AIR QUALITY IMPACT ASSESSMENT PROTOCOL, LITTLE SNAKE RESOURCE MANAGEMENT PLAN, MOFFAT, ROUTT AND RIO BLANCO COUNTIES, COLORADO

Prepared for:

Bureau of Land Management
Little Snake Field Office
455 Emerson St.
Craig, Colorado 81625
and

Bureau of Land Management
Colorado State Office
2850 Youngfield St.
Lakewood, Colorado 80215

Prepared by:

Booz Allen Hamilton
5299 DTC Blvd
Greenwood Village, CO 80111

November 2007

This page intentionally left blank.

TABLE OF CONTENTS

LIST OF MAPS

LIST OF TABLES

This page intentionally left blank.

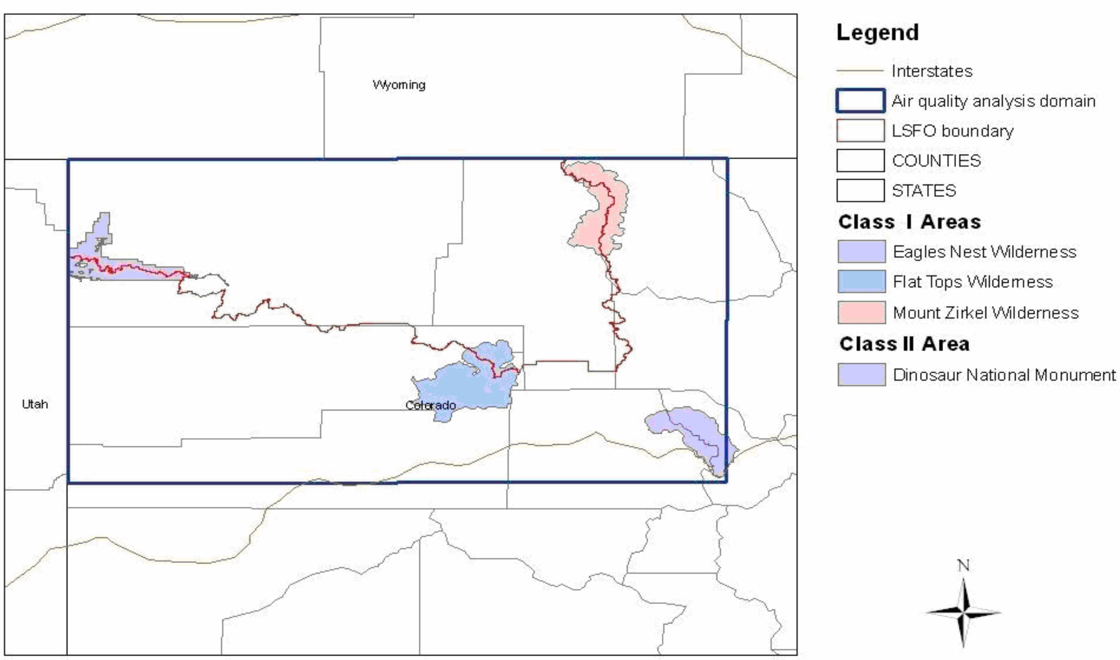
1.0 INTRODUCTION

This Air Quality Impact Assessment Protocol (Protocol) identifies the methodology for quantifying potential air quality impacts from the proposed Little Snake Resource Management Plan (RMP). This methodology is being provided prior to study initiation to ensure that the approach, input data, and computation methods are acceptable to the Bureau of Land Management (BLM), and that other interested parties have the opportunity to review the Protocol and provide input before the study is initiated.

The Little Snake Field Office (LSFO), Bureau of Land Management (BLM), is developing a Resource Management Plan (RMP) for all the federal surface and mineral estate managed by BLM within the Little Snake Field Office boundary in three counties in northwest Colorado – Moffat, Routt, and Rio Blanco Counties. The Little Snake Resource Management Plan Planning Area (RMPPA) encompasses approximately 1.3 million acres of BLM-administered pubic lands and 1.1 million acres of federally-owned mineral estate. Land ownership in the Little Snake RMPPA ranges from large tracts of BLM land to patches of public land surrounded by private and state lands.

The Little Snake RMPPA (Map 1.1) will require the examination of general RMP development impacts in northwestern Colorado study area (the modeling domain).

Map 1.1: Little Snake RMP Area and Air Quality Analysis Domain



1.1 OIL AND GAS DEVELOPMENT ALTERNATIVES

The BLM proposes to evaluate the development of hydrocarbon resources underlying oil and gas leases owned, at least in part, by various parties within the Little Snake RMPPA in Moffat, Routt, and Rio Blanco counties, Colorado.

1.1.1 Alternatives A, B and C (Preferred Alternative)

A BLM land use plan does not authorize oil and gas development, but it does identify areas that are available for future oil and gas leasing. For analysis purposes, the Reasonable Foreseeable Development (RFD) Scenario (2005) anticipated that approximately 3,031 oil and gas wells would be drilled in the Little Snake RMPPA under the Preferred Alternative (Alternative C) in addition to wells that currently exist in the RMPPA. The same number of wells also applies to the No Action Alternative (A) and Alternative B.

This proposal assumes that the additional wells would be drilled conventionally, i.e., with vertical well bores. All proposed wells are anticipated to be drilled during an approximate 20-year period. The average life of a well is expected to be 40 years.

There would be a single-well location design (i.e., one well per well pad). The estimated size of each drill site location is 2.75 acres, of which approximately 1.75 acres would be reclaimed after the well is completed and the gas gathering pipeline is installed.

It was assumed that each well would have a three-phase separator and glycol dehydrator to process and average of 50 MBtu/hour product. Condensate and water would be stored in tanks, which would be serviced weekly by a tanker truck traveling on approximately 6 mile of unsurfaced access road. It was also assumed that thirty 200 hp field compressors would be needed for every 1,000 wells. In addition, eight 50,000 hp central (pipeline or sales) compressors would also be utilized. The peak production year to be modeled will be the year with the highest overall emissions.

1.1.2 Alternative D (Action with Resource Protection)

An alternative with lower development than the Preferred Alternative will be included (Alternative D). For this alternative it is anticipated that 2,273 wells for the RMP area would be developed (this is 75% of the Preferred Alternative.) Therefore, two model runs will be made; one for Alternatives A, B and C, and one for Alternative D.

1.1.3 Cumulative Analysis

The analysis will include a qualitative discussion of cumulative effects. The cumulative impact analyses prepared for the other recent NEPA documents, such as the Roan Plateau/Vernal analysis and the Moxa Arch analysis, will be used qualitatively to indicate possible cumulative effects of the Little Snake RMP decisions. If future implementation actions are proposed, BLM would perform separate direct, indirect and cumulative impact analyses. For example, both the Hiawatha Project EIS and the White River RMP amendment are analyzing cumulative effects.

2.0 PROJECT EMISSIONS

The alternatives in the Draft RMP/EIS include assumptions about the future anticipated development of oil and gas wells. Relevant production facilities associated with each well would include a separator, dehydrator, water tank, condensate tank, and methanol tank. Ancillary facilities would include new compressor engines.

Emissions inventories for oxides of nitrogen (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than or equal to 10 microns in size (PM_{10}), particulate matter less than or equal to 2.5 microns in size ($PM_{2.5}$), and volatile organic compounds (VOC), will be developed for production activities assumed in the Little Snake RMPPA. The emissions inventory will be developed based on the Preferred Alternative and Alternative D as reported in the Draft RMP/EIS, which apply reasonable but conservative scenarios identified for each activity. The inventory is consistent using manufacturer's emissions data, the Environmental Protection Agency's (EPA's) AP-42 (EPA 1995), Gas Research Institute (GRI) emission factors (1999), and other accepted engineering methods as described below.

2.1 WELL LOCATION ASSUMPTIONS

Due to the lack of any specific project proposal (with the exception of the Hiawatha Regional Energy Development Project), EPA Region 8 Management agreed that BLM could combine assumed oil and gas activity into distribution zones, based primarily on the major oil and gas formations in the planning area. This is the only possible approach where future development locations are generally unknown, and will not be known until future site-specific NEPA analyses are performed.

For the Hiawatha Regional Energy Development Project, the Operators' Proposed Action is to drill up to 4,208 new wells beyond the number of wells that currently exist within the Hiawatha Project Area. The 4,208 well maximum represents a full development scenario based on currently known geologic and reservoir properties. The Operators estimate that approximately two-thirds (2,805) of the potential wells could be located within the Wyoming portion of the Project Area, and the remaining one-third (1,403) could be located within the Colorado portion of the Project Area. This is a 30-year project. Therefore, converting this project to 20 years, which is the life of the Little Snake RMP, 935 wells would be drilled within the Little Snake RMPPA during the life of the plan.

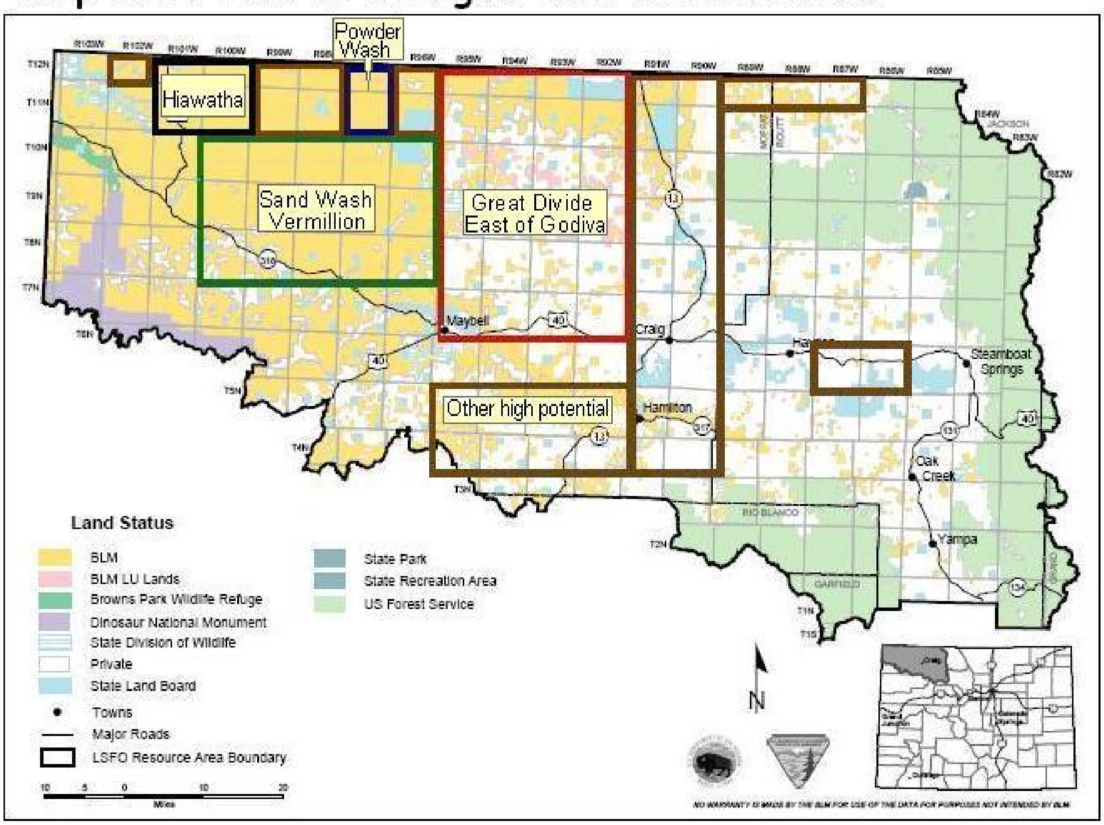
The estimate of well numbers per distribution zone was determined using an analysis of Applications for Permit to Drill (APDs) for the time period of January 2001 through September 2007. APDs were grouped into five general zones: four zones representing the major oil and gas formations/existing fields in the Little Snake RMPPA. The fifth zone would represent all the other areas outside of the four zones, within the area of high oil and gas potential. The results of the analysis of modern development trends and the projected well numbers are shown on Table 2-1.

Table 2-1. Past Oil and Gas Activity and Projected Development

Area	Township & Range	Number of APDs 01/01/01 to 09/10/07	Percentage of APDs 01/01/01 to 09/10/07	Projected Wells – Alts A/B/C	Projected Wells – Alt D
Powder Wash	**T11N – T12N R97W**	21	11%	333	250
Hiawatha, Vermillion, Sugar Loaf	**T11N – T12N R100W – R101W**	71	37%	1,222	841
Great Divide, East of Godiva Rim	**T7N – T12N R92W – R95W**	55	29%	879	659
Sand Wash & Vermillion Basins	**T8N – T10N R97W – R100W**	22	12%	364	273
Other		21	11%	333	250
Total		190	100%	3,031	2,273

The wells are spatially distributed as indicted in Map 2.1. Wells in the "Other" category will be distributed evenly throughout all "Other" townships.

Map 2.1: Five oil and gas distribution zones



Other assumptions for the air quality analysis:

- Of all the wells, 54% would be gas producers, 20% would be oil producers, 20% would be dry holes and 6% would be other types of wells, such as water injection wells. (BLM 2005)
- 70% of all wells would be on federal minerals, and 30% would be on non-federal minerals. (BLM 2007)

2.2 CONSTRUCTION EMISSIONS

This analysis will consider only emissions from drilling operations that would occur during construction activities. Drilling engine emissions will be calculated using EPA's AP-42 or other appropriate engineering estimates. Future required emission controls will be assumed to phase into operation at 20% per calendar year (for example, it is assumed that all engines will be Tier II in 2010, but only 20% of engines will be Tier IV in 2011.)

Emissions associated with potential: well pad, pipeline, and access road construction; flow-back/flaring; vehicle travel during the drilling and completion phases; as well as construction and vehicle traffic would be either minimal, or cannot be quantified at this time.

2.3 PRODUCTION EMISSIONS

Production emissions developed for the DEIS will be used in this analysis, pro-rated on a "per-well" basis. Sources of pollutant emissions during the production phase included combustion emissions from well-site facilities and compressor engines, and VOC emissions from gas transmission operations. Vehicle exhaust and fugitive particulate emissions from unpaved road travel would also occur. Combustion equipment emissions will be calculated using AP-42, manufacturer's, and/or GRI emission factors. Fugitive dust from unpaved roads and wind erosion emissions from disturbed areas were calculated using AP-42 emission factors. VOC emissions from production (aside from those arising from combustion sources) were generated by well-site dehydrators, fugitive leaks, and flashing emissions from stored liquids. Both fugitive and flashing emissions were calculated using representative constituent analyses of natural gas and stored liquids, respectively, as well as a discussion of Best Achievable Control Technology (BACT) applicability and requirements.

3.0 CRITERIA POLLUTANT MODELING

3.1 MODELING METHODOLOGY

Because of the similarity between other oil and gas development projects and the Little Snake RMP, the near-field air quality impact assessment from studies such as the Moxa Arch and Hiawatha projects are also relevant to the Little Snake RMP; therefore, only the far-field air quality (AQ) and air quality related values (AQRVs) are addressed in this analysis Protocol. The ambient air quality impact assessment will be performed to quantify maximum pollutant impacts in the project. Based on an agreement with EPA Region 8, the CALPUFF-lite modeling system (IWAQM, 1998; Earth Tech 2001b; 2002) will be used to assess impacts, using a single SAMSON meteorological database and discrete downwind receptors. The study will be performed using the following recent and major guidance sources:

- *Guideline on Air Quality Models, 40 Code of Federal Regulations (C.F.R.), Part 51, Appendix W*;
- *Phase 2 of the Interagency Workgroup on Air Quality Modeling* (IWAQM, 1998);
- *Guide for Applying the EPA Class I Screening Methodology with the CALPUFF Modeling System* (Earth Tech 2001b; 2002)
- *Federal Land Managers - Air Quality Related Values Workgroup (FLAG), Phase I Report*, December 2000 (FLAG 2000).

The CALPUFF-lite modeling approach is meant to be a conservative screening approach. The chief difference in the CALPUFF-lite and more refined CALMET/CALPUFF modeling approach is in the meteorological inputs. The refined CALPUFF modeling approach uses hourly three-dimensional meteorological fields to transport and disperse the CALPUFF puffs. CALPUFF-lite uses hourly meteorological data collected at a single monitoring site, like inputs used by the AERMOD and ISC steady-state Gaussian plume models. Since CALMET modeling is quite resource and computer intensive, the CALPUFF-lite approach greatly reduces the complexity and time needed to perform the analysis. Especially since the generation of the single site of hourly meteorological data is usually already available as part of the near-field Class II area analysis. In order to build in a level of conservatism in the CALPUFF-lite approach, instead of just obtaining AQ and AQRV impacts at receptors place along the boundaries and within a Class I area, impacts are obtained for numerous receptors located throughout the Class I area. Even with this assumption, because of the complexity of three-dimension wind fields, the CALPUFF-lite screening approach may not always be conservative compared to the refined CALMET/CALPUFF modeling approach.

CALPUFF output will be post-processed with POSTUTIL and CALPOST to derive concentrations for comparison to ambient standards, significance thresholds, and Class I and II Increments; deposition rates for comparison to sulfur (S) and nitrogen (N) deposition thresholds and to calculate acid neutralizing capacity (ANC) for sensitive water bodies; and light extinction for comparison to visibility impact thresholds in Class I and other sensitive areas. A discussion of the post-processing methodology to be used is provided in Section 3.3 of this Protocol.

3.2 MODEL INPUT

3.2.1 Model Domain and Settings

The modeling domain (Map 1.1) consists of 250 km by 170 km domain that includes the Little Snake RMPPA, Class I and other sensitive areas. In CALPUFF-lite a single layer is used in the vertical because the single hourly wind speed measured at the anemometer height will be scaled to “stack-top” as in ISC/AERMOD. The Guide to CALPUFF-lite recommends putting the top of layer 1 above the maximum expected mixing height and suggests values of 3,000 m to 5,000 m AGL (Earth Tech, 2001b; 2002). The Colorado Department of Health and Environment (CDPHE) performed an analysis to determine the maximum mixing heights in Colorado for their Best Available Retrofit (BART) CALPUFF modeling and concluded that a 3,000 m AGL maximum mixing height for Colorado was too low and ended up setting the mixing height maximum of 4,500 m AGL (CDPHE, 2005). Given these results, a layer 1 top (i.e., cell face 2) of 5,000 m AGL will be used in the RMP CALPUFF-lite modeling.

The CALPUFF-lite simulations will model the following species: SO_2, sulfate (SO_4), NOx, nitric acid (HNO_3), nitrate (NO_3), $PM_{2.5}$ and PM_{10}. Chemical transformation will be based on the MESOPUFF II chemistry for conversion of SO_2 to $SO_{4,}$ as well as NO_x to HNO_3 and NO_3. NO_x, HNO_3, and SO_2 will be modeled with gaseous deposition, and SO_4, NO_3, PM_{10}, and $PM_{2.5}$ will be modeled using particle deposition.

3.2.2 Emissions

Pollutant emission rates estimated as described in Section 2.0 will be input to CALPUFF to predict air quality impacts from the alternatives. In general, average well-related emissions will be distributed as area emissions throughout the appropriate oil and gas distribution zones, all assuming a single effective stack height. Central (pipeline or sales) compressor emissions will also be distributed as area emissions throughout the appropriate oil and gas distribution zones, but assuming a different effective stack height. As noted in Section 2.0, the Little Snake RMP emission sources will be located in five general zones, four zones representing the major oil and gas formations/existing fields in the RMPAA and another representing other potential zones. Emissions will be calculated based on assumed engine technology changes.

3.2.3 Receptors

Discrete receptors will located throughout the PSD Class I Eagles Nest, Mount Zirkel and Flat Tops wilderness areas, based on values provided by the USDA-Forest Service. Additional receptors will be placed along the boundary and at elevated points within the Dinosaur National Monument. Discrete receptors will also be located at sensitive lake locations identified by the USDA-Forest Service.

Prevention of Significant Deterioration (PSD) Class I and other sensitive areas located within the modeling domain and the approximate distance of each from the Little Snake RMPPA are shown in Map 1.1. Federal Class I areas to be evaluated are listed in Table 3-1.

Table 3-1. Distance and Direction to Class I Areas

Class I / Sensitive Areas	Distance from LSRMP	Direction from LSRMP
Eagles Nest Wilderness	30 km	Southeast
Flat Tops Wilderness	Adjacent	Southeast
Mount Zirkel Wilderness	Adjacent	East
Dinosaur National Monument	Adjacent	Southwest

In addition, discrete receptors will be placed at the following sensitive lakes identified as the most sensitive to acid deposition (Table 3-2.)

Table 3-2. Distance and Direction to Sensitive Lakes

Sensitive Lake Receptors	Distance from LSRMP Centerpoint (km)	Direction from LSRMP Centerpoint
Lake Elbert, Mount Zirkel Wilderness	90	Northeast
Long Lake Reservoir, Mount Zirkel Wilderness	90	Northeast
Seven Lakes, Mount Zirkel Wilderness	90	Northeast
Summit Lake, Mount Zirkel Wilderness	90	Northeast
Lower NWL Packtrail Pothole, Flat Tops Wilderness	55	Southeast
Ned Wilson Lake, Flat Tops Wilderness	55	Southeast
Ned Wilson Spring #1, Flat Tops Wilderness	55	Southeast
Trappers Lake, Flat Tops Wilderness	55	Southeast
Upper Ned Wilson Lake, Flat Tops Wilderness	55	Southeast
Upper NWL Packtrail Pothole, Flat Tops Wilderness	55	Southeast
Booth Lake, Eagles Nest Wilderness	150	Southeast
Upper Willow Lake, Eagles Nest Wilderness	150	Southeast

3.2.4 Background Data

3.2.4.1 Criteria Pollutants

Ambient air concentration data collected at monitoring sites in the region provide a measure of background conditions in existence during the most recent available time period (Table 3-3.) Regional monitoring-based background values for criteria pollutants (PM_{10}, $PM_{2.5}$, CO, NO_x, and SO_2) were collected at monitoring sites in northwestern Colorado and Wyoming. Ambient air background concentrations (as reported in Table 3-3 of the DEIS) will be added to modeled pollutant concentrations (expressed in micrograms per cubic meter [$\mu g/m^3$]) to arrive at total ambient air quality impacts for comparison to National Ambient Air Quality Standards (NAAQS) and Colorado Ambient Air Quality Standards (CAAQS), as discussed in Section 4.0.

Table 3-3. Analysis Background Ambient Air Quality Concentrations ($\mu g/m^3$)

Pollutant	Averaging Period	Measured Background Concentration
Carbon monoxide (CO)	1-hour 8-hour	2,299 1,148
Nitrogen dioxide (NO_2)	Annual	3.4
Ozone (O_3)	8-hour	68
PM_{10}	24-hour Annual	119 25
$PM_{2.5}$	24-hour Annual	20 8
Sulfur dioxide (SO_2)	3-hour 24-hour Annual	132 43 9

Source: LSRMP DEIS (BLM 2007)

3.2.4.2 Chemical Species

The Guide to CALPUFF-lite modeling recommends using monthly estimates of background ammonia and ozone concentrations for the conversion of SO_2 and NO/NO_2 to sulfates and nitrates, respectively. The CDPHE performed an analysis of background ammonia concentrations for their CALPUFF BART modeling, and recommended a value of 1.0 ppb for northwestern Colorado based on the Mount Zirkel Visibility Study so that will also be used in the CALPUFF-lite modeling of the Little Snake RMPAA. Note that the 1.0 ppb background ammonia value is also consistent with the IWAQM guidance (IWAQM, 1998). Similarly, monthly average ozone concentrations representative of daytime (7a.m.-7 p.m.) periods from the Mount Zirkel Visibility Study will be used.

3.2.4.3 Visibility

Potential visibility impacts will be estimated by comparing predicted atmospheric extinction (derived from modeled speciated aerosols and observed daily f(RH) values) to observed data collected by the IMPROVE visibility Program. The visibility methodology will use an established approach utilized by BLM on previous studies. Both the Seasonal FLAG Screening Analysis Spreadsheet Method (Archer, 2003) and the Daily FLAG Refined Analysis Spreadsheet Method (Archer, 2007) are used in a spreadsheet format.

The Seasonal FLAG Screening Analysis Spreadsheet was prepared based on the Federal Land Mangers' Air Quality Related Values Workgroup (FLAG) published method to evaluate potential visibility impacts at mandatory federal PSD Class I areas (FR 66:2, pp 382-383; Wednesday, January 3, 2001), as well as monthly f(RH) values subsequently provided by FLAG.

The Daily FLAG Refined Analysis Spreadsheet was prepared based on the Federal Land Mangers' Air Quality Related Values Workgroup (FLAG) published method to evaluate potential visibility impacts at mandatory federal PSD Class I areas (FR 66:2, pp 382-383; Wednesday, January 3, 2001), using available speciated aerosol measurements collected on the White River National Forest and representative hourly average relative humidity measurements.

3.2.4.4 Lake Chemistry

The most recent lake chemistry background ANC data have been obtained from the USDA-Forest Service for each sensitive lake listed in Table 3.2. The 10th percentile lowest ANC values were calculated for each lake, and potential impacts will be calculated following procedures provided by the USDA-Forest Service (2000).

3.2.5 Meteorology Data

The meteorological data to be used will be for Rock Springs, Wyoming (Rock Springs surface; Lander Hunt Field upper air) for the years 1985 and 1987-1990 as provided by EPA Region 8 personnel which was obtained from the CDPHE-APCD. The data were processed with the CPRAMMET program.

3.3 POST-PROCESSING

Post-processing of the CALPUFF-lite results will determine the maximum applicable predicted concentrations for comparisons to applicable PSD increments and ambient air quality standards. In addition, the maximum 24-hour speciated aerosol values will be predicted in each sensitive area, and annual concentrations will be calculated for atmospheric deposition and potential lake chemistry changes.

3.3.1 Concentration

CALPOST will be used to process the CALPUFF concentration output file to compute maximum concentration values for SO_2 (3-hour, 24-hour, and annual average), $PM_{2.5}$ (24-hour and annual average), PM_{10} (24-hour and annual average) and NO_2 (annual average).

3.3.2 Visibility

As discussed in Section 3.2.4.5, visibility impacts (measured as change in light extinction) will be calculated using the spreadsheet screening methods, which differ by the background data used to derive the percent change in visibility. This will require predictions of the maximum 24-hour speciated aerosols within the sensitive receptor areas. Changes in light extinction will be estimated for source emissions at receptor locations outlined in Section 3.2.3 of this Protocol.

3.3.3 Deposition

The POSTUTIL utility provided with the CALPUFF modeling system will be used to estimate total sulfur (S) and nitrogen (N) deposition fluxes from CALPUFF-predicted wet and dry fluxes of SO_2, SO_4, NO_x, NO_3, and HNO_3. CALPOST will be used to summarize the annual S and N deposition values from the POSTUTIL program using the appropriate conversion factors to convert to S and N deposition.

4.0 ASSESSMENT OF AIR QUALITY IMPACTS

Pollutant significance levels include applicable ambient air quality standards and PSD increments. However, comparison to increments is for informational purposes only and is not a regulatory PSD Increment Consumption Analysis, which would be completed as necessary during the Colorado APCD permitting process.

In addition, the NAAQS and ambient standards adopted by state regulatory agencies set absolute upper limits for specific air pollutant concentrations (expressed in $\mu g/m^3$) at all locations where the public has access. Modeled concentrations will be added to the existing ambient air quality background concentrations shown in Table 3-3, and the total concentrations will be compared to corresponding NAAQS and state ambient air quality standards (i.e., CAAQS) shown in Table 4-1. Ambient air quality standards, PSD Class II, and PSD Class I Increments are shown in Table 4-1.

Table 4-1. Ambient Standards, Class II PSD Increments, and Class I PSD Increments ($\mu g/m^3$)

Pollutant/Averaging Time	Ambient Air Quality Standards		PSD Class II Increment	PSD Class I Increment
	National	Colorado		
Carbon monoxide (CO)				
1-hour [1]	40,000	40,000	--	--
8-hour [1]	10,000	10,000	--	--
Nitrogen dioxide (NO_2)				
Annual [2]	100	100	25	2.5
Ozone (O_3)				
8-hour [3]	157	157	--	--
PM_{10}				
24-hour [1]	150	150	30	8
Annual	--	--	17	4
$PM_{2.5}$				
24-hour	35	--	--	--
Annual [2]	15	--	--	--
Sulfur dioxide (SO_2)				
3-hour [1]	1,300	700 [4]	512	25
24-hour [1]	365	100 [4]	91	5
Annual [2]	80	15 [4]	20	2

1 No more than one exceedance per year.
2 Annual arithmetic mean.
3 Average of annual fourth-highest daily maximum 8-hour average.
4 Category III Incremental standards (increase over established baseline).
Note: On September 21, 2006, EPA announced final revisions to the National Ambient Air Quality Standards for particulate matter. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 ug/m^3 and revokes the annual PM_{10} standard of 50 ug/m^3. EPA retained the existing annual $PM_{2.5}$ standard of 15 ug/m^3 and the 24-hour PM_{10} standard of 150 ug/m^3. The final rule has not yet been published in the Federal Register and is not effective until 60 days after publication in the Federal Register. After the final rule becomes effective, the State of Colorado will enter into rulemaking to revise the Colorado Ambient Air Quality Standards.

4.1 CLASS I AND CLASS II INCREMENTS

Under federal and state PSD regulations, increases in ambient air concentrations in Class I areas are limited by PSD Class I Increments. Specifically, emissions associated with a particular development may increase ambient concentrations above baseline levels only within those specific increments developed for SO_2, PM_{10}, and NO_2. PSD Class I and II Increments are shown in Table 4-1.

Modeled concentrations predicted in Federal PSD Class I areas for all alternatives will be compared to Class I Increments. These demonstrations are for informational purposes only and are not regulatory PSD Increment consumption analyses, which would be completed as necessary during Colorado APCD permitting processes.

4.2 VISIBILITY

The 1.0 deciview "just noticeable change" threshold value will be compared to results modeled at PSD Class I and sensitive Class II areas. A summary of the number of days greater than this threshold value will be provided in the EIS.

4.3 DEPOSITION

CALPUFF-lite will be used to predict the total wet and dry fluxes of SO_2, SO_4, NO_x, NO_3, and HNO_3 at the sensitive receptor areas. The modeled deposition flux of each oxide of S or N will then be adjusted for the difference of the molecular weight of their oxide and then summed to yield a total deposition flux of S or N. The total S deposition and N deposition from emissions will be calculated and presented in kilograms/hectare/year (kg/ha/yr). Estimated total deposition fluxes of S and N from source impacts at sensitive areas will be compared with threshold values for terrestrial ecosystems presented by the USDA-Forest Service in its screening procedure to evaluate effects of air pollution in wilderness areas (Fox et al. 1989). These threshold values are 5 and 3 kg/ha/yr for total S and N deposition fluxes, respectively.

4.4 ACID NEUTRALIZING CAPACITY

The CALPUFF-lite predicted annual deposition fluxes of S and N at sensitive lake receptors listed in Section 3.2.3 will be used to estimate the change in sensitive lake Acid Neutralizing Capacity (ANC.) The change in ANC will be calculated following the January 2000, USFS Rocky Mountain Region's *Screening Methodology for Calculating ANC Change to High Elevation Lakes, User's Guide* (USDA-Forest Service 2000). The predicted changes in ANC will be compared with the Level of Acceptable Change (LAC) thresholds of 10% for lakes with ANC values greater than 25 microequivalents per liter (μeq/l) and 1 μeq/l for lakes with background ANC values of 25 μeq/l and less.

5.0 REFERENCES

Archer, S.F. 2003. DRAFT Microsoft Excel © Seasonal FLAG Screening Analysis Spreadsheet. USDI - Bureau of Land Management, National Science and Technology Center. Denver, Colorado.

Archer, S.F. 2007. DRAFT Microsoft Excel © Mesa Verde Daily FLAG Refined Analysis Spreadsheet. USDI - Bureau of Land Management, National Science and Technology Center, Denver, Colorado.

Bureau of Land Management. 2005. Reasonable Foreseeable Development: Oil and Gas in the Little Snake Field Office Administrative Boundary.

______. 2007. Draft Environmental Impact Statement for the Little Snake Resource Management Plan. BLM\CO\PL-07\002.

Colorado Department of Health and the Environment. 2005. CALMET/CALPUFF BART Protocol for Class I federal Are Individual Source Attribution Visibility Impairment Modeling Analysis. Colorado Department of Health and the Environment, Air Pollution Control Division, Denver, Colorado. October 24.

Earth Tech. 2001a. The Southwest Wyoming Regional CALPUFF Air Quality Modeling Study Final Report. Earth Tech, Inc., Concord, Massachusetts. February 2001.

______. 2001b. Guide for Applying the EPA Class I Screening Methodology with the CALPUFF Modeling System. Earth Tech, Inc., Concord, Massachusetts. September. (http://www.src.com/calpuff/Screen_Guide.PDF).

______. 2002. Guide for Applying the EPA Class I Screening Methodology with the CALPUFF Modeling System. Earth Tech, Inc., Concord, Massachusetts. January.

Environmental Protection Agency. 1995. Compilation of Air Pollutant Emission Factors (AP-42), Vol. 1, Stationary Point and Area Sources, Fifth Edition. Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

Federal Land Managers' Air Quality Related Values Workgroup. 2000. Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report. U.S. Forest Service-Air Quality Program, National Park Service-Air Resources Division, U.S. Fish and Wildlife Service-Air Quality Branch. December 2000.

Fox, Douglas, Ann M. Bartuska, James G. Byrne, Ellis Cowling, Rich Fisher, Gene E. Likens, Steven E. Lindberg, Rick A. Linthurst, Jay Messer, and Dale S. Nichols. 1989. A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas. General Technical Report RM-168. U.S.D.A. Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 36 pp.

Gas Research Institute. 1999. GRI-HAPCalc® Version 3.01. Gas Research Institute. Des Plaines, Illinois.

Interagency Workgroup on Air Quality Modeling. 1998. Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts. EPA-454/R-98-019. Office of Quality Planning and Standards. U.S. EPA, Research Triangle Park, North Carolina. December 1998.

USDA-Forest Service. 2000. Screening Methodology for Calculating ANC Change to High Elevation Lakes, User's Guide. U.S. Department of Agriculture (USDA) Forest Service, Rocky Mountain Region. January 2000.

This page intentionally left blank.