PROPOSED CASPER
RESOURCE MANAGEMENT PLAN AND
FINAL ENVIRONMENTAL IMPACT STATEMENT

APPENDIX L

Air Quality Mitigation Matrix

Appendix L
Air Quality Mitigation Matrix

The following table outlines options for air quality mitigation in the planning area.

Table L-1. Potential Mitigation Measures for Air Quality Impacts Associated with the Proposed Casper Resource Management Plan

Type of Mitigation	Estimated Cost of Mitigation	Environmental Liabilities	Environmental Benefit	Potential Limitations
Nitrogen Oxide (NO_X) and Carbon Monoxide (CO) Mitigation Measures				
Utilize selective catalytic reduction (SCR) on drill rig engines and compressors.	Relatively expensive as compared to nonselective catalysts. Typical costs are $125/hp (EPA Cost Control Manual, January 2002) for compressors.	Requires the use and storage of ammonia, which presents health and safety issues. Results in increased ammonia emissions, which may contribute to the formation of ammonium sulfates and increased visibility degradation.	NO_X emission rate for compressors reduced to 0.1 g/hp-hr; reduced ammonium nitrate formation and resulting visibility impacts. Application to drill rig engines may result in substantial NO_x reduction.	Not applicable for 2-stroke engines.
Application of nonselective catalytic reduction on drill rig engines and compressors	$5,000 to $25,000 per unit	Regeneration/disposal costs for catalysts.	As a result of the BACT process, average NO_X emission rates for Wyoming compressor engines 100 hp or greater is 1.0 g/hp-hr; the application of nonselective catalysts may reduce the NO_X emission rate to 0.7 g/hp-hr for some types of engines. Application to drill rig engines may result in substantial NO_x reduction (although less reduction than with SCR).	Not applicable for lean-burn or 2-stroke engines.

Table L-1. Potential Mitigation Measures for Air Quality Impacts Associated with the Proposed Casper Resource Management Plan (Continued)

Type of Mitigation	Estimated Cost of Mitigation	Environmental Liabilities	Environmental Benefit	Potential Limitations
Nitrogen Oxide (NO_X) and Carbon Monoxide (CO) Mitigation Measures (Continued)				
Utilize compressors driven by electrical motors.	Capital costs equal 40% of gas turbine costs; operating cost dependent on the location of high voltage powerlines.	Displaced air emissions from compressor units to electric generating stations (EGS).	May displace air emissions away from sensitive Class I areas; moderate emission reduction near compressor station. Also, typically emissions at an EGS are more heavily controlled than at individual compressor stations, so the displaced emissions are also lower than if emitted by a compressor station.	Requires high voltage power lines.
Increased diameter of sales pipelines	With larger diameter of sales pipelines, capital costs increase while operating costs decrease.	Slightly more surface disturbance.	Lower pipeline pressures, resulting in lower compression hp requirements.	None
Centralization of dehydrator units	Variable		Minor reduction in emissions.	Requires infrastructure to be feasible.
Reduce number of vehicle miles driven and unnecessary idling.	Minor		Minor to moderate emissions reduction.	
Utilize wind-generated electricity to power compressors.	Capital costs are very large.	Visual impacts from generation equipment; increased mortality of birds, including raptors.	Reduced use of fossil fuels and associated emissions.	Location of wind-generation facilities is critical; requires consistent strong winds for economic operation and high voltage transmission lines between generation facility and compressor stations.

Table L-1. Potential Mitigation Measures for Air Quality Impacts Associated with the Proposed Casper Resource Management Plan (Continued)

Type of Mitigation	Estimated Cost of Mitigation	Environmental Liabilities	Environmental Benefit	Potential Limitations
Nitrogen Oxide (NO_X) and Carbon Monoxide (CO) Mitigation Measures (Continued)				
Increased emissions monitoring	Minor to moderate	None	Allows better planning of when, and especially where to allow future emissions to occur and when/where to provide for additional emissions mitigation. The Wyoming DEQ AQD currently has an emission tracking agreement with the BLM. The *Amended Letter of Agreement for Tracking Nitrogen Oxide Emissions* dated April 2000 calls for annual reports tracking changes in NO_X emission beginning January 1, 1996.	The monitoring of emission sources provides improved information for estimating impacts, but does not necessarily reduce the magnitude of the impacts.
Increased ambient pollutant monitoring	Moderate	None	Will measure impacts from pollutant sources of concern if correctly located.	
Reduced rate of development	Short-term loss of state and federal royalties.	Emissions generated at a lower rate for a longer period.	Peak emissions and associated impacts reduced.	Economic limitations - A minimum production rate is required to cost-effectively develop the resource while maintaining the processing and transportation infrastructure.

Table L-1. Potential Mitigation Measures for Air Quality Impacts Associated with the Proposed Casper Resource Management Plan (Continued)

Type of Mitigation	Estimated Cost of Mitigation	Environmental Liabilities	Environmental Benefit	Potential Limitations
Particulate Matter (PM) Mitigation Measures				
Increase water application rate to achieve greater than 50% fugitive dust control.	Varies with the source of the water and the trucking distance.	None	Can achieve fugitive dust control rates up to 95%	Diminishing returns per gallon of water applied; water must be applied at much greater rates to achieve control efficiencies greater than 75%
Unpaved road dust suppressant treatments	$2,400 to $50,000 per mile	Treatment chemicals have the potential to negatively impact water quality.	Estimated 20% to 100% reduction in fugitive dust emissions.	None
Administrative control of speed limits	Relatively low costs for installing signs and enforcement.	None	Slower speeds may provide 20% to 50% reduction in dust emissions.	State or county may retain authority for determining speed limits on primary roads.
Installation of remote telemetry	Approximately $13,000 per well	None	Reduction in vehicle miles traveled and associated vehicle emissions during production operations; no benefit for construction operations, which generate the greatest amount of PM.	Effective only for the production phase of the operations; would have no impact on construction activities that generate the greatest amount of PM.
Gravel roads	Approximately $9,000 per mile	None	Estimated 30% reduction in fugitive road dust (NOTE: use of additional low-impact road design specifications [e.g., 95% base compaction prior to placement of gravel; use of non-chlorine based dust abatement chemicals] can provide greater reduction).	None
Paved roads	Approximately $11,000 to $60,000 per mile	None	Estimated 90% reduction in fugitive road dust.	None

Table L-1. Potential Mitigation Measures for Air Quality Impacts Associated with the Proposed Casper Resource Management Plan (Continued)

Type of Mitigation	Estimated Cost of Mitigation	Environmental Liabilities	Environmental Benefit	Potential Limitations
Volatile Organic Compounds (VOCs) and Hazardous Air Pollutants (HAPs) Mitigation Measures				
Flareless ("green") completion	Substantial cost for equipment and infrastructure (condensate pipeline), with the payoff in about one year at $3/Mcf.		Minor reduction in emissions; substantial reduction in noise and night-time disturbance.	Requires infrastructure to be feasible.
Condensate tank vents, carbon canisters or other VOC capture to the vent discharge	Minor costs		Minor emission reduction	

AQD	Air Quality Division	HAP	hazardous air pollutants
BACT	best available control technology	hp	horsepower
CO	carbon monoxide	hr	hour
DEQ	Department of Environmental Quality	NO_x	nitrogen oxides
EGS	electric generating systems	PM	particulate matter
EPA	U.S. Environmental Protection Agency	SCR	sensitive catalytic reduction
g	gram	VOC	volatile organic compound

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