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December 19, 2014

Warren McCullough, Bureau Chief
Environmental Management Bureau
Montana Department of Environmental Quality
1520 East Sixth Avenue
P.O. Box 200901
Helena, MT 59620

RE: Notice of Major Facility Siting Act Certificate Amendment for Colstrip Units 3 and 4 Consumption of Rosebud Mine Coal

Dear Mr. McCullough:

Enclosed is a notice of amendment of Colstrip Units 3 and 4's Major Facility Siting Act certificate related to the consumption by Units 3 and 4 of Rosebud Mine coal from Areas A, B, F and G of the mine. This notice is provided pursuant to Mont. Code Ann. § 75-20-213. Also included is an evaluation of potential impacts from the units' consumption of Rosebud Mine coal from Areas A, B, F and G.

With this submission, we request an amendment to Colstrip Unit 3 and 4's Major Facility Siting Act certificate pursuant to Mont. Code Ann. § 75-20-219(2). As addressed in detail in the attached document, the changes attendant to the amendment would not result in a material increase in any environmental impact and would not be a substantial change in the location of any portion of the facility. With this in mind, we request MDEQ automatically grant this amendment request as contemplated in Section 75-20-219(2).

Please contact me if you have any questions or need further information.

Sincerely,

A handwritten signature in cursive script that reads "Gordon Criswell".

Gordon Criswell
Director, Compliance

GDC/gdc
Enclosure

CC: – Craig Jones, Ed Warner - DEQ

**A description and assessment of impacts of the
consumption by Colstrip Units 3 & 4 of Rosebud Seam coal
from the Rosebud Mine Areas A, B, F and G**

Prepared For:

Montana Department of Environmental Quality

Prepared By:

PPL Montana

C/O Gordon Criswell, PE
Colstrip Steam Electric Station
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1.0 Introduction

The Colstrip Steam Electric Station (CSES) consists of four units: Units 1 and 2 are 333 MW each (gross) and Units 3 and 4 that are 805 MW each (gross). The units combust locally mined sub-bituminous Powder River Basin coal. Construction on Units 1 and 2 began in 1972, with Unit 1 starting commercial operation in 1975 and Unit 2 starting commercial operation in 1976. Units 3 and 4 were constructed later; Unit 3 began commercial operation in 1984 and Unit 4 began commercial operation in 1986. Units 3 and 4 were sited and constructed pursuant to a certificate issued under the Major Facility Siting Act (MFSA), Mont. Code Ann. § 75-20, et seq. (“Certificate”). That Certificate governs Units 3 and 4 and their associated facilities. PPL Montana (PPLM) has operated the CSES since December 17, 1999.

Units 3 and 4 currently burn coal from Area C of the Rosebud Mine. Future fuel supply is planned from Areas F and G and potentially from Areas A and B¹ of the Rosebud Mine. This certificate notice addresses the fact that “Areas C, D, and E” were referenced in the Certificate as supplying Rosebud coal for Units 3 and 4. Even though there is no evidence in the MFSA record to indicate that the reference to “Areas C, D, and E” was for any purpose other than a description of the existing Rosebud Mine areas at the time the MFSA Certificate was issued, this Certificate amendment is requested to modify the identification of the mine areas supplying fuel to Units 3 and 4.

2.0 Legal Standard

Under ARM 17.20.1801, a notice for a certificate amendment must be filed if “a certificate holder desires to change or add to a facility for which a certificate has been granted[.]” Changes or additions subject to this section include:

- (1) any change in location or design or any addition to a facility or an associated facility that could reasonably be expected to result in a material increase in any environmental impact;
- (2) any change in location or design or any addition to a facility or an associated facility that could reasonably be expected to result in impacts to new geographic areas or human, animal or plant populations that were not evaluated prior to the issuance of the certificate;
- (3) any change in or addition to a facility or an associated facility affecting compliance with a condition of the certificate; and
- (4) any change in or addition to a facility or associated facility that would materially change the basis of any finding required by subchapter 16.

As addressed in detail below, the only potential criterion above that could be triggered by the move to fuel supply from Areas A, B, F and G is subsection (3). Because of this potential trigger, and out of an abundance of caution, PPLM is providing this amendment notice.

¹ Areas A and B currently provide the coal supply to Colstrip Units 1&2

“In order for the department to determine that an amendment to a certificate should be granted or modified, the department must find and determine that the amendment will not materially alter the findings required by Sub-Chapter 16 that were the basis for granting the certificate.” ARM 17.20.1804. Further, “[w]ithin 30 days after notice of an amendment to a certificate is given as set forth in 75-20-213, including notice to all active parties to the original proceeding, the department shall determine whether the proposed change in the facility would result in a material increase in any environmental impact of the facility or a substantial change in the location of all or a portion of the facility as set forth in the certificate.” Mont. Code Ann. § 75-20-219(1). “In those cases in which the department determines that the proposed change in the facility would not result in a material increase in any environmental impact or would not be a substantial change in the location of all or a portion of the facility, the department shall automatically grant the amendment either as applied for or upon terms or conditions that the department considers appropriate.” Mont. Code Ann. § 75-20-219(2).

Here, the proposed amendment will not (1) materially alter the findings that were the basis for the Units 3 and 4 MFSA certificate; (2) result in a material increase in any environmental impact of the facility; or (3) result in a substantial change in the location of all or a portion of the facility. For those reasons, PPLM requests that MDEQ automatically grant the amendment in accordance with Section 75-20-219(2).

3.0 Project Description

Before the Units 3 and 4 MFSA certificate was issued, extensive hearings and written submissions addressed many public and agency concerns about the construction and operation of Units 3 and 4. Much of the discussion was focused on air quality issues and related coal quality requirements. As addressed in Colstrip’s MFSA certificate, “the composition of the coal was considered to estimate the quantities of ash and sulfur dioxide that would enter the boiler, leave the boiler, and enter any pollution control equipment.” *Exhibit A to the Units 3 and 4 Major Facility Siting Certificate*, ¶ XVI.

Because of these air quality concerns, sulfur content in the coal burned in Units 3 and 4 is limited in this original certificate to not exceed 1% inlet sulfur content. *Id.*, p. 22. Coal burned in Units 3 and 4 is also specifically limited to coal from the Rosebud seam. Finding of Fact No. 15 from the Board of Natural Resources and Conservation and the Board of Health and Environmental Sciences, issued on November 21, 1975 (adopted in the Board of Natural Resources and Conservation’s Findings of Fact, Opinion, Decision, Order, and Recommendations, which was issued on July 22, 1976, as the “MFSA Certificate”) states:

“The fuel to be used in Units #3 and #4 will be Rosebud seam coal from the Colstrip area. (Berube 7-902). It will be mined from areas designated C, D and E, shown on Exhibits 52, 53, 140 and 141. (Berube 8-1027-1029; Rice 28-3635-3636, 3640-3641). Exhibit A to the Units 3 and 4 Major Facility Siting Certificate, ¶ XV. “

There is no evidence in the MFSA record to indicate that the reference to “Areas C, D, and E” was for any purpose other than a description of the existing and planned Rosebud mine areas at the time the MFSA Certificate was issued in 1976. The 1% sulfur and the Rosebud seam requirements have, however, been carried over into Colstrip’s Title V permit:

“In accordance with the conditional certification of Colstrip Units #3 and #4 made pursuant to Section 70-810 (L), Revised Code of Montana (R.C.M) 1947 of the Major Facility Siting Act (MFSA), PPLM shall utilize only coal from the Rosebud seam within Units #3 and #4 (Board of Health and Environmental Sciences (BHES)

Findings of Fact and Conclusions of Law signed on November 21, 1975; this requirement is "State-Only")."

Colstrip Title V Operating Permit #OP0513-09, § A.15.

Western Energy Company (WECO) owns and operates the Rosebud Mine, which is the coal supplier located adjacent to the CSES. This mine produces Rosebud seam coal and has supplied this coal to Colstrip Units 3 and 4 since they began commercial operations in 1984 and 1986, respectively. In this time, Areas D and E of the Rosebud Mine have been completely mined out and are in the process of being reclaimed. The current fuel supply for Units 3 and 4 is derived from Area C of the Rosebud Mine. WECO is currently in the process of permitting what it refers to as "Area F" of the Rosebud mine. Once this permitting process is complete, Units 3 and 4 contemplate using coal from this and potentially other areas of the Rosebud mine that may be permitted for production in the future, as well as coal from Areas A and B, which is currently burned at Colstrip Units 1 and 2. As discussed in detail below, the use of coal from these areas of the Rosebud mine will have no impact on Colstrip emissions. The current, stringent coal quality requirements will remain in place, and the coal in any new or existing areas of the Rosebud mine is the same quality or better for emissions control related purposes to that currently fueling Units 3 and 4.

A comparison of coal constituents is in Exhibit 3 attached to this document. This comparison shows the coal quality estimates for Areas A - F, and G. As depicted in this attachment, the coal quality of Areas A, B, F and G is the same or better for emissions purposes to that of Areas C, D, and E.

With this amendment notice, PPLM requests the following change in Paragraph XV of Exhibit A to the Units 3 and 4 Major Facility Siting Certificate (proposed additional wording underlined):

"XV

The fuel to be used in Units #3 and #4 will be Rosebud seam coal from the Colstrip area. (Berube 7-902). It will be mined from areas designated C, D and E, shown on Exhibits 52, 53, 140 and 141. (Berube 8-1027-1029; Rice 2§-3635-3636, 3640-3641). Based upon Certificate amendment in 2014, Units 3&4 are also allowed to utilize Rosebud seam coal mined from areas A, B, F, and G, such coal having been shown to be of substantially the same or better quality for emissions control related purposes. (xx xx, 2014 Amendment changing description of source areas)"

3.1 Pollution control installed at each of Colstrip Units 3 and 4²

In addition to the inlet sulfur requirement, which addresses the amount of sulfur dioxide generated by the Colstrip power generating process, Colstrip is also equipped with extensive pollution control equipment that controls emissions leaving the plant. A summary of Units 3 and 4's emissions limits are attached hereto as Exhibit 1. Obviously, PPLM is required to continue

² The pollution control described in this section is what is currently installed on Colstrip Units 3 and 4. It is here for descriptive purposes to illustrate the high capability of the Units 3 and 4 pollution control systems. From time to time, as technology changes, Colstrip Units 3 and 4 may change specific technologies in order to meet new regulations, take advantage of efficiencies of new technology, address balance of plant impacts, or for other reasons. Any change in pollution control technology will receive the proper regulatory review and all necessary permits or permit amendments will be obtained. Any new technology will be thoroughly evaluated and tested before implementation, and compliance with all applicable standards will be maintained.

to comply with these limits and any additional forthcoming ones, regardless of Units 3 and 4's fuel supply source.

Nitrogen Oxides ("NOx"): Advanced fuel and air nozzle and damper design, as well as advanced overfire air, coupled with sophisticated boiler tuning and digital control [Alstom LNCFS Level III SOFA System] enable these units to control NOx to comply with Unit 3 and 4's 0.18 lb/mmbtu limit.

Sulfur Dioxide ("SO2") and Particulate Matter ("PM"): The scrubber systems are designed to remove fly ash particulate and sulfur dioxide gases. The scrubbers—a wet venturi plumb bob type, designed and built by Bechtel Power Corporation—use high energy mixing of lime slurry and the combustion gases to achieve design control rates from Rosebud Seam coal of 99.5% for PM and 95% for SO2.

Mercury: Units 3 and 4 also use the scrubbers in conjunction with a mercury oxidizer and sorbent system [Alstom Mer-Cure/KNX system] to control mercury. These systems are designed to meet the current Montana standard (0.9 lb/TBtu), equivalent to approximately 90% mercury control.

The high capability of these pollution control devices at Units 3 and 4 exceeds performance required by all air standards and can be further examined by review of emission reports submitted to MDEQ's Air Resources Bureau.

3.2 Emissions control for Rosebud seam coal mined from Areas A, B, F and G

The pollution control systems installed on Colstrip Units 3 and 4 have been specifically designed to provide their high performance while consuming Rosebud seam coal. As demonstrated in Exhibit 3 to this notice, coal from Areas A, B, F and G of the Rosebud Mine has, for emissions control related purposes, the same or better chemical characteristics as Area C, D and E coal. This is no surprise, as the coal is from the same Rosebud Seam, and is mined from adjacent sections of the Rosebud Mine. Because all these areas contain coal of essentially the same chemical characteristics, use of Area A, B, F and G coal will result in the same or better performance from the pollution control equipment at Colstrip Units 3 and 4, and combustion of the coal will result in flue gas with the same characteristics or better for emissions purposes as flue gas from Area C coal.

3.3 Coal Quality Comparison Summary

This section contains a summary of Exhibit 3, which compares coals from Areas A, B, C, D, E, F, and G to determine if those from Areas A, B, F, and G (proposed coals) are significantly different from those of Areas C, D, and E (original certificate coals) in terms of potential air emissions or ground and surface water impacts. For this comparison, representative results for thirty parameters, typical for characterization of coal, were reviewed including major components, trace oxides and trace elements.

Figure 1 summarizes the comparison of the major components in graphical format. In the original certificate proceedings, combined coal characteristics were reported for Areas C, D, and E. Coal from Areas A and B is consumed in a combined fashion; Areas F and G may also be consumed in this fashion in the future. Consequently the charts refer to composites of these Areas as "CDE", "AB", and "FG".

The charts in Figure 1 show that the coals are essentially of the same quality with % ash being slightly lower in the proposed coals compared to the original certificate coals and the % fixed

carbon being slightly higher in the proposed coals compared to the original certificate coals. Although the scale of the charts is insufficient to show it, sulfur is from 16% to 35% lower in the proposed coals. Lower ash, sulfur, and higher fixed carbon should result in lower potential emissions.

Figure 2 contains a summary comparison of each of the thirty parameters for the five single and composite areas. The upper range of the original certificate coal parameter is identified with a red line and the lower range is identified with a blue line. The charts in this figure indicate the quality of coal from Areas AB, F, G, and FG are within the range of coal quality that was identified in the original certificate for each parameter from Areas C, D, & E. Three of the trace metal parameters are slightly lower than the original range. These graphs illustrate that the coal quality of the proposed coals is not different than the coal quality identified in the original certificate and that there should be no difference in potential air emissions or ground and surface water impacts from Units 3&4.

The original certificate also identified a range of scrubber design parameters for the Units 3&4 scrubbers. Figure 3 contains a comparison of this range of scrubber design parameters against the same parameters from Areas AB, F, G, and FG. The Figure 3 charts show that the quality of coal from Areas AB, F, G, and FG are within the range of scrubber design parameters identified in the certificate. This indicates that the scrubber performance should be no different with the proposed coals and that there should be no difference in potential air emissions or ground and surface water impacts from Units 3&4.

Based on the information addressed above, and the discussion of certificate conditions in Sections 5 and 6, PPLM believes that an amendment to its Colstrip Units 3 and 4 MFSAs Certificate to burn coal from Areas A, B, F and G of the Rosebud Mine should be automatically granted pursuant to Mont. Code Ann. § 75-20-219(2).

Figure 1 – Summary of Major Coal Quality Components

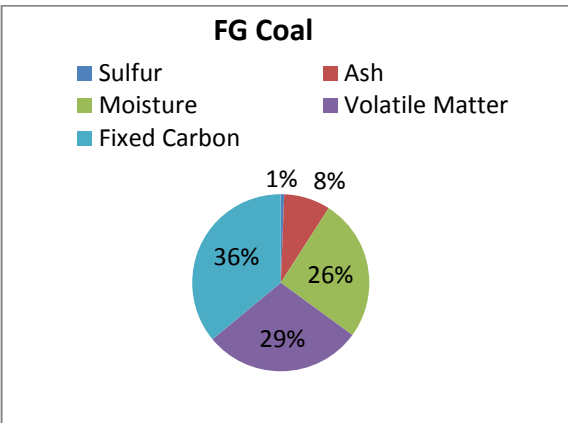
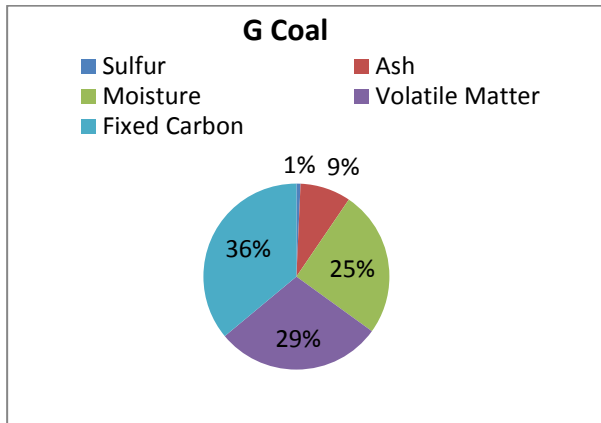
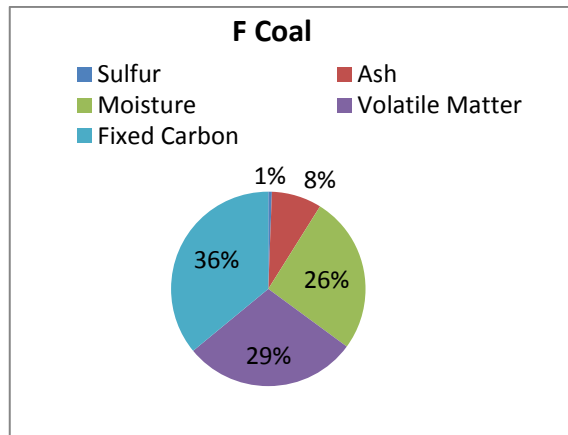
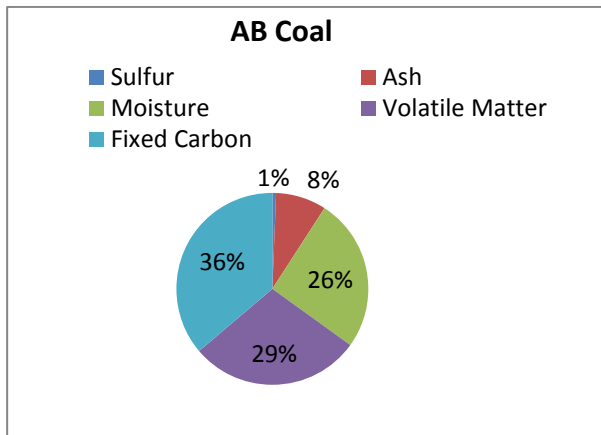
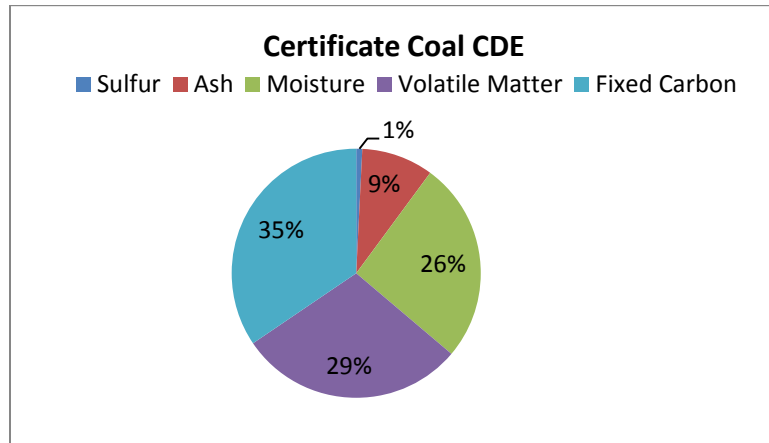


Figure 2 – Comparison of Original and Proposed Coal Quality

Major Parameters

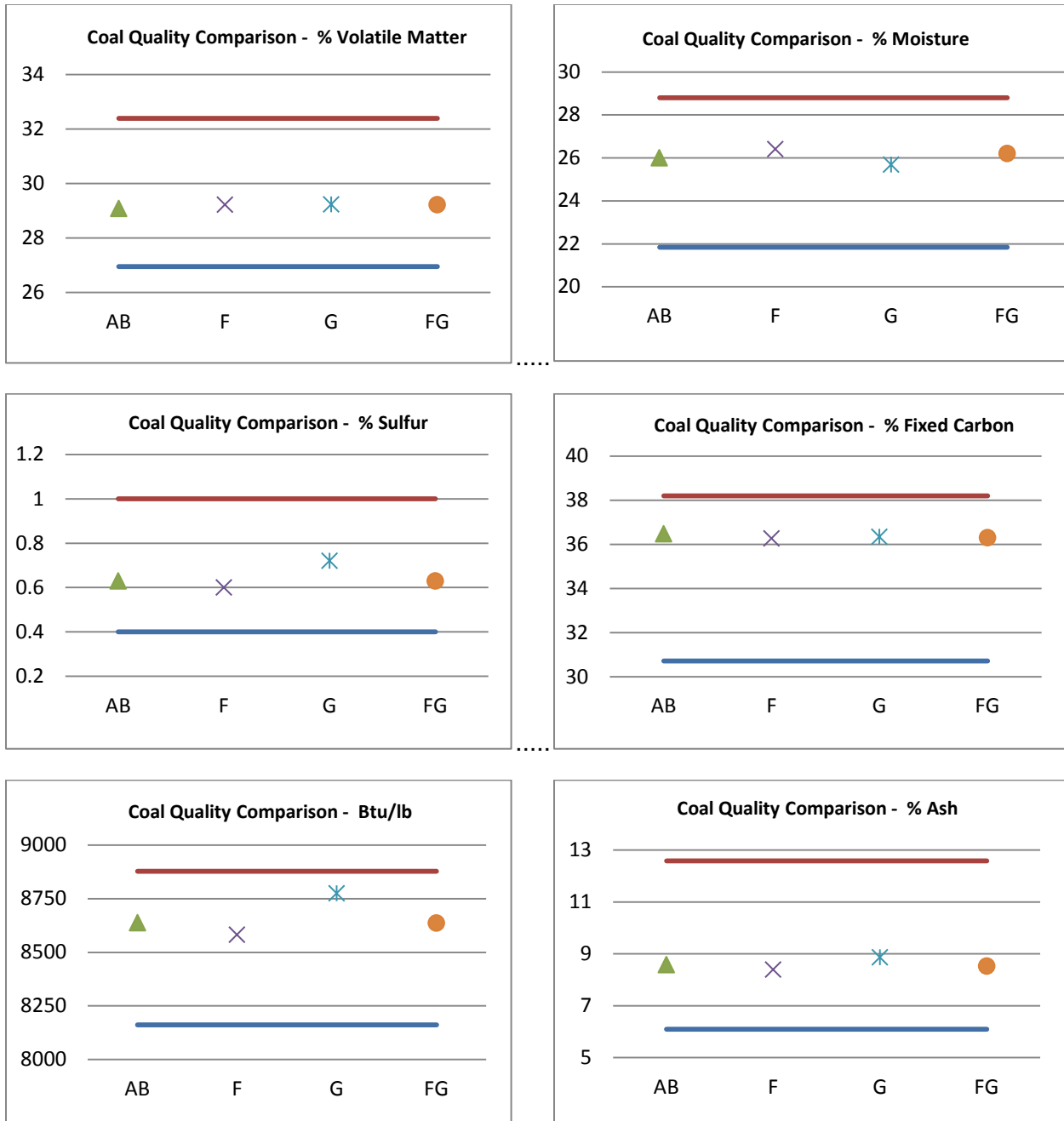


Figure 2 – Continued

Oxide Parameters

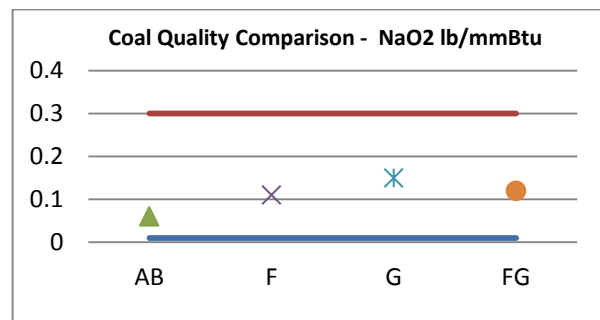
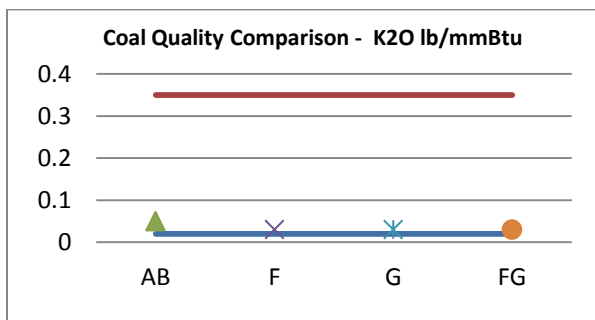
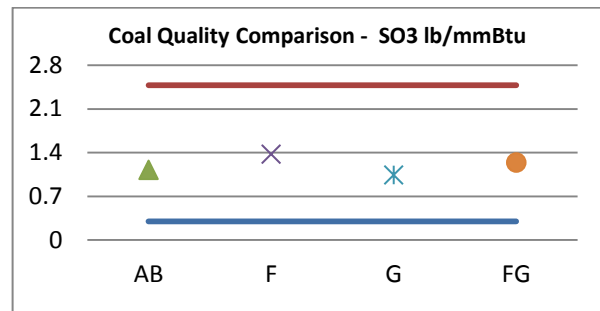
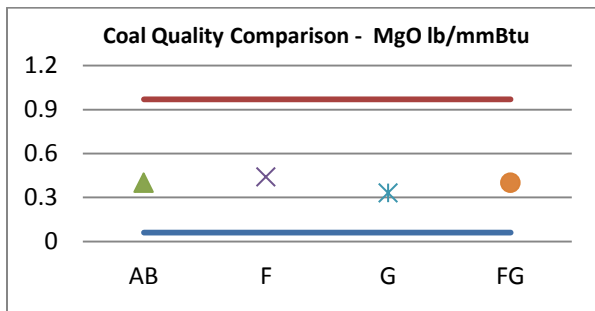
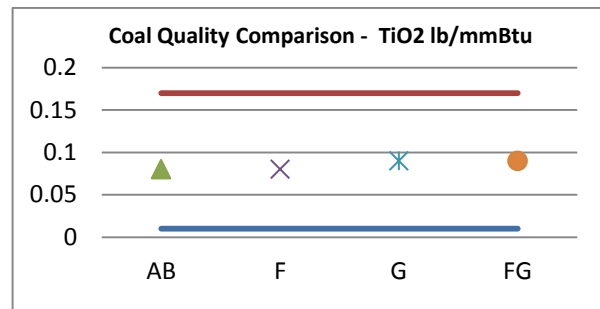
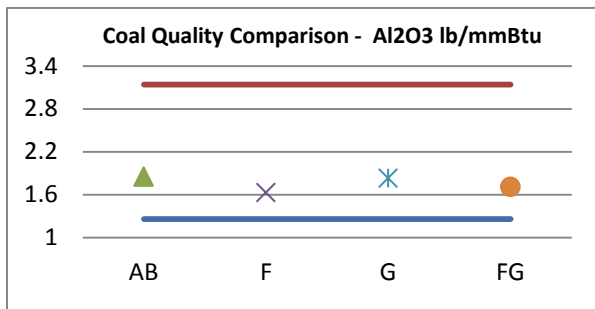
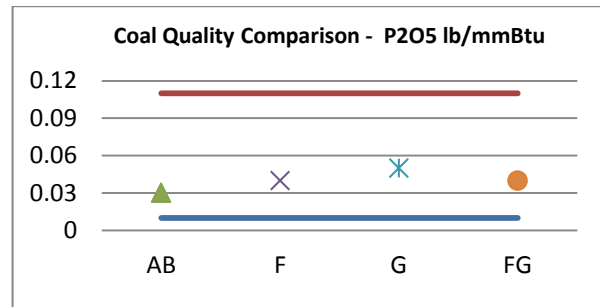
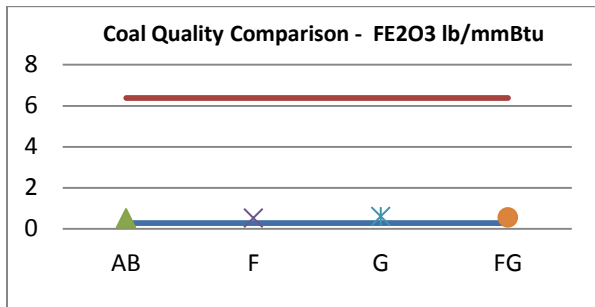
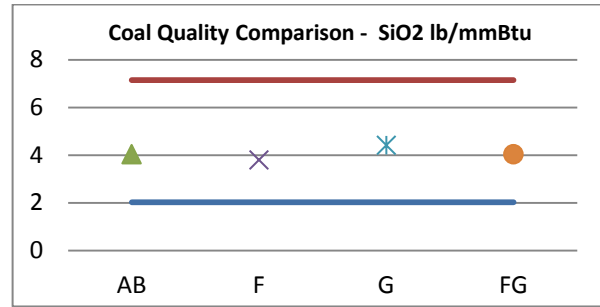
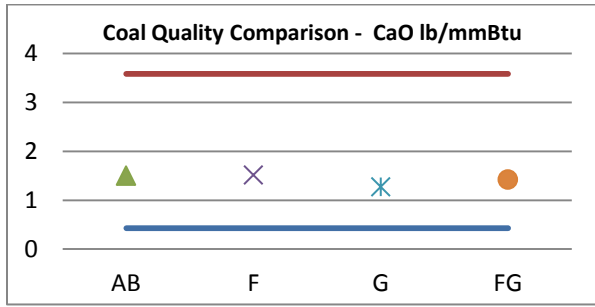


Figure 2 – Continued Trace Metal Parameters

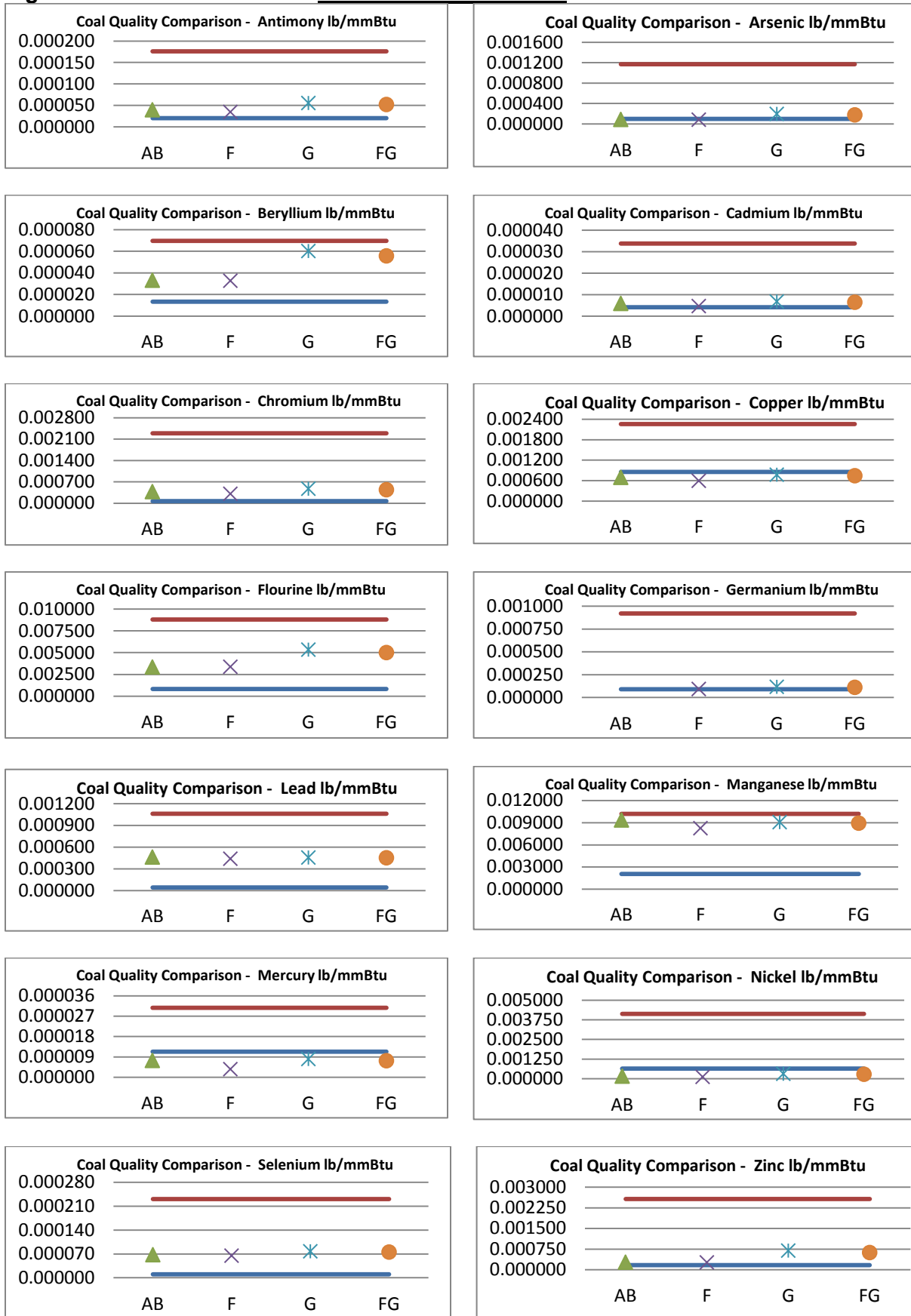
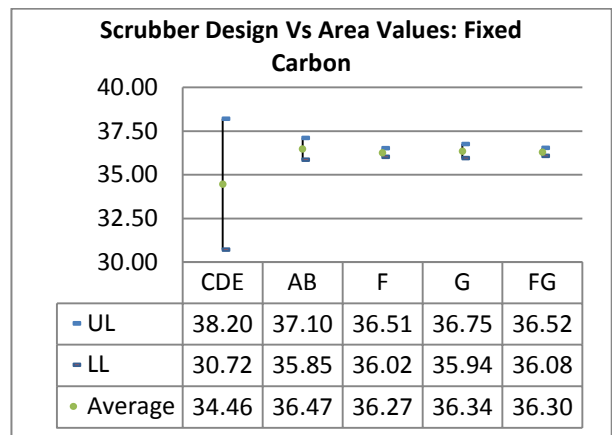
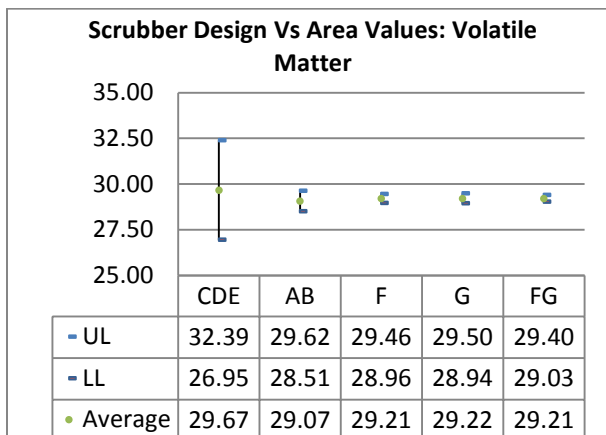
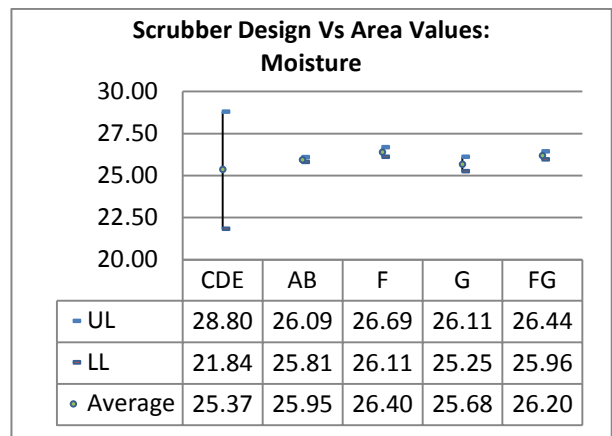
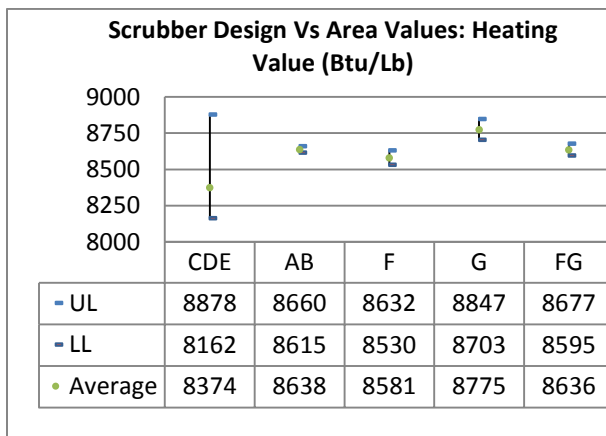
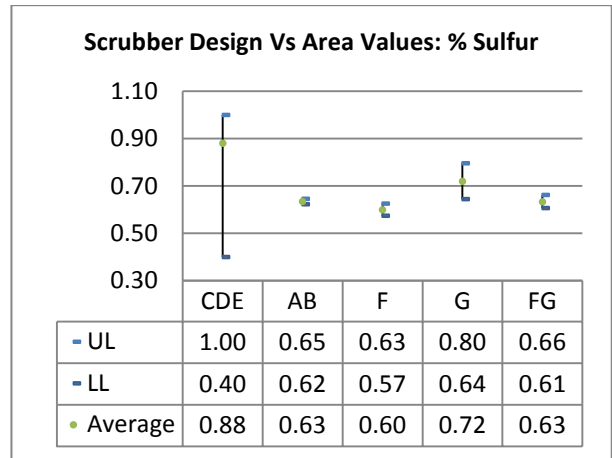
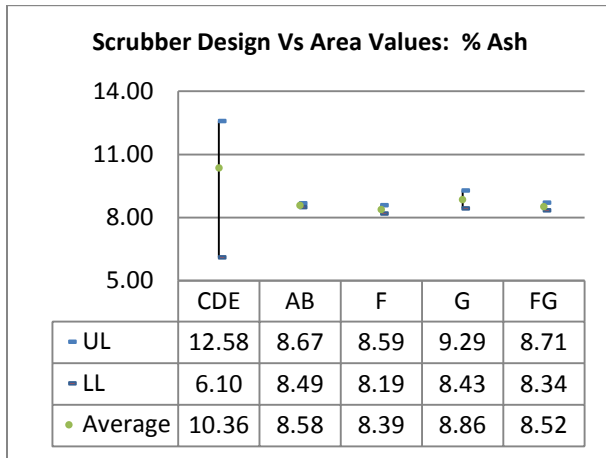


Figure 3 – Proposed Coal Quality Comparison to Scrubber Design Parameters



Note: UL and LL for Area CDE are maximum and minimum scrubber design parameters. All other UL and LL values are upper and lower 99% confidence interval bounds.

4.0 Project Schedule

Units 3 and 4 intend to commence use of coal from Areas A, B, F and G once WECO has

received necessary permits for mining the areas. This mine permitting process is wholly separate from any permitting process applicable to Colstrip Units 3 & 4. As addressed on page 39 of MDEQ's January 4, 2013 Technical Review Document for Colstrip Units 3&4 Title V Permit OP0513-08, "the Westmoreland Rosebud Coal Mine and PPLM Colstrip are not the same source with respect to PSD, NSR, and/or Title V. They will remain as separate permitted sources."

According to an August 27, 2013 Notice of Intent to Initiate Public Scoping and Prepare an Environmental Impact Statement for Area F of the Rosebud Coal Mine, WECO submitted permit application C2011003F to MDEQ in October 2011 for Area F. MDEQ determined that WECO's revised application was administratively complete on August 1, 2012, and began its ongoing technical adequacy review. Because Area F encompasses federal lands, a NEPA analysis will also be required. A single EIS that meets both MEPA and NEPA requirements is currently being prepared. The details of the Area F expansion have been provided to MDEQ and are addressed in the August 27 Notice. The draft EIS is expected to be released for public comment in Spring-Summer 2015, and the final EIS is expected by the latter half of the same year.

It is anticipated that similar permitting of Area G of the Rosebud Mine will commence within the next few years. It is also possible that Areas A and B of the Rosebud Mine, which are the current fuel supply for Colstrip Units 1 and 2, may be a fuel source for Units 3 and 4. Use of coal from any of these existing or future areas of the Rosebud Mine will obviously be consistent with Colstrip's coal quality and air emissions requirements.

5.0 Certificate Amendment Criteria Evaluation

A review of the four criteria³ which require a certificate amendment was conducted. PPLM's interpretation of the criteria is as follows:

5.1 *"any change in location or design or any addition to a facility or an associated facility that could reasonably be expected to result in a material increase in any environmental impact."*

PPLM response: Use of coal from Areas A, B, F and G of the Rosebud Mine is not a "change in location or design or any addition to a facility or associated facility." In fact, no changes at all will be made at the "facility." Even if the move to Areas A, B, F and G for fuel supply could be deemed a "change," it will not result in any material increase in any environmental impact, because the coal quality is the same or better for emissions purposes, and PPLM will still be required to comply with all emissions limits applicable to Units 3 and 4.

5.2 *"any change in location or design or any addition to a facility or an associated facility that could reasonably be expected to result in impacts to new geographic areas or human, animal or plant populations that were not evaluated prior to the issuance of the certificate."*

PPLM response: Use of coal from Areas A, B, F and G of the Rosebud Mine is not a "change in location or design or any addition to a facility or associated facility." In fact, no changes at all will be made at the "facility."⁴ Even if the move

3 ARM 17.20.1801 (1)-(4)

4 As discussed in section 3.0, mine and plant operations are completely separate and independent; proposed mining in Areas F and G is regulated by the MEPA/NEPA process

to Areas A, B, F and G for fuel supply could be deemed a “change,” it will not result in impacts to new geographic areas or human, animal or plant populations that were not evaluated prior to the issuance of the certificate, because the coal quality is the same or better for emissions related purposes, and PPLM will still be required to comply with all emissions limits applicable to Units 3 and 4.

5.3 *“any change in or addition to a facility or an associated facility affecting compliance with a condition of the certificate:”*

PPLM response: Use of coal from Areas A, B, F and G of the Rosebud Mine is not a “change in location or design or any addition to a facility or associated facility.” In fact, no changes at all will be made at the “facility.” Even if the move to Areas A, B, F and G for fuel supply could be deemed a “change,” it will not affect compliance with the conditions of the Units 3 and 4 MFSA certificate, as addressed in detail below. While PPLM does not believe this fuel supply move is a “change,” as used in 17.20.1801, the mention that Unit 3 and 4’s fuel supply be derived from Areas C, D, and E of the Rosebud Mine could arguably be considered a Certificate “condition.” As such, PPLM seeks amendment pursuant to this section.

5.4 *“any change in or addition to a facility or associated facility that would materially change the basis of any finding required by subchapter 16.”*

PPLM response: Use of coal from Areas A, B, F and G of the Rosebud Mine is not a “change in location or design or any addition to a facility or associated facility.” In fact, no changes at all will be made at the “facility.” Even if the move to Areas A, B, F and G for fuel supply could be deemed a “change,” this fuel supply change will not materially alter the basis of any finding required by ARM 17.20.1604 et seq. This subchapter addresses the basic findings necessary for original certification under the MFSA. As addressed below, the proposed use of coal from Areas A, B, F and G will have no substantive impact on either the operations of Units 3 and 4 or the conditions of the original MFSA certificate.

6.0 Major Facility Siting Certificate Findings of Fact and Conclusions of Law (i.e. – “MFSA Certificate Conditions”) Evaluation

This section contains an analysis of the “conditions” contained in the Certificate and if/how the consumption of Rosebud seam coal from Areas A, B, F, and G would impact the “condition.” Since the Findings of Fact and Conclusions of Law are incorporated into assessment of compliance with the Certificate, these are considered “conditions” of the Certificate for the purpose of this amendment. For efficiency this analysis omits certain conditions that are not relevant to the requested change. These non-applicable conditions are listed in Exhibit 2. Prior to the compilation of this notice, each and every condition was analyzed in detail for potential impacts brought by the change to Rosebud coal from Areas A, B, F, and G and that analysis forms the basis for the summary analysis presented here.

6.1 BEFORE THE BOARD OF NATURAL RESOURCES AND CONSERVATION

6.1.1 FINDINGS OF FACT⁵

⁵ For ease of reference, the Certificate “Conditions” are listed in the same order and approximate format as in the original Certificate

The Findings of Fact Listed on Exhibit 2 do not apply to the proposed change in fuel source for Units 3&4. These Findings are, for the most part, germane to the justification of a new facility, where there was no facility in existence at the time, or other unrelated topics such as transmission routing or recreational use, for example. In some cases, the Findings simply state facts in existence at the time such as then-current rules or the occurrence of other regulatory hearings. The Findings potentially impacted by the consumption of Rosebud coal from Areas A, B, F, and G are principally related to air quality, emissions control, or waste disposal and are discussed below.

“SECTION 70-816(2)(1) EFFECTS ON NATURAL SYSTEMS, WILDLIFE, PLANT LIFE

54. That the effects of the facility as proposed on the natural systems, wildlife and plant life will not be significant. (Kemp, NR 46, 9373-9374; Wahlquist, NR 22, 3804; Wilderson, NR 29 5284; Couture, NR 49, 9867; Brown, BH 48, 9684-9685; App. Ex. 292.)”

PPLM Response : The use of Areas A, B, F, and G Rosebud seam coal does not change this finding because use of this coal, which has essentially the same properties as those evaluated during the Certificate proceeding, see Exhibit 3, will be accompanied by the same or better byproduct control than that originally evaluated.

“SECTION 70-816(4) AIR QUALITY IMPACTS

72. That the Board of Health and Environmental Sciences, the duly authorized agency empowered to determine whether or not the proposed facility will violate state and federally established standards and implementation plans insofar as air and water quality are concerned, has, after hearing duly noticed and held, issued twenty-one (21) pages of Findings of Fact regarding air and water resources and impacts which Findings of Fact and Conclusions of Law are fully and completely incorporated and adopted herein. (Exhibit “A”).”

PPLM Response: This finding just describes the occurrence of the Board of Health and Environmental Sciences hearing, subsequent issuance of Findings of Fact and Conclusions of Law, and incorporation by reference. The use of Areas A, B, F, and G Rosebud seam coal cannot and does not change this finding since it is simply a description of what has already occurred. The Board of Health and Environmental Sciences certified that Colstrip Units 3&4 would not violate air quality standards after the proceedings referenced above and these are discussed later.

“[SECTION 70-816(4)(c) STANDARDS IN EFFECT AND PROJECTED]

77. That the Board of Health and Environmental Sciences of the State of Montana has reviewed the Application for the proposed facility and the design thereof, insofar as the New Source Performance Standards are concerned. (Exhibit “A” .)

78. That the emission control system for the proposed facility is based on the best available control technology for the specific plants to reduce emissions to levels within the New Source Performance Standards. (Berube. BH 8, 111, 113.)

79. That the best available control technology is synonymous with the highest state of the art and is that technology specifically designed to the specific site constraints which include the nature of the coal being burned, the meteorology of the area, the evaporative potential, the available ash disposal site and the available water, together with economic considerations. (Grimm, BH 45, 8986-8987.)

SECTION 70-816(4)(d) EMMISSIONS AND CONTROLS (i) – (v)

80. That the Board of Health and Environmental Sciences of the State of Montana has considered the stack design and the emission control systems of said facilities and determined that said emissions would not violate state and federally established emission

standards. (Exhibit "A".) Subsequent tests of Colstrip No. 1 have resulted in emissions well within state and federal standards.

SECTION 70-816(4)(e) RELATONSHIP TO PRESENT AND PROJECTED AIR QUALITY

81. That the Board of Health and Environmental Sciences of the State of Montana has considered the relationship of expected maximum ground level concentrations of the pollutants therein specified and found in its Finding of Fact No. XXIV, incorporated herein by this reference, that the same were within the standards in effect and projected for Colstrip 3 & 4, which said standards are set forth in Finding 76 herein.

82. That while there will be no emissions of sulfuric acid as such emitted directly from the proposed facilities, sulfuric acid can subsequently occur under certain conditions by the conversion of sulphur dioxide to sulfuric acid by oxidation and hydrolysis. That because of the arid climate and basic soils of the Colstrip area of southeastern Montana, the occurrence of and effects of sulfuric acid mists, if any, will be minimal. (Berube, BH 8, 1021, BH 9, 1248-1249; Abrams, BH 46, 6600, 6603; Faith, BH 5, 580, 584; Northern Cheyenne Exhibit 2.)

83. That the plumes from the proposed Colstrip plants will not increase the ozone or photo chemical oxidant ground level concentrations or background levels. (Colucci, BH 44, 6259.)

84. That the trace elements emitted from the proposed Colstrip plants will have no significant impact on soils, local vegetation, wildlife, domestic animals or humans. (Edmonds, BH 21, 3514)

85. That while no acid precipitation or other toxic substances are expected to be created or developed from the operation of the proposed facility, and no significant change in the pH of the precipitation in the Colstrip area will occur (Edmonds, BH 21, 3514), stringent monitoring of air pollutants will warn of exceptions to these expectations, and careful sludge disposal will alleviate possible water contamination problems."

PPLM Response (to findings 77- 85): The use of Areas A, B, F, and G Rosebud seam coal by Units 3 and 4 does not change any of these findings. First, as previously discussed, the coal is from the same seam, exhibits the same or better chemical characteristics for emissions control related purposes, see Exhibit 3, and results in the generation of almost identical flue gas as that originally reviewed. Second, the change to use of Areas A, B, F, and G Rosebud seam coal will not involve and does not necessitate in any way a change to the pollution control equipment installed on Units 3 and 4. Third, as time has progressed, Units 3 and 4 have been subject to more stringent standards and have at times installed upgraded pollution control equipment or instituted operational changes to comply with the more stringent standards, resulting in reduced emissions and by product discharge. Therefore the impacts to human health and the environment discussed in these findings have actually lessened since startup of Units 3 and 4. Exhibit 4 shows Units 3&4 emissions trends over time.

"SECTION 70-816(4)(f) MONITORING PROGRAM

86. That the Applicants have selected eleven (11) primary and secondary sites to monitor ground level concentrations in and around the proposed facility. (Grimm, BH 12, 1739-1740; App. Ex. 112.)

87. That the operation of the air quality system in Colstrip Unit 1 will be closely monitored by the Department of Health and Environmental Sciences and the Applicants and the data gathered therefrom will be interpreted by the Department of Health and Environmental Sciences as to the effectiveness of the air quality control systems installed thereon. (Exhibit "A")."

PPLM Response (to findings 86 and 87): Monitoring of air pollutants in the Colstrip area has changed since the beginning of Units 3 and 4 operation, and these changes

were driven by factors unrelated to the use of Areas A, B, F, and G Rosebud seam coal by Units 3 and 4. Thus, this move to a different area of the Rosebud Mine cannot and will not impact these findings.

6.1.2 CONCLUSIONS OF LAW

The Conclusions of Law from the hearing before the Board of Natural Resources and Conservation are treated in the same fashion as the Findings of Fact. The analysis below is based upon a review of all Conclusions, with the non-applicable Conclusions not discussed here but listed in Exhibit 2. The Conclusions potentially impacted by the consumption of Rosebud coal from Areas A, B, F, and G are discussed below using the numbering convention in the MFSA Certificate.

“4. The facility, Colstrip Units #3 and #4 and associate facilities, represents the minimum adverse environmental impact considering the state of available technology and the nature and economics of the various alternatives.

5. The probable environmental impact from the construction and operation of the facility will be minimal.”

PPLM response (to Conclusions 4. and 5.): The use of Areas A, B, F, and G Rosebud seam coal does not change this conclusion because coal from these areas, for purposes related to emission control, is of the same quality, see Exhibit 3, and by-products will be controlled to the same or better extent than was contemplated during the original evaluation of Colstrip Units 3 and 4.

“10. The only authorized state air and water quality agency, the Board of Health and Environmental Sciences, has certified that the proposed facility, Colstrip Units #3 and #4 and associated facilities will not violate state and federally established standards and implementation plans.”

PPLM response : The use of Areas A, B, F, and G Rosebud seam coal does not change this conclusion, because coal from these areas is of the same or better quality for emissions control related purposes, see Exhibit 3, and by-products will be controlled to the same or better extent than was contemplated during the original evaluation of Colstrip Units 3 and 4.

6.1.3 **Certificate Amendments Before the Board of Natural Resources and Conservation**⁶

With the exception of the amendments of March 31, 1981 and August 10, 2004 the Conditions from amendments to the Certificate are wholly unrelated to the consumption of Rosebud seam coal from Areas A, B, F, and G. The unrelated amendments are identified by date and general subject matter in Exhibit 2.

March 31, 1981 – Amended descriptions of pollution control equipment.

PPLM Response: The use of Areas A, B, F, and G Rosebud seam coal by Units 3 and 4

⁶ This section also includes amendments before the Board of Environmental Review, the successor to the Board of Natural Resources and Conservation for implementation of the Colstrip Major Facility Siting Act.

is unrelated to the pollution control at the facility since no equipment or operational changes are needed or proposed to accommodate this Rosebud seam area change. Thus, this finding is not impacted by the specific location of the Rosebud Mine fuel source for Units 3 and 4.

August 10, 2004 – Allowed offsite reuse/recycling of bottom ash.

PPLM Response: The use of Areas A, B, F, and G Rosebud seam coal by Units 3 and 4 does not change the findings and conclusions of this amendment since the Rosebud seam coal from these areas is not appreciably different from that of Areas C, D, and E. Furthermore a minor change in fuel source consumed will not impact the characteristics of the bottom ash. And finally, bottom ash is very chemically benign, as shown by this amendment and this fact will not change as a result of consumption of Rosebud seam coal from Areas A, B, F and G.

6.2 BEFORE THE BOARD OF HEALTH AND ENVIRONMENTAL SCIENCES

6.2.1 FINDINGS OF FACT

The Findings of Fact Listed on Exhibit 2 do not apply to the proposed change in fuel source for Units 3&4. The Findings potentially impacted by the consumption of Rosebud coal from Areas A, B, F, and G are discussed below.

“XIV.⁷

Pilot plant tests project that SO₂ emissions from Units ~~1, 2, 3 and 4~~ 3 and 4, will have an outlet concentration under "worst" coal conditions of 1% sulfur (965 PPM) of ~~260~~50 PPM, at 100% load, with a ph of ~~5-6~~ 6.5 and liquid to gas ratio of 33. (Abrams, 15-2144, 2145). With outlet concentration for sulfur dioxide under "worst" coal conditions of 1% sulfur at ~~260~~50 PPM, and based upon the units running at 100% load, the emissions for sulfur dioxide would then be:

Units 3 or 4: ~~4633~~ 761 pounds per hour or ~~96~~ 585 grams per second;

Units 1 or 2: 2071 pounds per hour or 250 grams per second.

(Applicants' E. 64 and 65; Grimm 13-1794, 1795, 1801; Applicants' Ex. 61 and 62;

Berube 8-1117, 1120,23 1121, 1124)

Emissions for particulate matter for Units 1 or 2 is 184 pounds per hour, or 46 grams per second combined, and for Units 3 or 4 is 408 pounds per hour each, or 103 grams per second combined. (Berube 9-1130, 1134).

The pilot plant tests also substantiate that fluoride emissions from the use of Rosebud coal, which contains 27 PPM, will emit 1.8 pounds per hour, or .227 grams per second, for Units 3 or 4, and .1 gram per second from Units 1 or 2. (Grimm, 12-1788, .13-1789, 1790. Applicants' Ex. 74, p. 15.2.1). Beryllium in the coal will be emitted at the rate of .0021 grams per second at 100% load for Units 3 or 4 (DNR Ex. 123), which is equivalent to .0061 grams per second for all four units. (Faith, 43-6240). Lead emissions in the Rosebud coal for Units 3 or 4 will be .0423 grams per second (DNR Ex. 123), which is equivalent to 1.22 grams per second for all 4 units. (Faith 43-6241). For oxides of nitrogen calculated as NO₂, the emission rate for Units 1 and 2 combined at .7 pounds per million BTU is 4.740 pounds per hour, or 598 grams per second; for Units 3 and 4 combined at .7 pounds per million BTU is 10602 pounds per hour, or 1336 grams per second, and thus for all four units emissions at .7 pounds per million BTU is 15,342 pounds per hour, or 1934 grams per second. (Faith, 26-346, 3463). The scrubber will reduce 15 to 20 per cent of the oxides of nitrogen emissions. (Abrams, 16-2272). (A-11)”

⁷ The inter- and under-lined text is contained within the certificate condition and reflects amended language resulting from a March 31, 1981 amendment.

PPLM Response: As discussed previously and shown on Exhibit 3, in makeup Rosebud seam coal from Areas A, B, F, and G is the same or better for emissions purposes as that from Areas C, D, and E and therefore the estimated emissions resulting from combustion of this coal will be substantially the same as those originally estimated. Therefore, the use of Rosebud seam coal from Areas A, B, F, and G will not affect this finding.

It should be noted that the pollution control technology at Colstrip has from time to time been upgraded to reflect new and more stringent regulations. A very relevant example is that the Mercury and Air Toxics Standards (MATS) rule of April 15, 2012 is specifically designed to require greater control of many of the pollutants described in this finding. Units 3 and 4 are subject to the MATS rule and exhibit greater control of these parameters than was originally evaluated.

“XV.

The fuel to be used in Units 3 and 4 will be Rosebud seam coal from the Colstrip area. (Berube 7-902). It will be mined from areas designated C, D and E, shown on Exhibits 52, 53, 140 and 141. (Berube 8-1027-1029; Rice 2\$-3635-3636, 3640-3641).”

PPLM Response: This is the only finding directly impacted by the use of Areas A, B, F, and G Rosebud seam coal. This finding is simply a description of the active mining areas at the time of the original issuance of the MFSA certificate. Since the supplying mine has or will soon exhaust coal from Areas C, D, and E of the Rosebud seam, it will necessarily be offering coal from Areas A, B, F and G of the Rosebud seam for consumption by Units 3 and 4. Therefore, a new description of source Areas for the Rosebud seam coal consumed by Units 3 and 4 is arguably required.

“XVI.

The results of analyses of all the core hole, samples, made by commercial testing laboratories, and which provide information necessary to properly specify equipment for Units #3 and #4 are included in Applicants' Ex. 53A and 53B, (Berube 7-908, 912, 913). The composition of the coal was considered to estimate the quantities of ash and sulfur dioxide that would enter the boiler, leave the boiler, and enter any pollution control equipment. (Berube, 8-1041, 1042).

XVII.

The values of the basic composition of the coal that should be considered for the emissions control system, including averages, maximums and minimums proper for design of the equipment are included in Applicants' Exh. 54. Berube 8-1042, 1043). This information is an instruction for the equipment supplier and not a description of the coal in the coal field. The value of 1% sulfur is a maximum for design purposes because it represents the maximum value of sulfur that the pollution control equipment will have to contend with in operation. (Berube 8-1044-1046). It is the maximum value of sulfur authorized by this Board for certification purposes.

XVIII.

Tentative specifications have been prepared advising this Board of the proposed construction and operation, of Units #3 and #4 (Applicants' Ex. 100).”

PPLM Response (to findings XVI,-XVIII.): The use of Rosebud seam coal from Areas A, B, F, and G, coal which is substantially the same as that from Areas C, D, and E, does not impact these findings because no design, equipment or operational changes are necessary or being proposed to accommodate the change in the specific location of the

Rosebud Mine fuel source.

“XXIV.

Based on the meteorology data, the modeling calculations, and applicants' assumptions, the expected maximum (peak) ground level concentrations for the following pollutants are:

(1) Sulfur Dioxide.

(a) *For Pasquill Methodology:*

Maximum one hour ground-level concentrations for all four Units are 405 micrograms per cubic meter. The maximum three hour ground-level concentrations for Units 3 and 4 are 120 micrograms per cubic meter and for all four Units are 194 micrograms per cubic meter. The maximum annual ground-level concentration for Units 3 and 4 are 0.9 micrograms per cubic meter and for all four units are 1.4 micrograms per cubic meter.

(b) *MSU Methodology:*

Maximum one-hour ground-level concentrations for all four Units are 256 micrograms per cubic meter. Maximum three-hour ground-level Concentrations for Units 3 and 4 are 100 micrograms per cubic meter, and for all four Units are 156 micrograms per cubic meter. Maximum 24-hour ground-level concentrations for Units 3 and 4 are 40 micrograms per cubic meter and for all four Units are 63 micrograms per cubic meter.

(2) Particulate matter.

(a) *Using Pasquill Methodology. '*

The maximum annual ground-level concentrations of particulate for Units 1 and 2 are .05 micrograms per cubic meter. For Units 3 and 4 are 0.07 micrograms per cubic meter, and for all four Units are 0.11 micrograms per cubic meter. The maximum 24-hour ground-level concentrations of particulate for Units 1 and 2 are 0.9 micrograms per cubic meter, for Units 3 and 4 are 1.3 micrograms per cubic meter, and for all four Units are 2.1 microgram per cubic meter.

(b) *Using MSU Methodology.*

The maximum 24-hour ground-level concentrations of particulate for Units 3 and 4 are 3.7 micograms per cubic meter, and for all four Units are 5.9 micrograms per cubic meter.

(3) Oxides of Nitrogen (Calculated as NO₂).

Pasquill Methodology - Annual.

For Units 1 and 2 are 0.6 micrograms per cubic meter, for Units 3 and 4 are 1.1 micrograms per cubic meter, and for all four Unit s are 1.7 micrograms per cubic meter.

(4) Sulfates:

(a) *Pasquill Methodology:*

Maximum one-hour ground-level concentrations for all four Units are 0.1 micrograms per cubic meter. Maximum 24-hour ground-level concentrations for all four Units are 0.4 micrograms per cubic meter. Maximum annual ground-level concentrations for all four Units are 0.2 micrograms per cubic meter.

(b) *MSU Methodology:*

Maximum one hour ground-level concentrations for all four Units are 7.8 micrograms per cubic meter. Maximum 24-hour, ground-level concentrations for all four Units are 1.1 micrograms per cubic meter.

(5) Fluorides:

(a) *Pasquill Method:*

Maximum 24-hour ground-level concentrations for all four Units are 0.01 parts per billion.

(b) *MSU Method:*

Maximum 24-hour ground-level concentrations for all four Units are 0.03 parts per billion.

(6) Beryllium:

(a) *Pasquill Methodology:*

For all four Units the 24-hour concentration would be .000084 micrograms per cubic meter. The 30 day value could not be greater.

(b) *The corresponding calculation for MSU methodology is .00026 micrograms per cubic meter.*

(7) Lead:

(a) *For Pasquill methodology, all four Units, 24--hour concentration could be .00168 micrograms per cubic meter. The 30-day value would be less.*

(b) *The corresponding calculation for MSU methodology would be .0045 micrograms per cubic meter.”*

PPLM Response: The use of Rosebud seam coal from Areas A, B, F, and G does not change this finding since the coal is the same or better for emissions control related purposes as that in the original modeling analysis. Modeling results will be the same or better for emissions purposes to those stated in this finding.

6.2.2 Conclusions of Law⁵

“1. The applicants' will utilize only coal from the Rosebud seam. It will at no time exceed 1% inlet sulfur content. Daily testing of the coal and sulfur content will be required to effect that control.”

PPLM Response: The use of Rosebud seam coal from Areas A, B, F, and G does not change this conclusion since the coal is from the seam specified, the Rosebud.

6.2.3 Subsequent Amendments before the Board of Health and Environmental Sciences.

March 31, 1981 – Amended descriptions of pollution control equipment.

PPLM Response: This amendment has been necessarily assessed in the findings of fact analysis in section 6.2.1.

7.0 Summary

7.1 MFSA Certificate Review - No Significant Environmental Impact.

PPLM, with the preceding discussion, has demonstrated that consumption of Rosebud coal from Areas A, B, F, and G will not result in any increase in environmental impact as delineated in the conditions contained in the MFSA Certificate. In fact, the only condition impacted by such fuel use is Board of Health and Environmental Sciences Finding of Fact XV., which is simply a description of the existing Rosebud seam mining areas existing at the time.

The data in Exhibit 3 show that the Rosebud coal from Areas A, B, F, and G is substantially the same or better in terms of quality and chemical characteristics as that from Rosebud seam Areas C, D, and E. Therefore impacts from consumption of such coal will necessarily be the same or better for emissions purposes.

7.2 MEPA Criteria Review Not Applicable

Section 75-20-216 explains that “[a]n environmental impact statement or analysis prepared pursuant to the Montana Environmental Policy Act may be included in the department findings if compelling evidence indicates that adverse environmental impacts are likely to result due to the construction and operation of a proposed facility.” Here, there is no indication that there is any environmental impact, let alone that “adverse environmental impacts are likely to result.” A MEPA analysis is, therefore, unnecessary.

7.3 Project Benefits

Consumption of Rosebud Seam coal from areas of the Rosebud Mine other than Areas C, D, and E will provide for the cost effective supply of reliable and needed electricity by Colstrip Units 3 and 4. Using coal from these additional areas of the mine is preferable to using coal from a source other than the Rosebud Mine. The continued consumption of coal from the Rosebud Mine will allow the plant to continue to operate as a low cost source of power, will continue the benefits provided to the local and state tax base, and will continue to provide jobs for the local community, while still protecting the environment to the current high degree. From an economic standpoint, Colstrip contributes an average of \$638 million annually in net output produced in Montana and is ultimately responsible for over 3,700 jobs in the state. See <http://www.colstripeconomicreport.com>.

7.4 Conclusion: Automatic Granting of Amendment is Justified

In accordance with Section 75-20-219(2), MDEQ is justified in automatically granting this amendment.

Rosebud coal from Areas A, B, F, and G is of the same or better quality for emissions control related purposes as rosebud coal from Areas C, D, and E and no additional equipment is needed or proposed by Colstrip Units 3 and 4 to consume this coal. Therefore, emissions and effluents resulting from combustion in the units will not be substantially changed. The highly efficient pollution control installed on Units 3&4, with the multiple improvements made over the years, is sufficient to accommodate the consumption of Rosebud coal from Areas A, B, F and G.

A thorough and detailed review of “conditions”, including Findings of Fact, Conclusions of Law, and Conditions, contained in the MFSA certificate clearly demonstrates no increase in environmental impact from the consumption of this coal. This demonstration is based upon: 1) The negligible change in emissions and effluents resulting from the consumption of Rosebud seam coal from Areas A, B, F and G; and 2) the capability of the highly efficient pollution control system existing on Units 3&4. In fact, of the more than 173 “conditions” placed upon the construction and operation of Colstrip Units 3 and 4, only one requires amendment as a result of the switch to Areas A, B, F, and G. This “condition” is merely a description of the Rosebud seam areas in existence at the time of the original Certificate issuance which would supply the facility. The only reason this “condition” needs amendment is to necessarily change the description of available Rosebud seam coal. The purely descriptive nature of the “condition” is further demonstrated by the fact that the Rosebud seam areas to supply Units 3 and 4 were not made a condition in the facility’s air quality permits.

A purely optional comparison of the quality of coal from Areas A-F and G, conducted out of an abundance of caution reveals no potential for an increase of environmental impacts and in fact reveals positive impacts.

Finally the project as proposed has substantial benefits. The project allows continued availability of low cost and environmentally friendly power produced by Units 3&4. Operation of the facility also provides substantial economic and population benefits to the locality, state and region.⁸

⁸ See, for example, the report, *The Economic Contribution of Colstrip Steam Electric Station Units 1-4*, Barkey and Polzin, 2012

Exhibit 1
Colstrip Units 3&4 Emission Limits

Exhibit 1
Colstrip Units 3&4 Emission Limits

CSES Units 3&4				
Stack Emissions				
Parameter	Units	Averaging Period	Limit	
PM (filterable)	lb./mmBtu	3-Hr Rolling	0.05	
	Lb./hr.	3-Hr Rolling	379	
SO ₂	Lb./mmBtu	Daily	0.18	
	Lb./Hr.	30-Day Rolling	761	
	Lb./Hr.	Daily	1,363	
SO ₂ Combined Units 3&4	Lb./Hr.	3-Hr Rolling	4,140	
NO _x	> 400 MWG	Lb./mmBtu	Daily	0.25
	≤400 MWG		Daily	0.30
	> 400 MWG	30-Day Rolling	0.18	
	≤ 400 MWG	30-Day Rolling	0.30	
	All loads	Lb./Hr.	Annual	0.40
	All loads		Daily	1,893
	All loads		30-Day Rolling	1,363
Mercury, Hg	Lb./TBtu	12-month Rolling	0.9	
Opacity	%	6-Minute	20.4	
Coal Sulfur Content	%	Weekly	1.0	
Particulate Compliance Assurance Monitoring (CAM) Plan				
Monitoring Indicator	Units	Averaging Period	Limit	
Stack Opacity	%	Daily	20.4	
Scrubber Plumb Bob DP	Inches H ₂ O	Daily	>17	
Scr. Venturi Spray System	On/Off	Hour	1	

**Exhibit 2 – Non-applicable
Conditions**

Exhibit 2
Non-Applicable Certificate Conditions

Following is a listing of “conditions” contained in the Units 3&4 MFSA Certificate, noted with one or more of the following letters, which indicate why the “condition” was judged non-applicable to this amendment notice.

A – Deals with the need for the facility, regional planning, where the facility should be built, alternatives to the original facility, or other similar issues which were already decided as evidenced by the original granting of the MFSA certificate, and thus cannot be changed by actions occurring today such as a change to a new source of Rosebud Seam coal.

B – Deals with a completely un-related issue such as transmission, recreational facilities, laws and regulations not relevant to this amendment notice, construction practices, or similar issues, and thus cannot be changed by actions occurring today such as a change to a new source of Rosebud Seam coal.

C – Deals with a simple statement of the occurrence, completion, or existence of other proceedings, bodies, effective regulations, or other laws and thus cannot be impacted by actions occurring today.

D – Deals with a potentially relevant “condition” that is duplicative to one already dealt with in the amendment notice.

E – Deals with original financial aspects of the facility, aspects which are not relevant currently or which would have to be updated if considered and thus are un-related to the source of fuel used by Units 3&4

From the hearing before the Board of Natural Resources and Conservation

SECTION 70-810(a) BASIS OF THE NEED FOR THE FACILITY

1. That by the time of completion of the facilities there will be a need for the energy produced therefrom in applicants’ service areas. **A**

SECTION 70-81(b) NATURE OF PROBABLE ENVIRONMENTAL IMPACT

2. That the nature of the probable environmental impact involves certain biological, economic, and sociological impacts on the people and on the natural environment, but that these impacts will be minimal and not unreasonable when considered in conjunction with the need and benefits to be derived from the proposed facilities. **A, D**

SECTION 70-810(c) MINIMUM ADVERSE ENVIRONMENTAL IMPACT

3. That the proposed facility represents the minimum adverse environmental impact, on both the human and natural environment, considering the state of available technology and the nature and economics of the various alternatives. **A**

SECTION 70-810(e) CONSISTENT WITH REGIONAL PLANS

4. That there is a distinct lack of regional or statewide energy development planning by any governmental body to date, but that in the absence of such plans, the facilities as proposed are consistent with regional plans for the expansion of the appropriate grids of the utility systems serving the state and interconnected utility systems, who are parties to the Application, and further that the proposed facilities will serve the interests of the utility systems of the Applicants insofar as economy and reliability are concerned. The transmission lines will be constructed above the ground. **A**

SECTION 70-810(f) STATE AND LOCAL LAWS

5. That the location of the facilities as proposed conforms to applicable state and local laws and regulations promulgated and issued under the Act. **B**

SECTION 70-810(g) PUBLIC INTEREST, CONVENIENCE AND NECESSITY

6. That the facilities as proposed will serve the public interest, convenience and necessity. **A**

SECTION 70-810(h) AIR AND WATER CERTIFICATION

7. That the Board of Health and Environmental Sciences, of and for the State of Montana, is the duly authorized agent empowered to determine whether or not the facilities as proposed will violate state and federally established air and water quality standards and implementation plans. **C**

8. That the Board of Health and Environmental Sciences has, after a hearing held pursuant to notice, certified to the Board of Natural Resources and Conservation that the facilities as proposed will not violate state and federally established air and water quality standards and implementation plans, a duly certified copy of the Board of Health's Findings of Fact, Conclusion of Law and hereto, marked as Exhibit "A" for identification, and by this reference fully and completely incorporated herein and made part hereof. **C**

SECTION 70-816(1) ENERGY NEEDS

9. That the collective loads and resources forecast by the Applicants, excluding Colstrip Units 3 and 4, covering peak for the years 1975-1976 through 1985-1986, shows a collective surplus of

peak until 1982-1983, at which time a deficit of 855 megawatts is forecast. A deficit continues for each year thereafter with the greatest deficit being 2,536 megawatts in 1985-1986. Even with Colstrip Units 3 and 4 on line, a collective deficit of 281 megawatts is forecast in 1984-1985 and 1,295 megawatts in 1985-1986. (Hofacker, NR13. 1939-1947; App. Exs. 3C, 3D, 4C, 4D, 5B, 5C, 7B, 7C; Knight, NR 14, 2284-2286; App. Exs.18B, 18D; Nogle, t,R 15, 2453-2456; App. Exs. 20A, 20B; Bredemeir, NR 16, 2602-2604; App. Exs. 19A, 19B; Lisbakken, NR 17, 2867- 2872, 2374-2877; App. Exs. 21B, 21C, 21E and 21G.) **A**

10. That the collective loads and resources forecast by the Applicants, excluding Colstrip Units 3 and 4, covering average energy for the years 1975-1976 through 1985-1986, shows a collective surplus of energy for the years 1976-1977 and 1977-1978, with deficits indicated for all other years, with the greatest deficit being 1764 megawatts for the year 1982-1983. Even with Colstrip Units 3 and 4 on line, they forecast a collective deficit in average energy in four (4) out of the six (6) years commencing with 1980-1981, the greatest deficit in any one year being 723 megawatts in 1982-1983. (Hofacker, NR 13, 1.939-1942, 1945-1948; App. Exs: 3C , 3E, 4C, 4E, 6B. 6C, 8B, 8C; Knight, NR 14, 2284-2286; App. Exs. 18B,18C; Nogle, NR 15, 2453-2456; App. Exs. 20 20B; Bredemeier, NR 16, 2603-2605, App. Exs. 19, I9C, Lisbakken, NR 17, 2867-2872, 2874-2877; App. Exs. 21B, 21D, 21F, 21H.) **A**

SECTION 70-816(1)(a) GROWTH

11. That available load growth information for the Applicants' systems supports there forecast covering future load growth for both peak and average energy. (Hofacker, NR 13,1963; Knight NR 15, 2436-2437; Nogle 16, 2567; Bredemeier, NR-16, 2629-2630; Lisbakken, NR 17, 2937-2940; Gregg, NR 47, 9388-9390.) **A**

12. That the Pacific Northwest Utilities Conference Committees, West Group Forecast of power loads and recourses, dated March 1, 1976, covering the period from July, 1976 to June 1987, forecasts an annual rate of growth for the West Group of utilities of approximately 5.1 percent insofar as peak is concerned, and 4.8 percent insofar as energy is concerned (Goldhammer, NR 44, 8915; App. Exs. 240H.) **A**

13. That during the period from 1961 to 1975 the combined sales of the Applicants to their customers grew at an annual rate of approximately six (6) percent per year, and should the foregoing growth pattern continue, the growth rate of the Applicants would be 6.6 percent to 7.5 percent from the present to 1980, and 3.9 percent to 5.4 percent per year for the period 1980-1990. (Anderson, NR 49, 9916-9920.) **A**

14. That the future consumptive use of electricity by the customers of the Applicants involves a degree of uncertainty; however, the historical projections of past trends to forecast future load demands, while reliable in the past, may fall short of the actual consumptive growth demand in the future. (Hofacker, NR 6, 1092-1108, NR 7, 1111-1122; Knight, NR 14, 2283-2284; Nogle, NR 15, 2457-2459; Bredemeier, NR 16, 2605-2606; Lisbakken, NR 17, 2867-2870; Anderson, NR 18, 2954-2956, 2970-2979; Coldiron, NR 20, 3358-3366; NR 49, 9826.) **A**

15. That Montana Rural Electric Cooperatives serve a large portion of the Montana agricultural community; that they are facing severe electrical energy shortages by virtue of their increased consumptive demand and by the curtailment of electrical energy supply by the Bonneville Power Administration and the Bureau of Reclamation above their existing contrast demand limits.

The BPA delivers power to satisfy a substantial portion of Montana's electric power needs. BPA sold about half of the electrical energy consumed within the state of Montana from 1970-1974. Only one-fifth of the amount supplied by BPA to Montana was generated in Montana and the balance, four-fifths, was generated at projects located in the state of Washington, Idaho and Oregon. During 1975, total sales to BPA customers in Montana averaged 474 megawatts, much of which is delivered by transmission facilities owned by The Montana Power Company.

BPA presently serves rural cooperatives in Montana including Flathead, Lincoln, Missoula, Ravalli Counties and Vigilante Electric Cooperatives, and BPA also markets power to the U.S. Bureau of Indian Affairs Flathead Irrigation Project, and the BPA will commence to serve Glacier Electric Cooperative in 1977 or 1978.

BPA sent a letter, dated January 9, 1976, to cooperatives in Montana which predicted energy shortages commencing 1978-79, primarily due to various delays in construction of generating plants. BPA's letter stated even a very successful voluntary conservation program, although necessary, would probably not be adequate to manage the forecasted electrical energy shortages, and therefore asked the cooperatives to make plans for curtailment programs.

The Bureau of Reclamation also serves cooperatives in Montana and other cooperatives receive power from generating plants in North Dakota. Montana's rural cooperatives east of the Continental Divide receive approximately one-half of their energy supplies from the Montana Power Company.

The Bureau of Reclamation has notified cooperatives in Montana that the Bureau of Reclamation will not supply their energy growth needs beyond 1977, and, therefore, after 1977, each cooperative must purchase their electric supply, above their existing contract demand limits from some other source. Central Montana Generation and Transmission (Montana G&T) endeavors to contract for supplies of electricity for fifteen cooperatives in Montana. Montana G&T has a contract with The Montana Power Company whereby The Montana Power Company will provide for annual load growth of the Montana G&T's cooperatives, but this contract between Montana G&T and The Montana Power Company requires mutual agreement of both parties.

The Montana G&T will be seeking 202 megawatts of power by 1985 which is an increase of some 388 percent from present requirements.

Cooperatives in Montana have been experiencing exceptionally high rates of growth. Ravalli County Cooperative has experienced an average compound growth rate of 9% from 1970 to 1975. During 1970-1975, Missoula Electric Cooperative experienced a 13% annual growth rate. The compounded kilowatt hour growth rate of Missoula Electric Co-op from 1960 to 1975 was 11.1% per year.

From 1970 to 1975 Vigilante Co-op experienced a 12% growth rate. The peak demand of Vigilante Cooperative in 1975 was almost 2% times greater than its peak demand in 1970. Most of this increase in usage is in irrigation, home heating and new customers. Fergus Electric Cooperative's demand for irrigation increased 20% from 1974-1975, and a similar increase is expected in the future.

The average annual growth rate of Flathead Irrigation Project power system has been 7.2% for the past twenty years, and the growth rate for the next ten years is expected to continue to increase at an even faster rate. This increasing use of electricity is stimulated by decreasing availability and increasing costs of oil and propane.

Park Electric Cooperative customers have more than doubled in the past seven years and Park Electric has experienced a total average increase of 65% in load growth from 1970-1975.

Despite encouragement to its customers to conserve electricity, Sun River Electric Cooperative rural residential loads increased over 12% last year.

The average annual increase in total kilowatt hour sales of the Yellowstone Valley Electric Cooperative for the past five years has been 12%. Some of this increase in power consumption is due to new customers, but the average usage per customer has also increased, partly because of electric heating and irrigation.

Big Horn Electric Cooperative's annual average increase has been 8.5% over the past twenty years, and electricity for Irrigation has increased 140% during the last five years.

McCone Electric Cooperative has experienced a load growth of 7.4% during 1974 and a 10.1% increase in 1975. (Siring, NR 27, 4730-4731; Rader, NR 25, 4469; Pike NR 30, 5548-5550, Pike Exhibit "A"; Hanson, NR 29, 5113; Follensbee, NR 32, 5084-5085; Gregg, NR 47, 9394-9395; Wilderson, NR 29, 5279-5280; Berberet, NR 29, 5321-5322; Rader, NR 25, 4470; Sept, NR 26, 4583-4584; Zahller, NR 36, 6909-6910; Pile, NR 31, 5902-5903; Casterline NR 35, 6719.) **A**

16. That the Montana Department of Natural Resources did not make a complete, thorough independent study and analysis of the consumptive electrical energy growth patterns and future electrical energy supply potential of and for the Montana Rural Electrical Cooperatives in the preparation of its Draft and Final Environmental Impact Statement on the Application. (Wicks 1 NR 30, 5695-5697.) **A**

SECTION 70-816 (1)(b) ALTERNATIVE SOURCES OF ENERGY 17. That the Montana Power Company, since the early 1960's, as a matter of company policy, has been a net importer of approximately 20 percent of its electricity requirements from other utility companies. Even with Colstrip, Unit 1 on line the company is importing approximately 15 percent of its peak resources and approximately 13 percent of its average energy resources in the current year, 1975-1976. (O'Connor, NR 1, 233-234; Hofacker, NR6, 1088-1089, NR 13, 1947; Goldhammer, NR 17, 2751.) **A**

18. Pacific Power's load and resource forecast for its Montana stem shows that approximately 85% of its Peak requirement must be imported from outside the state. Excluding Colstrip Units 3 and 4, the forecast shows that it is necessary to import 117 mw in 1980-1981 to meet the load. By 1985-1986, the imports would increase to 179 mw. With Colstrip Units 3 and 4 on line, these imports are reduced to 47 mw in 1980-1981 and to 39 mw in 1985- 86.(Lisbakken, R 17-2874-2877; App. Exs. 21C,21E,21G.) **A**

19. Pacific Power's load and resource forecast for its Montana system shows that approximately 95%-98% of its average energy requirements must be imported from outside the state. Excluding Colstrip Units 3 and 4, the forecast shows that it is necessary to import 65 mw in 1980-1981 to meet the average energy load. By 1985-1986 the imports would increase to 93 mw. With Colstrip Units 3 and 4 on line, these imports are reduced to 26 mw in 1980-1981 and to zero mw in 1981-1982 and thereafter through 1985-1986. If the forecast is extended, it would show that for this year and thereafter imports would need to be commenced again. (Libakken, NR17-2874-2877; App. Exs. 21D, 21F, 21H.) **A**

20. That the lead time necessary to put on line a coal- fired steam generating unit in the state of Montana is approximately nine to ten years. Included in the foregoing estimate is time for the selection of a site location and for the accumulation of meteorological data (air, temperature, weather, etc.), time for the obtaining of a permit under the Montana Utility Siting Act and time for placing orders for the materials and for building the plant. (Hofacker, NR 8, 1333; Labrie, NR 13, 2094.) **A**

21. That during the time that Colstrip Units 3 and 4 were under consideration by the Applicants, there were not available and desirable any other alternative sources of energy which were as feasible, suitable and reasonable as the generation to be produced from Colstrip Units 3 and 4. There is still no available, alternative source of energy to meet projected load growth demands available to the Applicants. (O'Connor, NR 1, 241-242, NRI, 245 248, 251-253, NR4, 727-735; Hofacker, NR8, 1316-1317, NR 10, 1630 1634, 1638, 1641-1642; Labrie, NR 13, 2080-2087, 2089-2100, 2103-2104, NR 14, 2184-2189, 2192-2207, NR 25-26, 4492-4498, NR 45, 9092 9093; Knight, NR 14, 2286-2295; Nogle, NR 15,

2463; Bredemeier, NR 16, 2607; Lisbakken, NR 17, 2871, 2877; Goldhammer, NR 17, 2745-2746, 2748-2749, 2751-2752, 2821-2831; Hanson, NR 29, 5113, 5116; App. Exs. 16, 17, 227, 228, 229, 230,231,267, 267A, 267B.) **A**

SECTION 70-816 (1)(c) ALTERNATIVE SOURCES OF ENERGY IN LIEU OF PROPOSED FACILITY

22. That prior to the time that the decision was made by the Montana Power and Puget Power to build Colstrip Units 1 and 2, more than ten possible sites in the state of Montana were considered for the location of the generation plant by Montana Power. Many siting studies were prepared and much research and investigation accomplished by the company which considered economic, environmental and other factors involved, applicable to the prospective locations. The eventual choice was Colstrip which was considered to have the most advantages. Once this site was selected and money spent to develop it, the Colstrip site also became the logical place for the construction of Units 3 and 4. This decision was based upon the same reasons why Colstrip was selected for Units 1 and 2 as well as the fact that the site had already been developed for Units 1 and 2. (Labrie, NR 13, 2080-2084, 2094-2095, NR 45, 9085, App. Exs. 14, 16, 16 267, 267A, 2678.) **A**

23. That prior to the time that it was decided to make application for Colstrip Units 3 and 4, Montana Power and the other Applicants made various studies, investigations and research concerning the availability and desirability of alternative sources of energy in lieu of the coal-fired steam generating plants planned for Colstrip, Montana. Among the alternatives considered were the following: the construction and operation of alternative generation sources such as hydroelectric, nuclear, oil and gas, coal gasification or liquefaction, solar, geothermal, magnetohydrodynamics and wind; not building additional generation; building smaller units; and building the plant in another location. Upon the basis of the foregoing research, it was decided that coal-fired steam generating plants located at Colstrip such as Units 3 and 4, were the lowest cost alternative and otherwise best choice available to meet the Applicants' power needs in the future and would result in the lowest cost to their customers.(See citations for Finding No. 19.) **A**

24. That it is more economical to generate power at Colstrip, Montana, using coal-fired steam plants, as is contemplated with Colstrip Units 3 and 4, and transmit this power to the service areas of the Applicants and the Pacific Northwest over existing and proposed transmission lines rather than ship coal by railroad from the Colstrip area to alternate power generation plants located in Montana or in the Pacific Northwest and transmit this power over transmission lines to the Applicants' service areas and to the Pacific Northwest. (Hofacker, NR 7,1161--1208; Labrie, NR 13, 2081-2085, NR 26, 4494; Bredemeier, NR 16, 271.4-2718; Pettibone, NR 19, 3058-3071; Woodley, NR 27, 4629-4611, 4659-4689, NR 46, 9298; App. Exs. 12, 22, 214, 229, 232,2 32A , 2 32 B .) **A**

25. That generally speaking a large power generating plant, all other things being equal, costs less to build per unit of capacity than a small plant and larger plants per unit of capacity are less costly to operate than small ones. The foregoing truism is known as "economies of scale." Prior to the decision to build Colstrip Units 3 and 4, various alternatives of larger plants vs. small plants were considered. (Labrie, NR 13, 2085-2090, 2092-2094; Noble, NR 16, 2571-2573; App. Ex. 17.) **A**

SECTION 70-816(1)(d) PROMOTIONAL ACTIVITIES

26. That while the applicants have in the past promoted increased use of electricity, it is evident that more recent promotion conservation measures indicates a lack of any significant promotion which may have given rise to the need for the power to be produced by Colstrip Units 3 and 4. (O'Connor, NR 2, 276-279; Knight, NR 14, 2288; Nogle, NR 15, 2456-2457; Bredemeier, NR 16, 2606-2607; Lisbakken, NR 17, 2871; Richards, NR 43, 8523-8533.) **A**

SECTION 70-316 (l) (e) SOCIALLY BENEFICIAL USES

27. That the power to be produced from Colstrip Units 3 and 4 will be used, directly and indirectly, for socially beneficial purposes, namely: to allow for the development and expansion of municipal waste water and sewage treatment facilities, (Westien, NR 25-26, 4571-4575; Hansen, NR 31, 5874-5879); to allow for the development and, expansion by the agricultural community of sprinkler irrigation, (Hansen, NR 31, 5876; Johnson, NR 27, 4725; Eddleman, NR 31, 5884-5885); to allow for the increased development and expansion of those industries which heretofore have adversely affected both the human and natural environment by allowing said industries to install and operate air and water quality control devices, which will require substantial amounts of electrical energy, in order to comply with air and water quality standards and regulations, (Hearst, NR 27, L 692; Potts, NR 30, 5405-5406); to allow for the continued expansion of research in the field of alternative energy sources, (Gregg, NR 47, 9394-9395) and to allow for the maintenance and preservation of a progressive rather than a regressive society, (Hamrell, NR 28, 1917; Christman, NR 28, 4912; Martin, NR 28, /J-920-4921; Gi11igan, NR 28, 4924; Robinson, NR 28, 4891; Halderman, NR 28, 4896; Howe, NR 28, 4900; Charette , NR 31, 5759; Harris, NR 31, 57641 Pine, NR 33, 6179-6180; Fontaine, NR 31, 5757; Pile, NR 31, 5901; Brown NR 48, 9684; Cox NR 26, 4514; Gross, NR 27 4669). **A**

SECTION 70-816 (1) (f) CONSERVATION ACTIVITIES

28. That conservation activities can be effective in decreasing electrical power demands for a period of time if such conservation activities are engaged in by the public at large, the business, industrial and agricultural committees and the procedure of electrical power. However, conservation activities, in and of themselves, will not materially and significantly reduce the demand for electrical power. (O'Connor, NR2, 279-281; Hofacker, NR 13, 1951; Knight, NR 11, 2288-2289; Nogle, NR 15,

2156- 2457; Bredemeier, NR 16, 2606; Lisbakken NR 17, 2870; Goldhammer, NR 17, 2747-2748, 2841-2842; Gregg, NR 47, 9405.) **A**

SECTION 70-816 (l)(g) RESEARCH ACTIVITIES

29. That all of the Applicants have in the past, and are now, participating in research activities to develop more efficient methods of energy generation and to develop methods of minimizing the environmental impact of energy generation and transmission facilities. **A, B**

SECTION 70-816 (2) LAND-USE IMPACTS

30. That the land-use impacts of the facility as proposed are not significant nor inconsistent for a facility of this type or nature. **A**

SECTION 70-816(2)(a) AREA OF LAND REQUIRED AND ULTIMATE USE

31. That the area of land required for the facility as proposed, and the ultimate use thereof when compared with the benefits which will be derived therefrom by a majority of the people served thereby, is consistent and not unrealistic for a project of this type and nature. (Labrie, NR 13, 2106-2109; Wahlquist, NR 22, 3818; App. Exs. 92, 98.) **A**

SECTION 70-816(2)(b) CONSISTENCY WITH LAND USE PLANS

32. That no area wide state or regional land-use plan or plans exist so as to compare the consistency of the facility as proposed with such plan or plans. (Labrie, NR 13, 2109; Cumins, NR 48, 9620.) **A, C**

SECTION 70-816(2)(c) CONSISTENCY WITH NEARBY LAND-USE.

33. That the facility as proposed, specifically the site of the proposed Colstrip Units 3 and 4, is consistent with the general land-use in and around Colstrip proper; however, an inconsistency of land-use does exist in that the regional land-use patterns are predominantly agriculturally oriented. (Labrie, NR 13, 2109-2110.) **A**

34. That the inconsistency between the specific land-use of the site of the proposed Colstrip Units 3 and 4 and the regional agriculturally oriented land-use is compatible. **A**

SECTION 70-816(2)(d) ALTERNATIVE USES OF THE SITE 35. That in view of the existence of Colstrip Units 1 and 2, which units are contiguous and adjacent to the site for the proposed Colstrip Units 3 and 4, any alternative use of the site would not be within the realm of achieving the highest and best use of the land area involved. (Labrie, NR 13, 2109-2110.) **A**

SECTION 70-816(2)(e) IMPACT ON POPULATION

36. That impact on the population already in the area will be minimal in view of the fact that Colstrip Units 1 and 2 are a reality. The accumulative effect of the proposed Colstrip Units 3 and 4, together with the existing Units 1 and 2, on the population already in the area will not be significant. **A**

37. That the impact on the population attracted by the construction and/or operation of the proposed facility will be a self-imposed impact and is not considered significant. **A**

38. That the impact of availability of energy from the proposed facility on the growth patterns and population dispersal will be a benefit and not a detriment to the population in the immediate locality, the state of Montana and the Pacific Northwest in general. **A**

39. That a significant beneficial impact on Rosebud County and the state of Montana will occur by virtue of the tax revenues which will be generated by the proposed facility, which estimated total annual revenues range from a low of \$2,170,000 in 1980 to a high of \$8,507,000 in 1982 to the state of Montana, with accumulative total tax revenue to the state of Montana for the proposed units for the three years from 1980 through 1982 of potentially \$17,092,000. The estimated total annual revenue to be received by Rosebud County in the form of taxes from the proposed facility varies from a low of \$1,856,000 in 1978 to a high of \$6,585,000 in 1982. The cumulative total tax revenue generated by the proposed facility to Rosebud County for the years 1978-1982 is estimated to be \$23,179,000. (Beisel, NR 19, 3160-3175; Cumins, NR 48, 9620-9626, 9666-9675; Logan, NR 48, 9745-9753, 9794-9795; O'Connor, NR 2, 268-270, Schmechel, NR 22, 3877; Hofacker NR 7, 1208-1264, NR8, 1313-1315; App. Exs. 13, 26, 27, 28, 29, 30, 223, 224, 225; Williams, NR 24, 4140-4147; Crosswhite, NR 25-26, 4302-4304.) **E**

SECTION 70-316 (2)(f) GEOLOGIC SUITABILITY OF SITE AND ROUTE

40. That the geologic suitability of the site and route for the facility as proposed was taken into account and considered insofar as design characteristics are concerned. (Labrie, NR 13, 2113; Z6bel, NR 24, 4199.) **A**

41. That considering the geologic suitability of the proposed corridor, from Colstrip to Hot Springs, with regard to the potential seismic activity, together with the transmission line design criteria indicates no problem from earth tremors will be encountered. (Labrie, NR 13, 2113; Z bel, NR 24, 4214.) **C**

SECTION 70-816(2)(g) SEISMOLIGIC CHARACTERISTICS

42. That the frequency and magnitude of seismic activity in the Colstrip area is minimal. (Labrie, NR 13, 2113.) 43. That the design of the proposed facility, specifically the site for the proposed Colstrip Units 3 and 4, has considered the seismology of the area. (Labrie, NR 13, 2113.) **A**

44. That the proposed corridor within which the transmission facility will be located to transmit the power generated by the proposed Colstrip Units 3 and 4 is located in geographic areas, portions of which have been known to have a higher frequency of occurrence and magnitude of seismic activity than the Colstrip site itself. **B**

45. That the geologic suitability of the proposed corridor insofar as seismic activity is concerned was taken into account in the selection of the site for the facility as proposed. (Labrie, NR 13, 2113.) **B**

SECTION 70-816(2)(h) CONSTRUCTION PRACTICES

46. That the construction practices to be followed in the construction of the plants are consistent with normal practices for such facilities (Labrie NR13,2110), and further, that formally adopted transmission line construction guidelines should be developed and approved by this Board prior to the commencement of construction. **B**

SECTION 70-816(2)(i) EXTENT OF EROSION, SCOURING, WASTING OF LAND

47. That the construction reclamation practices of the Applicants safeguards and ensures that a minimum of erosion, scouring and wasting of land, both at the site of the proposed facility and as a result of the fossil fuel demands of the facility, will result. The Montana Reclamation Act will govern the mined areas. (Labrie, NR 13, 2110-2111, 2114-2115; Hodder, NR 27, 4541; Wahlquist, NR 22, 3819.) **B**

SECTION 70-816 (2) (j) CORRIDOR DESIGN AND CONSTRUCTIONS PRECAUTIONS

48. That a two-mile wide corridor has been proposed by the Applicants and this corridor is a reasonable one from the standpoint of minimizing the environmental impact on both the human and natural environments. The final center-line selection is subject to approval of the Board. (Walquist, NR 22, 3820; Zobel, NR 24, 4201, 4202; App. Exs. 92, 98, 99.) **B**

49. That the corridor-selection process as used by the Applicants is consistent with one method that has been in use. (Wahlquist, NR 22, 3820.) **B**

50. That some construction precautions to be followed during the installation of the transmission facilities have been proposed by the Applicants (Zobal, NR 24, 4202, 4210-4211), but that these guidelines need to be assembled and clearly stated in a Construction Guidelines document for the State of Montana. **B**

51. That the design of the transmission lines was especially adapted for the project as proposed to minimize and eliminate field effects, prevent violations of photo chemical oxidant standards and meets all applicable code requirements.

The power generated at Colstrip will be transmitted over two parallel 500 KV transmission lines starting at Colstrip and terminating at Hot Springs, Montana, with switching stations located at Colstrip and at or near Broadview and Helena, Montana. At Broadview will be installed 500 KV buses to tie the two lines together. The line terminals will be equipped with three cycle circuit breakers and high speed relaying to rapidly interrupt and isolate faulty line sections together with series compensation and line reactors of adequate size to satisfy the requirements for power transfer capability and voltage regulation. Also planned is the installation of transformation from 500 KV to 230 KV to allow Montana Power Company to tie into its present 230 KV grid system as well as the intertie south to Yellowtail Dam and other utilities in Wyoming. Near Helena, there will be a switching station consisting of circuit breakers, series capacitors, line reactors, relays and communications. The two 500 KV lines will be tied or bussed together at this station. The terminal at Hot Springs, Montana, was selected because Bonneville Power Administration (BPA) has a 500 KV station at that location. BPA will wheel the power from Hot Springs west for three Applicant utilities: Washington Water Power, Puget Sound Power & Light, and Portland General Electric and Pacific Power and Light will receive its power at Hot Springs for use in Northwestern Montana.

The transmission lines will be steel tower construction using different tower construction which are identical to those shown in Applicants' Exhibits 70,71,72. Each structure is galvanized steel and all insulators are glass.

Construction will be long span construction which envisions approximately four pairs of structures per mile and thus visual exposure is minimized. Also, the lines will be located to avoid as much as possible population centers and residences. The structures as planned are "see through" structures and thus appearance is minimized. Alternatives of aluminum, wood/and welded steel were studied and rejected due to cost and environmental considerations.

The transmission lines will be designed and constructed to withstand two inches of radial ice with no wind or a 120 mile per hour wind on bare wire, which are the extreme conditions anticipated. The lines are also designed for an unbalanced ice load, that is, a condition where ice drops off the wire which can twist the structures. The design factors and criteria selected are suitable and reasonable for the transmission lines.

The Mallard 795 conductor with four conductor bundle configuration was selected over other alternatives. This conductor meets strength requirements and results in lower noise levels because of its larger size. The load and corona losses expected are 72.5 kilowatts (KW) per mile per line at a line loading of 750 megawatts (MW) and 103.6 KW per mile per line at a line loading of 900 MW. These line losses are well within acceptable limits.

Operating experience through 1973 of over 11,000 miles of 500 KV transmission in the United States and 2600 miles of experience by BPA through 1975 demonstrate that extra high voltage (EHV) lines can be designed and operated with minimum adverse effects on the environment and humans.

The minimum conductor-to-ground clearances for Colstrip lines (37' mid span and 41' at road crossings) will reduce induced currents on the largest vehicles to values well below five milliamps (MA) levels. This five MA current level is used as the maximum continuous current that the general public may be exposed to. It is the design criteria in wide use and based on extensive research on what are called current let-go thresholds of people.

Any fence on the right-of-way parallel to the line will be grounded every 100 feet to keep the current below 5 MA. Also, fences crossing the right-of-way will be grounded at each edge of the right-of-way and at every gate or other opening.

Corona related and are discharge effects which principally occur during light rain or snow or heavy wind or from nicks and scratches on the conductor surface, can cause audible noise effects. Corona effects can also produce radio interference (RI) and television interference (TVI). For Colstrip transmission conductor design, the predicted foul weather audible noise at the edge of the right-of-way is 53 decibels (db(a)). Based on data gathered by BPA, such level is at the lower end of the range of noise levels (52.5 to 58.5 db(a)) in which moderate or some complaints can be expected. Audible noise will not, however, be annoyance problem from the Colstrip lines. Based on analysis by C.T. Main, the predicted fair weather radio noise level is 46 db above 1 millivolt per meter (MV/M) at 1 MHz at the edge of the 300 foot right-of-way. The average foul weather radio noise will be 20 db higher. With 300 foot right-of-way, 20% of the type "B" stations will receive class "B" service at the edge of the right-of-way. Due to appreciable lateral attenuation of radio noise, households located further than 150 feet from the edge of the right-of-way will receive 100% of type "B" stations with signal to noise ratio of 24 db.

Ozone produced by corona on transmission lines cannot be measured under field conditions due to the minute amounts produced, their rapid dispersal and ambient levels which vary widely. No violation of the photochemical or ozone standard will occur from the operation of the switching stations or transmission lines.

The location and design of each tower structure will meet or exceed all requirements for

strength and electrical conductor clearance above ground in accordance with the National Electric Safety Code, which has been adopted to insure protection of the public health and safety. The Colstrip line clearances will, in every instance, exceed the criteria of such codes. (Zobel, NR 24, 4212-4216;

Ender, NR 25, 4369-4375, 4378, 4422; Faith, BH 36, 6236-6238; Mueller, BH 36, 4826-4827; Wilkerson, NR 29, 3283.) **B**

SECTION 70-816(2)(k) SCENIC IMPACTS

52. That minimal adverse scenic impact will occur from the construction of Colstrip Units 3 and 4. **A**

53. That scenic impacts will occur from the construction of the transmission line within the corridor proposed by the Applicants. However, such scenic impacts can be minimized by the final selection of the center line of the transmission facility itself, and the use of the proposed towers designed to carry the transmission line. (Labrie, NR 13, 2111; Schmechel, NR 22, 2875-2876, Zobel, NR 24, 4195-4196.) **B**

SECTION 70-816 (2) (m) IMPACTS ON ARCHITECTURE, ARCHEOLOGY, CULTURAL AREAS AND FEATURES

55. That the effects of the facility as proposed on architecture, archeology, cultural areas and features will not be significant, and in the case of transmission line, can be mitigated by proper attention being given to the location of the towers.(Labrie, NR13, 2111; Schmechel, NR 22, 2875-2876; Wahlquist, NR 72, 3802, 380; Zobel, NR 24, 4204.) **A, B**

SECTION 70-816(2)(n) EXTENT OF RECREATIONAL OPPORTUNITIES AND RELATED COMPATIBLE USES

56. The extent of the recreational opportunities and related compatible uses are minimal. **B**

SECTION 70-816(2)(o)

PUBLIC RECREATION PLAN FOR THE PROJECT

57. That the Applicants have proposed an adequate public recreation plan at the Colstrip townsite, developed in conjunction with the facility as proposed. (Schmechel, NR 22, 3879; Labrie, NR 13, 2108; Spring, NR 23, 3941-3945; App. Exs. 37, 38, 39, 46B, 46C, and 46D.) **B**

SECTION 70-816(2)(p) PUBLIC FACILITIES AND ACCOMMODATION

58. That the Applicants have proposed an adequate plan at the Colstrip townsite for public facilities and accommodations, developed in conjunction with the facility as proposed. (Schmechel, NR 22,3879; Labrie, NR 13, 2108; Spring, NR 23, 3941-3945; App. Exs. 37, 38, 39, 46B, 46C and 46D.) **B**

SECTION 70-816(2)(q) OPPORTUNITIES FOR JOINT USE OF WASTE HEAT FROM FACILITY 59. That there is no opportunity for joint use of the waste heat from the facility as proposed by other energy intensive industries. (Labrie, NR 13, 2111.) **B**

SECTION 70-816(3) WATER RESOURCES IMPACTS

60. That the Board of Health and Environmental Sciences, the duly authorized agency empowered to determine whether or not the proposed facility will violate state and federally established standards and implementation plans insofar as air and water quality are concerned, has, after hearing duly noticed and held, issued twenty-one (21) pages of Findings of Fact regarding air and water resources and impacts which Findings of Fact and Conclusions of Law are fully and completely incorporated and adopted herein. (Exhibit "A".) **C**

SECTION 70-816(3)(a) and (b) HYDROLOGIC STUDIES

61. That seepage from the waste disposal ponds will be minimal and will be collected by wells and returned to the ponds. (McMillan, BH 43, 6185-6191, 6194; App. Ex. 175.) **B**

62. That the seepage from the surge pond is expected to be approximately 112 gpm. (Berube, BH 22, 2831-2839; Grimm, BH 24, 6370-6376; Northern Plains Exhibits 2 and 3A; McMillan, BH 43, 6178-6243.) **B**

SECTION 70-816 (3) (c) COOLING TOWER EVALUATION

63. That after the evaluation of eight (8) separate systems, a mechanical draft evaporative cooling tower system has been selected by the Applicants as the most reliable and economical. (Berube, BH 11, 1511-1531.) **B**

SECTION 70-816(3)(d) INVENTORY OF EFFLUENTS

64. That the effluents emanating from Colstrip 1-4 are not anticipated to impair the quality of the ground and surface water of the area and will not violate applicable standards, however careful monitoring of seepage and complete sealing of sludge ponds will ensure that water quality of the area is not degraded. (BHES-Findings XXXV-XXXIX). **B, D**

SECTION 70-816(3)(e) HYDROLOGIC STUDIES OF EFFECTS ON RECEIVING WATERS

65. That the units as proposed will use a closed loop water system which system does not discharge effluents from the plants into ground water or surface water or large evaporation ponds and therefore will have no effect on the ground or surface water in the area. (Labrie, BH 20, 2627, NR 45, 4644-4646, Exhibit "A".) **B, C**

SECTION 70-816(3)(f) RELATIONSHIP TO WATER QUALITY STANDARDS

66. That the facility as proposed will not violate any applicable water standards. (Botz, BH 39, 5223 5227; Willems, BH 38, 5157-5158, Exhibit "A".) **B, C, D**

SECTION 70-816 (3) (g) EFFECTS ON WATER USED BY OTHERS

67. That the Applicants previously established and filed water rights entitling them to use the projected withdrawal from the Yellowstone River and the historic flows and past use of the waters of said River indicate that sufficient water is available for the withdrawals projected, and that such withdrawals will not significantly affect the quantity or quality of the Yellowstone River for other users of the water therefrom. (Labrie, BH 21, 2726; App. Ex. 165; Dunkle, BH 29, 3824-3826; Willems, BH 38, 5157; Botz, BH 39, 5529-5231, Exhibit "A".) **B**

SECTION 70-816 (3)(h) EFFECTS ON PLANT AND ANIMAL LIFE

68. That neither withdrawal of the water from the Yellowstone River under the conditions prescribed by the BHES, nor the minimum seepage from the ponds will have any act on plants, animals, wildlife, fish or vegetation in the areas directly and indirectly effected by such withdrawals. (Dunkle, BH 29,3821 -3826; Willems, BH 38, 5157; Botz, BH 39, 5229-5231; Martin, NR 45, 9055, Exhibit "A".) **B**

SECTION 70-816(3)(i) EFFECTS ON UNIQUE ECOSYSTEMS; e.g., WETLANDS

69. That the withdrawal of water from the Yellowstone River will not affect the wetland ecosystem, directly or indirectly, of the Yellowstone River in any significant respect. (Martin, NR 15, 9055; App. :E:x. 208, Exh.tbite "A".) **B**

SECTION 70-816(3)(j) MONITORING PROGRAMS

70. That seepage from the surge ponds will be monitored by observation wells which will be constructed at appropriate sites around said ponds. (McMillian, BH 43, 6185; App. Ex. 175, Exhibit "A".) **B**

71. That observation wells will be constructed around the sludge ponds to ensure that any seepage from the ponds will not exceed the estimated minimum amounts around the rim and through the foundation of the dam. (McMillan, BH 43, 6191-619 4, Exhibit "A".) **B**

73. That the meteorological data obtained over the one year study period insofar as wind direction and velocity, ambient temperature ranges, precipitation values, inversion occurrences and other effects influencing the dispersion of the plume have been analyzed and the results from said analysis incorporated into the design of the proposed facility to ensure that air quality impacts will be minimized and air quality standards met. (Heimbach, BH 24, 3082, App. Exs. 76, Parts 1 and 2, 76B; Crow, BH 25, 3319-3324, 3339, 3348; BH 26, 3425; Faith, BH 2, 201.) **B**

74. That further meteorological data will be collected prior to final selection of the proposed corridor. **B**

SECTION 70-816(4)(b) TOPOGRAPHY

75. That the terrain in the Colstrip area is of a rolling nature and that said terrain does not affect the dispersion of pollutants from stacks having a height such as those proposed. (Faith, BH 2, 204) **B, C**

SECTION 70-816(4)(c) STANDARDS IN EFFECT AND PROJECTED

76. That the standards in effect and projected for emissions for the proposed facility are the New Source Performance Standards, Title 40, Chapter One, Part 60, Code of Federal Regulations, Section 60.40, et. seq; Section 16-2.14 (1)-S 14082 Montana Administrative Code, and that no different standards are projected to apply to the proposed Colstrip Units 3 and 4. In adopting federal primary standards, the Clean Air Act of 1970 required that for each pollutant there exists a threshold level or margin of safety below which harmful human health effects do not occur. The current 24-hour federal primary ambient standard for sulfur dioxide is 365 micrograms per cubic meter (ug/m³) (1.14 ppm), while the Montana standard is 265 ug/m³ or 0.10 ppm. The available epidemiologic data establishes a threshold between 300 ug/m³ and 500 ug/m³ and thus the federal and Montana standards protect public health. The federal annual standard is 80 ug/m³ (0.03 ppm) for sulfur dioxide and Montana /is more stringent, being 0.02 ppm or 52 ug/m³. No significant increase in morbidity results from long term exposure to so₂ concentrations below the federal standard and with the Montana standard a greater margin of safety is included. The federal primary standard maximum 24-hour level for particulate matter is 260 ug/m³ while Montana is 200 ug/m³ not to be exceeded for more than one percent of the days a year. Epidemiologic data supports a threshold between 300 and 375 ug/m³. Thus the federal and Montana standards are well below such level and are adequate to protect public health. The federal and Montana annual primary ambient air quality for particulate matter is 75 ug/m³. The data which supports the threshold level suggests a safety factor of at least 33%. While there is no sulfate federal standard, the Montana sulfate standards are set to protect public health. Further as to sulfates, there is no scientific basis at present for assigning any public health risk to sulfate levels presently

measured in western United States. Further, the adoption of new source performance standard which govern Colstrip #3 and #4 set by the Environmental Protection agency is set to insure that the ambient air quality standards are not violated. The federal secondary 3 hour standard of 1300 ug/m³ not to be exceeded more than one per year is sufficient to protect public welfare which includes effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility and climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being. The federal secondary standard for particulates is 60 ug/m³, annual arithmetic Mean and 150 ug/m³, maximum 24-hour concentration not to be exceeded more than once per year. In addition, the Montana long term and short term standards apply to public welfare. The Montana fluoride standards cited in these findings are also applicable to public welfare. All standards which are in effect are sufficient to protect public welfare. (Brandt, NR 46, 9174-9116; Colucci, BH 44.6291-6293; App. Ex. 275.) **C**

SECTION 70-816(5) SOLID WASTES IMPACT

88. That waste materials from scrubber units and boilers will be conveyed to sealed ash disposal ponds and eventually dried and the disposal ponds reclaimed. (Labrie, BH 20, 2065-2628, BH 21, 2731-2733; Grimm, BH 12, 1701-1702; Berube, BH 22, 2831-2838, 2860-2861, BH 45, 6474-6475, 6527-6530; App. Exs. 50A, 51.) **B**

SECTION 70-816(5)(a) SOLID WASTE INVENTORY

89. That all effluents from seepage from the waste disposal ponds have been analyzed (Northern Plains Resource Council Exhibit 3A; Grimm, BII44, 6370-6376), and to insure no adverse effects on the area the waste disposal ponds will be sealed and monitoring wells installed. **B, C**

SECTION 70 816 (5)(b) DISPOSAL PROGRAM

90. That the ash and sludge disposal program projects temporary retention ponds located in a 40-acre area just south of the plants and then the wastes are slurred to permanent disposal ponds. The first two permanent disposal areas developed (112 and 147 acres each) will be located 10,000 feet northwest of the plants in Section 20, 21, 28 and 29, T2N, R41E. A third pond is proposed in Sections 5, 6, 7 and 8, T1N, RL 2W. When these ponds are filled, they will be dried up, covered with soil and reclaimed. (Labrie, BH 20, 2625-2628, BH 21, 2731-2733; Grimm, BH 12, 1701-1702; Berube, BH 22, 2831-2838, 2860-2861, BH 45, 6474-6475, 6527-6530; App. Exs. 50A, 51.) **B, C**

SECTION 70-816 (5) (c) RELATIONSHIP OF DISPOSAL PRACTICES TO ENVIRONMENTAL QUALITY CRITERIA

91. That the disposal ponds will not impair the quality of the ground or surface water of the area or violate any applicable standards. (Berube, BH 22, 2831-2839; McMillan, BH 43, 6178-6234; Botz, BH 39, 5223-5227; Willems, BH 38, 5157-5158.) **B, C, D**

SECTION 70-816 (5)(d) CAPACITY OF DISPOSAL SITES TO ACCEPT PROJECTED WASTE LOADINGS

92. That all three permanent ponds will service the 37 year life of the plant. (Labrie, BH 20, 2625-2628, BH 21, 2731-2733.) **B, C**

SECTION 70 816 (6)(a) - (d). RADIATION IMPACTS

93. That analysis of coal from the Colstrip area indicates the presence of trace amounts of radioactive substances, such as radium, uranium and thorium. The quantities found are so low as to be insignificant. It appears that no land-use controls over development and population, waste disposal or special safeguards or monitoring are required for radiation impacts. (Labrie, NR 13, 2111.) **B, C**

SECTION 70-816 (7)(a) NOISE IMPACTS-CONSTRUCTION PERIOD LEVELS

94. That the United States Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted occupational noise standards which apply to the Colstrip plants and that OSHA noise regulations have been and will continue to be taken into account in the design of Units 3 and 4. All OSHA standards, together with the comparable Montana occupation noise standards will be met. (Labrie, NR 13, 2111-2113.) **B, C**

SECTION 70-816 (7)(b) OPERATIONAL LEVELS

95. That after the units are operating, additional noise reducing features will be added as required to meet all standards. (Labrie, NR 13, 2111-2113.) **B, C**

SECTION 70-816(7)(c) RELATIONSHIP OF PRESENT AND PROJECTED NOISE LEVELS TO EXISTING AND POTENTIAL STRICTER NOISE STANDARDS

96. That all present standards will be complied with and no potential stricter noise levels are known. (Labrie, NR13, 2111-2113.) **B, C**

SECTION 70-816 (7) (d) MONITORING ADEQUACY OF DEVICES AND METHODS

97. That adequacy monitoring devices are being utilized by trained personnel in order to establish the noise levels of Units 1 and 2 and will also be used at Units 3 and 4. (Labrie, NR 13, 2111-2113.) **B, C**

Conclusions of Law From Proceedings Before the Board of Natural Resources and Conservation

1. That Applicants have met the burden of proof required herein and that each finding of fact set forth herein is supported by substantial credible evidence contained in the record of these proceedings. **C**

2. The Board hereby adopts all of the Findings of Fact and Conclusions of Law heretofore entered in this proceeding by the Montana Board of Health and Environmental Sciences and dated November 21, 1975. **C**

6. All of the requirements and criteria of the Montana Utility Siting Act of 1973, including but not restricted to Sections 70-810, 70-811, 70-816, Revised Codes of Montana, 1947, have been met, satisfied and complied with by the Applicants. **C**

7. Colstrip Units #3 and #4 and associated facilities are consistent with regional plans for expansion of the appropriate grid of the utility systems serving Montana and interconnected utility systems, such facilities will serve the interests of utility system economy and reliability, and none will be constructed underground. **A, B, C**

8. The location of Colstrip Units #3 and #4 and associated facilities as proposed conforms to applicable state and local laws and regulations issued thereunder. **A**

9. Colstrip Units #3 and #4 and associated facilities will serve the public interest, convenience and necessity. **A**

11. There are not available any viable or reasonable alternatives to the proposed facilities. **A**

12. That the Board of Natural Resources and Conservation grant the application requested and issue a certificate of and Environmental Compatibility and public need required by the Utility Siting Act of 1973 subject, however, to the following terms and conditions, to wit:

a. That the Applicants take what measures are necessary through the enlargement of existing ponds or the construction of additional surge pond facilities so as to ensure a fifty (50) day supply of water at all times, for the operation of the four Colstrip units. **A, C**

b. That the Applicants, at their expenses, shall in full cooperation with the Montana Department of Fish and Game, The Montana Department of Natural Resources and Conservation, and the Montana Department of Health and Environmental Sciences, construct, maintain and operate a water gauging station, at the point of withdrawal of water from the Yellowstone River at Nichols, Montana, or just upstream from said withdrawal point, that will measure the daily flow of

water at said point of withdrawal, and that the Applicants shall furnish all measurements on a periodic basis to the Montana Department of Fish and Game, the Montana Department of Natural Resources and Conservation, and the Mont. Department of and State Board of Health and Environmental Sciences. **A, C**

c. That the seepage from the existing surge pond and any enlarged or additional surge ponds be monitored, as specified by the State Board of Health and Environmental Sciences, and that every feasible engineering means be taken by the Applicants to minimize such seepage. **A, C**

d. That the sludge pond or ponds shall be completely sealed. If the conventional means such as compaction and bentonite application do not seal the pond(s), as indicated by monitoring wells the Applicants shall install and operate, then extreme measures even up to complete sealing by a plastic membrane shall be taken. **A, C**

e. That the reclamation of the sludge ponds, when they are filled and dried out, shall follow the basic reclamation requirements and standards applicable to the proper covering of highly saline backfill in coal areas. **A, C**

f. That the Applicants' general contractor, Bechtel Corporation, shall attempt to work with the Northern Cheyenne Tribe, and its members, in an effort to establish programs to develop skilled labor among the Northern Cheyenne tribal members to the end that said Northern Cheyenne tribal members may be usefully employed during the construction of and subsequent operation of Colstrip Units 3 and 4. **A, C**

g. That the Applicants, at their expenses, shall in cooperation with both the Montana Department of Health and Environmental Sciences and the Tribal Council of the Northern Cheyenne Tribe, construct, maintain and operate an air quality monitoring station on the Northern Cheyenne Reservation as part of the total air quality monitoring program, and further that the Applicants shall compile, collect and furnish all of the results of said monitoring station on a periodic basis to the Department of Health and Environmental Sciences and to the Tribal Council of the Northern Cheyenne Tribe. **A, C**

h. That all monitoring programs heretofore institute in regard to Colstrip Units 1 and 2, and in the Application proposed be implemented and instituted so as to provide a continual flow of factual data insofar as air, surface and ground water are concerned. **A, C**

i. That the Applicants enter into a written agreement with the Board of Health and Environmental Sciences for the payment of the monitoring facilities and operation thereof required by said Board in their certification heretofore issued, and for any further monitoring required in the conditions set forth herein by the State Board of Natural Resources and Conservation. **A, C**

j. That as and when Units #3 and #4 come on line, the Applicants and the Department of Health and Environmental Sciences shall set up by a new agreement a reasonable continuing schedule of monitoring, covering sites, kinds of tests, frequency of tests, and other matters deemed necessary, to maintain the integrity of the monitoring system in determining compliance or non-compliance with the Montana Air Quality standards over a long period of time. **A, C**

k. That the Applicants prepare and transmit a written offer to each of the Montana Rural Electric Cooperatives offering said Cooperatives an opportunity to purchase ownership in the proposed Colstrip Units 3 and 4, which ownership shall be in such amounts as may be mutually agreed upon by and between the Applicants and the Cooperatives, individually or collectively, desiring to purchase such ownership, which will be sufficient to meet the projected energy demands placed on the Cooperatives. **A, C**

l. That relative to the transmission facilities:

1. The Applicants are recognized as responsible for all aspects of said construction, irrespective of how they may sub-contract the work. **B**

2. The Applicants shall develop a set of construction Guidelines which must be approved by this Board, and they must do so and receive approval before transmission line construction commences.

This recognizes that the Colstrip-Broadview segment is covered by previous Conclusions from this Board, relative to the 230 KV line. However, whatever must be done to upgrade that segment to 500 KV must comply with the Construction Guidelines. These Construction Guidelines must not only stipulate construction practices which will minimize Environmental damage, but must also cover the reclamation of unavoidably or accidentally damaged land or water resources. As part of the contracts or subcontracts relative to transmission line construction, the Applicants shall stipulate compliance with the Construction Guidelines, and a performance bond shall be required covering not only construction aspects but also reclamation aspects. Details of the Bonding shall be set forth in the Construction Guidelines. **B**

3. The Applicants shall continue to gather both geologic and meteorologic data for the area of the proposed corridor and submit the same to the Department of Natural Resources and Conservation for its review, so as to determine the proper design and location of the transmission line towers in areas of severe meteorological occurrences, with specific references to the problems of the accumulation of ice and problems of high velocity winds. **B**

4. The final location of the center line of the right-of-way of the Transmission line is subject to the future approval of this Board. Specific means and procedures shall be worked out with this Board for the approval process. The selection of the final center-line location shall as far as possible avoid skylining, will skirt bases of hills, will avoid closely paralleling main highways, will avoid crossing irrigation or potential irrigation lands except on property boundaries, will cross roads and streams directly rather than obliquely, and will otherwise minimize the impact of those lines. **B**

5. The, final proposed location of the center-line for the transmission facility, associated with Colstrip Units #3 and #4 shall be located in cooperation with and consultation with the individual land owners whose land the said facility passes over, through and across so as to mitigate the effects of said transmission facility on the individual land owners. When the Applicants submit the final proposed location of the center-line for the final approval by this Board, they shall include information substantiating compliance with this related Condition. **B**

6. The features of design of the Transmission lines shall be as stated by the Applicants' Findings, and by any modifications which may mitigate geologic, seismic, or meteorologic problems. **B**

m. That the conditions set forth in pp 22 and 23 in the Findings of Fact of the State Board of Health and Environmental Sciences of the State of Montana are hereby fully and completely incorporated as conditions herein. **C**

n. That the Applicants make every effort, and report periodically to the State Board of Health and Environmental Sciences on those efforts, to continually increase the efficiency of the air pollution control system, by adopting or adapting new technology. Any modifications of the air pollution control system, or its means of operation, that will result in emission levels lower than those specified in the Findings of Fact and Conclusions of Law by the Board of Health and Environmental Sciences, which are approved by the Departments or Board of Health and Environmental Sciences shall be adopted and incorporated herein. The applicants shall serve the Board of Natural Resources and Conservation with a certified copy of the approval of modifications and the new permits which have been issued by the Board or Department of Health and Environmental Sciences within 10 days of such final decision at which time the Board of Natural Resources and Conservation shall issue a notice to show cause why the certificate should not be so modified. **C**

Amendments to the MFSa Certificate -

February 10, 1978 – Adoption of Construction Guidelines **A, B,**

June 1, 1979 – Potential Use of McKay Seam Coal

Mine mouth Versus Load Center Power Generation

Transmission Facilities Siting **A, B**

September 12, 1980 – Transmission Routing **B**

September 12, 1980 – Supplemental Yellowtail Dam Water Release Agreement **B**

January 12, 1981 – Ownership Transfer from Puget Sound Energy construction company **B**

June 18, 1982 – Ownership Offer to MT Cooperatives B, E

From the Hearing before the Board of Health and Environmental Sciences

I.

The air quality standards applicable to Colstrip Units #3 and #4 are:

A. Emissions:

New Source Performance Standards (Title 40, 2 Chapter 1, Part 60, Code of Federal Regulations, Section 60, 40, et seq.):

Particulate Matter:

- (1) No discharge to exceed 0.18 g per million cal heat input being .10 lb per million BTU; and,
- (2) Exhibit greater than 20% opacity except that a maximum of 40% opacity shall be permissible for not more than two (2) minutes in any hour. Where the pressure of uncombined water is the only reason for failure to meet the requirements of this paragraph, such failure will not be a violation of this section.

Sulfur Dioxide:

No discharge to exceed (2) 2.2 g per million Cal heat input being 1.2 lb per million BTU.

Nitrogen Dioxide:

No discharge to exceed (3) 1.26 g per million Cal heat input being 0.70 lb. per million BTU.

B. Ambient Air Quality Standards: (Montana)

Sulfur Dioxide: 0.02 ppm (52 ug/m3) Annual

0.10 ppm (2 ug/m3) 24 hr.

(Not to be exceeded for more than one per cent (1%) of the time)

0.25 ppm (65 ug/m3) 1 hr.

(not to be exceeded for more than one hour in any four consecutive days at same receptor point)

Total Suspended Particulates:

75 ug/m3 Annual

200 ug/m3 24 hour

(Not to be exceeded for more than one per cent of days per year)

Suspended Sulfate:

		4 ug/m3	Annual
		12 ug/m3	--
		(Not to be exceeded over one per cent of the time)	
Sulfuric Acid Mist:			
		4 ug/m3	Annual
		12/ugm3	--
		(Not to be exceeded over one per cent of the time)	
		30 ug/m3	1 hour
		(Not to be exceeded over one per cent of the time)	
Lead:		5.0 ug/m3	30 day Average
Beryllium:		0.01 ug/m3	30 day Average
Flouride, Total in Air as HF-1		1 ppb	24 hour Average
National:		(ug/m3)	
			Primary Secondary
Sulfur Dioxide	Annual	80	--
		24 hour 365	
		(Not to be exceeded more than once a year)	
3 hour	--	1300	
Particulates:	Annual	75	60
		24 hour 260	150
		(Not to be exceeded more than once a year)	
Photochemical Oxidants (Ozone):		160 (.08 ppm)	--
		(Not to be exceeded more than once per year)	
Nitrogen Oxides:	Annual	--	100

C. For Class II significant deterioration standards allowable increase applicable to Units 3 and 4 only:
(ug/m3)

Sulfur Dioxide	Annual	15
	24 hour	100
	3 hour maximum	700
Particulates:	Annual	10
	24 hour maximum	30

(A-20)

D. Air quality permit 1187-M1 is fully and completely incorporated herein and made part hereof and by reference is deemed controlling if it should be determined to be in conflict with any of the provisions of A through C of this finding. (Permit 1187-M1) **C**

II.

The water quality standards applicable to Colstrip Units #3 and #4 are Section 69-4827, Revised Codes of Montana, 1947 (Water Pollution), and Section 69-4901 through Section 69-4908, Revised Codes of Montana, 1947 (Public Water Supply). The applicable water quality regulations of the State of Montana pertaining to this portion of the hearing are found- in Section 16-2.14(10)-SI4480, entitled "Water Quality Standards", pp. 16 375.2 through 16-393.8, Vol. 2, Title 16, Health and Environmental Sciences of the Montana Administrative Code. The foregoing water quality standards found in the Montana Administrative Code pertain only to surface water; ground water standards have not yet been adopted by the Board of Health and Environmental Sciences. There are no federal water quality statutes, rules, regulations, standards or laws which are applicable to this hearing. (A-43) **C**

III.

Under the foregoing Montana Administrative Code, the Yellowstone River drainage from the Billings water supply intake to the North Dakota state line, with the exception of various tributaries listed in the code, has a water use classification of B-D3 (Department of Health's Exhibit 27; Section 16-2.14(10)-S14480(4), p. 16-387, Vol. 2, Title 16 of the Montana Administrative Code. (A44) **C**

IV.

The system to be constructed for the control of emissions from Colstrip Units #3 and #4, consists of venturi wet scrubber modules (Applicant's Exhibit 63), (Grimm, 12-1712). There will be eight scrubber modules constructed for Unit 3 and eight scrubber modules for Unit #4 (Grimm, 12-1717), with one module in each unit to be used as a spare. (Grimm, 13-1841). (A1) **A,C**

V.

The components that make up each individual module include: dampers, so the modules can be isolated for maintenance, (Grimm, 12-1718), and turning vanes and flow distributors [to] the Venturi plumb bob section, (Grimm, 12-1719), the absorption vessel with counter current absorption sprays and agitated integral recycle tank with top mounted agitator, (Grimm, 12-1721, 1722, 14-1936) 1 (Applicants' Exhibit 109); backup counter current absorption sprays; a regeneration tank; the Koch or wash tray to remove entrained scrubber sludge from the flue gas, (Grimm, 12 7 1723, 1726), Applicants' Exhibit 110); demisters that separate entrained moisture from the flue gas, (Grimm, 12-1727, 1729), Applicants' Exhibit 111), a stainless steel fleximesh, (Abrams 15-2138); flue gas reheater to reheat the scrubbed gases to 175° Fahrenheit,(Grimm, 12-1729, 1730), equipped with a soot blower to-remove fly ash deposits, (Grimm, 14-1950), and the dry induced draft fan which pulls the flue gas through the scrubber system by a suction or vacuum process. (Grimm, 12-1730). For operation purposes, access ports for observation into the scrubber will be provided to allow the operator to observe any build-up of solid deposits, (Grimm, 14-1935). (A2) **A, C**

VI.

The Venturi scrubber system captures the fly ash present in the flue gas, (Grimm, 12-1745). The fly ash results from the burning of the coal, (Grimm, 12-1720), and contains alkali material of calcium and magnesium which absorbs the sulfur dioxide, (Grimm, 12-1720, 1745). The fly ash is recovered in the Venturi section and drops to the recycle tank, which holds 12% per centum quantity of suspended solids so as to eliminate scaling of the system, (Grimm, 12-1746). The resulting water/fly ash alkaline slurry is recycled through the Venturi and the counter current absorption spray section to effect sulfur dioxide removal. (Grimm, 12-1717, 1720) **A, C**

VII.

The flue gas enters the Venturi at the preheaters outlet, (Grimm, 12-1717). The pressure drop in the throat of the Venturi is governed by the plumb bob and it restricts the flue gas stream so that the velocity of the flue gas, when increased, mixes with the liquor (water or recycled slurry) which is thus atomized. The atomized liquor drops contact the particulate in the flue gas and enlarges the fine particulate because of the deposition of the atomized particles of liquor. Thus the higher the velocity of the gas through the throat of the Venturi, the higher atomization and more removal of fine particulate takes place. (Abrams, 15-2026). The flue gas passes into the absorber sections where the wash tray and demister remove entrained scrubber sludge and water droplets. (Grimm, 12-1726, 1727, 13-1828). Then, upon leaving the absorber section, it passes through, the reheater section which heats the gases above their dew point to a temperature of 175° Fahrenheit, (Grimm, 12-1730). This reheating protects the induced draft fan from contract with a wet gas,thus keeping it dry and the heated gas gives the plume more buoyancy (Grimm, 12-1730, 13-1842; Raben, 23-3013). Waste scrubber sludge is continually bled from the system at a rate proportionate to the boiler load and removed fly ash. (A4) **A, C**

VIII.3

Chemical control of the scrubber system should be maintained at a pH of 5.0 to 6.5 (Grimm, 13-1867), to prevent scale, i.e., crystals of calcium sulfate and calcium sulfite, (Applicants' Exhibit 74, p. 3-2). A liquid to gas ratio of 33, i.e., 33 gallons of liquid per thousand actual cubic feet of incoming flue gas, (Grimm, 12-1719, 14-1913; Raben, 23-3010), in the entire system is used to remove the sulfur oxides, particulate matter, fluorides, (Grimm, 13-1787, 1788), oxides of nitrogen, (Abrams, 16-2272), lead, beryllium and other trace elements, (Grimm, 12-1720), (DNR Exhibit, 123), (Applicants' Exhibit, 74). A constant velocity of flue gas flow into the throat of the Venturi regardless of the boiler load is maintained by the use of the plumb bob to insure constant outlet grain loading of particulate matter (Grimm, 12-1719; Abrams, 15-2071). The velocity of the flue gas going through the mist eliminator should be maintained at 8.7 feet per second at full load and 7.5 feet per second at average load of 80% to prevent plugging of the demister, (Abrams, 15-2075, 2076; Grimm, 14-1896), (Applicants' Exhibit, 74). (A-5) **A, C**

IX.

The system is designed without any by-pass, (Grimm, 13-1853), so that all flue gas from the boiler will be treated in the scrubber modules when the plant is in operation and thus meet emission standards, (Grimm, 14-1965). A by-pass is a means of ducting the flue gas around the scrubber modules in the event the modules become inoperable and by its use the flue gas passes untreated to the stack, (Grimm, 14-1933, 1947). (A-6) **A, C**

X.

Scaling in the scrubber is deterred by: (1) proper control of pH through injection of lime as additional alkali substance to absorb sulfur dioxide and (2) recycle of the liquor which provides seed crystals of calcium sulphate with the fly ash as precipitation sites for calcium sulphate so as to prevent the supersaturation of calcium sulphate in the recycled liquor, (Grimm, 14-1836, 1912; Raben, 23-2996, 2999). The recycle tank of the system is a holding tank which catches the slurry from the downcomer. It holds the volume of slurry for eight minutes, which is equivalent to providing contact with the liquor of each individual particle of fly ash for ten hours, (Abrams, 14-2001). Thus the slurry is desupersaturated, i.e., the solids of calcium sulfate resulting from absorption of SO₂ will deposit on the nucleus of the calcium sulfate and fly ash existing in the slurry. The effluent or waste, which is insoluble, is placed in separate holding tank for ten minutes to complete the reaction and then is pumped to a retention final disposal pond where the solids settle. The remaining clear liquor from the pond is returned to the system. The percentage of suspended solids in the slurry liquor at 12%, will help avoid scaling of the unit, (Abrams, 15-2073, 2075). (A-7) **A, C**

XI.

The operation of the scrubber will be controlled by operators in a control room where instruments record the inlet and outlet concentrations of so₂ and also record the ph of the scrubber system. In the event the outlet concentration increases (above 260 50 ppm with an inlet concentration of 965 ppm) while the ph drops (below 5.6 6.0), the operator can add additional time to bring the ph to proper level and thus reduce the so₂ outlet concentration, (Grimm, 13-1875). (A-8) **A, C**

XII.

The emission control system for Colstrip Units #3 and #4 is the best suited for the Colstrip plants because it makes use of the alkalinity nature of the fly ash found in the Rosebud coal and thus reduces dependence upon additional lime injection, (Grinun, 14-1964). **A, C**

XIII.

Chemical control of the scrubber system should be maintained at a ph of 5.0 to 5.6 (Grimm, 13-1867), to prevent scale, i.e., crystals of calcium sulfate and calcium sulfite, (Applicants' Exhibit 74, p. 3-2). A liquid to gas ratio of 33, i.e., 33 gallons of liquid per thousand actual cubic feet of incoming flue gas, (Grimm, 12-1719, 14-1913; Raben, 23-3010), in the entire system is used to remove the sulfur oxides, particulate matter, fluorides, (Grimm, 13-1787, 1788), oxides of nitrogen, (Abrams, 16-2272), lead, beryllium and other trace elements, (Grimm, 12-1720), (DNR Exhibit, 123), (Applicants' Exhibit, 74). A constant velocity of flue gas flow into the throat of the Venturi regardless of the boiler load is maintained by the use of the plumb bob to insure constant outlet grain loading of particulate matter (Grimm, 12-1719; Abrams, 15-2071). The velocity of the flue gas going through the mist eliminator should be maintained at 8.7 feet per second at full load and 7.5 feet per second at average load of 80% to prevent plugging of the demister, (Abrams, 15-2075, 2076; Grimm, 14-1896), (Applicants' Exhibit, 74). (A-5) **A, C**

XIX.

The flue gas desulphurization system to be installed at Colstrip Units #3 and #4 and which are presently under construction at Units #1 and #2 may prove to be reliable systems to remove pollutants from the flue gas because Venturi scrubbers have been in operation at other power generating plants and are not a new equipment system (Abrams, 14-1990). The Colstrip modules have improved the design and operating efficiencies over previous modules.(Labrie, 21-2770; Abrams, 14-1944, 1990; Raben, 23-3062). The alkali nature of the fly ash of Rosebud coal as does the addition of dolomitic hydrated lime contributes to that improvement, (Abrams, 14-2000). In addition, the pilot plant study conducted at Corette generating station, Billings, Montana confirmed the chemistry of the system, (Abrams, 15-2014;Raben, 33-2931). (Applicants' exhibits, 73 and 74). The particulate removal based upon pilot plant studies is projected within the range of 99.465% to 99.76% and will be enhanced by the utilization of the wash tray and stainless steel pleximesh in the scrubber units. (Abrams, 15-2042, 2045, 15-2034, 2035). Utilization of the wash tray reduced the solid buildup in the demister and improved the particulate The

estimated capital cost of the system is \$151,614,000.00, which is equivalent to \$108.30 per kilowatt (Applicants' Ex. 108A), and this represents the least expensive and most economical system for Units #3 and #4. (Leffman 20-2410). The operation costs of Units 3 and 4 are also the most economical of all other systems and will operate at an estimated cost of \$1,030,000.00 per year. (Applicants' Ex. 108B). **A, C, E**

XX.

A dispersion model is used to predict maximum ground level concentrations. A dispersion model is a mathematical equation which indicates the change in concentrations of various pollutants in different positions downwind. Tall stacks effect the ground level concentrations of pollutants which come from the plant. In most models, the basic characteristics include: (1) the stack and emission parameters; (2) the plume rise equations; (3) the dispersion (spread of the plume) equations; and (4) the diffusion equation which calculate the ground level concentrations (Gelhaus 38-5068). Meteorology in the Colstrip area must be considered to determine whether the peak or maximum concentrations as computed by any model will in fact occur since air pollution is very closely related to the atmosphere and the changes of the atmosphere. (Crow, 25-3318, 3320, 3333, 3334, 43-6149). **C**

XXI.

For predicting maximum ground level concentrations for Units #3 and #4, one model used Briggs plume rise equation (Applicants' Ex. 66), Hillsmeier-Gifford plume spread classified by the Pasquill method and the Gaussian dispersion equations; Maximum concentrations were determined by multiplying the highest relative concentrations by projected emission rates. (Applicants' Ex. 67 and 121). Inversion heights published by Holzworth apply. **C**

XXII.

Meteorological data for the Colstrip area was gathered by the Earth Science Department of Montana State University over a two-year period under a research grant funded by Montana Power Company and in conjunction with the Department of Health and Environmental Sciences. (Heimback 24-3062; Applicants' Ex. 76, Part I and Part II; Ex.76-B). Another dispersion model was developed by the Montana State University personnel who conducted the meteorological study. (Heimback 24-3090, 3092) (Applicants' Ex. 76 D, E, F and G). **C**

XXIII.

In applying the MSU model, predictions for downwind distances of less than, or equal to, 2.3 kilometers applicants divided by a factor of two. (Heimback 24-3093, 45-6452, 6470) (Applicants' Ex. 183, p. 166). All calculations using the MSU model were made assuming an inversion at the top of the plume height for one hour concentrations, this being a worst case condition for an emission situation. **C**

XXV.3

Colstrip Units 3 and 4 will project two 525 692-foot stacks and will project compliance with all applicable standards.

XXVI.

Generally there are four steps, in the development of a power plant pollution control system. The first step is bench scale, which is what the applicants did at the Corette Station. The next step is a pilot plant, which will provide for the testing of the Units, coming to 25 times the size of the unit tested at the Corette Station. The next step would be a prototype of a demonstration unit. The last step would be a commercial unit in operation. (Raben 23-2967). (0-119) **A, C**

XXVII.

The criteria established by the National Academy of Engineers are generally accepted. They require 90% or greater sulfur oxide recovery, 90% availability of a reliable system, one year of commercial demonstration on a 100 megawatt unit or larger, and economic feasibility for operation based upon sufficient data. **A, C**

XXVIII.

Colstrip Unit #1 would produce useful information to be incorporated into Units 3 and 4 for consideration of the proper pollution control there to be installed. (Crow, 26-3427; Grimm 14-1921). (0-125). Colstrip #1 is presently available for observation and evaluation. (Leffman, 19-2484). **A, C**

XXIX

A closed loop water system (a system which does not discharge effluents from the plants downstream or into other waters) was adopted for Colstrip Units 1-4 so that there would be no discharge from the plants into the Yellowstone River or other state waters. (Labrie 20-2627, 45-6444-6446). **A, C**

XXX.

The surge pond is located approximately one mile northwest of the plants and comprises approximately 160 acres. When filled it will hold approximately one billion gallons of water or 2800 acre feet. It contains 19 days' storage of water at summer withdrawal rates for Units 1-4 and 26 days' storage of water for winter withdrawal rates for the four units. (Grinun, 12-17 01,13-18347 Labrie, 2072630; Berube, 22-2831-2832; McMillan, 43-6177-6184, 6227; Applicants' Exhibits 51, 175.) (A-31) **A, C**

XXXI.

Much of the waste matter from the four units, such as ash from the scrubber and boiler systems, suspended solids, sediment, and other matter, will be disposed of by using water to convey them to

their eventual destinations, the disposal ponds. In some instances the wastes will be further processed and clean water will be returned into the system in order to reduce the amount of water used. Waste ash from various systems and some other waste will be first sluiced to temporary retention ponds located in a 40-acre area just south of the plants. These wastes will eventually be moved to the ultimate disposal ponds by slurry pipeline. The first two permanent disposal areas developed will be located approximately 10,000 feet northwest from the plants in Sections 20, 21, 28 and 29, Township 2 North, Range 41 East. During the life of Units 3 and 4, it will be necessary to develop further disposal ponds to be located in Sections 5, 6, 7 and 8, Township 1 North, Range 42 East. After these ponds are filled with waste, they will be dried up, covered with dirt and reclaimed; the first permanent retention pond will contain a surface acreage of approximately 112 acres and it, like all the other retention ponds, will be sealed, using normal construction methods. The first permanent retention pond will have a useful life of approximately six years if the pond is utilized for all four units. Its useful life will be approximately 12 years in the event that it is utilized for the wastes from Units 1 and 2 only. (Labrie, 20-2625-2628, 21-2731--2733; Grimm 12-1701-1712; Berube, 22-2831-2838, 2860-2861, 45-6474-6475, 6527-6530; (Applicants' Ex. 501A, 51.) (A-32) **A, C**

XXXII.

Maximum water consumption for Colstrip Units 1, 3 and 4, running at full or 100% load will be reached during the summer months of July and August of each year at the rate of approximately 56.12 cubic feet per second (approximately 25,187 gallons per minute or 40,631 acre feet annually). (Labrie, 20-2629-2630 Berue, 22-2839 2842; Applicants' Exhibit 50B). (A-33). **A, C**

XXXIII.

The lowest historical daily flow of water in the Yellowstone River at the location of Nichols is approximately 1,000 cubic feet per second (approximately 448,800 gallons per minute or 724,000 acre feet annually). Lowest flows of water in the Yellowstone River at the point of diversion near Nichols occur during the winter months of December, January and February with the highest flows during the the spring month of June. (Labrie, 20-2630; Dunkle, 30A-3903) (Applicants' Ex. 137, 138). (A-36) **A, C**

XXXIV.

Because of the storage capacity of the surge pond and the historical flows of water on record in the Yellowstone River, it will not be necessary for the Applicants to withdraw water from the Yellowstone River for use in their Colstrip Units when the river is flowing water at Nichols less than 1,500 cubic feet per second (673,000 gallons per minute or 1,086,000 acre feet per year). (Labrie-, 20-2630). (A-38) **A, C**

XXXV.

Dissolved solid concentrations in the Yellowstone River increase downstream and decrease with increased flow. Suspended sediment in the Yellowstone River also varies with flow, but in a manner opposite to the dissolved solid concentrations; that is, suspended sediment increases with increasing flow. In general, water quality is best in the Yellowstone River at high flow periods in the more upstream

locations, but sediment detracts from this quality at high flow periods, particularly at downstream locations. (Dunkle, 29-3822-3823; Botz,39-5222-5223). (A-42) **A, C**

XXXVI.

The effects of the withdrawal of water from the Yellowstone River for utilization at Colstrip Units 1-4 as proposed by the applicants does not appear to be significant. (Dunkle, 29-3824-3826; Willems, 38-5157; Botz, 39-5229-5231). **A, C**

XXXVII.

The impact of the withdrawal of water from the Yellowstone River for utilization at Colstrip Units 1-4 as proposed by the Applicants upon the water quality of the Yellowstone River will be insignificant and will not cause a violation of any of the standards applicable to the Yellowstone River. (Willems, 38-15157). (A-4 6) **A, B, C**

XXXVIII.

The impact of Colstrip Units 1-4 upon surface water quality outside of the Yellowstone River will be insignificant and will not violate any applicable standards. (Botz, 39-5223-5227; Willems, 38-5157-5158). (A-4 7) **A, B, C**

XXXIX.

The various ponds which will be used for storage of water in the evaporation and disposal of water and waste materials emanating from Colstrip Units 1-4 will have seepage not anticipated to impair the quality of the ground water in the area. (Northern Plains Ex.2, 3A; Berube, 22-2831-2839; Grimm, 44-6370-6376). **A, B, C**

XXXX.

The applicants were aware of the generalized statement of the non-degradation standards both in the Montana State implementation Plan and the statutes and regulation of the Department of Health and Environmental Sciences and the Board of Health and Environmental Sciences in the State of Montana. The applicants knew that it would be necessary to resolve the highest state of the art in their pollution control system. (Berube, 10-1392, 1393) (2-144). **B, C**

Conclusions of Law From Before the Board of Health and Environmental Sciences

2. The operation of the air quality system in Colstrip #1 will be closely monitored by the Department of Health and Environmental Sciences and the applicants. The data therefrom is to be interpreted by the

Department as to the effectiveness of such system of control of air quality. This monitoring will be continuous during the construction of Units #3 and #4. In the event Colstrip #1 violates the compliance standards during its operation and performance, certification of Colstrip Units #3 and #4 **will be** suspended pending the implementation of modifications in Colstrip Units 1, 2, 3 and 4 to bring the units into compliance. **B, C**

3. The certification with conditions herein set forth does not constitute a waiver of any of the requirements of the Clean Air Act, the Water Pollution Control Act, or the implementation plan, including the necessity of obtaining a permit in accordance with the rules and regulations implemented under Section. 69-3911, R.C.M. 1947. **B, C**

4. Any compliance modifications required during the operations of Colstrip Units 1 or 2 will be installed in Colstrip Units 3 and 4. **C**

5. No water will be withdrawn from the Yellowstone River when the Yellowstone River is flowing at Nichols less than 1,500 cubic feet per second. Daily testing will be required during periods of low water. **B, C**

6. All ponds, surge ponds, settling ponds and impoundments shall be properly sealed. They shall be monitored for seepage, including the installation of test wells to determine the extent of ground water pollution, and the necessities of correction therefore. **B, C.**

Exhibit 3 – Coal Quality of Areas A, B, C, D, E, F, and G

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Exhibit 3
Coal Quality of Areas A, B, C, D, E, F, and G

Executive Summary

Coals from Areas A, B, C, D, E, F, and G were compared to determine if those from Areas A, B, F, and G (proposed coals) are significantly different from those of Areas C, D, and E in terms of air emissions or potential ground and surface water impacts from Units 3&4. These comparisons were done using the available results from representative samples of coal. Thirty parameters, typical for characterization of coal, were reviewed, including major components, trace oxides and trace elements. These comparisons support several conclusions about the potential consumption of the proposed coals at Units 3&4.

The Units 3&4 scrubbers are well-designed to handle any of the proposed coals because the range of major coal components in these areas are completely encompassed within the Units 3&4 scrubber design ranges. At equivalent heat input to Units 3 & 4, less sulfur (16% - 22% less) and ash (10%-13% less) should be produced with the use of any of the proposed coals. The trace oxides and trace element concentrations in the proposed coals are sufficiently similar to those of Areas C, D, and E that with the consumption of these coals, the current level of emissions control and compliance with current and future standards should continue and possibly improve. Proposed coal mercury levels are significantly lower, while thirteen of fourteen measured non-mercury trace elements are lower or no different, and the vast majority (90%) of measured ash oxides are lower or no different in the proposed coals. Additionally, recent performance tests reveal that trace element control by the Units 3&4 scrubbers has shown a significant improvement over that originally measured.

Because the proposed coals are sufficiently similar to those of Areas C, D, and E, the capability of the Units 3&4 scrubber by-product disposal system to effectively handle the material generated from their consumption should not be significantly impacted. The system will likely see reduced total loading of materials handled due to lower levels of sulfur (16%-22%) and ash (10%-13%) present in the proposed coals. There also should be no material difference between the coals in terms of what compounds are being disposed; the twenty-four trace oxides and elements reviewed here make up on average 97% of the expected coal by-products from all areas. The expected make-up of the proposed coals' byproducts will not contain significantly more amounts of the oxides and elements reviewed; the proposed coals exhibit the same or less concentrations of 91% of the compared trace oxides and elements. Consequently, potential impacts to ground and surface water from the closed loop effluent system will not be affected by consumption of the proposed coals.

Introduction

A comparison of coal mined locally near Colstrip Units 3&4 is made in this exhibit. All of the coal being compared is from the same seam – the Rosebud – and is mined from 3 different locations in the Rosebud seam. Units 3&4 have historically consumed coal from Areas C, D, and E, which will be used as the baseline to which other coals will be compared. Coal from Areas A and B, historically consumed by Units 1&2, will be compared to that from Areas C, D, and E; as will coal from Areas F and G, which will be mined in the future. Areas C, D and E coal was characterized in Exhibits 53A, 54, 55, and 60 from the original Units 3&4 Certificate proceedings. Attachment 3-1 contains this information.

The first question to be answered by this comparison is whether or not coal from Areas A, B, F and G is the same as or better than that from Areas C, D, and E, in terms of emissions control. Exhibit 60 from the certification proceedings (Attachment 3-1 Page 2), shows the major coal component values given to the manufacturer of the scrubbers for design purposes. These major components, along with certain other components which were or have since become important to emission control form the basis for answering this question.

A second question to be answered by this comparison is whether or not, if Units 3&4 consume coal from Areas A, B, F and G, the constituents removed by the scrubbers and conveyed to the disposal ponds could change the disposal system characteristics in ways that might increase any potential impacts to ground or surface waters. Stated another way, the question becomes whether or not coal from Areas A, B, F and G is the same as or better than coal from Areas C, D, and E in terms of potential impacts to ground or surface waters. The amount and quality of the sulfur removal byproducts and ash constituents will form the basis for answering this question.

Sampling and Analysis

The coal samples analyzed for this comparison were obtained by one of two methods: 1) composited core samples (core), or 2) composited belt samples (belt). The core samples were taken at the Rosebud mine and the belt samples were taken at the Colstrip plant. Both types of samples are representative of coal that has been or could be consumed by Units 3&4. More detailed sampling procedures are available upon request, but they are not discussed further here. The samples used for this comparison are the most representative available and the analyses results from them are used for critical business purposes including characterization of the coal offered to potential customers by the mine, assessment of the quality of coal received by the plant, performance monitoring of units 3&4, and fuel supply contract or plant ownership payments and/or reimbursements.

The baseline results from Areas C, D, and E, as well as the results from Areas F, and G were obtained from core samples. Results for Areas A and B were obtained from belt samples. With the exception of those for boron, the sample results for Areas C, D, and E were obtained around the time of the designing of Colstrip Units 3&4 as well as the Major Facility Siting Certificate proceedings. The Date of the Certificate of Compatibility and Public Need for Units 3&4 is July 22, 1976. Area C, D, and E coal boron results are for the period January 1, 2010 - June 2, 2014.

Areas A and B results are for the period January 1, 2000 and December 31, 2013; only one sample was obtained prior to 2010. Areas F and G sample results were obtained during the period January 1, 2011 – October 15, 2014

Analysis methods for the baseline results are described in the background documentation for the Units 3&4 Certificate of Environmental Compatibility and Public Need. The methods used to obtain the non-baseline results are listed in Attachment 3-2. The non-baseline analyses were conducted by Standard Laboratories.

Results

Standard statistical methods were used to compare constituents. Student T distribution hypothesis testing¹ was completed to determine if there was a statistically significant difference

¹ Groebner and Shannon, Business Statistics, 1981

between results at the 99% confidence level.

Attachment 3-3 summarizes the constituents found in the coal from Areas A, B, F, and G. Only pooled results are given for Areas A and B, and are labeled with the descriptor “AB”. Pooled results for Areas F and G, labeled “FG” have been added to individual area results. Attachment 3-4 summarizes the comparisons between chemical constituents. The analyses results for Areas C, D, and E have been pooled for this comparison and labeled “CDE”.

Pooling of the results as described was done to reflect actual current and future coal use practices and is appropriate because of the way the Colstrip scrubbers were designed; the way the coal has historically been contracted for, delivered and consumed; and expectations for future contracting, delivery and consumption. The Units 3 & 4 scrubbers were designed for coal from any of the Areas C, D and E; and the coal supply for Units 3&4 has been contracted for and delivered without regard to its source except that it is from any of Areas C, D, or E. Likewise, the Units 1&2 scrubbers were designed for coal from either of Areas A or B; and these Units’ coal supply has also been contracted for and delivered without regard to its source except that it is from either of the Areas A or B. The Colstrip plants expect to utilize future coal supplies similarly, including comparable contracting, delivery and consumption practices for Areas F and G coal. Areas F and G results are treated separately in addition to being compared on a pooled basis, because Area G coal is not expected to be available until sometime after Area F coal due to the relative timing of the applicable mine permit amendments.

Major Components

In this section the following six major components in Areas AB, F, G, and FG are compared against those in Area CDE, all on an “As received” basis:

- %Ash,
- %Sulfur,
- Heating Value [Btu/Lb],
- %Moisture,
- %Volatile Matter and
- %Fixed Carbon

The summary below compares each of Area’s AB, F, G and FG major components to those of Area CDE. For each parameter the figures “-”, “+”, and “n” indicate the relationship between parameters in the different areas, with a “-” indicating a negative difference, a “+” indicating a positive difference and an “n” indicating no difference.

Table 1 – Summary of Comparisons to CDE – Major Components

Parameter	AB	F	G	FG
Ash	-	-	n	-
Sulfur	-	-	n	-
Btu/Lb	+	+	+	+
Moisture	n	n	n	n
Volatile Matter	n	n	n	n
Fixed Carbon	+	+	+	+

This summary indicates that Btu/Lb and Fixed Carbon are higher in Areas AB, F, G, and FG when compared to Area CDE and that there is no difference in the Moisture and Volatile Matter for these areas. Areas AB, F, and FG exhibit lower Percent Sulfur and Percent Ash than Area CDE, while Area G shows no significant difference in these parameters.

An additional comparison was made of the major components contained in the non-baseline areas with those given to the scrubber manufacturer of Units 3&4. These comparisons are shown in Exhibit 3-4, Pages 1, 2, and 3. They indicate that the entire 99% confidence interval ranges of all major components measured in Areas AB, F, G and FG are within the bounds of the design parameters given to the scrubber manufacturer.

A further comparison is made across the range of 30 analyzed coal parameters by comparing the maximums and minimums of Area CDE identified in the original certificate proceedings to the average characteristics exhibited by the proposed coals and expected to be consumed by Units 3&4. This comparison shows that the expected parameters from the proposed coals fall within the ranges identified in the certificate proceedings.

Oxides in Ash

The following ten oxides found in the ash of Areas AB, F, G, and FG were compared to those in CDE, on a percentage of ash and a #/MMBtu basis:

- Calcium Oxide [CaO],
- Silicon Dioxide [SiO₂],
- Ferric Oxide [Fe₂O₃],
- Phosphorus Pentoxide [P₂O₅],
- Aluminum Oxide [Al₂O₃],
- Titanium Dioxide [TiO₂],
- Magnesium Oxide [MgO]
- Sulfur Trioxide [SO₃]
- Potassium Oxide [K₂O],
- Sodium Oxide [Na₂O]

The concentrations of these components in terms of #/MMBtu more accurately reflect impacts to the scrubbers and plant disposal system, since the ash content and heating value of the coal is taken into account. This comparison is summarized below with Tables 2a and 2b in a similar fashion to the comparison of the major components. The columns for each parameter show statistically significant differences or lack thereof in the same manner as for Table 1.

Table 2a – Summary of Comparisons to CDE – Trace Oxides

Parameter	AB	F	G	FG
CaO (% of Ash)	n	+	n	+
SiO ₂ (% of Ash)	n	-	+	n
Fe ₂ O ₃ (% of Ash)	n	-	-	-
P ₂ O ₅ (% of Ash)	n	n	+	n
Al ₂ O ₃ (% of Ash)	+	+	+	+
TiO ₂ (% of Ash)	n	+	+	+
MgO (% of Ash)	n	+	-	n
SO ₃ (% of Ash)	n	n	-	n
K ₂ O (% of Ash)	n	-	-	-
Na ₂ O (% of Ash)	n	+	+	+

Table 2b – Summary of Comparisons to CDE – Trace Oxides #/MMBtu Basis

Parameter	AB	F	G	FG
CaO (% of Ash)	n	n	-	n
SiO ₂ (% of Ash)	-	-	-	-
Fe ₂ O ₃ (% of Ash)	-	-	-	-
P ₂ O ₅ (% of Ash)	-	n	n	n
Al ₂ O ₃ (% of Ash)	+	n	+	n
TiO ₂ (% of Ash)	n	n	+	+
MgO (% of Ash)	-	n	-	-
SO ₃ (% of Ash)	-	n	-	-
K ₂ O (% of Ash)	-	-	-	-
Na ₂ O (% of Ash)	n	+	+	+

This Trace Oxides summary shows variable comparisons between coal in Areas AB, F, G, and FG versus that of Area CDE. On a percentage of ash basis, for CaO, Areas F and FG show relatively higher calcium oxides, while CaO of Area AB and G is not significantly different from that of Area CDE. For SiO₂, Areas AB and FG exhibit no statistical difference, while Area F contains statistically lower and Area G higher SiO₂ than Area CDE. For Fe₂O₃, three Areas (F, G, and FG) have relatively lower content than Area CDE, with Area AB exhibiting no difference. P₂O₅ shows no statistical difference for three Areas – AB, F, and FG - while Area G exhibits statistically higher concentrations of P₂O₅ in ash than Area CDE. On a #/MMBtu basis all these components show no statistically significant difference or statistically significant lower concentrations than CDE.

On a percentage of ash basis, all compared areas show higher Aluminum Oxide than Area CDE. TiO₂ content is greater in all non-baseline areas, but Area AB's difference is not statistically significant. There is no statistical difference in ash concentrations of MgO between Areas AB, FG and CDE, while Area F exhibits higher and Area G exhibits lower MgO, Three of the four non-baseline Areas (AB, F, FG) exhibit lower SO₃ content in the ash than Area CDE, but only the difference between Areas CDE and G is significant at the 99% confidence level. On a #/MMBtu basis, Al₂O₃ and TiO₂ show statistically significant higher concentrations for Areas AB (Al₂O₃) G (Al₂O₃ and TiO₂) and Area FG (TiO₂). All other comparisons of the above components yield no or lower statistical differences.

On a percentage of ash basis, Areas F, G, and FG show lower K₂O than Area CDE, with AB not statistically different. Finally, Na₂O content is higher in the ash of Areas F, G, and FG; AB is not statistically different when compared to Area CDE ash. On a #/MMBtu basis, K₂O shows statistically significant lower concentrations in all non-baseline areas, while Na₂O shows statistically higher concentrations in Areas F, G, and FG.

Trace Elements

Table 3 compares the as received coal content and #/MMBtu loading of fourteen trace elements:

- Antimony
- Arsenic

- Beryllium
- Cadmium
- Chromium
- Copper
- Fluorine
- Germanium
- Lead
- Manganese
- Mercury
- Nickel
- Selenium
- Zinc

Table 3 is arranged in the same format as Tables 1 and 2.

Table 3a – Summary of Comparisons to CDE – Trace Elements

Parameter	AB	F	G	FG
Antimony	n	n	n	n
Arsenic	-	-	n	-
Beryllium	n	n	n	n
Cadmium	n	-	n	-
Chromium	n	n	n	n
Copper	-	-	-	-
Fluorine	n	n	n	n
Germanium	-----	-	n	-
Lead	n	n	n	n
Manganese	+	n	+	+
Mercury	-	-	-	-
Nickel	-	-	n	-
Selenium	n	n	n	n
Zinc	-	-	n	n

Table 3b – Summary of Comparisons to CDE – Trace Elements #/MMBtu Basis

Parameter	AB	F	G	FG
Antimony	n	n	n	n
Arsenic	-	-	-	-
Beryllium	n	n	n	n
Cadmium	n	-	n	n
Chromium	n	n	n	n
Copper	-	-	-	-
Fluorine	n	n	n	n
Germanium	-----	-	-	-
Lead	n	n	n	n
Manganese	n	n	+	+
Mercury	-	-	-	-
Nickel	-	-	-	-
Selenium	n	n	n	n
Zinc	-	-	n	n

As Table 3 shows, with the exception of manganese, on a parts per million basis coals from Areas AB, F, G and FG exhibit no statistically significant differences or lower concentrations of these elements than coal from Area CDE. Areas AB, G and FG exhibit higher manganese than

Area CDE and Area F exhibits no statistical difference. For this comparison, note that it is done an as received in coal basis using modified MFSA Proceedings Exhibit 54 (Attachment 3-1, Page 2). On a #/MMBtu basis, the results follow the same pattern, but the non-baseline coals show a decrease in each component because of the lower ash and higher heating value of these coals, the result being that only Areas' G and FG differences in manganese are statistically significant.

Discussion

Emissions Control

Many factors influence the emissions from Colstrip Units 3&4, but future consumption of coal from Areas AB, F, G, or FG would tend to lower regulated emissions because of these coals' major constituent, trace oxides, and trace element content. Lower sulfur and ash content, along with higher heating value should mean lower emissions produced at the same production rate. The following table illustrates this effect by comparing the ash and sulfur values of the coal on a #/MMBtu basis, which takes into account the combined impact of sulfur, ash and heat content of the coal. The table shows that at equivalent heat input to Units 3 & 4, less sulfur (16% - 22% less) and ash (10%-13% less) will be produced and subsequently emitted with the use of any of the proposed areas' coal.

Table 4 – Sulfur and Ash #/MMBtu Comparison

Sulfur	Area Coal Content - #/MMBtu				
	CDE	AB	F	G	FG
	0.93	0.73	0.70	0.82	0.73
% Difference From CDE		-22	-32	-16	-25

Ash	Area Coal Content - #/MMBtu				
	CDE	AB	F	G	FG
	11.11	9.93	9.78	10.10	9.87
% Difference From CDE		-11	-13	-10	-12

Furthermore, the comparisons shown in Figure 3-4, Pages 1-3 show that the range of major coal components for which the Units 3&4 scrubbers were designed completely encompass the reasonably expected ranges of these components, represented by the 99% confidence interval. Thus the Units 3&4 scrubbers are well-designed to handle coal from any of Areas AB, F, G and FG. Consequently control of emissions should exhibit the same or better levels with combustion of such coal.

The Units 3&4 scrubbers have been designed to utilize the available alkalinity of the fly ash to help remove acid gases (including sulfur dioxide). Alkaline ash oxides, outstanding among them being CaO, or lime, provide this benefit to the scrubbers' acid gas removal capabilities. These

can be indicated by the base/acid ratio¹. The base/acid ratio of the ashes from Areas AB, F, G and FG ranges from 0.38 (Area G) to 0.47 (Area F), while that of Area CDE is 0.44. The similarities of the base/acid ratios indicate that any of these ashes could perform similarly with regard to the scrubbers' acid gas removal.

With the exception of those previously addressed, the other ash oxides do not impact scrubber performance. Na₂O can impact boiler operation by lowering the ash fusion temperature, leading to increased slagging. This increased slagging has been observed on smaller, hotter furnaces than those existing at Colstrip Units 3&4, but the larger, cooler furnaces design of Units 3&4 eliminates this problem. All four non-baseline coal areas exhibit higher Na₂O than that found in Area CDE.

Trace oxides and trace elements are bound to the fly ash emitted when coal is combusted, so the ash content of the coal influences the emissions of these components. Fluorine, mercury, and selenium compounds are exceptions, being emitted in both gaseous and particulate form.²

Emissions of trace element compounds are regulated by the future Mercury and Air Toxics Standards (MATS) and are also removed in the Colstrip scrubbers. The coals in Areas AB, F and G are not reasonably different (as represented by the 99% confidence difference test) in these elements from that of Area CDE. Consequently, except as discussed below, trace element compound emissions should not be significantly impacted by the use of this proposed coal.

Mercury has been a regulated pollutant in Montana since 2009 and will also be regulated under the MATS. The mercury comparison in Table 3 indicates that the use of Areas AB, F, G and FG coal should help to lower mercury emissions since these coals contain lower levels of mercury.

MATS will regulate non-mercury metals and acid gases. The MATS rule allows compliance demonstration for non-mercury metals using particulate matter emissions as a surrogate standard because all but one of the non-mercury metals are contained in fly ash particulate.³ Consequently, the previously discussed expected lowering of fly ash emitted as a result of consumption of coal from Areas AB, F, G and FG will also aid compliance with the non-mercury metals standards of MATS. Similarly, lower SO₂ emissions resulting from the consumption of the coal of Areas AB, F, G and FG, will enhance compliance with the acid gas standards in MATS since MATS allows a use of a surrogate SO₂ standard for compliance demonstration with the acid gas standards.

The efficiency with which the Unit 3&4 scrubbers remove trace elements is very high and has improved over the years. A comparison of original measured control efficiencies with recent performance indicates higher removal efficiencies are being achieved today than were originally achieved in pilot plant testing. Table 5 compares measured original and current removal efficiency for three trace elements; beryllium, fluorine and lead. These were discussed before the Board of Health and Environmental Sciences during the 1975 Units 3&4 Certification proceedings (see Finding of Fact XIV, Section 6.2 of amendment notice) and appear to have been discussed as a representation of what could be expected for all trace elements. Table 5 shows that for these three trace elements and by proxy all trace elements, removal efficiencies achieved by the Units 3&4 scrubbers are from 3.6 to 11 percentage points better than originally measured. This improvement in removal efficiency of trace elements suggest that trace element

1 The ratio of the oxides CaO, Fe₂O₃, MgO, K₂O, and Na₂O to the oxides SiO₂, Al₂O₃ and TiO₂

2 USEPA, MATS rule, 77 Federal Register, February 16, 2012.

3 Id.

emissions could be lower than originally estimated from Units 3&4 during the Certificate proceedings.

Table 5 – Scrubber Removal Efficiency – Beryllium, Fluoride and Lead

Finding of Fact XIV Measurements			
Trace Element	Estimated Full Load Inlet Emission Rate (Lb/Hour)	Estimated Full Load Outlet Emission Rate (Lb/Hour)	Measured Pilot Plant Control Efficiency (%)
Beryllium	0.225	0.017	92.6
Fluorine	24.34	1.800	92.6
Lead	2.797	0.335	88.0
MATS 2010 Characterization Testing ⁴			
Trace Element	Measured Full Load Inlet Emission Rate (Lb/Hour)	Measured Full Load Outlet Emission Rate (Lb/Hour)	Measured Unit 3 Scrubber Control Efficiency (%)
Beryllium	0.379	8.406E-04	99.8
Fluorine	28.02	1.053E+00	96.2
Lead	3.723	3.552E-02	99.0

Ground and Surface Water Impacts

Constituents removed by the Units 3&4 scrubbers are made up of coal ash and acid gas reactants, the majority of which is calcium sulfate from SO₂ removal. Scrubber by-products are conveyed and disposed through a closed loop system consisting of pipelines and ponds. This system does not discharge effluents from the plants into ground or surface water. An extensive surface and groundwater monitoring program is in place to detect any impacts from the closed loop system and any such impacts are mitigated appropriately. These activities are required by the Units 3&4 Certificate of Compatibility and Public Need and are further regulated by the recent Administrative Order on Consent Regarding Impacts Related To Wastewater Facilities Comprising the Closed-Loop System At Colstrip Steam Electric Station, Colstrip Montana (Administrative Order).

Consequently, the potential impacts to ground and surface water from the closed loop system depend not as much on the constituents within the material as on the successful operation of the closed loop system, the appropriate operation of the ground and surface water monitoring program, appropriate and timely mitigation of any impacts, and the proper conduct of activities specified in the Administrative Order. It follows then, that a fuel switch at the plant will not change the effectiveness of the practices in place to prevent, detect, and address potential ground or surface water impacts. However, it is worthwhile to review the constituents of the new potential fuels in Areas A, B, F and G to determine if their consumption would constitute a significant change in the characteristics of, or an addition to, the constituents handled in the disposal system.

⁴ Testing was performed June 22-24, 2010 on Colstrip Unit 3

The volume, or loading of by-products disposed is obviously a major characteristic that has the potential to be impacted by a change in fuel. As described in the previous section on air emissions, the coal in Areas AB, F, G and FG is lower in sulfur by from 16% - 32% and ash by from 10% - 13% than that of Area CDE. Since the volume of the by-products removed by the scrubber and subsequently handled by the closed loop disposal system is directly linked to the amount generated from combustion, it is highly likely that use of coal from the non-baseline areas will result in less volume of material to be disposed. Consequently, the non-baseline fuel should not increase the potential of ground or surface water impacts due to a change in volume, and as discussed, strictly from a volume standpoint, the potential should actually decrease.

Trace oxides and elements make up most if not all of the fly ash handled in the by-product disposal system. The expected profile of the ash, or what compounds the ash would contain, as well as the relative amounts of these constituents between coal sources, are of interest in assessing any expected changes in potential ground or surface water impacts.

Table 6 summarizes the percentage in ash for the sum of the various trace oxides and elements discussed in this Exhibit.⁵ Table 6 shows the total percentage of these constituents for Areas AB, F, G and FG are within 1%, or essentially the same as, that of Area CDE. The un-measured constituents in ash from the baseline and non-baseline coals would make up less than 3% of the total. Based upon these two observations there can be no doubt that the twenty-four measured trace oxides and elements account for the vast majority of ash constituents in all the coals, and that these compounds represent all but about 3% of the ash contents of these coals. Such similarity in the presence and amounts of these twenty-four compounds strongly suggest that there should only be negligible differences in what is contained in the remaining approximately 3% of the ash generated from consumption of the non-baseline coals.

As a result, there should be no significant difference in the overall profile of the ash generated from Areas AB, F, G, and FG handled by the closed loop disposal system. So from that perspective, no significant increase in potential impacts to ground or surface water should be expected to occur.

Table 6 – Total Trace Oxide and Element Comparison

% In Ash	Area Trace and Oxide Content				
	CDE	AB	F	G	FG
	96.43	97.21	97.50	97.22	97.36
% Difference From CDE		0.8	1.1	0.8	1.0

Table 6 and the discussion above addresses the profile of the ash; Tables 2, 3, and the discussion below address the relative amounts of constituents in the ash across the different coals. Tables 2, 3 and 7 (discussed below) show comparisons of specific trace oxides and elements in the various coals. A total of 99 individual comparisons⁶ were made. Of these

⁵ The trace element concentrations in ash were projected based upon their concentrations and the ash concentrations in the as received coal.

⁶ Germanium results for area AB are unavailable. This total includes the boron results.

comparisons, the majority (91%⁷) showed either no significant difference between Areas CDE, AB, F, G and FG or that the non-baseline areas had lower concentrations than Area CDE. These comparisons indicate that the ash material currently and potentially disposed by Units 3&4 is very similar with respect to the amounts of chemical constituent regardless of fuel source location. Furthermore, since the disposal system is closed loop and adequate precautions in the form of a rigorous monitoring and mitigation program are in place, minor differences in the ash material handled will not, in and of themselves, increase the potential risks to ground or surface water.

The trace element Boron (B) was not measured as part of the Units 3&4 MFSA Certificate proceedings but is a parameter of interest with most coal ash disposal programs. Although a baseline for B from the original Units 3&4 Certificate proceedings is unavailable, data from recent samples of Areas C and D⁸ coal offer a proxy. This proxy baseline value has been compared to the measured B levels in coal from Areas AB, F, G and FG in Table 7. This summary table indicates that B levels across all coal areas are similar, with Areas AB and F showing no statistically significant difference, and Areas G and FG exhibiting lower B than CDE, as a statistically significant level. Thus, on the basis of B concentration, use of coal from any of Areas AB, F, G or FG will not significantly change the potential impact to ground or surface waters.

Table 7 – Summary of Comparisons to CDE – Boron

Parameter	AB	F	G	FG
Boron	n	n	-	-

Summary

Based upon the comparison of constituents contained in coals from mining Areas A, B, F and G against those contained in mining Areas C, D, and E, it is evident that consumption of the non-baseline coals by Units 3&4 will not result in a material increase to potential air and water impacts. A firm case could be made that the consumption of these coals will result in a decrease to the potential air and water impacts from these coals.

The non-baseline coals’ ash, sulfur, heating value, moisture, volatile matter, and fixed carbon are well within the design capabilities of the Units 3&4 scrubbers. The loading of pollutants of interest to the scrubbers, and hence resulting emissions, will likely decrease with the combustion of coal from Areas AB, F, G, and FG. This reduction will take place because of lower ash, sulfur, mercury, and most other MATS pollutants, coupled with higher heating value and improved removal efficiency in the scrubbers. Trace oxides and non-mercury metals are contained principally in the coal ash, so lower ash content translates to lower emissions of these compounds. There is little dissimilarity between the components of the ash within the coals reviewed.

The closed loop nature of the scrubbing by product system, along with a rigorous regulatory structure, make it highly unlikely that a switch of coals could increase potential ground and surface water impacts, provided such new source was sufficiently similar to the current source.

⁷ Based on #/MMBtu of the constituents, which more accurately reflects the actual loading to equipment

⁸ Due to the timing of area E being mined out, samples were unavailable

Based upon the slight differences between baseline and non-baseline expected ash profiles and constituent amounts, Areas AB, F, G and FG coal are in fact sufficiently similar to that from Area CDE, that a switch to one or all of these areas should in no way increase potential ground and surface water impacts. More significantly, because of lower ash and sulfur content of the non-baseline coals, the decreased loading to the closed loop disposal system could result in a decreased potential for ground and surface water impacts.

Attachment 3-1 Page 1
Areas C, D, and E Coal Quality
MFSA Proceeding Exhibit 53A - Volatile Matter, Fixed Carbon and Ash Oxides

<u>Area</u>	<u>Parameter</u>	<u>Average</u>	<u>Std. Dev.</u>	<u>Minimum</u>	<u>Maximum</u>	<u># Samples</u>
C	Volatile Matter %	29.67	1.353	27.02	38.1	123
D	Volatile Matter %	29.82	0.919	27.8	31.48	63
E	Volatile Matter %	28.6	1.049	26.7	31.6	31
C	Fixed Carbon %	34.46	1.872	25	41.01	123
D	Fixed Carbon %	35.96	1.025	33.82	38.86	63
E	Fixed Carbon %	33.48	0.974	36.9	41.3	31
C	CaO (% of Ash)	11.51	3.945	3.5	29.1	122
D	CaO (% of Ash)	16.56	4.918	12.16	31.63	39
E	CaO (% of Ash)	14.37	4.112	9.78	29.25	33
C	SiO2 (% of Ash)	43.93	5.93	16.46	58.2	122
D	SiO2 (% of Ash)	38.09	4.441	24.04	44.51	39
E	SiO2 (% of Ash)	37.25	4.472	25.32	44.54	33
C	Fe2O3 (% of Ash)	7.75	5.356	2.49	51.96	122
D	Fe2O3 (% of Ash)	6.46	1.812	2.96	10.26	39
E	Fe2O3 (% of Ash)	7.99	3.775	3.39	20.67	33
C	P2O5 (% of Ash)	0.34	0.152	0.05	0.86	119
D	P2O5 (% of Ash)	0.35	0.134	0.12	0.66	39
E	P2O5 (% of Ash)	0.34	0.134	0.11	0.75	33
C	Al2O3 (% of Ash)	13.92	2.255	12.2	25.57	122
D	Al2O3 (% of Ash)	16.73	2.036	13.08	20.9	39
E	Al2O3 (% of Ash)	17.81	1.645	13.23	20.54	33
C	TiO2 (% of Ash)	0.69	0.261	0.08	1.36	119
D	TiO2 (% of Ash)	0.72	0.17	0.4	1.03	39
E	TiO2 (% of Ash)	0.68	0.184	0.14	1.38	33
C	MgO (% of Ash)	3.82	1.197	0.49	7.9	122
D	MgO (% of Ash)	4.25	0.807	2.28	5.73	39
E	MgO (% of Ash)	4.31	0.612	3.24	5.79	33
C	SO3 (% of Ash)	11.43	2.863	2.46	20.21	119
D	SO3 (% of Ash)	15.08	1.323	12.15	18.27	39
E	SO3 (% of Ash)	16.02	1.971	12.71	20.82	33
C	K2O (% of Ash)	0.69	0.411	0.16	2.81	119
D	K2O (% of Ash)	0.38	0.259	0.2	1.48	39
E	K2O (% of Ash)	0.32	0.155	0.17	0.86	33
C	Na2O (% of Ash)	0.41	0.342	0.12	2.36	119
D	Na2O (% of Ash)	0.54	0.537	0.18	3.14	39
E	Na2O (% of Ash)	0.37	0.197	0.11	1.03	33

Note: Volatile Matter and Fixed Carbon in % of Coal on "As Received" Basis

Attachment 3-1 Page 2
 Areas C, D, and E Coal Quality
 MFSA Proceeding Exhibit 55 – Summary of Trace Elements Reports
 PPM in Air Dried Coal

Element	Average	Max	Min	St Dev
Antimony	0.47	1.72	0.2	0.379
Arsenic	5.32	11.45	0.97	3.37
Beryllium	0.29	0.68	0.13	0.14
Cadmium	0.1	0.33	0.04	0.069
Chromium	6.02	22.35	0.67	5.83
Copper	15.89	22.1	8.4	3.68
Fluorine	31.41	86	8	20.87
Germanium	3.74	9	0.88	2.15
Lead	3.61	10.4	0.4	2.46
Manganese	50.9	100	20.12	22.59
Mercury	0.2	0.3	0.11	0.052
Nickel	22	40.4	6.3	8
Selenium	0.49	2.26	0.1	8.89
Zinc	10.72	25.1	1.6	6.43

MFSA Proceeding Exhibit 55 (modified) – Summary of Trace Elements Reports
 PPM (As Received) in Coal

Element	Average	Max	Min	St Dev	# Samples
Antimony	0.41	1.50	0.17	0.33	17
Arsenic	4.63	9.96	0.84	2.93	17
Beryllium	0.25	0.59	0.11	0.12	17
Cadmium	0.09	0.29	0.03	0.06	17
Chromium	5.23	19.43	0.58	5.07	17
Copper	13.82	19.22	7.30	3.20	17
Fluorine	27.31	74.78	6.96	18.15	17
Germanium	3.25	7.83	0.77	1.87	17
Lead	3.14	9.04	0.35	2.14	17
Manganese	44.26	86.96	17.50	19.64	17
Mercury	0.17	0.26	0.10	0.05	17
Nickel	19.13	35.13	5.48	6.96	17
Selenium	0.43	1.97	0.09	7.73	17
Zinc	9.32	21.83	1.39	5.59	17

Attachment 3-1 Page 3
 Areas C, D, and E Coal Quality
 MFSA Proceeding Exhibit 60 – Major Parameters in Coal

Area	Parameter	# Samples	Min	Max	Mean	Sdev
C	Sulfur %	119	0.4	1.77	0.83	0.26
	Ash %	122	4.14	18.36	10.3	1.75
	Btu/LB	122	7365	9028	8382	239
D	Sulfur %	63	0.3	1.11	0.73	0.152
	Ash %	63	7.01	10.15	8025	0.761
	Btu/LB	63	8247	8810	8562	136
E	Sulfur %	31	0.45	1.37	0.78	0.217
	Ash %	31	6.9	10.1	8.19	0.819
	Btu/LB	31	8245	9182	8555	206

Attachment 3-1 Page 4
Areas C, D, and E Coal Quality
MFSA Proceeding Exhibit 54 – Coal Composition for Emissions Control System Design

Parameter	Maximum	Average	Minimum
Moisture %	28.8	25.37	21.84
Volatile Matter %	32.39	29.67	26.95
Fixed Carbon %	38.2	34.46	30.72
Sulfur %	1	0.88	0.4
Ash %	12.58	10.36	6.1
Heating Value Btu/lb	8878	8374	8162

Note: All values on “As Received” Basis
Maximums and Minimums are calculated values

Attachment 3-1, Page 5
Areas C, D, and E Coal Quality
Pooled Coal Quality Data

Area	Parameter	Mean	Sdev	Min	Max	# Samples
CDE	Sulfur %	0.79	0.23	0.3	1.77	213
	Ash %	9.40	1.42	4.14	18.36	216
	Btu/LB	8459	209	7365	9182	216
	Moisture %	26.28	1.59	19.38	30.75	217
	Volatile Matter	29.56	1.20	26.70	38.10	217
	Fixed Carbon %	34.76	1.56	25.00	41.30	217
	CaO (% of Ash)	13.01	4.18	3.50	31.63	194
	SiO2 (% of Ash)	41.62	5.44	16.46	58.20	194
	Fe2O3 (% of Ash)	7.53	4.61	2.49	51.96	194
	P2O5 (% of Ash)	0.34	0.15	0.05	0.86	191
	Al2O3 (% of Ash)	15.15	2.12	12.20	25.57	194
	TiO2 (% of Ash)	0.69	0.23	0.08	1.38	191
	MgO (% of Ash)	3.99	1.05	0.49	7.90	194
	SO3 (% of Ash)	12.97	2.48	2.46	20.82	191
	K2O (% of Ash)	0.56	0.35	0.16	2.81	191
	Na2O (% of Ash)	0.43	0.37	0.11	3.14	191
	Antimony	0.41	0.33	0.17	1.50	17
	Arsenic	4.63	2.93	0.84	9.96	17
	Beryllium	0.25	0.12	0.11	0.59	17
	Cadmium	0.09	0.06	0.03	0.29	17
	Chromium	5.23	5.07	0.58	19.43	17
	Copper	13.82	3.20	7.30	19.22	17
	Fluorine	27.31	18.15	6.96	74.78	17
	Germanium	3.25	1.87	0.77	7.83	17
	Lead	3.14	2.14	0.35	9.04	17
	Manganese	44.26	19.64	17.50	86.96	17
	Mercury	0.17	0.05	0.10	0.26	17
	Nickel	19.13	6.96	5.48	35.13	17
	Selenium	0.43	7.73	0.09	1.97	17
	Zinc	9.32	5.59	1.39	21.83	17

Attachment 3-1, Page 6
Areas C, D, and E Coal Quality
Pooled Coal Quality Data
Ash Oxides and Trace Elements - #/MMBtu Basis

Area	Parameter	Mean	Sdev	Min	Max	# Samples
CDE	CaO	1.44	0.47	0.43	3.58	194
	SiO2	4.74	0.64	2.02	7.15	194
	Fe2O3	0.85	0.55	0.29	6.38	194
	P2O5	0.04	0.02	0.01	0.11	191
	Al2O3	1.69	0.25	1.26	3.14	194
	TiO2	0.08	0.03	0.01	0.17	191
	MgO	0.45	0.12	0.06	0.97	194
	SO3	1.44	0.30	0.30	2.48	191
	K2O	0.07	0.04	0.02	0.35	191
	Na2O	0.05	0.04	0.01	0.30	191
	Antimony	4.81E-05	3.88E-05	2.05E-05	1.76E-04	17
	Arsenic	5.44E-04	3.45E-04	9.92E-05	1.17E-03	17
	Beryllium	2.97E-05	1.43E-05	1.33E-05	6.96E-05	17
	Cadmium	1.02E-05	7.06E-06	4.09E-06	3.38E-05	17
	Chromium	6.16E-04	5.96E-04	6.85E-05	2.29E-03	17
	Copper	1.63E-03	3.76E-04	8.59E-04	2.26E-03	17
	Fluorine	3.21E-03	2.14E-03	8.18E-04	8.80E-03	17
	Germanium	3.83E-04	2.20E-04	9.00E-05	9.21E-04	17
	Lead	3.69E-04	2.52E-04	4.09E-05	1.06E-03	17
	Manganese	5.21E-03	2.31E-03	2.06E-03	1.02E-02	17
	Mercury	2.05E-05	5.32E-06	1.13E-05	3.07E-05	17
	Nickel	2.25E-03	8.18E-04	6.45E-04	4.13E-03	17
	Selenium	5.01E-05	9.09E-04	1.02E-05	2.31E-04	17
	Zinc	1.10E-03	6.58E-04	1.64E-04	2.57E-03	17

Attachment 3-2
Coal Sample Analysis Methods
Areas A, B, F, and G

Parameter	Analysis Method
Ash (%)	D3174
Sulfur (%)	D4239
Heating Value (Btu/lb)	D5865
Moisture (%)	D3302
Oxides(% in Ash)	D6349
Antimony	D6357
Arsenic	D6357
Beryllium	D6357
Cadmium	D6357
Chromium	D6357
Copper	D6357
Fluorine	D5987/D3761
Germanium	D6357
Lead	D6357
Manganese	D6357/D3683
Mercury	D6722
Nickel	D6357
Selenium	D4606
Zinc	D6357

Note: Methods are as reported by Standard Laboratories and reference the appropriate ASTM method number.

Attachment 3-3 Page 1
 Summary of Coal Constituents in Areas AB, F, G and FG
 Volatile Matter, Fixed Carbon and Ash Oxides

Area	Parameter	Average	Std. Dev.	Minimum	Maximum	# Samples
AB	Volatile Matter %	29.07	0.76	27.95	30.27	16
F	Volatile Matter %	29.21	1.54	21.85	33.04	258
G	Volatile Matter %	29.22	1.53	20.21	33.67	205
FG	Volatile Matter %	29.21	1.54	20.21	33.67	463
AB	Fixed Carbon %	36.47	0.85	34.85	38.07	16
F	Fixed Carbon %	36.27	1.49	31.91	44.08	258
G	Fixed Carbon %	36.34	2.24	19.18	40.66	205
FG	Fixed Carbon %	36.30	1.86	19.18	44.08	463
AB	CaO (% of Ash)	15.06	2.27	11.15	19.84	15
F	CaO (% of Ash)	15.47	2.34	7.67	32.60	123
G	CaO (% of Ash)	12.53	1.19	8.83	19.70	77
FG	CaO (% of Ash)	14.34	1.98	7.67	32.60	200
AB	SiO2 (% of Ash)	40.62	2.22	37.09	43.19	15
F	SiO2 (% of Ash)	38.79	2.03	28.29	47.69	123
G	SiO2 (% of Ash)	43.59	1.75	35.09	50.67	77
FG	SiO2 (% of Ash)	40.64	1.93	28.29	50.67	200
AB	Fe2O3 (% of Ash)	5.13	0.46	4.36	6.23	15
F	Fe2O3 (% of Ash)	5.34	1.35	2.42	21.47	123
G	Fe2O3 (% of Ash)	6.02	1.11	3.23	18.47	77
FG	Fe2O3 (% of Ash)	5.60	1.26	2.42	21.47	200
AB	P2O5 (% of Ash)	0.27	0.10	0.11	0.5	15
F	P2O5 (% of Ash)	0.37	0.11	0.00	1.09	122
G	P2O5 (% of Ash)	0.45	0.15	0.09	0.97	76
FG	P2O5 (% of Ash)	0.40	0.12	0.00	1.09	198
AB	Al2O3 (% of Ash)	18.66	0.84	16.44	20.15	15
F	Al2O3 (% of Ash)	16.69	0.92	11.94	21.36	123
G	Al2O3 (% of Ash)	18.15	0.64	15.11	20.07	77
FG	Al2O3 (% of Ash)	17.25	0.82	11.94	21.36	200
AB	TiO2 (% of Ash)	0.84	0.07	0.74	1.01	15
F	TiO2 (% of Ash)	0.84	0.09	0.40	1.15	123
G	TiO2 (% of Ash)	0.89	0.09	0.64	1.56	77
FG	TiO2 (% of Ash)	0.86	0.09	0.40	1.56	200
AB	MgO (% of Ash)	4.06	0.31	3.49	4.6	15
F	MgO (% of Ash)	4.51	0.84	2.17	6.68	123
G	MgO (% of Ash)	3.28	0.94	1.85	5.93	77
FG	MgO (% of Ash)	4.04	0.88	1.85	6.68	200
AB	SO3 (% of Ash)	11.32	2.15	8.58	18.4	15
F	SO3 (% of Ash)	13.97	2.55	5.68	23.23	123
G	SO3 (% of Ash)	10.29	1.10	6.05	16.93	77
FG	SO3 (% of Ash)	12.55	2.11	5.68	23.23	200
AB	K2O (% of Ash)	0.46	0.13	0.30	0.71	15
F	K2O (% of Ash)	0.26	0.07	0.09	0.59	123
G	K2O (% of Ash)	0.32	0.08	0.11	0.77	77
FG	K2O (% of Ash)	0.28	0.07	0.09	0.77	200
AB	Na2O (% of Ash)	0.64	0.44	0.17	1.74	15
F	Na2O (% of Ash)	1.12	1.25	0.00	3.94	104
G	Na2O (% of Ash)	1.53	1.15	0.23	3.71	40
FG	Na2O (% of Ash)	1.23	1.22	0.00	3.94	144

Note: Volatile Matter and Fixed Carbon in % of Coal on "As Received" Basis

Attachment 3-3 Page 2
 Summary of Coal Constituents for Areas AB, F, G and FG
 Trace Elements – PPM (As Received) in Coal

Area	Parameter	Average	Std. Dev.	Minimum	Maximum	# Samples
AB	Antimony	0.34	0.03	0.29	0.41	15
F	Antimony	0.30	0.02	0.27	0.32	13
G	Antimony	0.49	0.41	0.29	3.24	67
FG	Antimony	0.46	0.37	0.27	3.24	80
AB	Arsenic	0.75	0.12	0.56	0.95	15
F	Arsenic	0.72	0.07	0.63	0.79	13
G	Arsenic	1.71	2.00	0.64	16.31	67
FG	Arsenic	1.55	1.84	0.63	16.31	80
AB	Beryllium	0.29	0.05	0.24	0.40	15
F	Beryllium	0.28	0.05	0.16	0.32	13
G	Beryllium	0.53	0.76	0.16	5.09	67
FG	Beryllium	0.49	0.70	0.16	5.09	80
AB	Cadmium	0.05	0.01	0.04	0.06	15
F	Cadmium	0.04	0.00	0.03	0.05	13
G	Cadmium	0.06	0.02	0.03	0.12	67
FG	Cadmium	0.06	0.02	0.03	0.12	80
AB	Chromium	3.23	0.47	2.38	3.97	15
F	Chromium	2.56	0.35	2.37	3.16	13
G	Chromium	4.07	2.50	2.39	22.28	67
FG	Chromium	3.83	2.31	2.37	22.28	80
AB	Copper	5.99	0.59	5.56	7.15	15
F	Copper	5.05	0.51	3.96	5.54	13
G	Copper	6.73	1.39	4.77	12.73	67
FG	Copper	6.46	1.29	3.96	12.73	80
AB	Fluorine	28.94	10.00	3.74	43.71	15
F	Fluorine	28.91	2.83	23.73	32.44	13
G	Fluorine	46.71	24.99	14.32	124.92	67
FG	Fluorine	43.81	23.01	14.32	124.92	80
AB	Germanium	NA	NA	NA	NA	NA
F	Germanium	0.79	0.00	0.79	0.79	13
G	Germanium	0.98	1.32	0.79	11.94	80
FG	Germanium	1.02	1.44	0.80	11.94	67
AB	Lead	3.97	0.36	3.18	4.69	15
F	Lead	3.75	0.27	3.24	4.11	13
G	Lead	3.99	0.90	2.47	6.92	67
FG	Lead	3.95	0.83	2.47	6.92	80
AB	Manganese	80.64	34.92	0.13	119.21	15
F	Manganese	70.59	19.10	52.22	126.58	13
G	Manganese	79.35	18.35	43.76	151.97	67
FG	Manganese	77.93	18.47	43.76	151.97	80
AB	Mercury	0.06	0.11	0.02	0.45	15
F	Mercury	0.03	0.01	0.02	0.04	13
G	Mercury	0.07	0.04	0.02	0.22	67
FG	Mercury	0.06	0.04	0.02	0.22	80
AB	Nickel	1.32	0.39	0.79	1.59	15
F	Nickel	0.91	0.30	0.79	1.58	13
G	Nickel	2.72	1.00	1.59	7.96	67
FG	Nickel	2.43	0.93	0.79	7.96	80
AB	Selenium	0.58	0.07	0.40	0.72	15
F	Selenium	0.55	0.06	0.47	0.63	13
G	Selenium	0.68	0.18	0.48	1.59	67
FG	Selenium	0.66	0.17	0.47	1.59	80
AB	Zinc	2.28	0.94	0.79	3.97	15
F	Zinc	2.19	0.73	1.58	3.96	13
G	Zinc	6.02	6.19	1.59	40.58	67
FG	Zinc	5.40	5.70	1.58	40.58	80

Attachment 3-3 Page 3
 Areas AB, F, G and FG Coal Quality
 Major Parameters in Coal

<u>Area</u>	<u>Parameter</u>	<u>Average</u>	<u>Std. Dev.</u>	<u>Minimum</u>	<u>Maximum</u>	<u># Samples</u>
AB	Sulfur %	0.63	0.06	0.50	0.90	181
F	Sulfur %	0.6	0.1	0.39	1.06	104
G	Sulfur %	0.72	0.18	0.51	1.75	41
FG	Sulfur %	0.63	0.13	0.39	1.75	145
AB	Ash %	8.58	0.47	7.42	9.97	181
F	Ash %	8.39	0.77	6.93	10.92	104
G	Ash %	8.86	1.01	7.6	11.73	41
FG	Ash %	8.52	0.84	6.93	11.73	145
AB	Btu/LB	8,638	116	8,153	8,909	181
F	Btu/LB	8,581	197	7,546	8,869	104
G	Btu/LB	8,775	171	8,292	9,067	41
FG	Btu/LB	8636	190	7,546	9,067	145
AB	Moisture %	26.0	0.7	24.6	28.8	181
F	Moisture %	26.4	1.14	23.24	31.06	104
G	Moisture %	25.68	1.01	23.28	28.21	41
FG	Moisture %	26.20	1.11	23.24	31.06	145

Note: Parameters Reported on an As Received basis

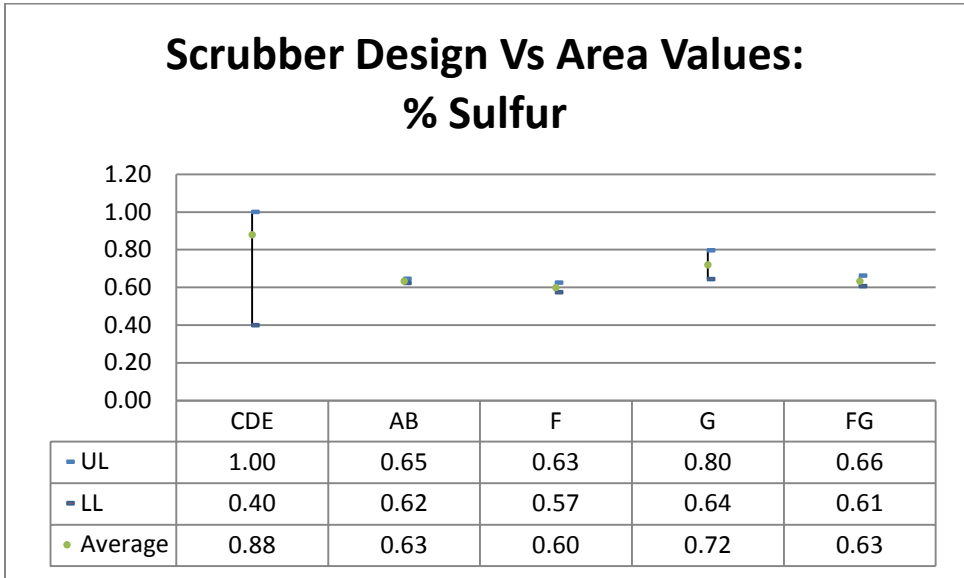
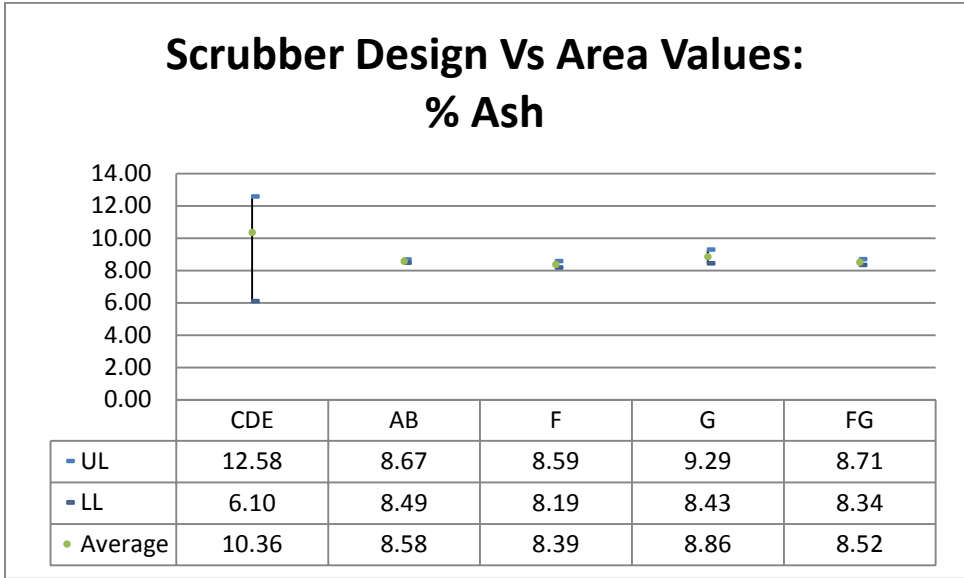
Attachment 3-3 Page 4
 Summary of Coal Constituents for Areas AB, F, G and FG
 Ash Oxides – #/MMBtu Basis

<u>Area</u>	<u>Parameter</u>	<u>Average</u>	<u>Std. Dev.</u>	<u>Minimum</u>	<u>Maximum</u>	<u># Samples</u>
AB	CaO	1.50	0.23	1.11	1.97	15
F	CaO	1.51	0.23	0.75	3.19	123
G	CaO	1.27	0.12	0.89	1.99	77
FG	CaO	1.42	0.19	0.75	3.19	200
AB	SiO2	4.03	0.22	3.68	4.29	15
F	SiO2	3.79	0.20	2.77	4.66	123
G	SiO2	4.40	0.18	3.54	5.12	77
FG	SiO2	4.03	0.19	2.77	5.12	200
AB	Fe2O3	0.51	0.05	0.43	0.62	15
F	Fe2O3	0.52	0.13	0.24	2.10	123
G	Fe2O3	0.61	0.11	0.33	1.86	77
FG	Fe2O3	0.56	0.12	0.24	2.10	200
AB	P2O5	0.03	0.01	0.01	0.05	15
F	P2O5	0.04	0.01	0.00	0.11	122
G	P2O5	0.05	0.02	0.01	0.10	76
FG	P2O5	0.04	0.01	0.00	0.11	198
AB	Al2O3	1.85	0.08	1.63	2.00	15
F	Al2O3	1.63	0.09	1.17	2.09	123
G	Al2O3	1.83	0.06	1.53	2.03	77
FG	Al2O3	1.71	0.08	1.17	2.09	200
AB	TiO2	0.08	0.01	0.07	0.10	15
F	TiO2	0.08	0.01	0.04	0.11	123
G	TiO2	0.09	0.01	0.06	0.16	77
FG	TiO2	0.09	0.01	0.04	0.16	200
AB	MgO	0.40	0.03	0.35	0.46	15
F	MgO	0.44	0.08	0.21	0.65	123
G	MgO	0.33	0.09	0.19	0.60	77
FG	MgO	0.40	0.09	0.19	0.65	200
AB	SO3	1.12	0.21	0.85	1.83	15
F	SO3	1.37	0.25	0.56	2.27	123
G	SO3	1.04	0.11	0.61	1.71	77
FG	SO3	1.24	0.21	0.56	2.27	200
AB	K2O	0.05	0.01	0.03	0.07	15
F	K2O	0.03	0.01	0.01	0.06	123
G	K2O	0.03	0.01	0.01	0.08	77
FG	K2O	0.03	0.01	0.01	0.08	200
AB	Na2O	0.06	0.04	0.02	0.17	15
F	Na2O	0.11	0.12	0.00	0.39	104
G	Na2O	0.15	0.12	0.02	0.37	40
FG	Na2O	0.12	0.12	0.00	0.39	144

Attachment 3-3 Page 5
Summary of Coal Constituents for Areas AB, F, G and FG
Trace Elements – #/MMBtu Basis

<u>Area</u>	<u>Parameter</u>	<u>Average</u>	<u>Std. Dev.</u>	<u>Minimum</u>	<u>Maximum</u>	<u># Samples</u>
AB	Antimony	3.97E-05	3.81E-06	3.40E-05	4.69E-05	15
F	Antimony	3.48E-05	1.78E-06	3.13E-05	3.78E-05	13
G	Antimony	5.54E-05	4.62E-05	3.26E-05	3.69E-04	67
FG	Antimony	5.20E-05	4.25E-05	3.13E-05	3.69E-04	80
AB	Arsenic	8.65E-05	1.38E-05	6.44E-05	1.10E-04	15
F	Arsenic	8.37E-05	7.95E-06	7.38E-05	9.22E-05	13
G	Arsenic	1.95E-04	2.28E-04	7.25E-05	1.86E-03	67
FG	Arsenic	1.77E-04	2.10E-04	7.25E-05	1.86E-03	80
AB	Beryllium	3.31E-05	5.82E-06	2.76E-05	4.60E-05	15
F	Beryllium	3.26E-05	6.09E-06	1.84E-05	3.69E-05	13
G	Beryllium	6.02E-05	8.69E-05	1.81E-05	5.80E-04	67
FG	Beryllium	5.57E-05	8.00E-05	1.81E-05	5.80E-04	80
AB	Cadmium	5.83E-06	8.28E-07	4.60E-06	7.36E-06	15
F	Cadmium	4.68E-06	4.55E-07	3.69E-06	5.53E-06	13
G	Cadmium	6.77E-06	2.69E-06	3.63E-06	1.36E-05	67
FG	Cadmium	6.43E-06	2.48E-06	3.63E-06	1.36E-05	80
AB	Chromium	3.74E-04	5.46E-05	2.76E-04	4.60E-04	15
F	Chromium	2.98E-04	4.04E-05	2.77E-04	3.69E-04	13
G	Chromium	4.64E-04	2.85E-04	2.72E-04	2.54E-03	67
FG	Chromium	4.37E-04	2.63E-04	2.72E-04	2.54E-03	80
AB	Copper	6.93E-04	6.84E-05	6.44E-04	8.28E-04	15
F	Copper	5.89E-04	6.00E-05	4.61E-04	6.45E-04	13
G	Copper	7.67E-04	1.58E-04	5.44E-04	1.45E-03	67
FG	Copper	7.38E-04	1.47E-04	4.61E-04	1.45E-03	80
AB	Fluorine	3.35E-03	1.16E-03	4.32E-04	5.06E-03	15
F	Fluorine	3.37E-03	3.29E-04	2.77E-03	3.78E-03	13
G	Fluorine	5.32E-03	2.85E-03	1.63E-03	1.42E-02	67
FG	Fluorine	5.01E-03	2.62E-03	1.63E-03	1.42E-02	80
AB	Germanium	-----	-----	-----	-----	-----
F	Germanium	9.22E-05	1.17E-09	9.22E-05	9.22E-05	13
G	Germanium	1.16E-04	1.64E-04	9.07E-05	1.36E-03	67
FG	Germanium	1.12E-04	1.51E-04	9.07E-05	1.36E-03	80
AB	Lead	4.60E-04	4.17E-05	3.68E-04	5.43E-04	15
F	Lead	4.38E-04	3.14E-05	3.78E-04	4.79E-04	13
G	Lead	4.55E-04	1.02E-04	2.81E-04	7.89E-04	67
FG	Lead	4.52E-04	9.46E-05	2.81E-04	7.89E-04	80
AB	Manganese	9.34E-03	4.04E-03	1.47E-05	1.38E-02	15
F	Manganese	8.23E-03	2.23E-03	6.08E-03	1.48E-02	13
G	Manganese	9.04E-03	2.09E-03	4.99E-03	1.73E-02	67
FG	Manganese	8.91E-03	2.11E-03	4.99E-03	1.73E-02	80
AB	Mercury	7.50E-06	1.24E-05	1.84E-06	5.22E-05	15
F	Mercury	3.59E-06	6.57E-07	2.12E-06	4.70E-06	13
G	Mercury	8.07E-06	4.76E-06	2.36E-06	2.49E-05	67
FG	Mercury	7.34E-06	4.38E-06	2.12E-06	2.49E-05	80
AB	Nickel	1.53E-04	4.49E-05	9.20E-05	1.84E-04	15
F	Nickel	1.06E-04	3.46E-05	9.22E-05	1.84E-04	13
G	Nickel	3.10E-04	1.14E-04	1.81E-04	9.07E-04	67
FG	Nickel	2.77E-04	1.06E-04	9.22E-05	9.07E-04	80
AB	Selenium	6.69E-05	8.13E-06	4.60E-05	8.28E-05	15
F	Selenium	6.45E-05	7.53E-06	5.53E-05	7.38E-05	13
G	Selenium	7.70E-05	2.05E-05	5.44E-05	1.81E-04	67
FG	Selenium	7.50E-05	1.91E-05	5.44E-05	1.81E-04	80
AB	Zinc	2.64E-04	1.09E-04	9.20E-05	4.60E-04	15
F	Zinc	2.55E-04	8.54E-05	1.84E-04	4.61E-04	13
G	Zinc	6.86E-04	7.06E-04	1.81E-04	4.62E-03	67
FG	Zinc	6.16E-04	6.50E-04	1.81E-04	4.62E-03	80

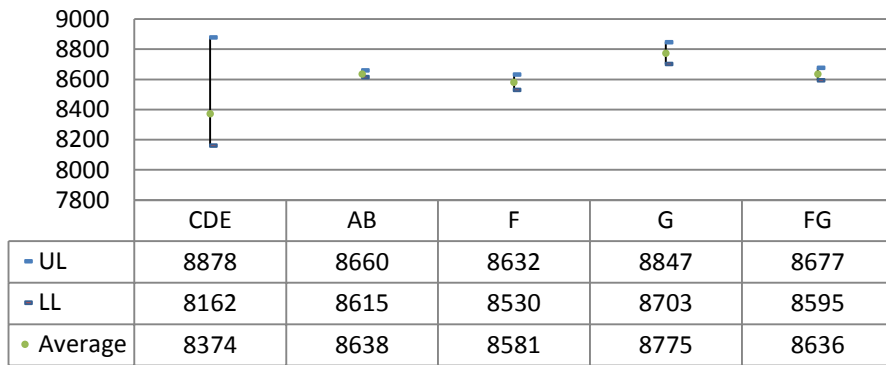
Attachment 3-4, Page 1
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Units 3&4 Scrubber Design Parameters



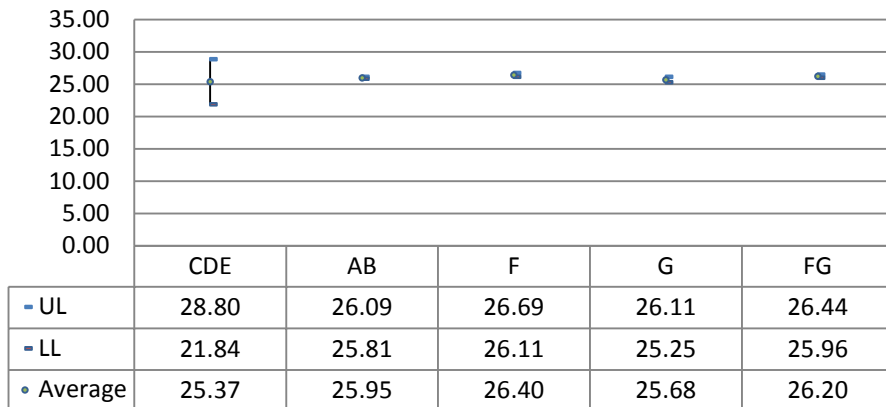
Note: UL and LL for Area CDE are maximum and minimum scrubber design parameters. All other UL and LL values are upper and lower 99% confidence interval bounds.

Attachment 3-4, Page 2
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Units 3&4 Scrubber Design Parameters

Scrubber Design Vs Area Values: Heating Value (Btu/Lb)

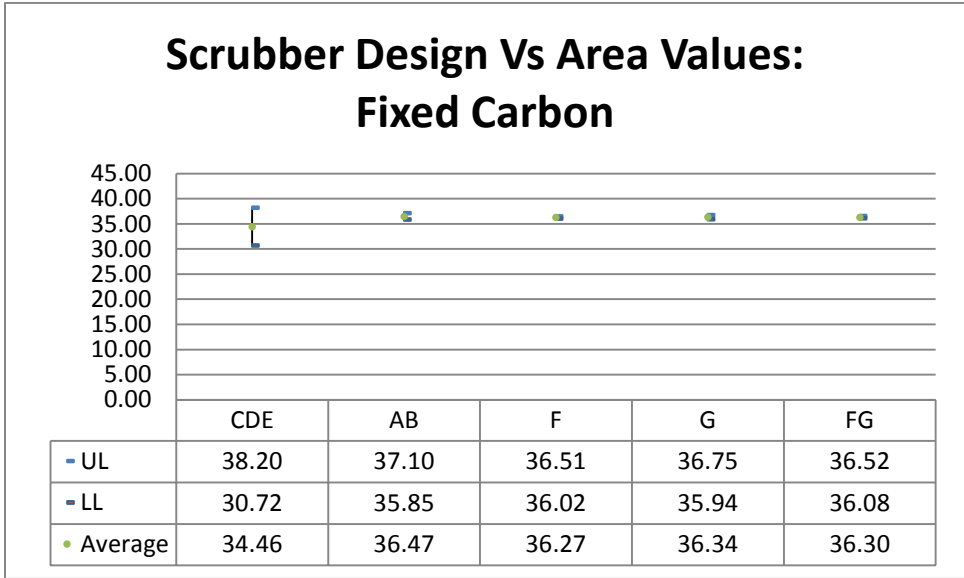
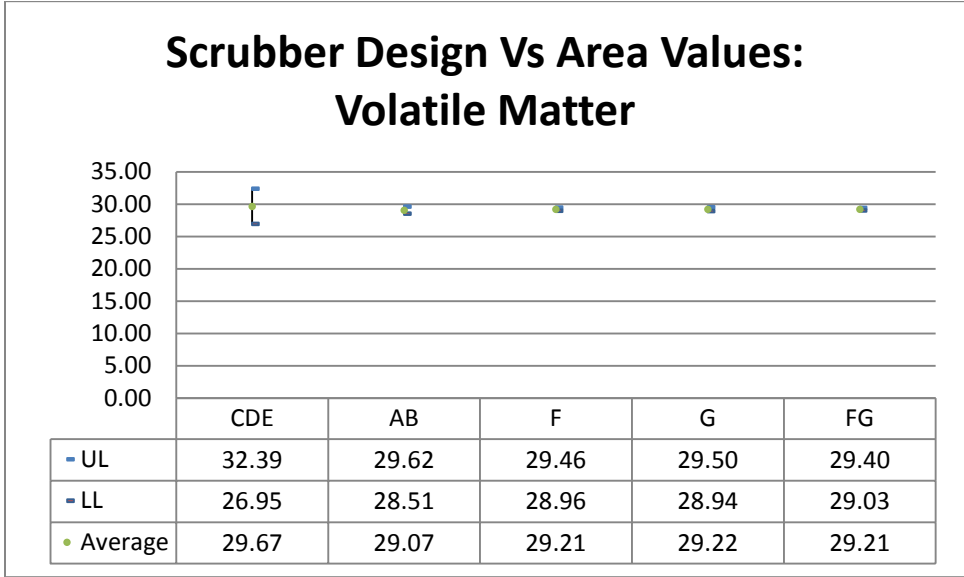


Scrubber Design Vs Area Values: Moisture



Note: UL and LL for Area CDE are maximum and minimum scrubber design parameters. All other UL and LL values are upper and lower 99% confidence interval bounds.

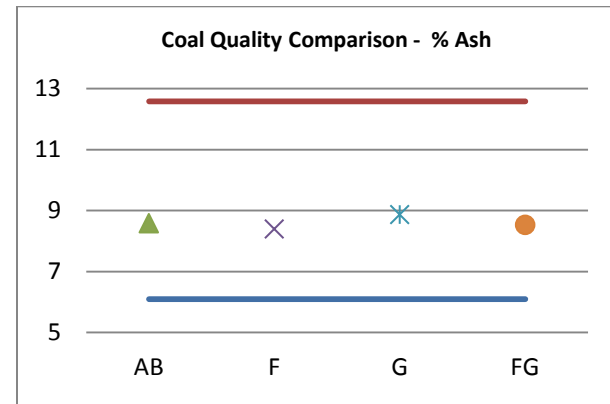
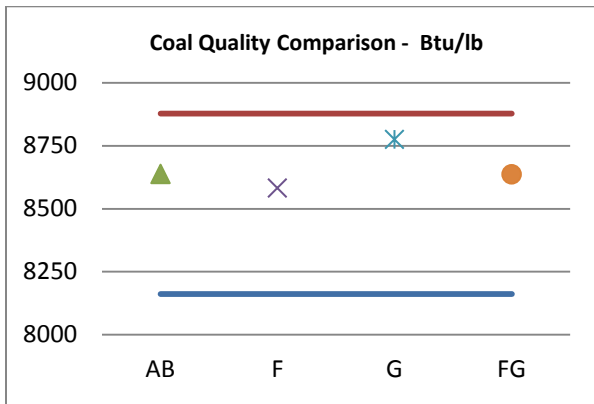
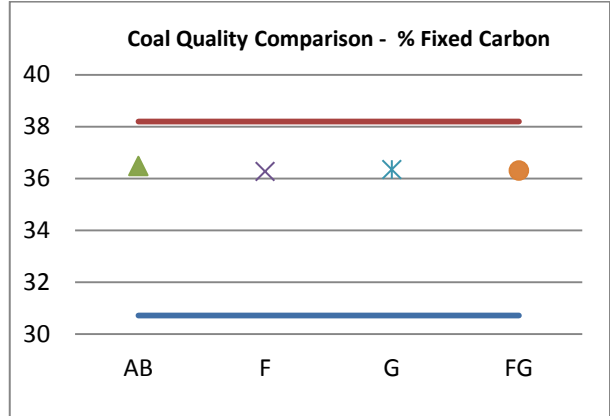
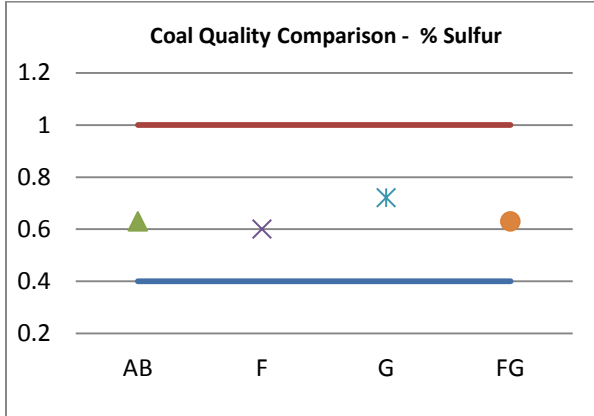
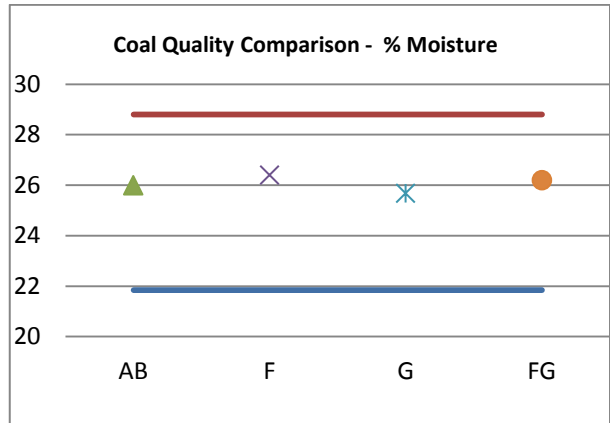
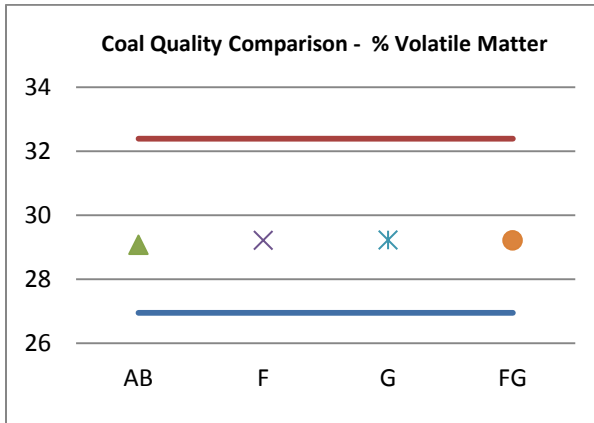
Attachment 3-4, Page 3
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Units 3&4 Scrubber Design Parameters



Note: UL and LL for Area CDE are maximum and minimum scrubber design parameters. All other UL and LL values are upper and lower 99% confidence interval bounds.

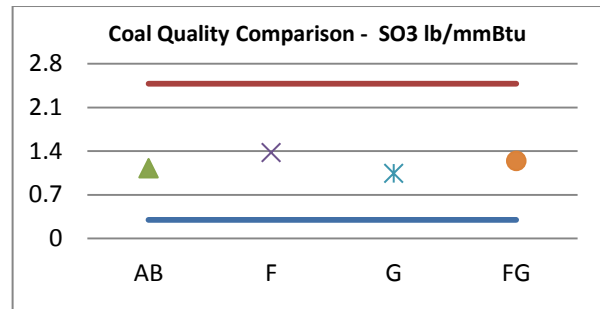
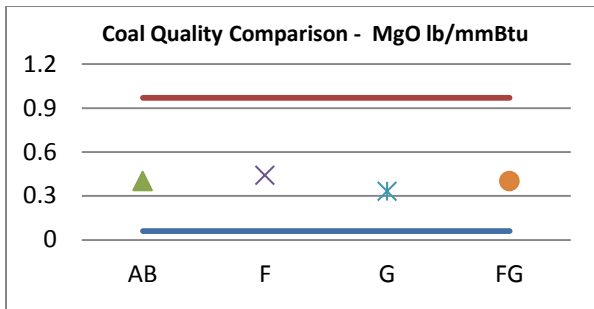
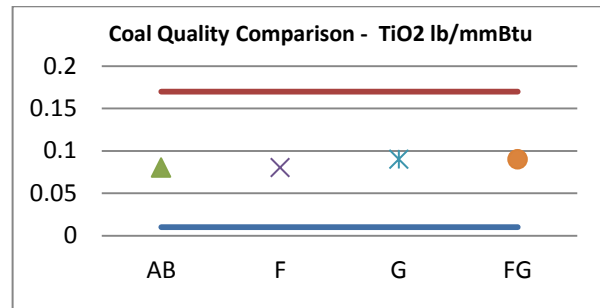
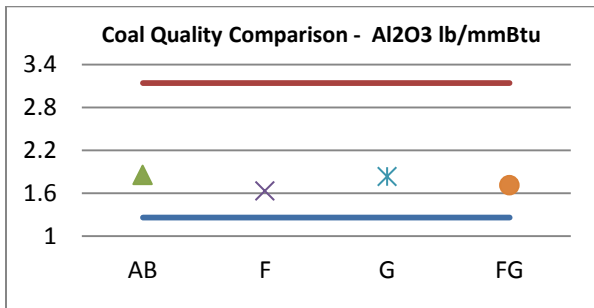
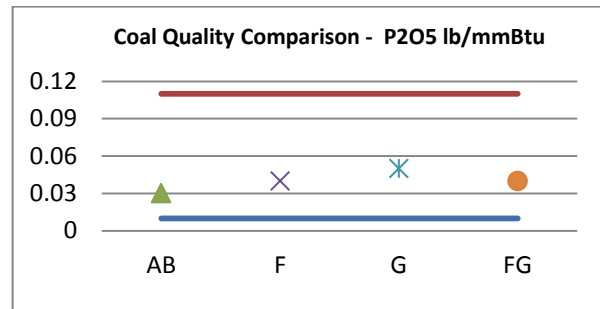
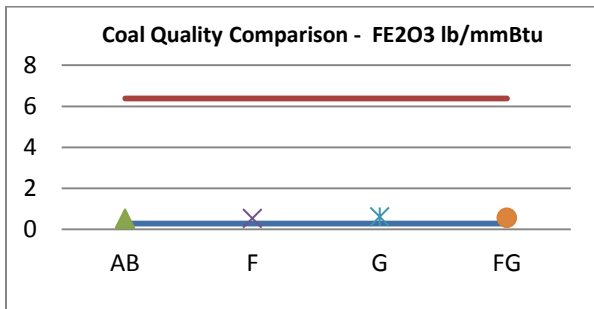
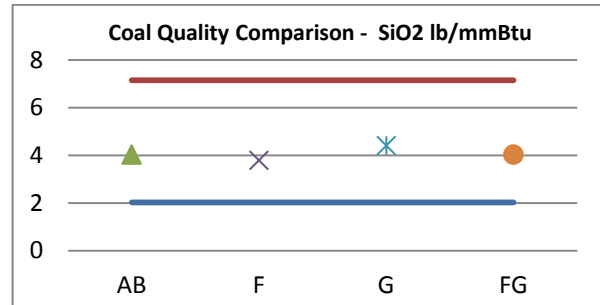
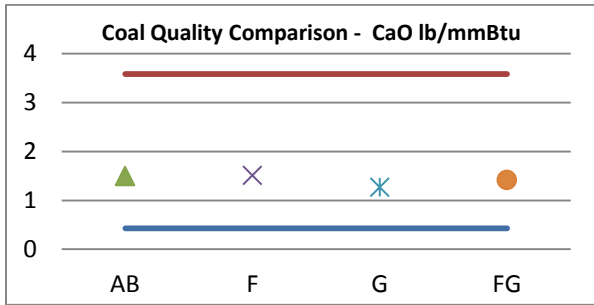
Attachment 3-5, Page 1
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Areas CDE Ranges in Certificate Proceedings

Major Parameters

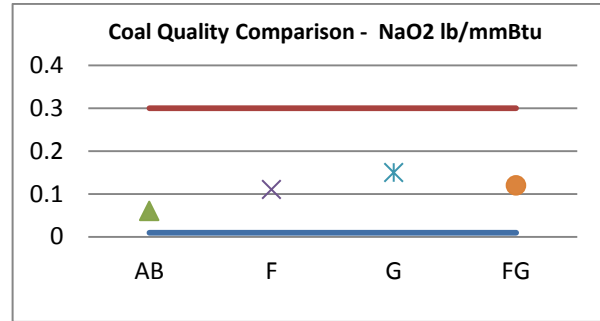
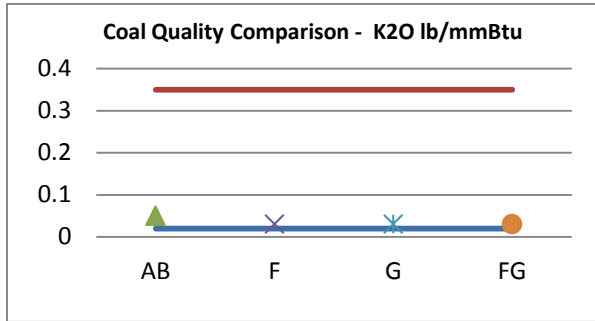


Attachment 3-5, Page 2
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Areas CDE Ranges in Certificate Proceedings

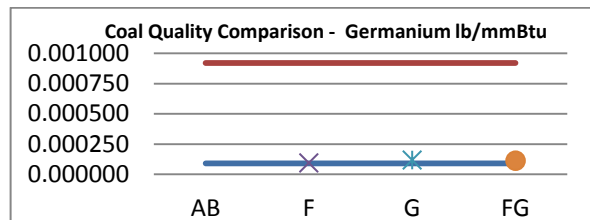
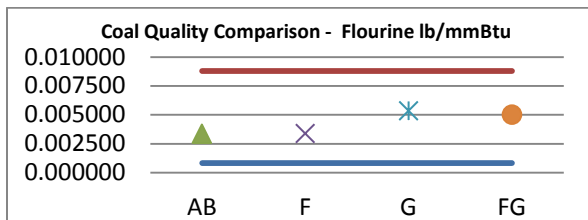
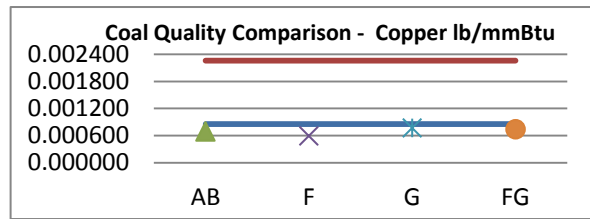
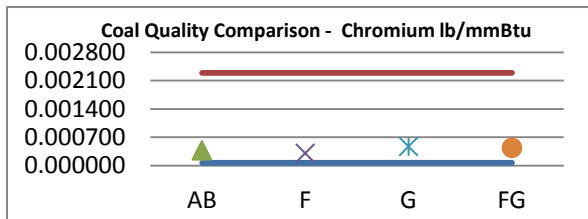
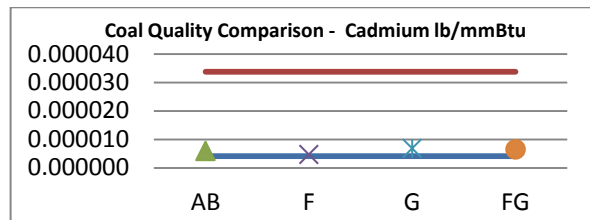
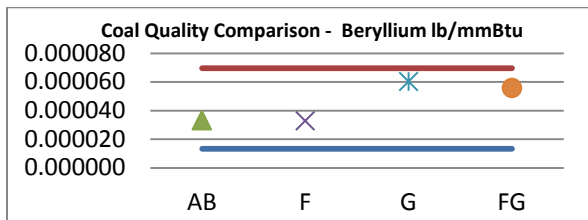
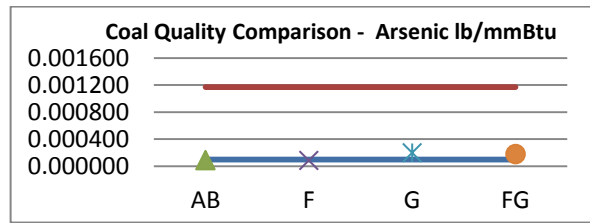
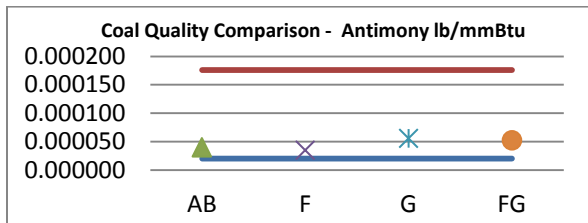
Oxide Parameters



Attachment 3-5, Page 3
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Areas CDE Ranges in Certificate Proceedings



Trace Metal Parameters



Attachment 3-5, Page 4
 Summary of Coal Constituent Comparison
 Areas AB, F, G, and FG
 Versus
 Areas CDE Ranges in Certificate Proceedings

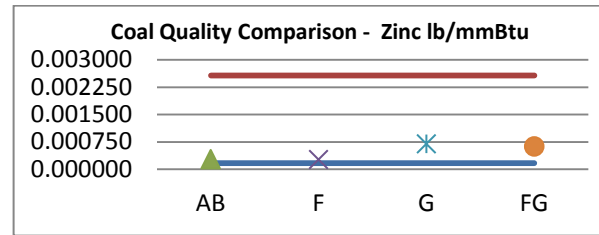
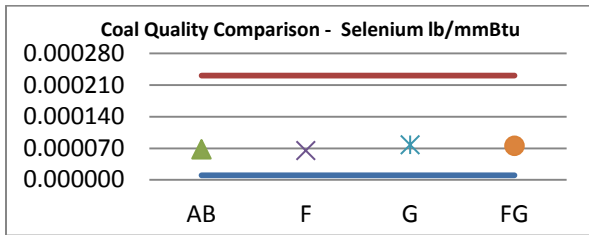
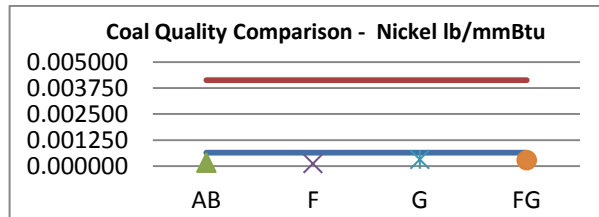
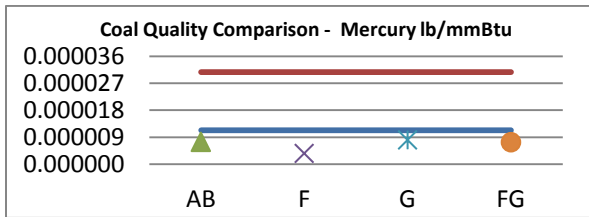
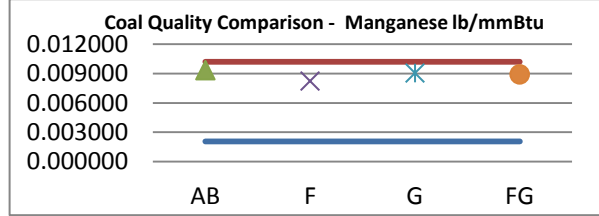
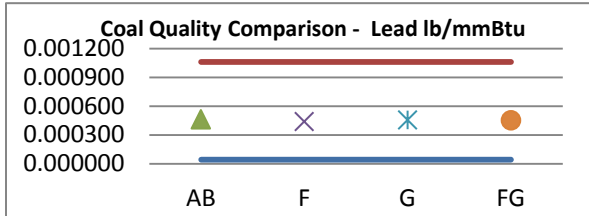
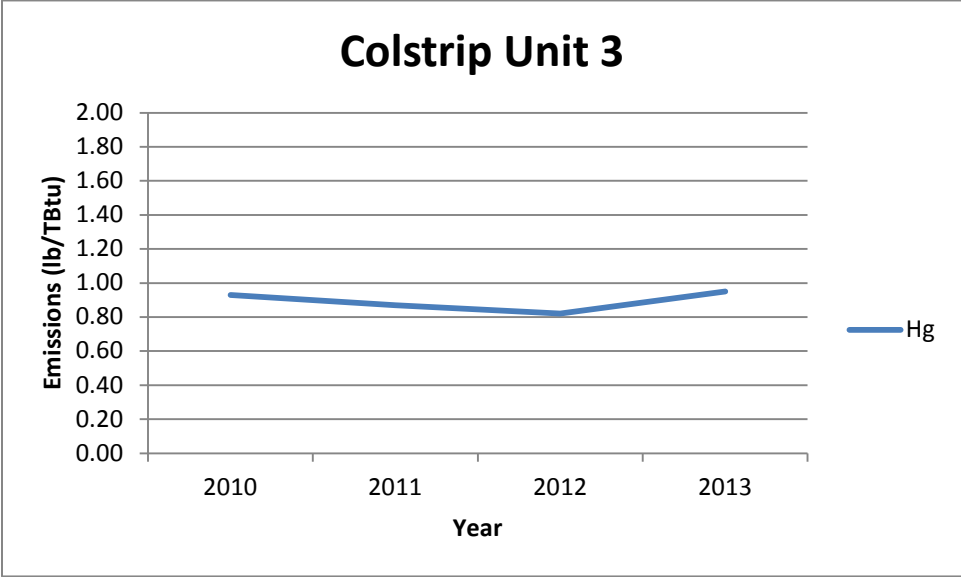
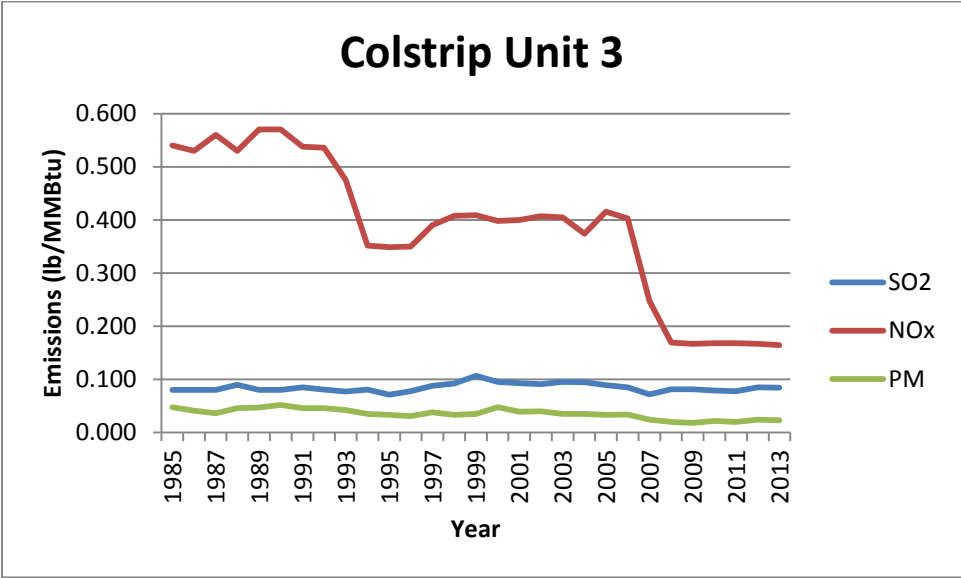


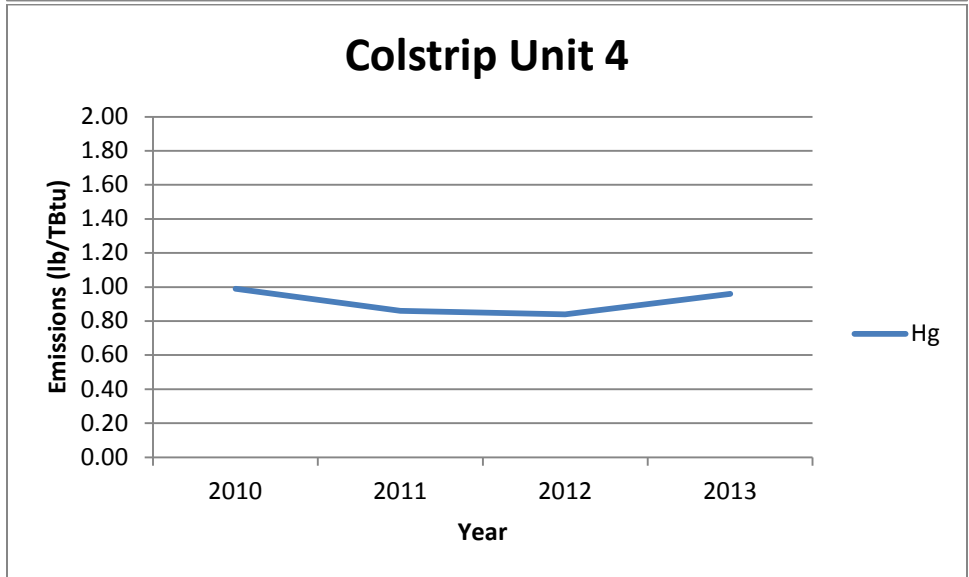
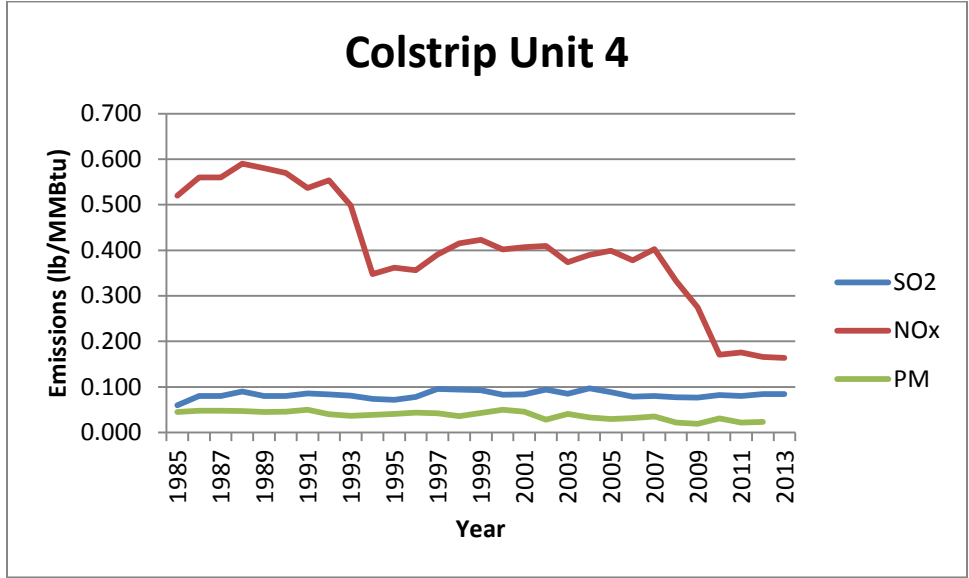
Exhibit 4 – Colstrip Units 3&4 Emissions

Exhibit 4
 Page 1
 Colstrip Units 3&4 Emissions



Note: SO2 – Sulfur Dioxide
 NOx – Nitrogen Oxides
 PM – Filterable Particulate Matter
 Hg - Mercury

Exhibit 4
Page 2
Colstrip Units 3 & 4 Emissions



Note: SO2 – Sulfur Dioxide
NOx – Nitrogen Oxides
PM – Filterable Particulate Matter
Hg - Mercury