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Terry L. O'Clair, Director
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918 E. Divide Ave., 2nd Floor
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Comments on Supplemental Evaluation of NO_x BART Determination for Coal Creek Station Units 1 and 2

Dear Mr. O'Clair:

Comments are provided herein pursuant to a public notice pertaining to above subject dated the September 12, 2012. The comments address the second paragraph on page 14 of a "Supplemental Evaluation of NO_x BART Determination for Coal Creek Station Units 1 and 2" (hereafter Supplemental Evaluation) dated September 2012 and prepared by the Division of Air Quality (DAQ). The public notice states that the document is an extension of DAQ's RH SIP which was submitted to EPA and presented for public comment by EPA in the fall of 2011.

Specifically, the comments herein address DAQ's setting and discussion for CALMET variable LCALGRD, which is user controlled through a user input data stream when executing the CALMET model. Comments that follow address the DAQ's failure to disclose and justify its choice of the "False" setting rather than the "True" setting for LCALGRD.

BACKGROUND DEFAULT SETTINGS FOR LCALGRD

The US Environment Protection Agency (EPA) has specified that the default setting for LCALGRD is "True." See pages 2-31 through 2-33 in "A User's Guide for Meteorological Model CALMET (Version 5)," which explain the technical reasons for the "True" setting irrespective of whether CALMET output are used with the Long Range Transport (LRT) model CALPUFF or the LRT model CALGRID, as well as pages 4-99, 4-114 and 4-193 where the guide states that "LCALGRD is normally set to TRUE for CALPUFF applications."

The user's guide also states on page 4-190:

> "CALGRID requires three-dimensional [3-D] fields of temperature and vertical velocity which are not required by CALPUFF *for certain simple simulations*. [A] switch is provided in the CALMET [user] control file which allows the user to eliminate these variables from the CALMET.DAT output file if the generated

> meteorological fields will be used to drive CALPUFF in a mode where they are not needed. The larger version of CALMET.DAT with the extra parameters can always also be used with CALPUFF." "However, under most conditions, a full 3-D temperature field will be required by CALPUFF." (Emphasis added.)

An example of a simple situation is a single upper air observation station collocated with a single surface station.

IWAQM has specified that its preferred setting for LCALGRD is "True." See page A-2 in its "Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts" published by EPA and dated December 1998.

Once more, EPA on behalf of IWAQM indicates that the preferred setting for LCALGRD is "True." See page 5 in EPA's memo titled "Clarification on EPA and FLM Recommended Settings for CALMET" dated August 31, 2009.

In summary, EPA and IWAQM set the input for CALMET variable LCALGRD as "True," which they note is the required choice for execution of the LRT model CALGRID as well as the default, recommended or preferred choice for CALPUFF.

DAQ's HISTORICAL SETTINGS FOR LCALGRD

The DAQ now admits that it has used the "False" setting for LCALGRD. On page 14 of the Supplemental Evaluation, DAQ states:

> "The Department received a public comment that suggested that the LCALGRD setting in Calmet should be "True" instead of the "False" setting the Department has been using."

The DAQ had not previously revealed this departure from the EPA and IWAQM default or preferred setting. See, for example;

> Pages 20 through 24 in DAQ's "Calpuff Analysis of Current PSD Class I Increment Consumption in North Dakota and Eastern Montana Using Actual Annual Average SO_2 Emission Rates" dated April 2002 which describes and lists non-IWAQM settings used by DAQ and such discussion and list does not include LCALGRD. However, Appendix C, page A-2, provides the IWAQM recommended inputs including the setting for LCALGRD as "T" for "True."
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> Pages 35 through 40 in DAQ's "Calpuff Analysis of Current PSD Class I Increment Consumption in North Dakota and Eastern Montana Using Actual Annual Average SO_2 Emission Rates" dated May 2003 where discussion did not disclose DAQ's use of the LCALGRD setting of "False." However, Appendix C, page A-2, provides the IWAQM recommended inputs including the setting for LCALGRD as "T" for "True."

> Pages 23 through 27 in DAQ's RH "Protocol for BART-Related Visibility Impairment Modeling Analyses in North Dakota (Final)," dated November, 2005, which states on page 26 that "NDDH settings for IWAQM-defined variables are consistent with IWAQM recommendations, with limited exceptions." The exceptions do not include LCALGRD, which apparently should have been noted in the protocol per DAQ's statement on page 14 of the Supplemental Evaluation.

The user chosen setting for LCALGRD in effect selects one of two algorithms for computing vertical temperature gradients across the domain modeled by CALMET. These algorithms compute vertical temperature gradients which affect computed mixing heights, and computed mixing heights affect computed SO_2 and SO_4 dispersion and, consequently, ground level concentrations. Because DAQ used a setting of "False" for LCALGRD, 3-D fields of temperature and vertical velocity were not included with CALMET output (CALMET.DAT) for input used with CALPUFF.

In summary, DAQ's statement on page 14 of the Supplemental Evaluation seems to conflict with documentation for applications of CALMET prior to the RH BART protocol. Rhetorically, was the setting for LCALGRD changed from "True" to "False" for the RH BART protocol or had the setting been "False" in every protocol? Clarification of the actual setting for LCALGRD in those prior applications seems warranted and if changed to "False," then an explanation as to why seems warranted.

Furthermore, the CALMET protocol actually used for RH BART deviated from the protocol described in documentation and, as confirmed by Appendix F of the Supplemental Evaluation, the results of the visibility modeling described in DAQ's RH SIP were not the results of the CALMET protocol described.

EPA's REVIEW OF DAQ'S MODELING PROTOCOL FOR REGIONAL HAZE

EPA has stated that DAQ's RH BART modeling protocol:

> "follows recommendations for modeling long range transport contained in 40 CFR part 51, appendix W ("The Guideline on Air Quality Models") and EPA's Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts. Furthermore, as discussed in Section 3 of the SIP, *Plan Development and Consultation,* the protocol was developed in consultation with EPA and FLM meteorologists."

See document number 323, section V.C, page 20907, in EPA docket EPA-R08-OAQ-2010-0406. Here, EPA apparently failed to notice that some settings for CALMET, including LCALGRD, and for CALPUFF were not IWAQM preferred settings or perhaps overlooks those alternate settings as it states that the DAQ's RH BART protocol as cited above followed, or did not deviate from, IWAQM. These EPA's statements failed to note that there were DAQ departures from IWAQM, including the CALMET user input variable LCALGRD.

NDAC REQUIREMENT

North Dakota Administrative Code, section 33-15-15-01.2, which replaces 40 CFR 52.21 (l)(r) states:

> "All estimates of ambient concentrations required under this chapter shall be based on applicable air quality models, technical data bases (including quality assured air quality monitoring results), and other requirements speci ed in appendix w of 40 CFR 51 ("guideline on air quality models" as it exists on July 2, 2010) as supplemented by the "North Dakota guideline for air quality modeling analyses". These documents are incorporated by reference. Technical inputs for these models shall be based upon credible technical data approved in advance by the department. In making such determinations, the department shall review such technical data to determine whether it is representative of actual source, meteorological, topographical, or local air quality circumstances."

The second paragraph on page 14 of the Supplemental Evaluation does not address this requirement of the NDAC[1] as it does not discuss whether the "False" setting for LCALGRD is more appropriate than the default or recommended "True" setting for the modeled domain. In other words, the DAQ has not justified execution of CALMET using the "False" setting over the large domain of western and central North Dakota and adjoining areas which has multiple NOAA/NWS upper air meteorological observation stations and multiple surface meteorological observation stations.[2] The large domain with multiple observation stations is not a simple situation.

ROLE OF SCIENCE

On page 14 of the Supplemental Evaluation, the DAQ also states:

> "The Department conducted modeling to evaluate the difference in the results using these two [LCALGRD] settings. The results indicate the "True" setting produces less improvement in visibility for the various control options (see Appendix D). The results shown above [on pages 13 and 14] indicate the larger visibility improvement associated with the two LCALGRD options (LCALGRD = F)."

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[1] This provision of NDAC was approved by EPA. See EPA's Technical Support Document for EPA SIP Action on the Submittal of the North Dakota Department of Health Air Pollution Control Rules 33-15-15, which is dated November 2, 2006, and is document number 0005(1) in EPA's docket number EPA-R08-OAR-2006-0502.

[2] See pages 3 through5 and pages 14 through22 in DAQ's RH "Protocol for BART-Related Visibility Impairment Modeling Analyses in North Dakota (Final)," dated November 2005. Note: the paragraph on page 13 of the Supplemental Evaluation indicates the published date was November 2006.

This paragraph and the Supplemental Evaluation in general do not address the technical merits of using a "False" setting versus using a "True" setting in the modeled domain. Instead, the Supplemental Evaluation directs readers to the modeled outcome on the source's impact on visibility using the "False" setting, which produces a greater improvement due to NO_x controls. In essence, it seems that rule of law (NDAC), EPA guidance, the CALMET user's guide and science are abandoned in favor of consistency with prior RH BART visibility modeling (see page 13 in the Supplemental Evaluation).

The DAQ paragraphs on pages 13 and 14 are confounded by the various modeling assessments of visibility impacts due to emissions at the Heskett Unit II plant. The accepted modeling protocol for visibility impacts by emissions at Unit II deviated from DAQ's 2005 RH BART protocol when using an EPA approved protocol. EPA stated:

> "The State's single-source modeling for Heskett Station Unit 2 predicted the highest maximum 24-hour 98th percentile visibility impact value to be 0.82 dv at Theodore Roosevelt and 0.58 dv at Lostwood. Since these values were close to the BART exemption threshold, MDU hired a consultant to perform a refined CALPUFF modeling analysis. We and the FLMs expressed concerns about the refined modeling. MDU agreed to remodel using an EPA approved protocol. The results of the final analysis predicted the highest maximum 24-hour 98th percentile visibility impact value to be 0.28 dv at TRNP and 0.23 dv at LWA in 2001. The refined modeling used a 1 kilometer grid size instead of 3 kilometer, speciated particulate matter emissions into several components with varying light scattering potential, and used annual average background visibility instead of the annual 20% best day's background visibility. We agree with the revised modeling results and with the State's analysis that Heskett Station Unit 2 is below the BART threshold and not subject to BART. Information on the refined modeling and the State's updated analysis was submitted with SIP Supplement No. 1 on July 27, 2010."

See footnote 13 attached to Table 4 on page 58583 in document 0001 in EPA docket EPA-R08-OAR-2010-0406. The document title is "Approval and Promulgation of Implementation Plans; North Dakota; Regional Haze State Implementation Plan; Federal Implementation Plan for Interstate Transport of Pollution Affecting Visibility and Regional Haze; Proposed Rule."

The EPA approved protocol resulted in less visibility impact as the 98^{th} percentile value at TRNP decreased from 0.82 dv to 0.28 dv, which is significant and which was likely do in part to using an EPA setting for LCALGRD of "True."[3] See "CALPUFF Visibility Modeling Protocol: MDU Heskett Unit 2 BART Analysis" dated November 2009 by AECOM, pages 1-1 and 1-2.

[3] There is no explanation by EPA or by the State's DAQ that this protocol satisfies NDAC 33-15-15-01.2 as an alternative to or substitute for the DAQ RH Bart protocol. And, there is no empirical demonstration which compares modeled data using the model settings of the EPA approved protocol for the source configuration, meteorological data, and geographic data for the modeled domain to available actual ambient monitored data within the modeled domain. See, for example, the Health Department's policy found in "Recommendations of the Hearing Officer to the State Health Officer of Proposed Findings and

In summary, the setting of "False" for LCALGRD versus the setting of "True" may not consistently produce greater or lesser estimates of visibility impacts or improvements for the emissions of sources scattered at locations across the modeled domain which includes central and western North Dakota as well as adjoining regions.

OBSERVATIONS

The comments herein focus on a very narrow aspect of RH BART analyses and of computer modeling analyses for estimating visibility impacts and for visibility improvement. Technical discretion in modeling is pervasive in spite of rule, abundant EPA guidance and other information.

Most if not all public citizens are not in-the-know, or do not have knowledge of analyses details; these details often affect analyses outcome. Persons, including experienced modelers, providing comments on modeling, as described by EPA in document number 0323, section V.C, in EPA docket EPA-R08-OAQ-2010-0406, would not have known that the setting for LCALGRD was "False" instead of "True," unless they had access to and reviewed actual CALMET user control input files. The situation also appears to apply to EPA and FLMs, even though they were consulted by DAQ in its preparation of modeling protocols.

Even though model algorithms and model input data contain uncertainty, the end results of protocol execution are numbers compared to standards or thresholds, which also include uncertainty. The comparison, however, is usually a pass or fail test that often has significant consequences. This decision scenario demands clarity in documentation of modeling that begins with law and rule followed by peer-reviewed technical guidance and appropriate discretion.

The situation here regarding a) the setting for LCALGRD and b) the MDU EPA-approved protocol as applied to Heskett II versus the DAQ EPA-approved RH BART protocol as applied to other sources might cause pause by some persons as to whether discretion is fundamentally sound or flawed. The situation does not narrow the uncertainty of modeling, and it confounds the role of models in enforcement when managing air quality.

Sincerely,

/ s /
Martin R. Schock

Determination," section 6.5; the proposed findings and determination were approved and adopted by the State Health Officer on September 7, 2005.