No	Yes	Yes
6.1-10	LTW-9	Pittsburgh	N/A	Leech Run Water, Week 9	Yes	No	No	Yes	Yes
6.1-11	LTW-10	Pittsburgh	N/A	Leech Run Water, Week 10	Yes	No	No	Yes	Yes
6.1-12	LTW-11	Pittsburgh	N/A	Leech Run Water, Week 11	Yes	No	No	Yes	Yes
6.1-13	LTW-12	Pittsburgh	N/A	Leech Run Water, Week 12	Yes	No	No	Yes	Yes
6.1-14	LTW-13	Pittsburgh	N/A	Leech Run Water, Week 13	Yes	No	No	Yes	Yes
6.1-15	LTW-14	Pittsburgh	N/A	Leech Run Water, Week 14	Yes	No	No	Yes	Yes
6.1-16	LTW-15	Pittsburgh	N/A	Leech Run Water, Week 15	Yes	No	No	Yes	Yes
6.2-1	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Control Day 0	Yes	No	No	Yes	Yes
6.2-2	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Control Day 7	Yes	No	No	Yes	Yes
6.2-3	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 1 Day 0	Yes	No	No	Yes	Yes
6.2-4	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 1 Day 7	Yes	No	No	Yes	Yes
6.2-5	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 2, Day 0	Yes	No	No	Yes	Yes
6.2-6	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 2, Day 1	Yes	No	No	Yes	Yes

Sample Information					Prox. Analysis	Ultimate Analysis	Heat Value	Sulfur Forms	Trace Element
Code	Sample Label	Seam	Size	Description					
6.1-1	LTHS	Pittsburgh	N/A	Leech Run Water, Head Sample	Yes	No	No	Yes	Yes
6.1-2	LTW-1	Pittsburgh	N/A	Leech Run Water, Week 1	Yes	No	No	Yes	Yes
6.1-3	LTW-2	Pittsburgh	N/A	Leech Run Water, Week 2	Yes	No	No	Yes	Yes
6.1-4	LTW-3	Pittsburgh	N/A	Leech Run Water, Week 3	Yes	No	No	Yes	Yes
6.1-5	LTW-4	Pittsburgh	N/A	Leech Run Water, Week 4	Yes	No	No	Yes	Yes
6.1-6	LTW-5	Pittsburgh	N/A	Leech Run Water, Week 5	Yes	No	No	Yes	Yes
6.1-7	LTW-6	Pittsburgh	N/A	Leech Run Water, Week 6	Yes	No	No	Yes	Yes
6.1-8	LTW-7	Pittsburgh	N/A	Leech Run Water, Week 7	Yes	No	No	Yes	Yes
6.1-9	LTW-8	Pittsburgh	N/A	Leech Run Water, Week 8	Yes	No	No	Yes	Yes
6.1-10	LTW-9	Pittsburgh	N/A	Leech Run Water, Week 9	Yes	No	No	Yes	Yes
6.1-11	LTW-10	Pittsburgh	N/A	Leech Run Water, Week 10	Yes	No	No	Yes	Yes
6.1-12	LTW-11	Pittsburgh	N/A	Leech Run Water, Week 11	Yes	No	No	Yes	Yes
6.1-13	LTW-12	Pittsburgh	N/A	Leech Run Water, Week 12	Yes	No	No	Yes	Yes
6.1-14	LTW-13	Pittsburgh	N/A	Leech Run Water, Week 13	Yes	No	No	Yes	Yes
6.1-15	LTW-14	Pittsburgh	N/A	Leech Run Water, Week 14	Yes	No	No	Yes	Yes
6.1-16	LTW-15	Pittsburgh	N/A	Leech Run Water, Week 15	Yes	No	No	Yes	Yes
6.2-1	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Control Day 0	Yes	No	No	Yes	Yes
6.2-2	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Control Day 7	Yes	No	No	Yes	Yes
6.2-3	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 1 Day 0	Yes	No	No	Yes	Yes
6.2-4	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 1 Day 7	Yes	No	No	Yes	Yes
6.2-5	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 2, Day 0	Yes	No	No	Yes	Yes
6.2-6	N/A	Pittsburgh	N/A	MAT Coarse Refuse, Series 2, Day 1	Yes	No	No	Yes	Yes