1.0 Introduction and Background

This air quality analysis addresses the impacts on ambient air quality and Air Quality Related Values (AQRVs) from the Continental Divide-Creston (CD-C) Project potential air emissions due to development and production activities within the CD-C Project Area (Figure 1-1) and from other documented regional emissions sources within a defined study area (Figure 1-2). Potential ambient air quality impacts are quantified and compared to applicable state and Federal standards, and AQRV impacts (impacts on visibility, atmospheric deposition, and potential increases in acidification to acid-sensitive lakes) are quantified and compared to applicable thresholds as defined in the Federal Land Managers' (FLMs') Air Quality Related Values Work Group (FLAG) and Interagency Workgroup on Air Quality Modeling (IWAQM) guidance documents (FLAG, 2010 and IWAQM, 1998), and other state and Federal agency guidance.

The methods used in the CD-C air impact analysis were documented in an Air Quality Impact Assessment Modeling Protocol (Carter Lake and ENVIRON, 2010) that was developed prior to the air impact assessment to ensure that the approach, input data, and computation methods were acceptable to the Wyoming Department of Environmental Quality – Air Quality Division (WDEQ-AQD), the Bureau of Land Management (BLM) and other air quality stakeholders, and that all air quality stakeholders had the opportunity to review the Protocol and provide input before the impact assessment was performed.

1.1 PROJECT DESCRIPTION

1.1.1 Overview of CD-C Project

BP America Production Company and other Operators (identified hereafter as the “Operators”) propose to develop natural gas resources within the existing Continental Divide, Wamsutter, Creston, and Blue Gap natural gas fields, located in Carbon and Sweetwater counties, Wyoming. The Project, known as the Continental Divide-Creston (CD-C) Natural Gas Development Project, involves approximately 1.1 million acres in an area with a “checkerboard” pattern of surface ownership (Figure 1-1). The BLM, the State of Wyoming, and private owners issued the oil and gas leases covering these lands. The Rawlins Field Office (RFO) manages BLM surface lands and the federal mineral estate in the Project Area. The Operators propose to drill approximately 8,950 natural gas wells in addition to the 2,850 wells that existed in the Project Area as of 2008.

The Project Area includes a mix of Federal, State, and private lands. The BLM manages approximately 626,355 acres (59%), the State of Wyoming owns approximately 21,600 acres (2%), and private landowners own approximately 421,360 acres (39%). The Project Area is generally located within Townships 14 through 24 North, Ranges 91 through 97 West, 6th Principal Meridian. The eastern boundary of the Project Area is about 25 air miles west of the city of Rawlins. Interstate 80 crosses through the center of the Project Area.

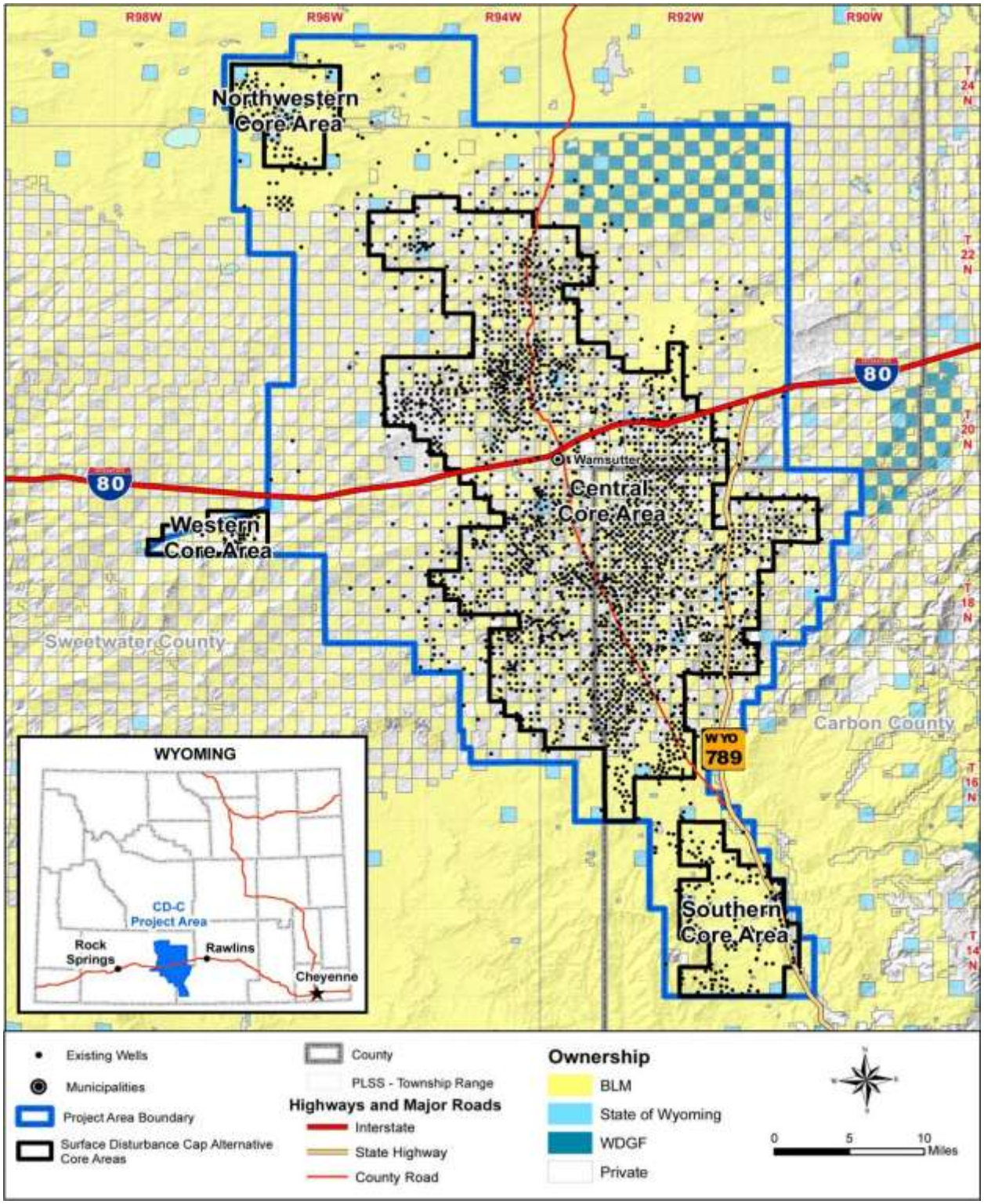

Figure 1-1. CD-C Project Location in Southwest Wyoming.

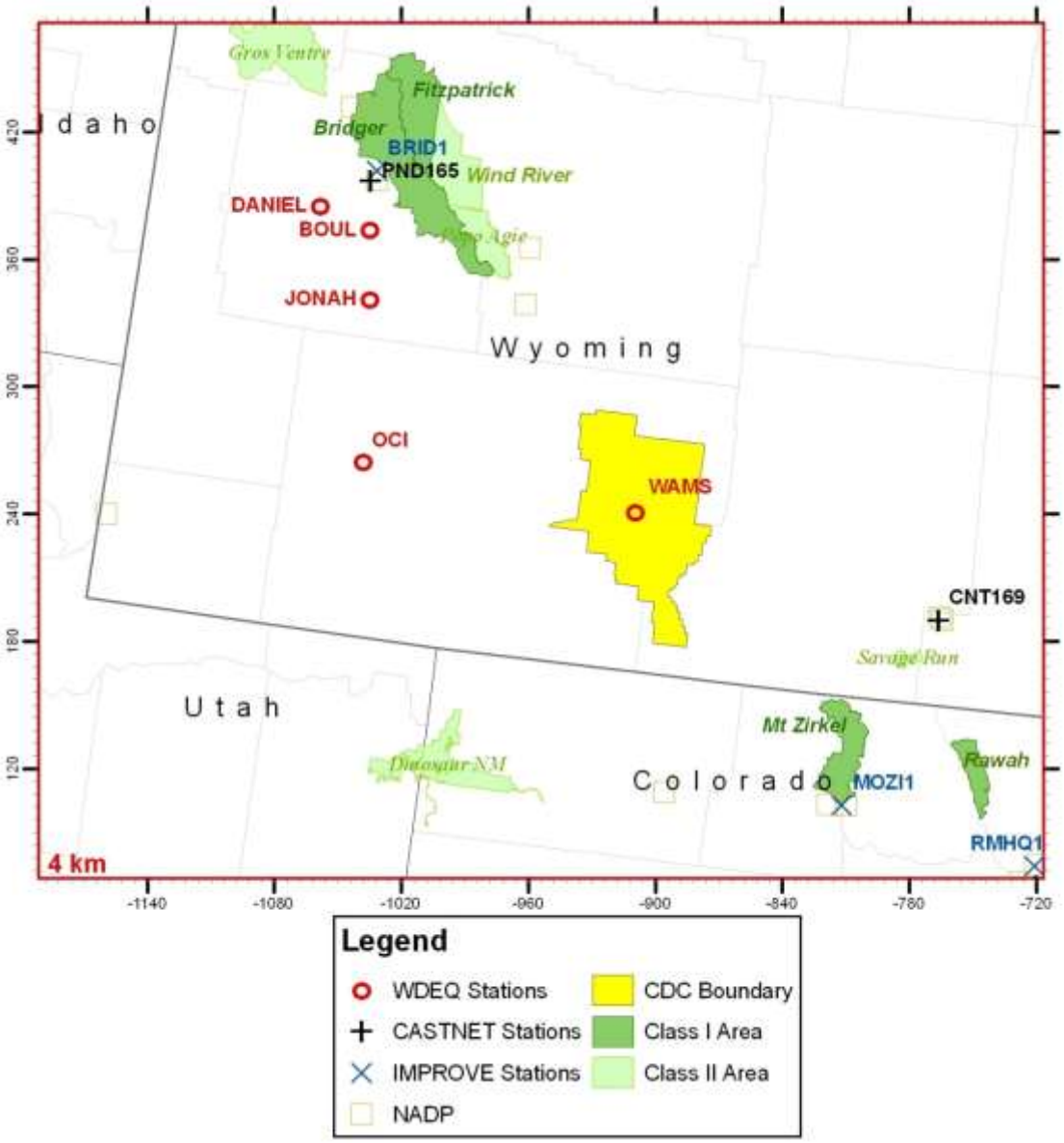

Figure 1-2. 4 km grid Study Area showing boundary of CD-C Project Area (yellow), nearby Class I/sensitive Class II areas (green), WDEQ monitoring sites (red) and CASTNet monitoring sites (black).

Collectively, the Operators propose to drill approximately 8,950 wells in addition to the wells that currently exist in the Project Area. Approximately 500 to 900 of the proposed wells could be coalbed natural gas (CBNG) wells. The Operators anticipate drilling infill wells at potentially up to 40 acres per downhole well bore. The total number of wells drilled will depend largely on factors outside of the Operators' control that affect the ability to adequately drain the reservoir, including geologic characteristics and reservoir quality, appropriate engineering technology, economic factors, commodity prices, availability of commodity markets, and lease stipulations and restrictions.

This proposal assumes that the gas wells may be drilled conventionally, i.e., with a vertical well bore on a single pad, or with multiple directional well bores from a single pad. The gas resource is primarily conventional natural gas; however the project also includes development of CBNG. Directional drilling is not being proposed by the CBNG operators. All proposed wells are anticipated to be drilled during an approximately 10 to 15 year period after Project approval. Although actual operations are subject to change as conditions warrant, the Operators' long-term plan of development is to drill additional wells at the rate of approximately 600 wells per year or until the resource base is fully developed. The average life of a well is expected to be 30 to 40 years for both the conventional gas and CBNG development.

1.1.2 Relationship to Existing Plans and Documents

Oil and gas extraction in the Project Area is currently guided by decisions in relevant programmatic National Environmental Policy Act (NEPA) documents including the Great Divide Resource Management Plan (RMP) (BLM, 1990), and decisions made in applicable project-specific BLM NEPA documents, including the Continental Divide/Wamsutter II Natural Gas Project and the Creston/Blue Gap Natural Gas Project.

Potential impacts to air quality resulting from natural gas development in the Continental Divide area were previously analyzed in the Continental Divide/Wamsutter II Natural Gas Project Environmental Impact Statement (CDWII EIS) (BLM, 1999). The Operators' development plan for that project was approved in May of 2000 (BLM, 2000). The 2,130 wells approved included approximately 930 new wells/well locations within the jurisdictional boundary of the Rock Springs Field Office (RSFO) area and 1,200 new wells/well locations within the jurisdictional boundary of the RFO area. The portion of the CDWII Project Area within the RSFO is not included in the Continental Divide-Creston Project Area.

In April 2005, BLM RFO received a proposal to drill and develop up to 1,250 additional natural gas wells and associated facilities in the Creston and Blue Gap fields from Devon Energy Corporation, representing themselves and other leaseholders,. The BLM RFO sent a letter to oil and gas operators with interests in the area stating that further development would require additional analysis and approval under the provisions of NEPA. The BLM had originally approved development of up to 275 natural gas wells and up to 250 well pads in the project area in October 1994. By August of 2004, the approved number of wells had been drilled. The 2005 Devon proposal was initiated in response to the BLM RFO letter and named the "Creston/Blue Gap II Natural Gas Project."

In November 2005, since the Operators had begun to approach the number of wells permitted in the original Continental Divide/Wamsutter EIS, the BLM RFO received a proposal from BP

America Production Company (BP), representing themselves and other leaseholders, to drill and develop up to 7,700 additional wells and associated facilities within a portion of the Continental Divide/Wamsutter II Natural Gas Project area. Development in that area had been approved in May of 2000 for up to 2,130 wells. There was no limit on the number of well pads. (The Continental Divide/Wamsutter Area is immediately north and east of the Creston/Blue Gap Project Area). After reviewing the Continental Divide and Creston/Blue Gap II proposals, and in view of their timing, the proximity of the areas, and the similarity of their proposed actions, BLM determined the two projects should be combined into one, the Continental Divide-Creston Natural Gas Development Project.

1.2 OVERVIEW OF MODELING APPROACH

In this subsection, we provide some background on Wyoming ozone air quality issues and outline the methods used in the near-field and far-field air quality modeling.

1.2.1 Near-Field Modeling

The EPA's regulatory guideline model, AERMOD was used to assess near-field impacts of criteria pollutants PM_{10}, $PM_{2.5}$, SO_2, NO_2 and CO, and to estimate short-term and long-term HAP impacts. AERMOD has been used to assess near-field impacts for previous natural gas development air quality analyses performed for EIS for the BLM in Wyoming. However, given the new 1-hour National Ambient Air Quality Standards for NO_2 and SO_2, refined modeling analyses have been performed for project development and project production activities to assess these standards.

1.2.2 Far-Field Modeling

The far-field modeling approach was determined by ozone air quality in Wyoming. Recent high levels of observed ozone dictated the choice of modeling tools and methods.

1.2.2.1 Ozone Air Quality in Wyoming

Ozone (O_3) is an important component of photochemical smog. Ozone is not emitted directly into the atmosphere, but is formed from photochemical reactions of precursor species in the presence of sunlight. The most important precursors are oxides of nitrogen (NO_X) and volatile organic compounds (VOCs). High ozone episodes occur most typically in urban areas during summer. Under these conditions, there is an abundance of ozone precursors from human activities and the high angle of the summer sun means there is sufficient sunlight available to drive the photochemical reactions which produce ozone. High summer temperatures enhance VOC emissions and speed the chemical reactions which produce ozone from its precursors.

In 2005, high ozone (i.e. 8-hour average concentrations>75 ppb) was measured in Sublette County, WY during winter. The phenomenon of winter high ozone under conditions with low sun angles and cold temperatures was novel, particularly because Sublette County is a relatively rural area whose main source of emissions is oil and gas exploration and production. It was determined by the WDEQ-AQD and its contractors that the high ozone values were not the result of a measurement error, a transport event, or a stratospheric ozone intrusion. High ozone levels were recorded again in Sublette County in 2006, 2008 and 2011. High winter ozone has also been measured in the Uinta Basin region in rural eastern Utah where extensive oil and gas production is also occurring, similar to Wyoming's Upper Green River Basin.

In 2007 and 2008, field studies were carried out in Wyoming's Upper Green River Basin in order to investigate the mechanisms for ozone formation under winter conditions (ENVIRON et al., 2008a). Data from this and subsequent Upper Green River Basin Winter Ozone Studies (ENVIRON et al., 2008a,b; 2010b; MSI et al., 2011) as well as photochemical modeling studies (e.g. Nopmongcol et al., 2010, Carter and Seinfeld, 2012) have been used to develop a conceptual model for ozone formation in winter. The conceptual model (Schnell et al., 2009; Stoeckenius and Ma, 2010) indicates that the following conditions are necessary to produce high winter ozone:

- Shallow temperature inversion (limits vertical mixing)
- White snow on ground (highly reflective snow enhances actinic UV flux and facilitates development and maintenance of inversion)
- Few or no clouds
- Stagnant and/or recirculating slow surface winds (limits dispersion of pollutants)
- High precursor concentrations
- High VOC/NO_X ratio

Although progress has been made in understanding winter ozone formation, many open questions remain, such as the importance of ozone, transport, the chemistry of aromatic compounds at low temperatures and the sources and role of HONO in winter ozone formation (Carter and Seinfeld, 2012). Measurement campaigns, emission inventory development and modeling studies are underway with the aim of improving our understanding of the processes that contribute to winter ozone formation in Wyoming and Utah. To date, there has been limited success in simulating observed winter ozone values using 3-dimensional photochemical grid models. Therefore, the WDEQ-AQD considers the simulation of winter ozone to be an area of active scientific research and not appropriate for a NEPA analysis.

In a memorandum dated March 31, 2009, the WDEQ-AQD (2009) advised the CD-C stakeholders of the AQD's position that the CD-C ozone model performance evaluation should be limited to April-October of the 2005 and 2006 calendar years. The text below is taken verbatim from the memorandum:

> *AQD's position is that any air quality impact analysis for ozone for any project in southwest Wyoming should not require that model performance be compared to the winter time high values measured in 2005, 2006, or 2008. AQD believes that current air quality models have not been formally evaluated for their ability to adequately model ozone formation considering the key met conditions believed to be necessary in the Upper Green River Basin (strong inversions, snow, low wind speeds, strong sunlight). AQD further believes that development of models capable of replicating the episodic conditions which allow elevated ozone levels to be formed should be done in separate research projects, and not as modeling is performed for a specific project under NEPA. For NEPA projects which are assessed prior to development of an adequate winter ozone model, AQD believes that the NEPA air quality protocol should require modeling for the period April 1 through October 31 (Wyoming's 'ozone monitoring season', per 40 CFR Part 58,*

> *Appendix D, Table D-3). Similarly, comparisons of model results to the NAAQS, using either RRF or absolute techniques, should be limited to the modeled period.*

The WDEQ-AQD has analyzed the potential for areas outside Sublette and parts of Lincoln County to influence measured high ozone events in Sublette County (WDEQ-AQD, 2009), and has concluded:

> *The analysis conclusively shows that elevated ozone at the Boulder monitor is primarily due to local emissions from oil and gas (O&G) development activities: drilling, production, storage, transport, and treating. The ozone exceedances only occur when winds are low indicating that there is no transport of ozone or precursors from distances outside the proposed nonattainment area. The ozone exceedances only occur in the winter when the following conditions are present: strong temperature inversions, low winds, cold temperatures, clear skies and snow cover. If transport from outside the proposed nonattainment area was contributing to the exceedances, then elevated ozone would be expected at other times of the year. Mountain ranges with peaks over 10,000 feet border the area to the west, north and east influence the local wind patterns. Emission sources in nearby counties are not upwind of the Boulder monitor during episodes which exceed the 8-hour ozone standard in Sublette County.*

The WDEQ-AQD has therefore instructed that no impact assessment of the CD-C Project emissions on winter ozone events should be carried out as part of the CD-C air quality impact analysis.

In March, 2009, the Governor of Wyoming recommended to EPA that Sublette County and parts of northeastern Lincoln and northwestern Sweetwater Counties be designated ozone non-attainment areas under the 2008 75 ppb ozone standard. Because of the importance of ozone as an air quality issue in Wyoming, the CD-C air quality impact analysis included evaluation of the effects of emissions from the CD-C Proposed Action on ozone throughout the study area during the April-October ozone season.

The CD-C Project Area is located in eastern Sweetwater and western Carbon Counties. Although the Project does not lie within the area proposed for non-attainment designation, the CD-C impact analysis evaluated potential ozone impacts from CD-C Proposed Action emissions and Alternatives on ozone in Sublette, northeastern Lincoln and northwestern Sweetwater Counties as well as the rest of the modeling domain during the April-October ozone season; this analysis can be found in Section 4.5.4. The need to address ozone impacts required the use of a photochemical grid model, which is a type of computer model that simulates the formation, transport, and fate of ozone and other pollutants in the atmosphere.

1.2.2.2 The CAMx Photochemical Grid Model

The analysis described in this document differs significantly from previous natural gas development air quality analyses performed for EIS for the BLM in Wyoming. Previous BLM analyses used the CALPUFF model to assess potential AQRV impacts in nearby Prevention of Significant Deterioration (PSD) Class I Areas and sensitive PSD Class II Wilderness Areas from

project and cumulative source emissions. The BLM and WDEQ-AQD elected to use a photochemical grid model (PGM) because PGMs represent the "state of the science" in tools and methods for both AQ (including ozone) and AQRV analyses.

At the direction of the WDEQ-AQD, the air quality impact assessment for the CD-C EIS was performed with the photochemical grid model CAMx (Comprehensive Air quality Model with Extensions; ENVIRON, 2010a; www.camx.com). The Comprehensive Air quality Model with extensions (CAMx) is an Eulerian photochemical dispersion model that allows for an integrated "one-atmosphere" assessment of gaseous and particulate air pollution (ozone, $PM_{2.5}$, PM_{10}, air toxics, mercury) over many scales ranging from sub-urban to continental. CAMx simulates the emission, dispersion, chemical reaction, and removal of pollutants in the troposphere by solving the pollutant continuity equation for each chemical species on a system of nested three-dimensional grids. The Eulerian continuity equation describes the time dependency of the average species concentration within each grid cell volume as a sum of all of the physical and chemical processes operating on that volume.

1.2.2.3 CD-C EIS Photochemical Modeling Analysis Modeling Strategy

The basic modeling strategy used in any EIS that employs a photochemical grid model, such as CAMx, is to first evaluate the ability of the model to reproduce ambient observations of trace pollutants during a recent historical episode (the "current year"); then, once confidence in the model is established, a future year case can be run and the potential project impacts evaluated.

A current year base case is simulated using a comprehensive regional emission inventory of actual emissions from all sources (including motor vehicles, power plants, oil and gas exploration and production sources, biogenic sources, etc.). It is preferable to run the model for more than one year so that as many different meteorological regimes as possible are simulated. Pollutants emitted from Project sources may only influence a particular sensitive receptor under certain conditions (wind direction, atmospheric stability) and a conservative estimate of AQ and AQRV impacts requires that those conditions be simulated. While it is not possible to ensure that all possible meteorological conditions that might lead to transport of pollutants from Project sources to sensitive receptors are simulated, modeling two full years increases the likelihood that the relevant conditions will occur.

The base case simulation is evaluated with respect to ambient air quality measurements. If the base case simulation reproduces concentrations of observed species with reasonable accuracy, then the model can be used in the future year impact assessment. The next step is to prepare a baseline model for use in future year projections. The only difference between the base case model and the baseline model is that the baseline model uses typical emissions while the base case model uses actual emissions. An example of an emissions source category for which the base case and baseline emissions are different is electrical generating units (EGUs). The base case emission inventory uses hourly EGU emissions derived from continuous emissions monitoring (CEM) data because the base case model is evaluated against concurrent observations to determine whether the model provides a realistic simulation of atmospheric processes. The purpose of the baseline model, on the other hand, is to serve as the base year from which future year projections are made. The baseline EGU emissions are used to represent typical conditions (no shutdowns for maintenance, for example) in order to be

consistent with the future year emissions, which also represent typical conditions. The baseline emission inventory, therefore, is usually identical to the base case emission inventory, except for the difference in emissions from EGUs and other source categories with large variability in time, such as drill rigs.

The future year modeling involves development of a future year Project emission inventory as well as a future year regional emission inventory. In the future year regional emission inventory, the emissions from human activities are projected from the base year to the future year and changes such as population growth and planned emissions controls (such as controls on motor vehicle emissions) are accounted for. Emissions that are not controllable, such as biogenics and wildfire emissions, are held fixed. The Project emissions are included in the future year emission inventory. The model is run using the future year regional emission inventory with the rest of the model (meteorological fields, boundary conditions, model settings, etc.) in the same configuration as in the base case. If multiple years were simulated in the base case, then the meteorological conditions for those same years are used together with the future year emissions scenario in the future year modeling. Project AQ and AQRV impacts are determined from the future year simulations.

1.2.2.4 Development of CD-C Photochemical Modeling Database

Following the original July, 2007 CD-C Modeling Protocol (Sage and ENVIRON, 2007), Carter Lake Consulting, together with BP and other Operators, developed a detailed inventory of oil and gas emissions sources in Southwest Wyoming for 2005 and 2006. The 2005-2006 oil and gas emissions inventory was reviewed and approved by the WDEQ-AQD in December, 2008. Carter Lake also assembled 2005 and 2006 emission inventories of non-oil and gas point sources in Wyoming and surrounding states. ENVIRON processed these inventories, as well as a comprehensive regional emission inventory within the SMOKE emissions modeling system (Sparse Matrix Operator Kernel Emissions; Coats, 1996a; Coats and Houyoux, 1996b) to generate base case 2005-2006 model-ready emissions files for use in the CAMx photochemical grid model. The 2005-2006 base case regional emissions inventory was reviewed by the WDEQ-AQD and approved in February, 2010. The 2005-2006 base case emissions inventory is described in detail in Section 2.2.1 and Appendix G of this document.

ENVIRON completed development of 36, 12 and 4 km resolution MM5 meteorological databases (Fifth generation Mesoscale Model; Anthes and Warner, 1978) for 2005 and 2006, and processed the meteorological data for use in CAMx. This meteorological database was reviewed by the WDEQ-AQD under the CD-C Project and approved in February, 2010. ENVIRON also prepared other inputs for CAMx such as photolysis rates, land use database, etc. The 2005-2006 emissions inventories developed by Carter Lake, BP and other Operators, and ENVIRON are described in Section 2 of this document, as are the meteorological modeling and the other CAMx inputs. An evaluation of the meteorological model performance in simulating observed meteorological fields is presented in Appendix D.

A preliminary CAMx 2005-2006 base case simulation that could potentially be used by multiple Southwest Wyoming EIS projects was performed during May 2009 and an initial model performance evaluation was conducted under the Hiawatha EIS (Kemball-Cook, et al., 2009). On August 20, 2009, the Hiawatha air quality stakeholders group (BLM, EPA, NPS, USFS and

WDEQ-AQD) met to discuss the model performance evaluation of the preliminary CAMx run. The stakeholders raised concerns over the CAMx model performance. In particular, concerns were raised regarding the summer ozone performance at the southwest Wyoming industrial monitoring sites (e.g., Boulder, Daniel and Jonah) and the particulate nitrate (NO_3) winter over-prediction and summer under-prediction tendency. The CD-C stakeholders also reviewed the evaluation and determined that diagnostic sensitivity testing should be conducted in order to improve model performance; this testing was carried out under CD-C by ENVIRON during the latter half of 2009, and is documented in detail in Appendix E of this document.

The sensitivity testing was performed in two phases. During the Round 1 sensitivity testing, a new CAMx vertical velocity algorithm was tested (Emery et al., 2009a,b). Use of the new algorithm eliminated spurious high ozone concentrations over high terrain in spring and improved model performance over broad regions of the western U.S. New boundary conditions were developed for the outer 36 km modeling domain based on data specific to the 2005-2006 modeling years. The vertical resolution of the CAMx photochemical grid model was increased and the model's top boundary condition was revised. The treatment of ammonia emissions was updated and simulation of mineral nitrate was added to the model in an effort to improve nitrate performance. At the conclusion of Round 1, the CD-C stakeholders elected to adopt the Round 1 CAMx configuration for CD-C 2005-2006 base case modeling along with the updated ammonia emissions and simulation mineral nitrate. However, additional ozone model performance improvements in southwest Wyoming were requested by the CD-C air quality stakeholders before beginning base case modeling, so a second round of CAMx sensitivity testing was carried out.

During the Round 2 testing, the sensitivity of ozone performance in southwest Wyoming was evaluated in response to changes in the CAMx treatment of dry deposition, vertical mixing, horizontal diffusion, horizontal resolution, emissions of nitrous acid (HONO), and the treatment of plumes from nitrogen oxide (NO_X) emission sources. As a result of changes made during the Round 2 testing, model performance for the southwest Wyoming summer high ozone episode improved to the point where it met EPA goals for 1-hour and daily maximum 8-hour ozone model performance. Nitrate performance also improved somewhat as a result of the Round 1 and Round 2 sensitivity testing, and the model was shown to be conservative in its nitrate predictions.

The results of the Round 1 and Round 2 sensitivity testing (presented in Appendix E) were reviewed by the CD-C stakeholders. On January 7, 2010, the CD-C stakeholders agreed upon a final model configuration to be used to conduct revised 2005-2006 base case modeling for the CD-C project. The final model configuration that was used for the CD-C base case modeling is described in this Protocol. In February, 2010, the WDEQ-AQD authorized ENVIRON to proceed with the 2005-2006 base case modeling under the CD-C project. The 2005-2006 base case model runs were evaluated and the results of the evaluation are presented in Appendix A. The CD-C, stakeholders approved the 2005-2006 base case during the spring of 2010.

At their January 7, 2010 meeting, the CD-C stakeholders determined that the baseline year to be used in performing future year modeling and impact analyses would be 2008. Originally, 2006 was to have been the baseline year, but extensive development of oil and gas resources in Southwest Wyoming occurred during the 2006-2008 period, and emissions of criteria pollutants

and ozone precursors from this source category were significantly larger in 2008 than in 2006. The economic slowdown in 2008-2009 led to a reduction in the pace of development such that total 2009 emissions are smaller than 2008 emissions. 2008 was a National Emission Inventory (NEI) year, in which states submit emission inventories to the EPA. Because emission inventories for 2008 for the State of Wyoming were available at the time of the baseline modeling, and because 2008 is the year of peak emissions from the energy sector in Wyoming, the stakeholders selected 2008 as the baseline year for the impact analysis modeling. Another important factor is that more ambient monitoring data were available in 2008 than in 2006. This is critical for developing future year ozone projections. Carter Lake Consulting and ENVIRON have developed an emission inventory for the year 2008, and this inventory development is described in Sections 2 and 4 and Appendix F. The WDEQ-AQD reviewed the 2008 baseline emission inventory and approved the use of the inventory for the CD-C 2008 baseline modeling (Personal Communication from Kelly Bott, WDEQ, July 7, 2010). A detailed description of the 2008 emission inventory is provided in Appendix F.

In the winter of 2010-2011, the 2008 baseline far-field modeling was carried out using the CAMx model. In addition to its use as the current year on which future year CD-C modeling is based, the 2008 baseline modeling was also being used to assess the impacts of the existing (as of 2008) CD-C Project on regional air quality. The CD-C Project area contains existing development which must be accounted for in the CD-C modeling in addition to the wells proposed as part of the CD-C Project. The purpose of this assessment was to evaluate the state of regional air quality under the baseline emission scenario. The CAMx output concentration fields were used for the evaluation of regional air quality, and the CAMx probing tools (described in Section 4) were used to isolate the contribution of existing 2008 CD-C Project area emissions sources to the total modeled concentrations. An AQRV impact analysis evaluated CD-C project impacts on visibility, deposition and acidification of sensitive lakes. Criteria pollutant levels within the 4 km domain were evaluated and the contributions of the CD-C Project emissions sources were quantified using the CAMx probing tools. Modeled ozone levels and CD-C Project area ozone impacts and results for criteria pollutants other than ozone (NO_2, SO_2, PM_{10}, $PM_{2.5}$ and CO) as well as the 2008 AQRV impacts of the existing CD-C Project are reported in Appendix I.

As the 2008 baseline modeling was completed, the CD-C Project emission inventory was finalized. The year of peak NO_X and VOC emissions (2022) from the CD-C Project was selected for future year modeling so as to conservatively estimate the maximum air quality impacts that would result from the CD-C Project over the LOP. A regional emission inventory of non-CD-C sources was developed for the 36, 12 and 4 km modeling grids and the year 2022.

In late 2011, the 2022 future year CAMx modeling was performed, and the results were presented to the CD-C stakeholders at a January 10, 2012 meeting. The results of the CD-C future year modeling and air quality impact analysis are presented in this document.

1.3 OUTLINE OF THE CD-C AIR QUALITY TECHNICAL SUPPORT DOCUMENT

In Section 2 of this document, we describe the development of emission inventories used in the CD-C Project impact analysis. An overview of the methods and data used in developing the CD-C Proposed Action emission inventory is given in Section 2. A detailed description of the

emissions calculation for each emissions source category is given in Appendix H. Because a photochemical grid model was used for the AQ and AQRV impact assessment, regional emission inventories for all anthropogenic, biogenic, and geogenic emissions sources were required. Inventories were developed for the 2005-2006 base case, the 2008 baseline year, and the 2022 future year. A brief description of these inventories may be found in Section 2 and the inventories for the 2005-2006 base case years are described in detail in Appendix G; the 2008 baseline inventory is discussed in depth in Appendix F.

Section 3 of this document describes the AERMOD near-field modeling, including the CD-C Project emissions and meteorological and other data used as inputs in the modeling. Impacts on near-field levels of criteria pollutants and hazardous air pollutants are described, and cancer risks are assessed.

Section 4 describes the methods and the results of the CAMx far-field modeling. An overview of the 2005-2006 base case modeling is given in this Section. Additional detail on the meteorological modeling for the years 2005-2006 may be found in Appendix D, which includes a description of the meteorological model and its configuration for the CD-C simulations, as well as inputs used and an evaluation of the model's performance in simulating observed meteorological data. Appendix A describes the model performance evaluation of the CAMx base case modeling of 2005-2006. Appendix A contains a description of the modeling inputs, model configuration, and methods and data used in the air quality model performance evaluation. Appendix E describes diagnostic and sensitivity testing that was carried out to determine the optimal configuration for performing the CD-C 2005-2006 base case modeling. The 2008 baseline modeling is described in Appendix I. The CD-C future year modeling and impact analysis is also given in Section 4. Methods and results are shown for impacts on criteria pollutants including ozone, visibility, acid deposition and effects of deposition on sensitive lakes.

Section 5 provides a summary of the air quality and AQRV impacts of the CD-C Project.