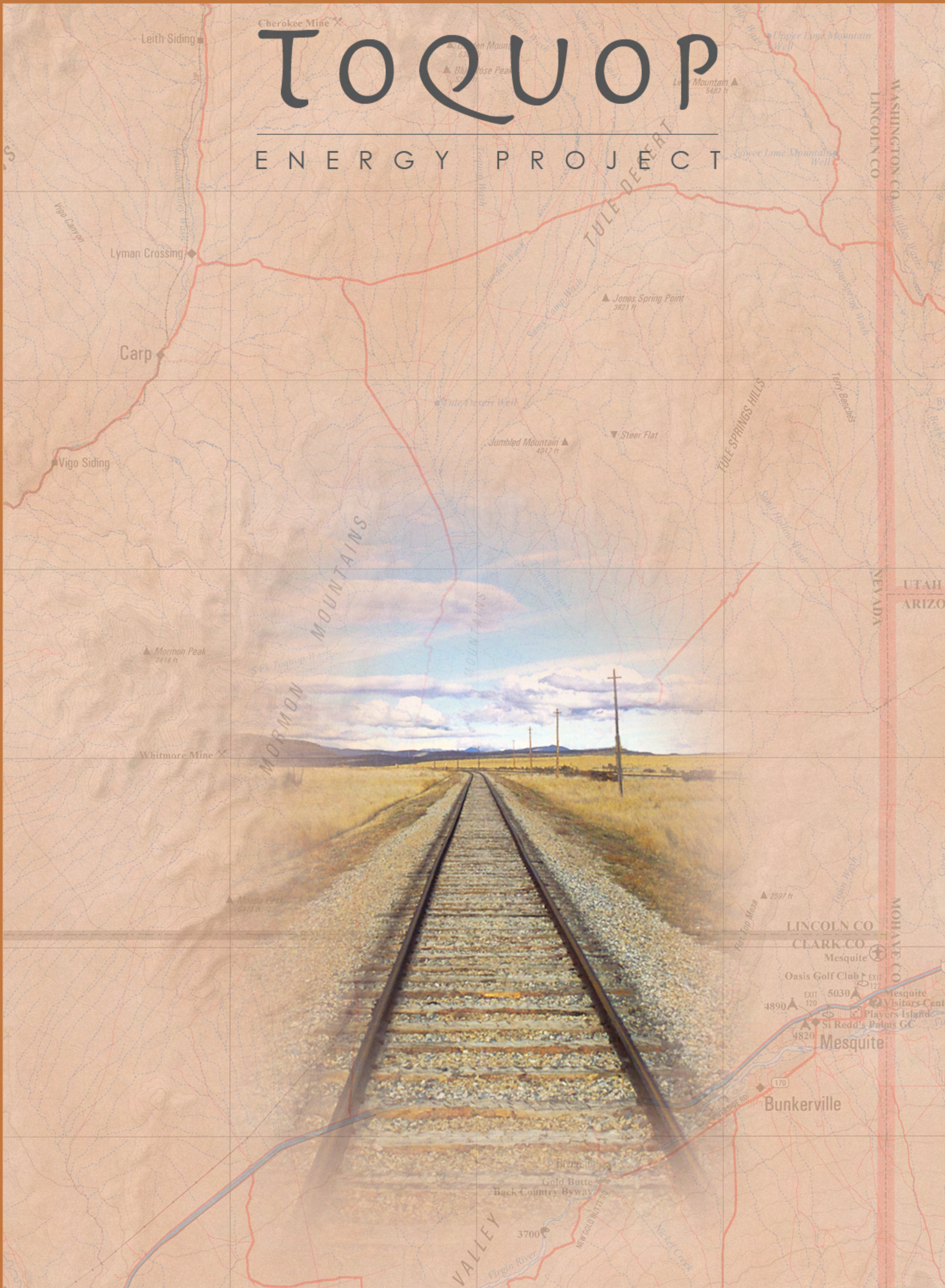
TOQUOP

ENERGY PROJECT



APPENDIX D - AIR QUALITY

APPENDIX D
AIR QUALITY

1.0 INTRODUCTION

This technical support document provides detailed information regarding the air quality impacts of the No-Action Alternative and the Proposed Action Alternative of the Toquop Energy Project.

2.0 METHODS

This section presents a discussion of the potential impacts associated with the No-Action Alternative and the Proposed Action Alternative and their potential effects on air quality in the project area. In most instances, impacts are categorized and described in general terms without reference to facility type or any site-specific resources.

Estimated emissions of criteria and hazardous air pollutants (HAPs) from the proposed power plant under the Proposed Action Alternative were extracted from the air quality permit application prepared by ENSR Corporation (ENSR) for Toquop Energy Company, LLC (Toquop Energy), which was submitted to the Nevada Division of Environmental Protection (NDEP), pursuant to the Federal Prevention of Significant Deterioration (PSD) program. In addition, ENSR performed dispersion modeling to evaluate air-quality impacts of the plant emissions on local and regional air quality.

For purposes of the air-quality impact analysis, the following qualitative terms were used to describe the potential impact levels in terms of their relationship to established standards for air quality:

- **Major**. Ambient air quality would be permanently degraded as a direct result of the Proposed Action Alternative, to the extent that redesignation of the project area by the U.S. Environmental Protection Agency (EPA), with respect to one or more of the National Ambient Air Quality Standards (NAAQS) pollutants, from “attainment” or “unclassified” to “non-attainment” would be possible; an air-quality degradation increment, applicable to attainment and unclassified areas under the Federal PSD program regulations, would be consistently exceeded; regional haze would be consistently worsened by 5 percent visibility extinction or more; or cumulative regional emissions would increase, causing one or more of the results above.
- **Moderate**. Discernible degradation of regional air quality that does not consistently exceed applicable NAAQS, PSD increments, or Federal/state visibility protection standards.
- **Minor**. Insignificant degradation of regional or local ambient air quality at levels less than 20 percent of applicable standards; temporary or transient emissions occurring within a defined time period.
- **Negligible**. Indiscernible or unmeasurable degradation of regional or local ambient air quality or visibility.
- **None**. No air pollutant emissions occur.

3.0 NO-ACTION ALTERNATIVE

3.1 Impacts

3.1.1 Construction

Direct effects on air quality would occur from construction activities at the proposed power plant site, along the access road, along the water pipeline, and in the well field. During construction, temporary and localized increases in ambient concentrations of nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter of less than 10 microns (PM_{10}), particulate matter with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$), and volatile organic compounds (VOCs) would result from exhaust emissions of vehicles, heavy construction equipment, diesel generators, and other machinery and tools. In addition, fugitive-dust emissions would result from vehicular travel on unpaved ground and from excavation and earthmoving activity. Areas surrounding the proposed power plant site, access road, and water pipeline would experience temporary disturbance associated with equipment access, materials, stockpile locations, and workspace requirements. In addition, earthmoving activities would increase the potential exposure of soils to accelerated erosion by wind and water.

A conservative emissions estimate was developed using the emission factor for generalized construction activities from the California Air Resources Board (CARB). Controlled emissions based on this factor are 0.11 ton per active acre per month of PM_{10} based on eight hours per day of construction activity (Countess Environmental 2006). This factor was increased to nine hours per day of construction activity, and a maximum of 35 percent of the proposed plant area (approximately 35 acres) was assumed to be disturbed in a given day. Additionally, it was estimated that access road construction would take place in 1.5-mile (2.4-kilometer [km]) sections before being paved, only one water well would be completed at a time, and excavation and soil disturbance for the water pipeline would occur in 2-mile (3.2-km) sections. Implementation of the No-Action Alternative would result in the direct disturbance of approximately 449 acres (Bureau of Land Management [BLM] 2003a).

Gaseous exhaust emissions were estimated using emission factors obtained from CARB Emission Inventory for Off-Road Large Compression-Ignited Engines. The operation of vehicles, heavy equipment, and other fuel-burning devices also results in emissions of particulate matter and gaseous pollutants, including NO_x, SO_2, and CO. Table D-1 summarizes the total mobile emissions of CO, NO_x, SO_2, PM_{10} that would be generated during the construction phase.

Table D-1
Emissions During the Construction Phase for the No-Action Alternative

	Carbon Monoxide (CO)	Nitrogen Oxides (NO_x)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10})
	tons	tons	tons	tons
Power plant	16.7	73.0	10.6	303.5
Access road	3.5	19.0	3.2	61.3
Water pipeline	0.9	4.3	0.7	33.1
Wells	3.6	19.3	3.3	1.3
Total	24.7	115.7	17.8	399.3

SOURCE: Bureau of Land Management 2003a

The potential impacts resulting from construction activities under the No-Action Alternative would occur over a limited geographic area and for a limited time, as fugitive dust tends to settle within a few kilometers and as the locations of active work areas would be transient, with work activities typically moving to a new location every few days. Finally, the fugitive-dust emissions would be temporary, ceasing once the four-year construction schedule is completed. A Class II area impact analysis was completed that demonstrated Federal and state ambient air-quality standards would not be exceeded at any time during the construction phase. All of the predicted construction impacts are less than the allowable ambient air-quality standards. The estimate of reasonable foreseeable, but conservative, impacts for construction of the proposed power plant, access road, water pipeline, and well site under the No-Action Alternative are provided in Tables D-2 through D-5.

Table D-2
Estimated Emissions during Construction of the Power Plant under the No-Action Alternative

Pollutant	Maximum 1-Hour Predicted Impacts (μg/m^3)	Averaging Period	Scaling Factor	Maximum Predicted Impacts (μg/m^3)[1]	NAAQS (μg/m^3)
Nitrogen dioxide (NO_2)	274.9	Annual	0.1	27.5	100
Carbon dioxide (CO_2)	51.8	8-hour	0.7	36.2	10,000
		1-hour	1.0	51.8	40,000
Sulfur dioxide (SO_2)	41.3	Annual	0.1	4.1	80
		24-hour	0.4	16.5	365
		3-hour	0.9	37.2	1,300
Particulate matter (PM_{10}) [2]	320.3	Annual	0.1	41.0	Revoked [3]
		24-hour	0.4	138.3	150

SOURCE: Bureau of Land Management 2003a
NOTES: [1] The impacts do not include background concentrations for the pollutants other than PM_{10}.
[2] Maximum predicted PM_{10} impacts include background of 9 μg/m^3 (annual average) and 10.2 μg/m^3 (24-hour average).
[3] Due to lack of evidence linking health problems to long-term exposure to PM_{10}, the U.S. Environmental Protection Agency has revoked the annual PM_{10} standard effective December 17, 2006.
μg/m^3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards

Table D-3
Estimated Emissions during Construction of the Access Road under the No-Action Alternative

Pollutant	Maximum 1-Hour Predicted Impacts (μg/m^3)	Averaging Period	Scaling Factor	Maximum Predicted Impacts (μg/m^3) [1]	NAAQS (μg/m^3)
Nitrogen dioxide (NO_2)	144.3	Annual	0.1	14.4	100
Carbon monoxide (CO_2)	102.4	8-hour	0.7	71.7	10,000
		1-hour	1.0	102.4	40,000
Sulfur dioxide (SO_2)	94.1	Annual	0.1	9.4	80
		24-hour	0.4	37.6	365
		3-hour	0.9	84.7	1,300
Particulate matter (PM_{10}) [2]	122.3	Annual	0.1	21.2	Revoked [3]
		24-hour	0.4	59.1	150

SOURCE: Bureau of Land Management 2003a
NOTES: [1] The impacts do not include background concentrations for the pollutants other than PM_{10}.
[2] Maximum predicted PM_{10} impacts include background of 9 μg/m^3 (annual average) and 10.2 μg/m^3 (24-hour average).
[3] Due to lack of evidence linking health problems to long-term exposure to PM_{10}, the U.S. Environmental Protection Agency has revoked the annual PM_{10} standard effective December 17, 2006.
μg/m^3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards

Table D-4
Estimated Emissions during Construction of the Water Pipeline under the No-Action Alternative

Pollutant	Maximum 1-Hour Predicted Impacts ($\mu g/m^3$)	Averaging Period	Scaling Factor	Maximum Predicted Impacts ($\mu g/m^3$) [1]	NAAQS ($\mu g/m^3$)
Nitrogen dioxide (NO_2)	67.5	Annual	0.1	6.8	100
Carbon dioxide (CO_2)	55.9	8-hour	0.7	39.1	10,000
		1-hour	1.0	55.9	40,000
Sulfur dioxide (SO_2)	46.3	Annual	0.1	4.6	80
		24-hour	0.4	18.5	365
		3-hour	0.9	41.7	1,300
Particulate matter (PM_{10}) [2]	255.1	Annual	0.1	34.5	Revoked [3]
		24-hour	0.4	112.2	150

SOURCE: Bureau of Land Management 2003a

NOTES:
[1] The impacts do not include background concentrations for the pollutants other than PM_{10}.
[2] Maximum predicted PM_{10} impacts include background of 9 $\mu g/m^3$ (annual average) and 10.2 $\mu g/m^3$ (24-hour average).
[3] Due to lack of evidence linking health problems to long-term exposure to PM_{10}, the U.S. Environmental Protection Agency has revoked the annual PM_{10} standard effective December 17, 2006.

$\mu g/m^3$ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards

Table D-5
Estimated Emissions during Construction of the Well Site under the No-Action Alternative

Pollutant	Maximum 1-Hour Predicted Impacts ($\mu g/m^3$)	Averaging Period	Scaling Factor	Maximum Predicted Impacts (µg/m3)[1]	NAAQS ($\mu g/m^3$)
Nitrogen dioxide (NO_2)	207.8	Annual	0.1	20.8	100
Carbon dioxide (CO_2)	231.7	8-hour	0.7	162.2	10,000
		1-hour	1.0	231.7	40,000
Sulfur dioxide (SO_2)	214.1	Annual	0.1	21.4	80
		24-hour	0.4	85.6	365
		3-hour	0.9	192.7	1,300
Particulate matter (PM_{10}) [2]	146.6	Annual	0.1	23.7	Revoked [3]
		24-hour	0.4	68.8	150

SOURCE: Bureau of Land Management 2003a

NOTES:
[1] The impacts do not include background concentrations for the pollutants other than PM_{10}.
[2] Maximum predicted PM_{10} impacts include background of 9 $\mu g/m^3$ (annual average) and 10.2 $\mu g/m^3$ (24-hour average).
[3] Due to lack of evidence linking health problems to long-term exposure to PM_{10}, the U.S. Environmental Protection Agency has revoked the annual PM_{10} standard effective December 17, 2006.

$\mu g/m^3$ = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards

3.1.1.1 Plant Operations

Operation of the 1,100-megawatt (MW) power plant would result in direct and indirect impacts on air quality within the project area. Air-pollutant emissions would result from the operation of the following natural-gas-fired equipment associated with the proposed power plant: four combustion turbines, eight duct burners, four fuel preheaters, and two auxiliary boilers. There also would be emissions from the two cooling towers, two diesel-fired emergency generators, and one diesel-fired emergency fire pump. The natural-gas- and diesel-fired equipment would cause air emissions of NO_x, CO, SO_2, PM_{10}, and VOCs. Minor quantities of HAPs, such as formaldehyde and benzene, also would be emitted from the combustion equipment. The cooling towers would cause emissions of PM_{10}. Table D-6 presents the potential criteria air pollutant emissions for the No-Action Alternative.

Table D-6
Summary of Maximum Annual Criteria Pollutant Emissions Summary
Under the No-Action Alternative

Source	NO_X (ton/year)	CO	SO_2	VOC	PM_{10}
Single-combustion turbine generator with duct burners	84.05	236.52	50.11	18.47	105.12
Fuel preheater (per unit)	1.10	2.01	0.13	1.05	0.44
Auxiliary boiler (per unit)	2.8	5.84	0.48	0.326	0.40
Cooling tower (per cell)	–	–	–	–	0.73
Emergency fire-water pump engine	0.98	0.04	0.01	0.03	0.01
Totals [2]	355.91	967.48	202.23	79.04	434.97

SOURCE: Bureau of Land Management 2003a

NOTES: [1] Includes emissions from four single-combustion turbine generators and insignificant activities.

Air quality impacts resulting from plant operations under the No-Action Alternative would be the least of all alternatives considered for SO_2, PM_{10}, CO, and lead (Pb). However, nitrogen dioxide (NO_2) emissions would be higher than for the proposed coal-fired plant.

NO_x = nitrogen oxides
CO = carbon monoxide
SO_2 = sulfur dioxide
VOC = volatile organic compounds
PM_{10} = particulate matter equal to or less than 10 microns in diameter

This facility would use a selective catalytic reduction (SCR) system to control NO_x emissions from the combustion turbines and duct burners. The SCR system would be designed to control the combustion turbine generator/duct burner NO_x to 2.5 parts per million by volume, on a dry basis, or ppmvd, corrected to 15 percent oxygen (ppmvd at 15 percent ozone [O_3]). NO_x values would be corrected to 15 percent oxygen to standardize the NO_x value for variations in exhaust oxygen levels[1]. The catalyst would be replaced when ammonia (NH_3) slip reaches 10 ppmvd. Modern engineering and computer controls would be used to minimize the emissions of other pollutants from the combustion turbine generators and other combustion sources. The cooling towers would utilize highly efficient drift eliminators to minimize PM_{10} emissions. (These drift eliminators minimize the “drift loss” of aerosols by removing droplets entrained in the cooling tower exhaust stream.)

[1] Note that the nitrogen oxide ($NO_{x)}$) value of 2.5 ppmvd at 15 percent oxygen ($O_{2)}$) was obtained from the Bureau of Land Management Final Environmental Impact Statement. However, the Environmental Protection Agency Reasonably Available Control Technology/Best Available Control Technical/Lower Achievable Emission Rate Clearinghouse lists numerous permits for natural-gas-fired combined-cycle combustion turbines greater than 25 megawatts with primary NO_x emission limits of 2.0 ppmvd at 15 percent O_2. Therefore, if the No-Action Alternative is constructed, the current Best Available Control Technical level of 2.0 parts per million by volume will likely be imposed during repermitting.

Manufacturer estimates, EPA AP-42 documents, and engineering experience from other plants were used to estimate criteria air pollutants from the facility. Maximum emissions of HAPs were estimated based on source test data compiled in the CARB California Air Toxic Emission Factor (CATEF) database.

3.1.1.2 Class II Impacts

Dispersion modeling was performed to predict the maximum NO_x, CO, PM_{10}, and SO_2 concentrations as a result of air emissions under the No-Action Alternative. No EPA-approved models exist for prediction of O_3 impacts from a single facility. Table D-7 presents the predicted impacts from the No-Action Alternative and compares them to the Class II increment and NAAQS. The Class II increment is the maximum allowable ambient air-quality deterioration allowed under the PSD program for a Class II area, while the NAAQS are the pollutant concentrations below which no adverse human health or environmental impacts are presumed to occur. None of the maximum predicted impacts exceeded the PSD increments or the NAAQS.

Table D-7
Estimated Air Quality Impacts during Plant Operations and Comparison to PSD Increment and NAAQS

Pollutant	Averaging Period	Maximum Predicted Impacts (µg/m^3) [1]	Ambient Impact Standards	
			PSD Increment (µg/m^3)	NAAQS (µg/m^3)
Nitrogen dioxide (NO_2)	Annual	12.6	25	100
Carbon dioxide (CO_2)	8-hour	51.7	NA	10,000
	1-hour	406.6	NA	40,000
Sulfur dioxide (SO_2)	Annual	0.9	20	80
	24-hour	4.5	91	365
	3-hour	21.8	512	1,300
Particulate matter (PM_{10}) [2]	Annual	2.1	17	Revoked [3]
	24-hour	9.4	30	150

SOURCE: Bureau of Land Management 2003a

NOTES: [1] Other than PM_{10}, these impacts do not include background concentrations.

[2] Maximum predicted PM_{10} impacts include background of 9-µg/m^3 (annual average) and 10.2 µg/m^3 (24-hour average).

[3] Due to lack of evidence linking health problems to long-term exposure to PM_{10}, the U.S. Environmental Protection Agency has revoked the annual PM_{10} standard effective December 17, 2006.

µg/m^3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
PSD = prevention of significant deterioration

Ambient impacts of HAPs were estimated using Industrial Source Complex Short Term 3 (ISCST3) and Complex Terrain Screening (CTSCREEN) modeling results. Table D-8 presents reasonable foreseeable, but conservative, results of 8-hour, 24-hour, and annual average HAP concentrations (BLM 2003a). None of the estimated HAP concentrations exceed the available standards, based on the appropriate exposure time. Therefore, even if residents were located close to the site, it would be very unlikely that the estimated HAP concentrations would result in an unacceptable risk. This rationale holds true for employees working at the facility. At this time, no residents or businesses are located near the power plant site.

Table D-8
Hazardous Air Pollutant Impact Analysis

Hazardous Air Pollutant (HAP)	8-Hour Average Concentration (μg/m^3)	24-hour Average Concentration (μg/m^3)	Annual Average Concentration (μg/m^3)	Nevada AACS (8-hour)[1] (μg/m^3)	8-hour Average Concentration Greater than Nevada AACS?	ATSDR MLR (acute, 1 to 14 days) [2,4] (μg/m^3)	24-hour Average Concentration Greater than ATSDR MRL	Region 9 Ambient Air PRG (chronic)[3] (μg/m^3)	24-hour Average Concentration Greater than EPA Region 9 PRG?
Formaldehyde	4.9E-01	2.8E-01	7.0E-02	7.1E+01	No	3.3E+01	No	1.5E-01	No
1.3-Butadiene	2.7E-02	1.5E-02	3.9E.03	5.2E+04	No	NA[5]	—	3.7E-03	No
Acetaldehyde	5.2E-01	3.0E-01	7.5E-02	NA[5]	—	NA[5]	—	8.7E-01	No
Acrolein	4.4E-02	2.5E-02	6.3-03	6.9E+00	No	4.1E-02	No	2.1E-02	No
Ethylbenzene	6.3E-02	3.6E-02	9.0E-03	1.0E+04	No	8.1E+02	No	1.1E+03	No
Hexane	5.2E-01	2.9E-01	7.4E-02	4.3E+03	No	NA[5]	—	2.1E+02	No
Naphthalene	1.4E-02	8.0E-03	2.0E-03	1.2E+03	No	NA[5]	—	3.1E+00	No
Propylene oxide	1.1E-01	6.1E-02	1.5E-02	NA[5]	—	NA[5]	—	5.2E-01	No
Toluene	2.9E-01	1.6E-01	4.1E-02	8.9E+03	No	8.1E+02	No	4.0E+02	No
Xylene (m,p)[6]	1.2E-01	6.9E-02	1.7E-02	NA[5]	—	NA[5]	—	NA[5]	—
Xylene (o)[6]	1.1E-01	6.2E-02	1.5E-02	NA[5]	—	NA[5]	—	NA[5]	—
Xylene (total)	2.2E-01	1.2E-01	3.1E-02	1.0E+04	No	8.1E+02	No	7.3E+02	No

SOURCES: [1] Agency for Toxic Substances and Disease Registry Toxicological Profile Information Sheets
[2] Agency for Toxic Substances and Disease Registry Minimal Risk Levels for Hazardous Substances

NOTES: U.S. Environmental Protection Agency Region 9 Ambient Air Preliminary Remediations Goals.
Agency for Toxic Substances and Disease Registry Minimal Risk Levels for ethylbenzene is based on sub-chronic (2 weeks to 1 year) exposure term.
[3] NA = value is not available for this HAP.
The ortho (o-) meta (m-), and para (p-) isomers specify where the two methyl groups are attached to the carbon atoms of the benzene ring.
[3] = micrograms per cubic meter
ATSDR = Agency for Toxic Substances and Disease Registry
[4] EPA = U.S. Environmental Protection Agency
[5] MRL = Minimal Risk Levels
μg/m [6] PRG = preliminary remediation goal

3.1.1.3 Class I Impacts

The California Puff Model (CALPUFF) screening model was used to predict impacts at Grand Canyon National Park using National Weather Service meteorological data from Las Vegas. Table D-9 lists the maximum predicted impact at the Grand Canyon National Park and the PSD Class I significance levels. All predicted impacts were well below the PSD Class I significance levels; therefore, the No-Action Alternative is presumed to have an insignificant impact on the air quality in the area. The CALPUFF model predicted that the impact on regional haze within the Grand Canyon National Park would be a 3.5 percent change in atmospheric light extinction. A facility predicted to cause a change of 5 percent or less is considered to have an insignificant impact on visibility.

The CALPUFF model was also used to predict acidic deposition in the Grand Canyon National Park for the No-Action Alternative. The modeling results indicate that the added nitrogen compounds and sulfur deposition would not exceed 1.3×10^{-3} kilograms per hectare per year (kg/ha/yr), individually. These values are significantly lower than the deposition analysis thresholds (DAT) for nitrogen compounds and sulfur, which are both set at 5.0×10^{-3} kg/ha/yr.

Table D-9
Maximum Predicted Air Quality Impacts at Grand Canyon National Park

Pollutant	Averaging Period	Maximum Predicted Impacts (μg/m^3)	Class I Significance Level (μg/m^3)
Nitrogen dioxide (NO_2)	Annual	0.0098	0.1
Sulfur dioxide (SO_2)	Annual	0.009	0.1
	24-hour	0.078	0.2
	3-hour	0.03	1.0
Particulate matter (PM_{10})	Annual	0.02	0.2
	24-hour	0.17	0.3

SOURCE: Bureau of Land Management 2003a
NOTE: This table does not include any background concentrations.
μg/m^3 = micrograms per cubic meter

3.1.2 Mitigation

The following fugitive-dust mitigation measures were paraphrased from Appendix B of the 2003 Environmental Impact Statement (EIS) (BLM 2003a) and will be carried forward through all of the alternatives:

1. Contractors will be required to comply with all applicable Federal, state, and local laws and regulations concerning prevention and control of noise and air pollution. Contractors are expected to use reasonably available methods and devices to control, prevent, and reduce atmospheric emissions or discharges of atmospheric contaminants and noise.
2. Contractors will obtain applicable air-quality permits before starting construction or operating equipment that will result in regulated atmospheric emissions. The approvals require Best Available Control Technology (BACT) for regulated emissions vented through stacks and vents and sources of fugitive dust emissions. Methods such as wetting exposed soil or roads with water or chemical dust suppressants where dust is generated by passing vehicles will be employed.

3. Contractors will be required to reduce dust from construction operations and prevent it from causing a nuisance to people. To accomplish this, the following measures will be implemented:

   - For the duration of construction activities, actively disturbed areas will be stabilized through the use of wet suppression, as required, to meet ambient air quality standards. Surfactants may be used to aid in wet suppression, thereby reducing the volume of water required to effectively treat the site. Disturbed areas of the site, including storage piles not being actively used for a period of one week or longer, will be stabilized, as appropriate, to minimize dust emissions. Active stabilization may not be required if soil moisture or natural crusting is sufficient to limit ambient impacts. Water (where applied outside the fenced area) would be applied evenly to avoid pooling.
   - Bulk material stored on site that is a possible fugitive-dust source will be actively wetted, as needed, to minimize ambient impacts. It is anticipated that the majority of the material will be used on site upon arrival. Should bulk materials require onsite storage for an extended period of time, the application of active wet suppression or the installation of a porous wind fence will be used, as necessary, to minimize fugitive-dust generation.
   - Many of the unpaved surfaces, such as onsite access roads, will be covered with gravel and watered, as necessary, to minimize dust generation.
   - Onsite fugitive-dust emissions will be limited by reducing vehicle speeds and a combination of active and passive dust suppression measures. Additional mitigation practices will include the following:
     - Onsite access roads, parking lots, and lay-down areas will be maintained with a gravel cover to the maximum extent practical.
     - Traffic off maintained onsite access roads will be restricted and a posted speed limit of 15 miles per hour (mph) will be enforced to minimize emissions from unpaved road segments.
     - Unpaved road segments will be watered, as necessary.
     - Gaseous emissions from mobile sources will be minimized by proper maintenance and tune-up of equipment.

4.0 PROPOSED ACTION ALTERNATIVE

This section addresses the predicted or anticipated impacts on local and regional air quality attributable to the Proposed Action Alternative, including the following sources:

- Air pollution emissions from construction activities including fugitive dust from earthmoving activities (plant and rail line construction) and tailpipe emissions from construction vehicles and equipment.
- Particulate emissions from materials handling (including coal, ash, gypsum, lime, powdered activated carbon, and coal combustion products [CCP]) and vehicle traffic on roads during operations.
- Emissions of criteria air pollutants from the power plant operations, which include the combustion of coal, the operation of air-pollution-control equipment, and the combustion of fuel oil in the auxiliary boilers, fire-water pump engine, emergency generator, onsite locomotive engines, and fuel and oil storage tanks.

4.1 Sources of Air Pollutant Emissions from Construction Activity

URS Corporation (URS) estimated criteria pollutant emissions associated with construction activity, including fugitive dust due to earthmoving activity, vehicular traffic on roads, and particulate and gaseous pollutant emissions from gasoline- and diesel-fueled vehicles and equipment. Further technical details on how criteria and HAP emissions were estimated for the various elements of the project and how ambient air quality pollutant concentrations and deposition rates were developed are provided below. Tables showing the calculated emission rates, predicted ambient concentrations, visibility impacts, and predicted deposition rates are also provided.

4.1.1 Fugitive Dust from Earthmoving Activity

Earthmoving activity associated with construction projects typically cause emissions of particulate matter in the form of fugitive dust. For this EIS, the estimation of a PM_{10} emission rate considers the actual level of activity at the site and the effect of controls. For general construction activity in desert soils (plant site and rail line), a generally accepted estimate of controlled PM_{10} emissions is 0.11 tons/acre-month of total particulate matter (Countess Environmental 2006). These emission and control factors were used to estimate the PM_{10} emissions resulting from construction activity.

4.1.1.1 Vehicle and Equipment Exhaust Emissions

During construction, gasoline- and diesel-fueled vehicles and equipment generate gaseous and particulate exhaust emissions. Table D-10 includes a roster of typical equipment to be used during construction of the proposed project. This table also presents the emission factors for VOC, CO, NO_x, PM_{10}, and SO_2 used to calculate air pollution emission rates for this equipment. Emission factors for vehicles were obtained from EPA document AP-42, “Volume II, Emission Factors for Mobile Sources” (EPA 1995).

Table D-10
Construction Vehicle and Equipment Tailpipe Emission Factors (g/hp-hr)[1,2]

Equipment	SCC	Power (hp)	HC EF	CO EF	NO_x EF	PM_{10} EF[3]	SO_2 EF[4]
2-ton trucks	2270002051	250	0.33	1.20	5.36	0.30	0.005
5-15 ton trucks	2270002051	400	0.22	2.10	5.78	0.22	0.005
Sideboom (other)	2270002081	500	0.22	2.10	5.78	0.22	0.005
Dozer (rubber tire)	2270002063	850	0.31	1.23	5.92	0.21	0.005
Large shovel	2270002063	850	0.31	1.23	5.92	0.21	0.005
Grader	2270002048	600	0.22	2.10	5.78	0.30	0.005
Tractor / backhoe / loader	2270002066	100	1.22	6.39	6.23	1.04	0.006
Welder / air compressor / generator	2270006025	300	0.31	0.79	5.64	0.23	0.005
Crane	2270006015	400	0.21	1.37	6.09	0.16	0.005
Bore / drill rig	2270002033	400	0.21	1.37	6.09	0.16	0.005

SOURCE: U.S. Environmental Protection Agency 2004a
NOTES:
1 Tier1 values were used for all equipment.
2 Emission Factors were calculated using U.S. Environmental Protection Agency report “Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling-Compression-Ignition.”
3 The portion of particulate matter attributable to sulfur in the diesel fuel (S PM) is calculated assuming 0.0015 percent of sulfur content for the local diesel fuel (the Tier1 sulfur content).
4 SO_2 emission factor assumed diesel sulfur content of 0.0015 percent.
EF = emission factor
g/hp-hr = grams per horsepower hour
hp = horesepower

SCC = source classification code
HC = hydrocarbon
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter equal to or less than 10 microns in diameter
SO_2 = sulfur dioxide

Emission factors for off-highway diesel-fueled vehicles and equipment were calculated following the method outlined in the EPA report "Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling-Compression-Ignition" (EPA 2004a). For all such vehicles and equipment, Tier 1 emission factors were used. Tier 1 refers to the first Federal standards for non-road diesel engines regulations adopted in 1994 and phased in from 1996 to 2000. The use of the Tier 1 standards allows for conservative estimation of diesel exhaust emissions. Emission factors for pickup trucks and crew cabs were obtained from the EPA model MOBILE5, based on national averaged fleet conditions, at a speed of 15 mph and an ambient temperature of 60 degrees Fahrenheit (^oF). Annual emissions for all diesel-fueled vehicles and equipment were calculated based on average engine horsepower (hp) for each type of vehicle and equipment, and an operating schedule of 10 hours per day, 6 days per week and 52 weeks per year. Annual emissions for gasoline-fueled pickup trucks and crew cabs were calculated based on a traveling distance of 10 miles per day during power plant construction and 25 miles per day during rail line construction, all with an operating schedule of 6 days per week and 52 weeks per year.

4.2 Sources of Air Pollutant Emissions from Material Handling Operations

4.2.1 Locomotive Rail Line Travel Emissions

Railway locomotive engines will operate while delivering coal and other materials to the site. Exhaust emissions will be released during the operation of the diesel-fired locomotive engines. Locomotive rail line travel emissions were calculated using EPA document Technical Highlights – Emission Factors for Locomotives (EPA 1997). Similar assumptions were used by ENSR to calculate onsite locomotive emissions in Section 5.8 of Appendix 5, "Air Pollution Emissions Details and Summary," of the PSD Application (ENSR 2006a).

4.2.1.1 Coal Unloading, Handling, and Transfer Operations

The following text is excerpted from Section 7.1.5.1 , Description of Proposed Project, of the PSD Application (ENSR 2006a).

> The [Toquop Power Project] TPP has been designed to burn sub-bituminous coals from the Powder River Basin in Wyoming. [Sub-bituminous coal is a coal whose properties range from those of lignite to those of bituminous coal and used primarily as fuel for steam-electric power generation.] Coal will be delivered to the project site by rail from the existing UP [United Pacific] rail line that passes west of the power plant site. A new rail track or "line" will be constructed to connect the existing line to the power plant. On average, approximately one unit train will deliver coal to the site each day.
>
> Coal will be removed from each rail car by a bottom dumper system that will deposit the coal into a hopper for transfer by conveyor to the coal storage area. Conveyors will transfer the coal into and out of the coal storage area. A coal crusher unit will crush the coal, and the crushed coal will be conveyed to the coal silos adjacent to the main boiler.
>
> The fugitive dust emissions from the rail bottom dumper, the coal transfer points, and the crusher will be controlled by individual baghouses or filters that will draw air through the transfer points or processes, and filter particulates from the air stream, prior to being emitted into the atmosphere. The filtered (collected) materials will be transferred back to the coal operations for

eventual combustion in the boiler. A total of approximately 3 million tons of coal per year may be delivered to the site by train.

Coal Unloading System

The coal unloading system will be designed to accommodate the daily unloading of a maximum of one unit train with approximately 120 tons of coal in each car. If the boiler is operating at full load, an average of approximately one unit train per day will be required. The new incoming rail line and loop track will be designed and constructed to accommodate a maximum of one unit train per day. An automated train positioner and an enclosed bottom car dumper will be used to unload the coal. The coal unloading system will be provided with receiving hoppers and grillage, two belt feeders, chute work and cut-off gates, dust control systems, duplex sump pumps, emergency egress tunnel with ventilation, and all necessary control devices. The coal subsequently will be transferred from the rail unloading area to a transfer house.

Coal Stackout and Reclaim System

Coal from the transfer house will be transferred to the active areas of the coal storage piles via a gull-wing stacker. The traveling gull-wing stacker will be provided with dual stackout conveyors and telescoping chutes. All transfer points will be provided with dust spray controls. Mobile equipment will transfer coal from the active storage area to the long-term storage area.

The active areas of the storage pile will be of sufficient size to provide for about 7 days of active reclaimable coal. A reclaim tunnel will be located adjacent to the active storage area. Reclaim and blending will be accomplished using front-end loaders, which will transport the coal from the coal storage area to the reclaim coal grate. Reclaim conveyors will [move] coal to the transfer house and will be provided with belt scales and magnetic separators to direct coal to the crusher house feed conveyors.

Approximately 30 days of long-term coal storage will be provided in the storage pile. Mobile equipment will be used to transfer the coal from the long-term storage area to the active reclaim area.

Coal Crushing

Coal from the reclaim system will be transferred to the coal crusher house. The crusher house will be a totally enclosed structure and will include a surge bin, variable speed belt feeders, granulator crushers and motors, and all necessary chutes and gates. The crushers will reduce the coal to a nominal size of 1 to 2 inches.

Silo Fill System

The plant feed conveyor will transport coal to the surge bin located in the plant transfer tower. The belt feeders will be capable of feeding coal to one of two tripper conveyors. Each tripper conveyor will be provided with a traveling tripper to continuously fill the boiler silos.

4.2.1.2 Ash Handling and Disposal

The following text is excerpted from Section 7.1.5.2, Description of Proposed Project, of the PSD Application (ENSR 2006a):

Coal combustion will produce ash, which will be removed from the baghouse (fly ash) and from the bottom of the boiler (bottom ash). Fly ash will be collected from the flue gas by the baghouses and pneumatically transported into the fly ash silo. The fly ash will be transferred from the silos to trucks or rail cars for shipment offsite for beneficial reuse (as feedstock for concrete preparation or other uses), or loaded into trucks for disposal at the approved coal combustion products (CCP) landfill. Fly ash will be mixed with approximately 10 percent water by weight before being loaded into trucks for transport to the approved CCP disposal area.

Bottom ash will be removed from the boiler after quenching and pneumatically transported into the bottom ash silo storage silo for subsequent loading to trucks or rail cars for shipment offsite for beneficial reuse or for disposal at the approved CCP landfill. While transfers from the fly ash and bottom ash silos will be controlled by bin vent filters, all exposed ash will be wetted prior to any handling operations in the open. [Wetting of the ash will reduce particulate emissions during handling operations.]

4.2.1.3 Gypsum Handling and Disposal

The following text is excerpted from Section 7.1.5.3, Description of Proposed Project, of the PSD Application (ENSR 2006a):

Calcium sulfate (gypsum) will be generated annually by the power plant. The product from the flue gas desulfurization (FGD) process is synthetic gypsum. It will be produced in a form that has been dewatered to a moisture content in the range of 10 to 20 percent. This gypsum material will be loaded into trucks or rail cars for shipment offsite, for either beneficial reuse in sheet rock manufacturing or loaded into trucks for disposal at the approved CCP landfill.

4.2.1.4 Quicklime Handling and Storage

The following text is excerpted from Section 7.1.5.4, Description of Proposed Project, of the PSD Application (ENSR 2006a):

Quicklime required for the FGD system will be transported to the project site by rail or by truck, depending on which is the most cost-effective means of transportation. Quicklime will be used in the FGD system to remove sulfur dioxide (SO_2) from the flue gases. Quicklime will be delivered and unloaded through a pneumatic conveying system. The pneumatic conveyor system will transfer the Quicklime to the Quicklime storage silos. Each Quicklime silo will be equipped with a baghouse to control particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) emissions.

The Quicklime from the storage silos is transferred to the Quicklime preparation building. This transfer of Quicklime is an enclosed process. The Quicklime is mixed with water and made into a slurry that will be injected into the wet FGD system for SO_2 control. The Quicklime slurry is then stored in tanks near the wet FGD system. From these tanks, the Quicklime slurry is sent to the wet FGD system.

4.2.1.5 Powdered Activated Carbon Handling and Storage

The following text is excerpted from Section 7.1.5.5, Description of Proposed Project, of the PSD Application (ENSR 2006a):

The [project] plans to comply with the applicable New Source Performance Standards mercury control regulations that were promulgated by the U.S. Environmental Protection Agency (EPA) on May 18, 2005. While there has been considerable work done on a number of promising mercury control technologies at the pilot scale and small demonstration scale, no truly commercial control technology exists today. The technology that is closest to commercialization involves the injection of powdered activated carbon (PAC) upstream of a particulate collection device. This technology has been tested at commercial scale for relatively short periods of time on a number of commercial power plants with encouraging but varying results. Results are highly dependent upon the type of coal being burned and the configuration of the power plant, particularly the combination and sequence of pollution devices employed.

The preamble to the Clean Air Mercury Rule provides a discussion of the control of mercury by SCR and FGD equipment. From that discussion and the analysis of the data from EPA's Mercury Information Collection Request, Toquop Energy, LLC may comply with the final mercury new source performance emission standards without the addition of a specific mercury control device. Toquop Energy, LLC is considering the installation of a PAC system to enhance mercury controls; however, its ultimate installation would depend on the performance of the other control equipment (SCR and scrubber) and on the cost of mercury allowances under a (not-yet proposed) cap and trade system.

At this point in time, the most viable technology is the injection of PAC, which is the basis of the description provided below and in subsequent sections. However, prior to the expected start of construction, it is possible that another option (such as FGD additives, oxidation catalysts, and other technologies) could become the preferred technique. The following discussion applies to an activated carbon injection system, which is currently considered part of the proposed [project].

If needed, PAC would be delivered to the site by trucks and pneumatically unloaded into a storage silo. The boiler will be provided with a single storage silo capable of holding a 14-day supply of PAC. PM_{10} emissions from the transfer operations and activated carbon storage silo would be controlled by a baghouse. The PAC would be injected into the boiler flue gas stream downstream of the SCR system. With use of carbon injection at the TPP, the carbon would be collected in the main boiler particulate control equipment.

4.2.1.6 CCP Disposal Area

The following text is excerpted from Section 5.10, Air Pollution Emissions Details and Summary, of the PSD Application (ENSR 2006a):

As currently proposed, CCP, consisting of fly ash, bottom ash, FGD by-product (gypsum), and spent activated carbon (if used), will either be sold to potential end users or disposed at an onsite landfill, which will be specifically developed for [the project]. The projected emissions from the landfill activities are included in the modeling effort.

4.2.1.7 Vehicle Traffic On Roads

The following text is excerpted from Section 5.9, Air Pollution Emissions Details and Summary, of the PSD Application (ENSR 2006a):

Raw materials and CCP may arrive and depart to the site by either railcar or truck. Dust emissions were estimated from the paved roadways that may be used by activated carbon supply trucks, NH_3 supply trucks, Quicklime and Quicklime supply trucks, chemical delivery trucks, fuel oil supply trucks, and trucks transporting CCP off-site. Emissions from the paved roads were calculated based on an emission factor developed from Equation 2 in AP-42, Chapter 13.2.1, *Paved Roads*. Note tailpipe emissions from these commercial vehicles were not addressed in the PSD Application.

4.3 Sources of Air Pollutant Emissions from Power Plant Operations

The proposed project would include one pulverized coal (PC) supercritical boiler and a steam turbine generator capable of generating 750 MW (gross) of electric power. Major systems would include power generating and transmission, materials handling, heat rejection (cooling), and air-emissions control. The proposed Toquop Energy Project would also include two auxiliary boilers, a fire-water pump engine, an emergency generator, and fuel and oil storage tanks.

4.3.1 Coal Combustion Emissions

Local and regional ambient air quality impacts associated with the proposed project would result from the combustion of sub-bituminous coals mined from the Powder River Basin in Wyoming. Criteria pollutant emission rates for the proposed power plant were obtained from the PSD permit application prepared by ENSR.

The following text is excerpted from Section 7.1.2.1, Description of Proposed Project, of the PSD Application. (ENSR 2006a*)*:

> The project will operate one supercritical, PC-fired boiler. PC combustion is the most commonly used method of combustion in coal-fired power plants. It is a well-proven, reliable, and cost-effective technology for power generation in utility-scale applications. While the majority of the coal-fired power generation facilities in the United States (U.S.) use a sub-critical steam cycle, Toquop Energy, LLC has selected a supercritical steam cycle. The advantages of the supercritical steam cycle include higher efficiency, lower emissions, and reduced fuel consumption. Use of a once through, supercritical steam cycle and other design features will enable this plant to be one of the most efficient dry cooled steam electric plants ever built in the U.S. with a net efficiency greater than 40 percent based on the lower heating value of the fuel. State-of-the-art emission controls will be used to minimize emissions of potential air pollutants. Water consumption will be minimized by using a Heller system, dry natural draft cooling tower.
>
> The boiler will include four coal silos for short-term coal storage. Upon leaving the coal silos, the coal will be pulverized and fed into the low-oxides of nitrogen (NO_x) coal burners for combustion. The coal burners and the boiler will be designed to avoid hot spots that could lead to excessive generation of NO_x. The heat from the combustion of the coal will serve to generate steam at supercritical pressure and high temperature for increased cycle efficiency and lower relative emissions.
>
> Steam generated in the boiler will drive its individual steam turbine generator. The steam expands through the steam turbine, such that the thermal energy contained in the steam is converted to the mechanical energy required to rotate the steam turbine-generator shaft. The generator, which is directly coupled to the steam turbine, uses this mechanical energy to produce electricity. After releasing all economically-available energy, the steam exhausts from the steam turbine-generator and flows into the condenser, where waste heat in the steam is removed to condense the steam and form water. The condensed water is then pumped back to the boiler to complete the cycle.

4.3.1.1 Fuel Oil Combustion and Storage Emissions

The following text is excerpted from Section 7.1.3, Description of Proposed Project, of the PSD Application. (ENSR 2006a):

> Two auxiliary steam boilers will meet the steam demand during start up of the main steam generators (auxiliary steam consumers: de-aerator, steam air heater, turbine seals, etc). The auxiliary steam generators are of fire-tube/smoke-tube type (package boilers, shell type). Each auxiliary steam generator has a heat input capacity of 86.4 million British thermal units/hour. Emission will be controlled by only burning ultra low sulfur (0.0015 percent sulfur) distillate oil, low-NO_X burners, good combustion, and limiting operation to 550 hours/year. Support facilities required to operate the auxiliary boilers include water supply and storage, fuel delivery and storage, and an electrical distribution system. Fuel will be delivered by truck or rail to a 1,060,000-gallon diesel fuel tank.

The following text is excerpted from Section 7.1.4, Description of Proposed Project, of the PSD Application. (ENSR 2006a*)*:

> There will be one emergency diesel generator with an output capacity of 1,482 horsepower and one firewater pump engine with an output capacity of 284 horsepower. These units will operate during emergency situations and for readiness maintenance checks. Emission will be controlled by only burning ultra low sulfur (0.0015 percent sulfur) distillate oil, through good combustion practices, and limiting normal operation to a maximum of 100 hours/year for each engine.

The following text is excerpted from Section 7.1.7, Description of Proposed Project, of the PSD Application. (ENSR 2006a):

> One 1,060,000-gallon fuel oil storage tank; one 4,000-gallon fuel oil storage tank; one 1,000-gallon gasoline storage tank; two 14,000-gallon lube oil storage tanks; two 3,000-gallon lube oil storage tanks; a 1,000-gallon used oil storage tank; and one 300-gallon fuel oil storage tank will be located onsite. These tanks primarily will contain No. 2 fuel oil (commercial grade) to supply the emergency generator, fire-water pump engine and for startup of the pulverized coal-fired boilers, gasoline for plant equipment and lube oil for the main boilers and generators.

4.3.1.2 Commuting Employee Vehicles on Access Roads

Criteria air pollutant emissions resulting from employees driving vehicles to commute to the plant were conservatively estimated. URS conservatively assumed that all 110 employees will work five days per week, and that each person would drive a gasoline-fueled vehicle separately to work each day. Tailpipe emission factors for vehicles were obtained from EPA document AP-42, Volume II, “Emission Factors for Mobile Sources” (EPA 1995). Emission factors for pickup trucks and crew cabs were obtained from EPA model MOBILE5 based on national averaged fleet conditions at a speed of 15 mph and an ambient temperature of 60 ^{o}F. Annual emissions were calculated based on a round-trip travel distance of 50 miles per day from the plant to Mesquite, Nevada, with an operating schedule of 5 days per week (Monday through Friday) and 52 weeks per year.

4.4 Estimation of Air Pollutant Emissions

The following sections describe the methodology used to calculate emissions of regulated air pollutants from the proposed project, organized as follows:

- Criteria air pollutant emissions from project construction activity, including fugitive dust from earthmoving and tailpipe emissions from construction vehicles and equipment
- Criteria air pollutant emissions from material-handling operations, including coal, ash, gypsum, quicklime, powdered activated carbon CCP, and emissions due to vehicle traffic on roads during operations

- Criteria and hazardous air pollutant emissions from operation of the proposed power plant, including coal combustion emissions from the main stack; fuel oil combustion in auxiliary boilers, fire-water pump engine, and emergency generator; and tailpipe emissions from vehicles traveling to and from the plant site

4.4.1 Air Emissions from Project Construction Activity

4.4.1.1 Fugitive Dust Due to Earthmoving Activity

URS estimated criteria pollutant emissions associated with construction activity, including fugitive dust due to earthmoving activity, vehicular traffic on roads, and particulate and gaseous pollutant emissions from gasoline- and diesel-fueled vehicles and equipment.

For purposes of this impact analysis, it was assumed that disturbed ground would undergo watering during active earthmoving. According to the Western Regional Air Partnership (WRAP) Fugitive Dust Handbook (Countess Environmental 2006), the 0.11 ton/acre-month PM_{10} emission factor assumes a control effectiveness of 50 percent due to routine watering. (Please note that the previously permitted actions such as the access road, water pipeline, and well field are not specifically addressed in this analysis, as the impacts would be the same as described for the No-Action Alternative.)

URS conservatively assumed that up to 120 acres of ground would undergo active earthmoving activity at any one time on the power plant site during the initial 18 months. Maximum controlled PM_{10} emissions from plant site construction are estimated to be 13.2 tons/month. For the remaining 24 months it was assumed that a maximum of 40 acres per month would be undergo active earthmoving. Based on this varied earthmoving schedule, it is estimated that a maximum of 343.2 tons of PM_{10} will be emitted during plant site construction.

The rail line would be approximately 31 miles long, with a total project area of 697.6 acres. Maximum controlled PM_{10} emissions from construction of the rail line are estimated to be 76.7 tons/month. Based on an 18-month construction schedule, it is estimated that a maximum of 1,381 tons of PM_{10} would be emitted during construction of the proposed rail line.

Table D-11 summarizes the estimated PM_{10} emissions due to earthmoving activity from each phase of the Proposed Action Alternative. For the Proposed Action Alternative, the total maximum controlled PM_{10} emissions from construction of the plant site and rail line are estimated to be 89.9 tons/month. Since these emissions would be generated by earthmoving activity and occur at ground level, it is unlikely that the PM_{10} would be transported more than 1 or 2 km, except on unusually windy days (see Mitigation section for dust control measures during periods of high wind). In addition, the fugitive dust sources will be spatially distributed over a large area and spread out over the three-year duration of the construction period. Furthermore, the locations of active work areas would be transient, with work activities typically moving to a new location every few days. Finally, the PM_{10} emissions from earthmoving activity would be temporary, ceasing as each phase of the project is completed. Based on the foregoing, the ambient air quality impacts (fugitive dust) of project construction activity are considered to be minor.

Table D-11
Particulate Matter (PM_{10}) Emissions Associated with Construction of Plant Site and Rail line under the Proposed Alternative

Length (mile)	Work Area (acre)	Projected Construction Time (months)	PM_{10} EF (tons/acre-month) [1]	Controlled PM_{10} Emission (tons/month) [2]	Total Controlled PM_{10} Emission (tons) [3]
Proposed Toquop Power Plant Site					
NA	120.0 [4]	50.0	0.11	13.2	343.2
Proposed Rail line					
31.0	697.6	24.00	0.11	76.7	1,381
Totals [5]	817.6	-	0.11	89.9	1,724

SOURCE: Countess Environmental 2006
NOTES:
1 From Countess Environmental 2006 *WRAP Fugitive Dust Handbook.*
2 PM_{10} EM = ER (tons/acre-month) x Daily Activity (acres) = Controlled PM_{10} Emissions (tons/month)
3 PM_{10} EM = ER (tons/acre-month) x Daily Activity (acres) x Work Months (months) = Total Controlled PM_{10} Emissions
4 The estimated work area disturbed during plant construction was assumed to be 120 acres (plant site footprint) out of the specified 647.6 acres. A maximum of 120 acres per month would be disturbed during the first 18 months with 40-acres per month during the remaining 24 months.
5 Previously action items such as access roads, water pipeline, and well field are not included in this evaluation.
PM_{10} = particulate matter equal to or less than 10 microns in diameter
EF = emission factor
NA = not applicable

4.4.1.2 Criteria Pollutant Emissions from Construction Vehicles and Equipment

Table D-12 summarizes the equipment and vehicle roster and estimated criteria pollutant emission rates for construction of the proposed power plant. Table D-13 summarizes the equipment and vehicle roster and estimated criteria pollutant emission rates for construction of the proposed rail line. Table D-14 summarizes the combined estimated tailpipe criteria pollutant emission rates for all vehicles and equipment used on all phases of construction for the proposed project. The maximum annual emissions were calculated to be 33.6 tons of VOC, 194.8 tons of CO, 657.2 tons of NO_x, 28.6 tons of PM_{10} and 0.6 tons of SO_2. Total emissions for the duration of the construction activity were estimated to be 84.1 tons of VOC, 486.2 tons of CO, 1,657.2 tons of NO_x, 71.6 tons of PM_{10} and 1.5 tons of SO_2.

The criteria pollutant tailpipe emissions would be spatially distributed over a large area and spread out over the three-year duration of the construction period. Furthermore, the locations of active work areas will be transient, with work activities typically moving to a new location every few days. Finally, the tailpipe emissions from construction activity would be temporary, ceasing as each phase of the project is completed. Therefore, the criteria pollutant emissions from construction vehicles and equipment are considered to be negligible.

4.4.1.3 Locomotive Rail Travel Emissions

It was assumed that each train has three engines, each rated at 4,000 brake hp, and that a maximum of 0.87 unit train deliveries would occur per day. It was also assumed for analysis purposes that the locomotive would average 40 mph while traveling on the 31-mile-long rail line for a total round trip of 19,688 miles per year of or 492.2 hours per year. NO_x, CO, VOC, and particulate matter (PM) emissions were estimated using emission factors obtained from EPA-420-F-97-051, dated December 1997. SO_2 emissions were calculated assuming a diesel fuel heating value of 137, 000 British thermal units (Btu) per gallon, a diesel sulfur content of 0.0015 percent, and an estimated distillate oil density of 7.2 pounds per gallon. Note that the EPA low sulfur diesel rule for locomotives goes into effect on June 1st, 2007. Criteria pollutant emissions for the locomotive engines are summarized in Table D-12.

Table D-12
Summary of Criteria Pollutant Emissions for Locomotive Rail Line Travel

Pollutant	EF		Emissions		
	g/bhp-hr (1)	lb/bhp-hr	lb/hr	lb/yr	tpy
NO_x	0.51	0.001	13.49	6,639.78	3.32
CO	1.32	0.003	34.92	17,187.62	8.59
VOC	10.49	0.023	277.51	136,590.42	68.30
SO_2 (2)	-	-	0.14	68.91	0.03
PM	0.33	0.001	8.73	4,296.91	2.15

SOURCE; U.S. Environmental Protection Agency 1997
NOTES:
1 Emission factors (g/bhp-hr) were obtained from Table 9 –Fleet Average Emission Factors for Locomotives, EPA-420-F-97-051, December 1997.
2 SO_2 emissions (lb/hr) were calculated using the following equation: SO_2 (lb/hr) = Total hp rating * 7,500 (hp to British thermal unit/hour conversion factor) / Diesel Fuel Heating Value (British thermal unit/gallon) * Density of diesel fuel (pounds/gallon) * diesel fuel sulfur content (5) / 100 * 64 lb SO_2 / 32 lb S
EF = emission factor
g/bhp-hr = gram per brake horsepower hour
lb/bhp-hr = pound per brake horsepower hour
lb/hr = pounds per hour
lb/yr = pounds per year
tpy = tons per year
NO_x = nitrogen oxides
CO = carbon monoxide
VOC = volatile organic compounds
SO_2 = sulfur dioxide
PM = particulate matter

4.4.1.4 Emissions from Material Handling Operations

4.4.1.4.1 Coal Handling

PM_{10} emission rates for the coal handling were obtained from ENSR (ENSR 2006a). The following subsections summarize the PM_{10} emissions from these coal-handling operations:

The following text is excerpted from Section 5.2.1 through 5.2.6 of Appendix 5, Air Pollution Emissions Details and Summary, of the PSD Application (ENSR 2006a):

Railcar Unloading

Coal unloading operations occur inside a railcar dumper building via a bottom dumper. The coal is unloaded continuously from the railcars through a bottom dump system into underground hoppers, which then feed an unloading conveyor. Emissions from coal unloading operations are calculated using the equation in AP-42, Chapter 13.2.4, *Aggregate Handling and Storage Piles*. Hourly emissions are based upon a maximum hourly coal unloading rate of 5,000 tons/hour, and annual emissions are based on a maximum annual coal unloading rate of 2,944,000 tpy. Emissions from the entire system are controlled by fogging water sprays. The fogging water sprays are estimated to provide a PM_{10} control efficiency of 85 percent. Emissions of PM_{10} were calculated as 0.11 lb/hr and 0.03 tpy.

PM_{10} Emissions from Coal Unloading Operations
E_{PM10} (pounds/hour) = (1.45E-04 pounds/ton) * (5,000 tons/hour) * (1-85/100)
E_{PM10} (pounds/hour) = 0.11
E_{PM10} (tpy) = (1.45E-04 pounds/ton) * (2,944,000 ton/year) * (1-85/100) / (2,000 pounds/ton)
E_{PM10} (tpy) = 0.03

Coal Transfer Operations – Transfer House

Coal is transferred from the unloading conveyor belt to the coal yard conveyor belt inside the transfer house. Emissions from the transfer house building are controlled by a baghouse with a design outlet grain loading of 0.005 [grain per dry standard cubic foot] gr/dscf. The baghouse will be designed for 8,833 [dry standard cubic foot per minute] dscfm, and maximum hours of operation will be 24 hours per day and 8,760 hours per year. Emissions of PM_{10} from the coal transfer operations were calculated to be 0.38 lb/hr and 1.66 tpy.

PM_{10} Emissions from Coal Transfer Operations – Transfer House
E_{PM10} (pounds/hour) = (0.005 gr/dscf) * (8,833 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.38
E_{PM10} (tpy) = (0.38 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.66

Coal Stackout Operations

Emissions from coal stackout operations are calculated using the equation in AP-42, Chapter 13.2.4, *Aggregate Handling and Storage Piles*. Hourly emissions are based upon a maximum hourly coal unloading rate of 5,000 tons/hour, and annual emissions are based on a maximum annual coal unloading rate of 2,944,000 tons/year. An emission factor of 1.45E-04 pounds/ton was used to estimate PM_{10} emissions from the coal pile stackout and the coal yard conveyor; [Note that 1.45E-04 is equivalent to 0.000145]. A mean wind speed of 12.0 miles per hour (mph), obtained from the Overton, Nevada met station, and a mean coal moisture content of 19.42 percent based on the minimum coal moisture content from the worst-case coal were used. [Worst case coal assumes highest ash and sulfur content in order to calculate conservative emissions estimates.] Wet suppression (water sprays) will be used to control PM_{10} emissions from the coal yard stackout operations. There are hoods on the telescoping chute to provide weather protection and dust control. The water sprays and hoods are estimated to provide a PM_{10} control efficiency of 75 percent. Individual emissions of PM_{10} were calculated as 0.18 lb/hr and 0.05 tpy for both the Gull Wing Stacker and the coal yard conveying. Therefore the total PM_{10} emissions due to stackout operations are 0.36 lb/hr and 0.1 tpy.

PM_{10} Emissions from Coal Stackout Operations – Gull Wing Stacker to Coal Pile
E_{PM10} (pounds/hour) = (1.45E-04 pounds/ton) * (5,000 tons/hour) * (1-75/100)
E_{PM10} (pounds/hour) = 0.18
E_{PM10} (tpy) = (1.45E-04 pounds/ton) * (2,944,000 tpy) * (1-75/100) / (2,000 pounds/ton)
E_{PM10} (tpy) = 0.05

PM_{10} Emissions from Coal Stackout Operations – Coal Yard Conveying
E_{PM10} (pounds/hour) = (1.45E-04 pounds/ton) * (5,000 tons/hour) * (1-75/100)
E_{PM10} (pounds/hour) = 0.18
E_{PM10} (tpy) = (1.45E-04 pounds/ton) * (2,944,000 tpy) * (1-75/100) / (2,000 pounds/ton)
E_{PM10} (tpy) = 0.05

Table D-13
Plant Site Construction Vehicle/Equipment Emissions

Vehicle/Equipment	Quantity	Fuel	Average Engine Power (hp)	Unit of Emission Factors	Emission Factors [1, 2]					Maximum Annual Emissions (tons/year) [3, 4]					Total Emissions (tons) [3, 4, 5]				
					VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2
Trucks (2-ton)	5	Diesel	250	g/hp-hr	0.33	1.20	5.36	0.30	0.005	1.42	5.16	23.05	1.27	0.02	4.25	15.49	69.15	3.82	0.06
Trucks (5-15 tons)	10	Diesel	400	g/hp-hr	0.22	2.10	5.78	0.22	0.005	2.98	28.88	79.56	3.01	0.07	8.93	86.63	238.67	9.02	0.20
Sideboom	6	Diesel	500	g/hp-hr	0.22	2.10	5.78	0.22	0.005	2.23	21.66	59.67	2.25	0.05	6.70	64.97	179.00	6.76	0.15
Dozer	6	Diesel	850	g/hp-hr	0.31	1.23	5.92	0.21	0.005	5.36	21.54	103.75	3.64	0.09	16.09	64.63	311.25	10.91	0.26
Large Shovel	0	Diesel	850	g/hp-hr	0.31	1.23	5.92	0.21	0.005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grader	4	Diesel	600	g/hp-hr	0.22	2.10	5.78	0.30	0.005	1.79	17.33	47.73	2.45	0.04	5.36	51.98	143.20	7.34	0.12
Tractor / Backhoe / Loader	6	Diesel	100	g/hp-hr	1.22	6.39	6.23	1.04	0.006	2.51	13.18	12.86	2.14	0.01	7.52	39.54	38.58	6.43	0.04
Welder / Air Compressor / Generator	15	Diesel	300	g/hp-hr	0.31	0.79	5.64	0.23	0.005	4.86	12.15	87.35	3.49	0.08	14.58	36.46	262.05	10.48	0.23
Crane	4	Diesel	400	g/hp-hr	0.21	1.37	6.09	0.16	0.005	1.13	7.55	33.50	0.89	0.03	3.40	22.65	100.49	2.68	0.08
Bore/Drill Rig	0	Diesel	400	g/hp-hr	0.21	1.37	6.09	0.16	0.005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pickup Trucks and Crew Cabs	12	Gasoline	200	g/mile	4.72	46.06	2.41	0.093	0.113	0.19	1.90	0.10	0.00	0.00	0.58	5.70	0.30	0.01	0.01
Total Emissions										**22.48**	**129.35**	**447.57**	**19.15**	**0.39**	**67.43**	**388.05**	**1342.71**	**57.46**	**1.16**

SOURCE: U.S. Environmental Protection Agency 2004a

NOTES:

1 Emission factors for off-highway diesel fueled vehicle/equipment were calculated following the method outlined in the EPA report "Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling-Compression-Ignition," EPA420-P-04-009, April 2004. For all vehicles and equipment, Tier 1 emission factors were used.

2 Emission factors for pickup trucks and crew cab were obtained from MOBILE5 run based on national averaged fleet conditions, at a speed of 15 miles per hour and an ambient temperature of 60 degrees Fahrenheit (^oF).

3 Annual emissions for all diesel-fueled vehicle/equipment were calculated based on average engine horsepower for each type of vehicle/equipment, and an operating schedule of 10 hours/day, 6 days/week and 52 weeks/year.

4 Annul emissions for pickup trucks and crew cab were calculated based on a traveling distance of 10 miles/day during Power Plant construction with an operating schedule of 6 days/week and 52 weeks/year.

5 Total emissions from Power Plant construction are based on 36-months of construction.

VOC = volatile organic compounds
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter with aerodynamic diameter less than or equal to 10 micrometers
SO_2 = sulfur dioxide

Table D-14
Rail line Construction Vehicle/Equipment Emissions

Vehicle/Equipment	Quantity	Fuel	Average Engine Power (hp)	Unit of Emission Factors	Emission Factors [1, 2]					Maximum Annual Emissions (tons/year) [3, 4]					Total Emissions (tons) [3, 4, 5]				
					VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2
Trucks (2-ton)	2	Diesel	250	g/hp-hr	0.33	1.20	5.36	0.30	0.005	0.57	2.07	9.22	0.51	0.01	0.86	3.11	13.83	0.77	0.02
Trucks (5-15 tons)	5	Diesel	400	g/hp-hr	0.22	2.10	5.78	0.22	0.005	1.49	14.44	39.78	1.50	0.03	2.24	21.66	59.67	2.26	0.05
Sideboom	2	Diesel	500	g/hp-hr	0.22	2.10	5.78	0.22	0.005	0.74	7.22	19.89	0.75	0.02	1.11	10.83	29.84	1.13	0.03
Dozer	2	Diesel	850	g/hp-hr	0.31	1.23	5.92	0.21	0.005	1.79	7.18	34.58	1.21	0.03	2.69	10.77	51.88	1.82	0.05
Large Shovel	1	Diesel	850	g/hp-hr	0.31	1.23	5.92	0.21	0.005	0.89	3.59	17.29	0.61	0.01	1.34	5.39	25.94	0.91	0.02
Grader	2	Diesel	600	g/hp-hr	0.22	2.10	5.78	0.30	0.005	0.89	8.66	23.87	1.22	0.02	1.34	13.00	35.80	1.84	0.03
Tractor / Backhoe / Loader	5	Diesel	100	g/hp-hr	1.22	6.39	6.23	1.04	0.006	2.09	10.98	10.72	1.79	0.01	3.14	16.48	16.08	2.68	0.02
Welder / Air Compressor / Generator	5	Diesel	300	g/hp-hr	0.31	0.79	5.64	0.23	0.005	1.62	4.05	29.12	1.16	0.03	2.43	6.08	43.68	1.75	0.04
Crane	1	Diesel	400	g/hp-hr	0.21	1.37	6.09	0.16	0.005	0.28	1.89	8.37	0.22	0.01	0.42	2.83	12.56	0.34	0.01
Bore/Drill Rig	2	Diesel	400	g/hp-hr	0.21	1.37	6.09	0.16	0.005	0.57	3.77	16.75	0.45	0.01	0.86	5.66	25.13	0.67	0.02
Pickup Trucks and Crew Cabs	4	Gasoline	200	g/mile	4.72	46.06	2.41	0.093	0.113	0.16	1.58	0.08	0.00	0.00	0.24	2.37	0.12	0.01	0.01
Total Emissions										**11.10**	**65.44**	**209.67**	**9.43**	**0.18**	**16.67**	**98.18**	**314.53**	**14.18**	**0.30**

SOURCE: U.S. Environmental Protection Agency 2004a

NOTES:

[1] Emission factors for off-highway diesel fueled vehicle/equipment were calculated following the method outlined in the U.S. Environmental Protection Agency report "Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling-Compression-Ignition," EPA420-P-04-009, April 2004. For all vehicles and equipment, Tier 1 emission factors were used.

[2] Emission factors for pickup trucks and crew cab were obtained from MOBILE5 run based on national averaged fleet conditions, at a speed of 15 miles per hour and an ambient temperature of 60 degrees Fahrenheit (^oF).

[3] Annual emissions for all diesel-fueled vehicle/equipment were calculated based on average engine horsepower for each type of vehicle/equipment, and an operating schedule of 10 hours/day, 6 days/week and 52 weeks/year.

[4] Annul emissions for pickup trucks and crew cab were calculated based on a traveling distance of 25 miles/day during Railroad Construction with an operating schedule of 6 days/week and 52 weeks/year.

[5] Total emissions from Rail line construction are based on 18-months of construction.

hp = horsepower
VOC = volatile organic compounds
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter with aerodynamic diameter less than or equal to 10 micrometers
SO_2 = sulfur dioxide

Table D-15
Summary of Emissions from Construction Equipment and Vehicles

Vehicle/Equipment	Quantity		Fuel	Average Engine Power (hp)	Unit of Emission Factors	Emission Factors [1, 2]					Maximum Annual Emissions (tons/year) [3, 4]					Total Emissions (tons) [3, 4, 5]				
	Power Plant	Rail line				VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2
Trucks (2-ton)	5	2	Diesel	250	g/hp-hr	0.33	1.20	5.36	0.30	0.005	1.98	7.23	32.27	1.78	0.03	5.11	18.60	82.98	4.59	0.08
Trucks (5-15 tons)	10	5	Diesel	400	g/hp-hr	0.22	2.10	5.78	0.22	0.005	4.47	43.32	119.34	4.51	0.10	11.17	108.29	298.34	11.28	0.25
Sideboom	6	2	Diesel	500	g/hp-hr	0.22	2.10	5.78	0.22	0.005	2.98	28.88	79.56	3.01	0.07	7.81	75.80	208.84	7.89	0.18
Dozer	6	2	Diesel	850	g/hp-hr	0.31	1.23	5.92	0.21	0.005	7.15	28.73	138.33	4.85	0.12	18.78	75.40	363.13	12.73	0.31
Large Shovel	0	1	Diesel	850	g/hp-hr	0.31	1.23	5.92	0.21	0.005	0.89	3.59	17.29	0.61	0.01	1.34	5.39	25.94	0.91	0.02
Grader	4	2	Diesel	600	g/hp-hr	0.22	2.10	5.78	0.30	0.005	2.68	25.99	71.60	3.67	0.06	6.70	64.98	179.00	9.18	0.15
Tractor/backhoe/loader	6	5	Diesel	100	g/hp-hr	1.22	6.39	6.23	1.04	0.006	4.60	24.16	23.58	3.93	0.02	10.66	56.02	54.66	9.11	0.06
Welder/air compressor/generator	15	5	Diesel	300	g/hp-hr	0.31	0.79	5.64	0.23	0.005	6.48	16.20	116.47	4.66	0.10	17.01	42.54	305.73	12.23	0.27
Crane	4	1	Diesel	400	g/hp-hr	0.21	1.37	6.09	0.16	0.005	1.42	9.44	41.87	1.12	0.03	3.82	25.48	113.05	3.02	0.09
Bore/Drill Rig	0	2	Diesel	400	g/hp-hr	0.21	1.37	6.09	0.16	0.005	0.57	3.77	16.75	0.45	0.01	0.86	5.66	25.13	0.67	0.02
Pickup trucks and crew cab	12	4	Gasoline	200	g/mile	4.72	46.06	2.41	0.093	0.113	0.52	5.07	0.27	0.01	0.01	0.82	8.07	0.42	0.02	0.02
Total Emissions											33.58	194.79	657.24	28.58	0.57	84.10	486.23	1,657.24	71.64	1.46

SOURCE: U.S. Environmental Protection Agency 2004a

NOTES:

1 Emission factors for off-highway diesel fueled vehicle/equipment were calculated following the method outlined in the EPA report "Exhaust and Crankcase Emission Factors for Non-Road Engine Modeling-Compression-Ignition," EPA420-P-04-009, April 2004. For all vehicles and equipment, Tier 1 emission factors were used.

2 Emission factors for pickup trucks and crew cab were obtained from MOBILE5 run based on national averaged fleet conditions, at a speed of 15 miles per hour and an ambient temperature of 60 degrees Fahrenheit (^oF).

3 Annual emissions for all diesel-fueled vehicle/equipment were calculated based on average engine horsepower for each type of vehicle/equipment, and an operating schedule of 10 hours/day, 6 days/week and 52 weeks/year.

4 Annul emissions for pickup trucks and crew cab were calculated based on a traveling distance of 10 miles/day during Power Plant construction, 25 miles/day during Access Road Construction, and 50 miles/day during transmission line and water conveyance system construction, all with an operating schedule of 6 days/week and 52 weeks/year.

5 Total duration of Power Plant is 36 months while the Rail line construction is 18-months.

VOC = volatile organic compounds
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter with aerodynamic diameter less than or equal to 10 micrometers
SO_2 = sulfur dioxide

Coal Storage Pile

Emissions have been calculated separately for wind erosion and for maintenance activities on the coal storage pile. Emissions from wind erosion from both the active and inactive coal storage piles are calculated based on a guidance document produced by the Mojave Desert Air Quality Management District (2000), which is based on a derivation of AP-42, Chapter 13.2.5, *Industrial Wind Erosion*. An emission factor of 7.08E-01 tons/acre-year for PM_{10} was developed using conservative assumptions and estimated coal pile acreages; [Note that 7.08E-01 is equivalent to 0.708]. These assumptions, which can be found in detail on the emissions calculation sheet for coal pile wind erosion in Attachment 5-A, include silt loading (6 percent), days with precipitation (30 days), and frequency of windy hours (12.0 percent) on the active coal pile, a control efficiency of 75 percent for PM_{10} has been assumed to take account for wet suppression of the coal pile; [Attachment 5-A refers to the PSD Application and can be found within the Administrative Record]. For the inactive coal pile, since there will be minimal disturbances, caking of the surface layer will occur. [Caking of the surface layer refers to stabilization of the coal pile due to inactivity and natural precipitation events which would allow for "crusting" of the surface.] Therefore, wet suppression along with compaction and the use of coal pile binder on the inactive coal storage pile was assumed to allow for 87.5 percent control for PM_{10}.

<u>PM_{10} Emissions from Coal Storage Pile Wind Erosion</u>

E_{PM10} (tpy) = (7.08E-01 tons/acre-year) * (21.52 acres exposed surface area) * (1-75/100) [Active Pile]
E_{PM10} (tpy) = (7.08E-01 tons/acre-year) * (9.34 acres exposed surface area) * (1-87.5/100) [Inactive Pile]
E_{PM10} (tpy) = 3.81 [Active Pile]
E_{PM10} (tpy) = 0.83 [Inactive Pile]
E_{PM10} (pounds/hour) = (3.81 tpy) / (8,760 hours/year) * (2,000 pounds/ton) [Active Pile]
E_{PM10} (pounds/hour) = (0.83 tpy) / (8,760 hours/year) * (2,000 pounds/ton) [Inactive Pile]
E_{PM10} (pounds/hour) = 0.87 [Active Pile]
E_{PM10} (pounds/hour) = 0.19 [Inactive Pile]

Emissions from maintenance activities on the active coal storage pile are calculated using the equation in AP-42, Chapter 11.9, *Western Surface Coal Mining* (see Attachment 5A); [Attachment 5-A refers to the PSD Application and can be found within the Administrative Record]. Hourly emissions are based upon the equation for bulldozing of coal as provided in Table 11.9-1, a coal moisture content of 19.42 percent (worst-case coal), and a silt content of 8.6 percent (Table 11.9-3 for coal silt). Annual emissions assume bulldozing activities will occur for a maximum of 12 hours/day, and 3,744 hours/year. For emission calculation purposes, some form of wet suppression (water sprays) will be used during coal pile maintenance activities when necessary. Therefore, a PM_{10} control efficiency of 75 percent was used for water sprays.

<u>PM_{10} Emissions from Coal Storage Pile Maintenance (Bulldozing)</u>

E_{PM10} (pounds/hour) = [(18.6) * ($8.6^{1.5}$)] / ($19.42^{1.4}$) * (0.75 PM10 scaling factor) * (1-75/100)
E_{PM10} (pounds/hour) = 1.38
E_{PM10} (tpy) = (1.38 pounds/hour) * (3,744 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 2.59

Coal Reclaim Crushing and Transfer Operations

Coal will be reclaimed from either the active or inactive coal piles via front-end loader. The front-end loader will push the coal over a grate, where the coal will fall onto a conveyor belt, which will pass through the transfer house. In the transfer house, the coal will be transferred to the crusher feed conveyors, which will move the coal to the crusher house. Inside the crusher house, the crusher feed conveyors discharge the coal into a surge bin. The coal is fed from the surge bin to the coal crushers, which reduce the coal size. The coal is discharged from the crushers onto the plant feed conveyor belts inside the coal crusher building. Emissions from the coal crusher building are controlled by a baghouse with a design outlet grain loading of 0.005 gr/dscf. The baghouse will be designed for 8,833 dscfm. Coal crushing and transfer systems are anticipated to operate up to 24 hours/day.

<u>PM_{10} Emissions from Coal Crushing and Transfer Operations</u>
E_{PM10} (pounds/hour) = (0.005 gr/dscf) * (8,833 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.38
E_{PM10} (tpy) = (0.38 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.66

Coal Transfers to Tripper Deck Coal Silos

Coal transfers to the coal silos in the tripper deck occur inside the tripper deck building. Emissions from the coal tripper deck building are controlled by a baghouse with a design outlet grain loading of 0.005 gr/scf. These units feed directly to the boilers and hence could operate 8,760 hours per year. The baghouse will be designed for 11,667 dscfm.

<u>PM_{10} Emissions from Coal Transfers to Tripper Deck Operations</u>
E_{PM10} (pounds/hour) = (0.005 gr/dscf) * (11,667 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.50
E_{PM10} (tpy) = (0.50 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 2.19

4.4.1.5 Storage Silos

PM_{10} emission rates for the storage silos were obtained from ENSR (ENSR 2006a). Tables D-14 and D-15, along with the following subsections, summarize the PM_{10} emissions from these six storage silos:

The following text is excerpted from Section 5.3 of Appendix 5 (Air Pollution Emissions Details and Summary) of the PSD Application. (ENSR 2006a):

Fly Ash Storage Silo

Emissions from the fly ash storage silo can occur during two activities, when pneumatically transferring ash from the main boiler baghouses, and during unloading from the fly ash storage silo to trucks or railcars for ash disposal or beneficial reuse. Emissions from the fly ash storage silo are controlled by bin vent filters, with a design outlet grain loading of 0.01 gr/dscf. The fly ash storage silo bin vent filters will be designed for 3,500 dscfm. Emissions are calculated as follows:

PM_{10} Emissions from Fly Ash Storage Silo Bin Vent Filter – Transfers from Main Boiler Baghouse to Fly Ash Silo
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (3,500 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.30
E_{PM10} (tpy) = (0.30 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.31

PM_{10} Emissions from Fly Ash Storage Silo Bin Vent Filter – Transfers from Fly Ash Silo to Trucks/Railcars
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (3,500 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.30
E_{PM10} (tpy) = (0.30 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.31

Bottom Ash Storage Silo

Emissions from the bottom ash storage silo can occur during two activities, when pneumatically transferring ash from the main boiler hopper, and during unloading from the bottom ash storage silo to trucks or railcars for ash disposal or beneficial reuse. Emissions from the bottom ash storage silo are controlled by bin vent filters, with a design outlet grain loading of 0.01 gr/dscf. The bottom ash storage silo bin vent filters will be designed for 3,500 dscfm. Emissions are calculated as follows:

PM_{10} Emissions from Bottom Ash Storage Silo Bin Vent Filter – Transfers from Main Boiler Hopper to Bottom Ash Silo
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (3,500 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.30
E_{PM10} (tpy) = (0.30 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.31

PM_{10} Emissions from Bottom Ash Storage Silo Bin Vent Filter – Transfers from Bottom Ash Silo to Trucks/Railcars
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (3,500 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.30
E_{PM10} (tpy) = (0.30 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.31

FGD By-Product/Gypsum Storage Silo

Emissions from the FGD by-product/gypsum storage silo can occur during two activities, when pneumatically transferring gypsum from the FGD scrubber de-watering system, and during unloading from the FGD by-product/gypsum storage silo to trucks or railcars for ash disposal or beneficial reuse. Emissions from the FGD by-product/gypsum storage silo are controlled by bin vent filters, with a design outlet grain loading of 0.01 gr/dscf. The FGD by-product/gypsum storage silo bin vent filters will be designed for 3,500 dscfm. Emissions are calculated as follows:

PM_{10} Emissions from Gypsum Storage Silo Bin Vent Filter – Transfers from FDG System to Gypsum Ash Silo
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (3,500 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.30

E_{PM10} (tpy) = (0.30 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.31

PM_{10} Emissions from Gypsum Storage Silo Bin Vent Filter – Transfers from Gypsum Silo to Trucks/Railcars
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (3,500 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.30
E_{PM10} (tpy) = (0.30 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.31

Quicklime Storage Silos

Emissions from the Quicklime storage silos can occur during two activities, when pneumatically transferring Quicklime from supply trucks and during discharge from the Quicklime storage silo to the FGD slurry preparation building. Emissions from the Quicklime storage silo are controlled by bin vent filters, with a design outlet grain loading of 0.01 gr/dscf. The Quicklime storage silo bin vent filters will be designed for 4,000 dscfm. Emissions are calculated as follows:

PM_{10} Emissions from Quicklime Storage Silo Bin Vent Filter – Transfers from Quicklime Supply Trucks to Quicklime Silo
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (4,000 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.34
E_{PM10} (tpy) = (0.34 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.50

PM_{10} Emissions from Quicklime Storage Silo Bin Vent Filter – Transfers from Quicklime Silo to FGD Slurry Preparation Building
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (4,000 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.34
E_{PM10} (tpy) = (0.34 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.50

Powdered Activated Carbon (PAC) Storage Silo

PAC injection is being considered as a potential mercury (Hg) control option. One storage silo is being considered for storage and handling of PAC to be injected into the main boiler exhaust stream. PM_{10} emissions potentially occur when the PAC is off-loaded pneumatically from trucks into the storage silo. Since the transfers to the main boiler will be controlled and accounted for by the main boiler baghouse, only emissions from truck unloading activities are discussed here. Emissions from the unloading of PAC from supply trucks to the storage silo are controlled by bin vent filters, with a design outlet grain loading of 0.01 gr/dscf. Each bin vent filter will be designed for 4,000 dscfm. Emissions are calculated as follows:

PM_{10} Emissions from PAC Storage Silo
E_{PM10} (pounds/hour) = (0.01 gr/dscf) * (4,000 dscfm) / (7,000 gr/pound) * (60 minutes/hour)
E_{PM10} (pounds/hour) = 0.34
E_{PM10} (tpy) = (0.34 pounds/hour) * (8,760 hours/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 1.50

4.4.1.6 Coal Combustion Products (CCP) Disposal Area

The following text is excerpted from Section 5.4 of Appendix 5, Air Pollution Emissions Details and Summary, of the PSD Application (ENSR 2006a):

> As currently proposed, CCP, consisting of fly ash, bottom ash, FGD by-product (gypsum), and spent activated carbon (if used), will either be sold to potential end users or disposed at an onsite landfill, which will be specifically developed for [the project]. The projected emissions from the landfill activities are included in the modeling effort. As calculations in Attachment 5-A show, with the high moisture content (50 percent) and the local meteorological conditions, the maximum hourly emissions from the truck unloading operations are 0.0004 pounds/hour and 0.002 tons/year; [Attachment 5-A refers to the PSD Application and can be found within the Administrative Record]. The emissions from bulldozing at the landfill are based on 12 hours per day and 3,120 hours per year of bulldozer operation and a lower moisture content (27 percent) than the delivered CCP, giving a PM_{10} emission rate of 1.33 lbs/hour and 2.07 tpy.
>
> The emissions from wind erosion of the active CCP landfill cell were calculated based on a guidance document produced by the Mojave Desert Air Quality Management District (2000), which is based on a derivation of AP-42, Chapter 13.2.5, *Industrial Wind Erosion*. An emission factor of 9.44 tons/acre-year for PM_{10} was developed using conservative assumptions and an estimated active CCP cell acreage. These assumptions, which can be found in detail on the emissions calculation sheet for CCP pile wind erosion in Attachment 5-A, include silt loading (80 percent), days with precipitation (30 days), and frequency of windy hours (12.0 percent). On the active CCP pile, a control efficiency of 75 percent for PM_{10} has been assumed to take account for wet suppression of the CCP pile; [Attachment 5-A refers to the PSD Application and can be found within the Administrative Record]. Since the CCP materials are saturated and easily form a crust surface, there are negligible emissions from wind erosion from inactive areas of the CCP landfill. Roadways leading up to the central area of the landfill will be paved, and also will be controlled with water sprays. The roadway emissions are accounted for in the onsite paved roadway emissions as discussed in Section 5.9.

4.4.1.7 Vehicle Traffic On Roads

The following text is excerpted from Section 5.9 of Appendix 5, Air Pollution Emissions Details and Summary, of the PSD Application (ENSR 2006a):

> Raw materials and CCP may arrive and depart to the site by either railcar or truck. Dust emissions were estimated from the paved roadways that may be used by activated carbon supply trucks, NH_3 supply trucks, Quicklime and Quicklime supply trucks, chemical delivery trucks, fuel oil supply trucks, and trucks transporting CCP off-site. Emissions from the paved roads were calculated based on an emission factor developed from Equation 2 in AP-42, Chapter 13.2.1, *Paved Roads*. Maximum daily and annual truck deliveries for each material are summarized in [Table D-16]. Detailed calculations are provided in Attachment 5A; [Attachment 5-A refers to the PSD Application and can be found within the Administrative Record]. This table provides

conservative estimates of emissions, since the CCP may be transported off site by rail; however, this application includes an allowance for CCP transport over paved roadways. This "allowance" incorporates a conservative assumption that all CCP would be transported via paved roadway.

Table D-16
Annual and Daily Haul Trips

Material	Maximum Annual (truckloads/year)[1]	Maximum Daily (truckloads/day)	Basis
Activated carbon	180	2.0	Delivery for 3-day weekend
Ammonia (NH_3)	237	0.65	Delivery for 3-day weekend
Fuel Oil[2]	50	5.0	Delivery required to fill fuel oil tank half-full
Quicklime	9996	27.4	Delivery for 3-day weekend
Coal combustible product (CCP)	4838	13.3	115 percent of average daily delivery
Miscellaneous chemicals	350	15.0	
Totals	15,651	62	

SOURCE: ENSR Corporation 2006b
NOTES:
1 Based on annual material usage/waste production assuming worst-case coal for that material/waste.
2 Annual fuel oil usage is based two auxiliary boilers for 550 hours per year, and the fire-water pump engine and emergency generator for 100 hours per year, and fuel deliveries for maximum CCP hauling operations. Also included is the maximum amount of fuel oil to be used during boiler startups in a year.

A one-way trip distance of 1.0 mile [1.6 kilometers] was used for emission calculation purposes. With a maximum of 62 round trips per day, this leads to a maximum of approximately 124 vehicle miles traveled (VMT) per day and 31,302 miles per year [50,375 kilometers per year]. A control efficiency of 75 percent for PM10 has been accounted for periodic watering of the paved haul roads when necessary. Based on climatological data, the number of annual days of precipitation was set to 30. A detailed breakdown of emission calculations is found in the supporting documentation included at the end of this appendix. The emission calculations identify different truck weights for delivery of each material, and different emission factors (lbs/VMT) for each group of trucks. The overall summary of emission rates is shown below.

PM_{10} Emissions from Paved Haul Roads
E_{PM10} (pounds/hour) = (pounds/VMT) * (VMT/day) / (24 hours/day)
E_{PM10} (pounds/hour) = 1.16
E_{PM10} (tpy) = (pounds/VMT) * (VMT/year) / (2,000 pounds/ton)
E_{PM10} (tpy) = 3.79

Vehicle Tailpipe Emissions – Based on the total VMT described above and assuming the emission factors for 400 horsepower diesel trucks (5-15 ton vehicles), and an average vehicle speed of 15 miles per hour (mph) the total hours of operation per year is 2,087. Total tail pipe emissions are estimated as follows:

2,087 hours * 5-15 ton truck emission factor (determined is Table D-9) = emissions in grams per year

Therefore, the annual tailpipe emissions (in tons per year) for haul trucks would be:

NO_x = 5.31
CO = 1.93
SO_2 = 0.0046
VOC = 0.20
PM_{10} = 0.20

4.4.1.8 Emissions from Power Plant Operations

This subsection identifies the air pollutant emissions associated with operation of the proposed power plant, including vehicular emissions associated with employee commuting vehicles.

Criteria Pollutants Emission Estimates from PSD Permit Application

The proposed project will include one PC, supercritical boiler and a steam-turbine generator capable of generating 750 MW (gross) of electric power. Major systems include power generating and transmission, material handling, heat rejection (cooling), and air emissions control. Air-pollution emissions would result from the operation of the following: one coal-fired boiler, two fuel oil-fired auxiliary boilers, one emergency generator, one fire-water pump engine, onsite locomotives, fuel oil storage tanks, and other various material handling emissions.

Criteria air pollutant emission rates were obtained from the PSD application (ENSR 2006a). Table D-17 and Table D-18 present a summary of maximum potential-to-emit (PTE) criteria air pollutant emission rates from the proposed power plant. These emission rates are based on the conservative assumption that both generating units of the plant will operate for 8,760 hours each year, at full-load operation. Based on these potential-to-emit values, the proposed power plant will be a major source, as defined under federal New Source Review (NSR) regulations, codified at 40 CFR §51., for PM_{10}, NO_x, SO_2, CO, O_3 (NO_x and VOC emissions) and lead. Accordingly, the PSD permit application must identify BACT requirements, and address the ambient air quality impacts for each of these criteria pollutants. $PM_{2.5}$ emissions were estimated to be 83.7 percent of PM_{10} emissions. Emissions of NH_3 and $PM_{2.5}$ were not quantified in the PSD application.

Carbon Dioxide Emissions

Combustion of biomass and all fossil fuels (coal, coke, petroleum and natural gas) result in emissions of CO_2. CO_2 is widely considered to be a “greenhouse gas” (GHG). Greenhouse gases, which also include water vapor, methane, nitrous oxides, chlorofluorocarbons and other chemicals, play a natural role in maintaining the temperature of the earth’s atmosphere, by allowing some sunlight to pass through and heat the surface of the earth and then absorbing a portion of the infrared heat reflected or transmitted to the ground. Natural sources of GHG include volcanic eruptions, plant respiration and decomposition of organic matter.

Carbon dioxide forms when one atom of carbon unites with two atoms of oxygen, either during combustion or in the atmosphere after being emitted from the stack. Because the atomic weight of carbon is 12 and oxygen is 16, the atomic weight of carbon dioxide is 44. Based on that ratio and a 99 percent fraction of fuel oxidized during combustion 72.6 pounds of carbon dioxide for every percent-ton of carbon as shown by the following equation.

$$(44 \text{ ton } CO_2 / 12 \text{ ton C}) * 0.99 * 2000 (\text{lb } CO_2 / \text{ton } CO_2) * 1/100\% = 72.6 \text{ lb } (CO_2 / \text{ton } \%C)$$

Table D-17
Maximum Hourly Criteria Pollutant Emissions Summary

Unit ID	Source	NO_X	CO	SO_2	VOC	PM_{10}	Pb
		(pounds/hour)					
S2.001	Main boiler	363.0	604.8	308.4	18.3	181.5	1.21
S2.002	Auxiliary boiler #1	8.64	3.15	0.14	0.21	2.08	7.8E-04
S2.003	Auxiliary boiler #2	8.64	3.15	0.14	0.21	2.08	7.8E-04
S2.004	Emergency generator engine	15.68	8.49	0.36	(1)	0.49	1.1E-04
S2.005	Fire-water pump engine	1.88	1.63	0.004	(1)	0.09	2.2E-05
S2.006	Coal transfer building	--	--	--	--	0.38	--
S2.007	Coal crushing building	--	--	--	--	0.38	--
S2.008	Coal transfers to tripper deck silos	--	--	--	--	0.50	--
S2.009	Bottom ash storage silo vents	--	--	--	--	0.60	--
S2.010	Fly ash storage silo vents	--	--	--	--	0.60	--
S2.011	FGD byproduct/gypsum storage silo vents	--	--	--	--	0.60	--
S2.012	Quicklime storage silo vents	--	--	--	--	0.68	--
S2.013	Activated carbon storage silo	--	--	--	--	0.34	--
S2.014	Fuel storage tank (1,060,000 gallons)	--	--	--	0.06	--	--
PF.001	Railcar unloading	--	--	--	--	0.11	--
PF.002	Coal yard conveying	--	--	--	--	0.18	--
PF.003	Coal yard stackout operations	--	--	--	--	0.18	--
PF.004	Coal storage pile – wind erosion	--	--	--	--	1.06	--
PF.005	Coal storage bulldozing	--	--	--	--	1.38	--
PF.006	Paved haul roads	--	--	--	--	1.16	--
PF.007	Onsite locomotive engine	4.30	1.03	0.14	0.40	0.13	Neg.
PF.008	CCP landfill bulldozing	--	--	--	--	1.33	--
PF.009	CCP landfill truck drop	--	--	--	--	0.0004	--
PF.009	CCP landfill – active cell wind erosion	--	--	--	--	10.77	--

SOURCE: ENSR Corporation 2006a, 2007a

NOTES: Emissions standards for these engines are based upon U.S. Environmental Protection Agency Tier standards, which are based on a combination of NO_X + non-methane hydrocarbon; therefore, VOC emissions have been included in NO_X total emissions to produce a conservatively NO_X emission rate.

NOx = nitrogen oxides
CO = carbon monoxide
SO2 = sulfur dioxide
VOC = volatile organic compounds
PM_{10} = particulate matter equal or less than 10 micrometers
Pb = lead
FGD = flue gas desulphurization
Neg. = negligible
CCP = coal combustion products

Table D-18
Maximum Annual Criteria Pollutant Emissions Summary

Unit ID	Source	NO_X	CO	SO_2	VOC	PM_{10}	Pb
		(ton/year)					
S2.001	Main boiler	1,590.0	2649.0	1,351.0	80.0	795.0	5.30
S2.002	Auxiliary boiler #1	2.38	0.87	0.04	0.06	0.57	0.00021
S2.003	Auxiliary boiler #2	2.38	0.87	0.04	0.06	0.57	0.00021
S2.004	Emergency generator engine	0.78	0.42	0.018	(1)	0.02	0.0000057
S2.005	Fire-water pump engine	0.09	0.08	0.0002	(1)	0.005	0.0000011
S2.006	Coal transfer building	--	--	--	--	1.66	--
S2.007	Coal crushing building	--	--	--	--	1.66	--
S2.008	Coal transfers to tripper deck silos	--	--	--	--	2.19	--
S2.009	Bottom ash storage silo vents	--	--	--	--	2.62	--
S2.010	Fly ash storage silo vents	--	--	--	--	2.62	--
S2.011	FGD byproduct/gypsum storage silo vents	--	--	--	--	2.62	--
S2.012	Quicklime storage silo vents	--	--	--	--	3.0	--
S2.013	Activated carbon storage silo	--	--	--	--	1.50	--
S2.014	Fuel storage tank (1,060,000 gallons)	--	--	--	0.27	--	--
PF.001	Railcar unloading	--	--	--	--	0.03	--
PF.002	Coal yard conveying	--	--	--	--	0.05	--
PF.003	Coal yard stackout operations	--	--	--	--	0.05	--
PF.004	Coal storage pile – wind erosion	--	--	--	--	4.63	--
PF.005	Coal storage bulldozing	--	--	--	--	2.59	--
PF.006	Paved haul roads	--	--	--	--	3.79	--
PF.007	Onsite locomotive engine	18.85	4.53	0.61	1.75	0.59	Neg.
PF.008	CCP landfill bulldozing	--	--	--	--	2.07	--
PF.009	CCP landfill truck drop	--	--	--	--	0.002	--
PF.009	CCP landfill – active cell wind erosion	--	--	--	--	47.18	--
	Totals	1,614	2,656	1,352	82	875	5.3

SOURCE: ENSR Corporation 2006a, 2007a

NOTES: Emissions standards for these engines are based upon U.S. Environmental Protection Agency Tier standards, which are based on a combination of NO_X + non-methane hydrocarbon; therefore, VOC emissions have been included in NO_X total emissions to produce a conservatively NO_X emission rate.

CO = Carbon Monoxide
CCP = coal combustion products
FGD = flue gas desulphurization
Neg. = negligible
NO_x = nitrogen oxides
Pb = lead
PM_{10} = particulate matter equal or less than 10 micrometers
SO_2 = sulfur dioxide
VOC = volatile organic compounds

Carbon Dioxide emissions due to coal combustion were estimated using Table 1.1-20 *Default CO_2 Emission Factors for U.S. Coals* of EPA, AP-42, Volume I, Fifth Edition, Chapter 1: External Combustion Sources - Bituminous And Sub-bituminous Coal Combustion 9/98 (EPA 1998). The proposed project would combust sub-bituminous coal, which is assumed to have an average carbon content of 66.3 percent (EPA 1998). Therefore, the CO_2 emission factor for sub-bituminous coal is 4,813.4 pounds of CO_2 per ton of coal. The Proposed-Action Alternative (750 MW plant) is assumed to combust a maximum of 2,944,000 tons of coal per year. Multiplying the total coal combustion (in tpy) times a 95 percent correction factor and times the CO_2 emission factor (4,813.4 l CO_2 /ton coal) results in an estimated annual carbon dioxide emission total of 7.08 million tpy.

NH_3 Emissions

When SCR is used to control NO_x emissions, a small portion of the injected reagent (NH_3) does not get reacted and remains in the flue gas. Although NH_3 is not listed as a Federal HAP, it is regulated as an Extremely Hazardous Substance under Sections 302, 304 and 313 of the Federal Emergency Planning and Community Right-to-Know Act and must be reported annually under the Toxic Release Inventory (TRI) requirements. In addition, NH_3 is regulated by the Process Safety Management (PSM) requirements under Occupational Safety and Health Administration and the Risk Management Program requirements under Section 112(r) of the Federal Clean Air Act. Most of the excess reagent used is consumed through various chemical reactions within the SCR equipment. However, a small portion remains in the flue gas and is emitted to the atmosphere as "NH_3 slip." A number of factors can affect NH_3 slip, including reaction temperature, residence time, degree of mixing, and molar ratio of NH_3. The EPA document *Emission Inventory Improvement Program - Estimating Ammonia Emissions from Anthropogenic Nonagricultural Sources* (EPA 2004a) provides recommended emission factors for calculating NH_3 emissions based on tons of coal combusted. For coal-fired boilers constructed since 1997, the document prescribes a maximum NH_3 slip emission factor of 0.08 pounds NH_3 per ton of coal, which is based on a 5 ppmv NH_3 slip.

Multiplying the average annual coal combustion of 2,944,000 tpy (with a 95 percent correction factor) by the NH_3 emission factor (0.08 lb NH_3 / ton coal) results in a maximum annual NH_3 emissions rate of 117.8 tons for the Proposed Alternative.

4.4.1.9 Hazardous Air Pollutants

A summary of predicted HAPs emitted by the Toquop Energy Project during operation of the coal-fired boiler, auxiliary boilers, emergency generator engine and fire-water pump engine is presented in Table D-19. Mercury emissions would be controlled to meet the final Mercury New Source Performance Standard (NSPS) for new, sub-bituminous coal-fired boilers utilizing wet scrubbers, which is 0.042 lbs/GW-hr gross output.

The data show that the total emissions are above the major source threshold for HAPs, but since the source category has been removed from the Clean Air Act Section 112(c) list, the case-by-case review under Maximum Achievable Control Technology is not required.

Table D-19
Hazardous Air Pollutant Summary

Emissions Unit	Total HAPs (tpy)	Maximum Individual HAP (tpy)
Main boiler	87.10	50.59 (Hydrogen Chloride)
Auxiliary boilers	5.3E-02	4.2E-02 (Formaldehyde)
Emergency generator	1.2E-03	4.9E-04 (Benzene)
Diesel fire pump	7.6E-04	3.1E-04 (Propylene)
Totals	87.1	50.6 (Hydrogen Chloride)

SOURCE: ENSR Corporation 2006a
NOTES: HAP = hazardous air pollutant
tpy = tons per year

4.4.1.10 Vehicle Emissions Associated with Power Plant Operations

Table D-20 summarizes the predicted maximum annual tailpipe emissions resulting from power plant employees commuting to work. The overly conservative estimation technique is discussed in Section 4.

4.5 Predicted Ambient Air Quality Impacts

Pursuant to the PSD permitting process, ENSR performed a series of American Meteorological Society/U.S. Environmental Protection Agency Regulatory Model (AERMOD) modeling exercises to evaluate the ambient air quality impacts in Class II areas (near-field receptors within and outside Lincoln County, Nevada) including predicted near-field pollutant concentrations and distant Class II special consideration area pollutant concentrations, and CALPUFF to evaluate air quality impacts in five Class I areas within 186 miles (300 km).

4.5.1 Class II Area Impacts

This section presents the results of the PSD Class II modeling analysis prepared by ENSR for the Proposed Action Alternative. The analysis modeled project emissions from the main stack emissions from the 750-MW pulverized coal-fired boiler, as well as emissions from the following sources: two auxiliary boilers, one emergency generator, one fire water pumps, material handling sources, and emissions from road traffic.

The AERMOD model was used to predict the project impacts in PSD Class II areas, using an on-site meteorological data monitoring program, which has been set up at the southeast corner of the proposed site. Modeling domains and receptor networks appropriate for the Class II analysis were employed.

In the context of the Prevention of Significant Deterioration (PSD) permitting requirements, a PSD increment evaluation and NAAQS Evaluation were conducted to assess potential cumulative impacts on air quality. The PSD increment evaluation is used to estimate the degradation of air quality caused by construction of manmade sources of air pollution after certain baseline dates. The NAAQS evaluation, which includes background pollutant concentrations, is used to estimate the total impacts of all natural and anthropogenic sources of air pollution on air quality as compared to the pollutant concentrations at which human health or the environment could be impacted.

Table D-20 is a list of the permitted major sources included by ENSR in the PSD cumulative impact analysis.

Table D-20
Background Sources Included in the Cumulative Modeling Analysis

Facility Name	Facility Type	Location
Royal Cement Company	Cement plant	Logandale, Nevada
Nevada Power Company Reid Gardner Station	Coal-fired electric generating station	Moapa, Nevada
Western Mining and Materials	Crushing and screening plant	Black Rock, Arizona
Simplot Silica Products	Silica sand production	Overton, Nevada
Casablanca/Oasis Casino	Hotel and casino	Mesquite, Nevada
Rinker Materials Moapa Facility	Cement plant	Moapa, Nevada
Precision Aggregates	Sand and gravel yard	Mesquite, Nevada
Lasco Bathware	Plumbing products manufacturer	Moapa, Nevada
Legacy Rock	Sand and gravel yard	Logandale, Nevada
BLM Moapa Decorative Rock Pit	Sand and gravel yard	Logandale, Nevada
Sunroc Corp Bunkerville Ready Mix	Cement plant	Bunkerville, Nevada
Ready Mix, Inc.	Cement plant	Las Vegas, Nevada
Geneva Pipe of Nevada	Concrete pipe manufacturer	Moapa, Nevada
General Rock Products	Sand and gravel yard	Las Vegas, Nevada

SOURCE: ENSR Corporation 2007a
NOTE: BLM = Bureau of Land Management

Table D-21
Summary of Vehicle Emissions from Permanent Work Force

	Quantity [1]	Fuel	Average Engine Power (hp)	Unit of Emission Factors	Emission Factors (EF) [2]					Maximum Annual Emissions (tpy) [3]				
					VOC	CO	NO_x	PM_{10}	SO_2	VOC	CO	NO_x	PM_{10}	SO_2
Vehicle	110	Gasoline	200	g/mile	4.72	46.06	2.41	0.093	0.113	7.4	72.6	3.8	1.5	0.2

SOURCE: URS Corporation emissions calculations 2006

NOTES:

1. Each of the total estimated 110 full-time employees is assumed to work 5 days per week (260 days per year). Each employee is assumed to drive his or her own gasoline powered vehicle to and from work each day.
2. Emission factors for pickup trucks and crew cab were obtained from MOBILE5 run based on national averaged fleet conditions, at a speed of 15 miles per hour and an ambient temperature of 60 degrees Fahrenheit (^oF).
3. Annual emissions for pickup trucks and crew cabs were calculated based on a traveling distance of 50 miles/day for 260 days/year, as follows: TPY= 200 * (EF * 50 miles/day * 260 days/year) / (454 grams/pound * 2000 pounds/ton)

hp = horesepower
VOC = volatile organic compounds
CO = carbon monoxide
NO_x = nitrogen oxides
PM_{10} = particulate matter with aerodynamic diameter less than or equal to 10 micrometers
SO_2 = sulfur dioxide

The results of the modeling analysis are summarized as follows (ENSR 2006a):

- The proposed project impacts would be above PSD Class II significance levels for a limited area around the facility (about 1.8 km for the 3-hourSO_2, 0.6 km for annual NO_2, and 1.0 km for short term (24-hour) and annual PM_{10}). The project would have insignificant impacts for CO (1 and 8 hour), SO_2 (24 hour and annual) and Pb.
- The PSD application estimated $PM_{2.5}$ emissions as comprising 83.7 percent of PM_{10}. Since the maximum 24-hour and annual modeled ambient PM_{10} concentrations are less than the corresponding NAAQS for $PM_{2.5}$, compliance with the NAAQS for $PM_{2.5}$ is assured.
- Currently there are no other major sources of criteria pollutants near the proposed plant site so the proposed plant should be representative of the area.
- The peak air quality impacts from the facility are located very close to the fenceline (within about 1 km in most cases). These impacts are likely due to the emergency generator, auxiliary boilers and/or on-site locomotives that do not run continuously.
- The PSD increment consumption due to the facility emissions is well within PSD Class II increments. The modeling analysis for the proposed project shows compliance with PSD Class II increments and the NAAQS.
- The NO_2 annual impact is 19% of the PSD increment and is located approximately 0.6 km from the main stack. The SO_2 3-hour impact is 6% of the PSD increment and is located approximately 5.7 km from the main stack. The PM_{10} 24-hour and annual impacts are 48% and 22% of the PSD increments, respectively, and are located about 1 km of the main stack.
- The NO_2 annual impact is 5% of the NAAQS and located about 0.6 km from the main stack. The SO_2 3-hour impact is 2% of the NAAQS and is located 5.7 km from the main stack. The PM_{10} 24-hour impact is 10% of the NAAQS and is located about 1 km of the main stack. Note that the EPA revoked the annual PM_{10} standard effective December 17, 2006.
- The results of the additional impacts analysis indicate no predicted impacts above screening levels for soils and vegetation.

In conclusion, the potential effects on air quality due to emissions from the proposed project facility, in conjunction with nearby area source emissions, are expected to result in predicted concentrations in Class II areas that are in compliance with PSD and NAAQS limits. Therefore, the air quality impacts are minor as defined in Section 4.7.1 above.

Table D-22 summarizes the predicted ambient air quality impacts of the power plant, based on the AERMOD modeling results. The maximum predicted ambient concentrations for SO_2 (24-hour and annual) and CO (1-hour and 8-hour) are below the Significant Impact Level (SIL) for those pollutants. In accordance with the EPA document *Guideline on Air Quality Models* (EPA 1999), no further analysis of these pollutants (i.e. Class I impacts and increment consumption), for the specified averaging times, is required under the PSD regulations. The maximum predicted ambient concentrations for NO_x (annual), SO_2 (3-hour) and PM_{10} (24-hour and annual) are above the corresponding SIL. There are no promulgated SILs for lead. None of the predicted maximum ambient pollutant concentrations exceeded the corresponding PSD Class II degradation increment or the NAAQS.

Table D-23 summarizes the predicted ambient air quality impacts of the power plant on the Lake Mead National Recreation Area (NRA), based on the CALPUFF modeling results. The maximum predicted ambient concentrations for SO_2 (3-hour, 24-hour and annual), PM_{10} (24-hour and annual) and NO_2 (annual) are below the Class II Significance Impact Level (SIL) for those pollutants. Therefore, no additional modeling for PSD increment consumption is required for Lake Mead NRA.

Table D-22
Maximum Predicted Air Quality Impacts from the Proposed Project

Pollutant	Averaging Period	Maximum Modeled Conc. (µg/m^3)	Distance km (mi)	Bearing (degrees)	SIL (µg/m^3)	% of SIL	PSD Class II Increment (µg/m^3)	% of Increase	NAAQS (µg/m^3)	% of Ambient Standard
NO_2	Annual	**4.758**	0.6 km (0.4 mi)	193	1	476%	25	19%	100	5%
SO_2	3 hour	**30.505**	5.7 km (3.5 mi)	279	25	122%	512	6%	1,300	2%
	24 hour	3.193	5.7 km (3.5 mi)	279	5	64%	91	4%	365	1%
	Annual	0.413	9.6 km (6.0 mi)	19	1	41%	20	2%	80	1%
PM_{10}	24 hour	**14.450**	1.0 km (0.6 mi)	80	5	289%	30	48%	150	10%
	Annual	**3.722**	0.6 km (0.4 mi)	193	1	372%	17	22%	Revoked	NA
CO	1 hour	107.480	5.7 km (3.5 mi)	279	2,000	5%	N/A	N/A	40,000	0.3%
	8 hour	28.951	0.6 km (0.4 mi)	200	500	6%	N/A	N/A	10,000	0.3%
Pb	Quarterly	0.011	5.7 km (3.5 mi)	279	N/A	N/A	N/A	N/A	1.5	1%

SOURCE: ENSR Corporation 2007a
NOTES: µg/m^3 = micrograms per cubic meter
km = kilometer
mi = mile(s)
SIL = Significant Impact Level
PSD = Prevention of Significant Deterioration
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
SO_2 = sulfur dioxide
PM_{10} = particulate matter equal to or less than 10 microns in diameter
CO = carbon monoxide
Pb = lead
N/A = not applicable

Table D-23
Lake Mead National Recreation Area (Class II) PSD Increment
CALPUFF Modeling Results (2003-2005)

Pollutant	Class I Area	Average Period	Maximum Modeled Concentrations (µg/m^3)			Class II SIL	PSD Class II Increment
			2003	2004	2005	(µg/m^3)	(µg/m^3)
SO_2	Lake Mead NRA [1]	3-hr [2]	2.681	2.569	3.092	25.0	512
		24-hr	0.699	0.891	0.844	5.0	91
		Annual [3]	0.045	0.059	0.052	1.0	20
PM_{10}	Lake Mead NRA [1]	24-hr	0.374	0.459	0.469	5.0	30
		Annual	0.033	0.042	0.037	1.0	17
NO_2	Lake Mead NRA [1]	Annual	0.039	0.057	0.045	1.0	25

SOURCE: ENSR Corporation 2007d
NOTES: [1] Impacts assessed on the 2-kilometer meteorological and computational grid.
[2] 3-hour SO_2 concentrations reflect a 483.8 pounds/hour SO_2 limit.
[3] Annual SO_2 concentrations reflect 1,351 tons per year SO_2 limit.
µg/m^3 = micrograms per cubic meter
PSD = Prevention of Significant Deterioration
SIL = Significant Impact Level
NRA = National Recreation Area
SO_2 = sulfur dioxide
PM_{10} = particulate matter equal to or less than 10 microns in diameter
NO_2 = nitrogen dioxide

4.5.1.1 Class I Area Impacts

Dispersion modeling of the air quality impacts of the proposed project, using CALPUFF, has been completed for PSD Class I areas. The results are summarized below.

- The project impacts are below PSD significance levels and therefore would have an insignificant impact on SO_2, NO_2 and PM_{10} increments.
- The project's impact is a small fraction of the total PSD increment. The cumulative analysis shows that the proposed project would not cause or contribute to a PSD Class I increment violation, and that no Class I increment violations are predicted in the areas modeled.
- The project's impacts at all modeled Class I areas were below the deposition analysis thresholds (DAT) for sulfur and nitrogen deposition. The annual predicted impact of sulfur and nitrogen depositions are conservative because a 100 percent annual capacity factor is assumed in the emission portion of the model. Lake Mead NRA results are provided for informational purposes only as Sensitive Class II areas are not held to the 0.005 kilogram per hectare per year Class I DAT change in extinction significant threshold.
- The project's impacts on regional haze would be below the significance threshold of 5 percent change to background extinction with the use of the FLAG screening procedures and Method 2. The Method 6 results with P-G coefficients indicate that the 98 percentile of regional haze impacts are well below the 5 percent change in extinction. Therefore, the project does not have a significant regional haze impact. Lake Mead NRA results are provided for informational purposes only as Sensitive Class II areas are not held to the 5 percent change in extinction significant threshold.

Table D-24 presents the maximum predicted ambient concentrations of NO_2, SO_2 and PM_{10} within 5 Class I areas (located within 300 km of the project site) during the calendar years 2003, 2004 and 2005. The modeling results indicate that the proposed project has insignificant impacts on SO_2, PM_{10} and NO_2 Additionally, no Class I increment violations are predicted in the areas modeled.

4.5.1.2 Visibility and Regional Haze

Regional haze modeling was conducted using CALPUFF for Bryce Canyon, Capitol Reef, Grand Canyon, and Zion National Parks, and for the Sycamore Canyon Wilderness. Table D-25 presents the regional haze modeling results, using FLAG guidance, for calendar years 2003, 2004 and 2005. The modeling results using Method 6 (MVISBK=6) have no days above a 5 percent change in extinction at any Class I area during any year. Table D-26 presents the regional haze modeling results, showing that at the 98^{th} percentile the regional haze impacts are well below the threshold 5 percent change in extinction. This result is further evidence that the proposed project will not have an adverse impact on regional haze. Sensitive Class II areas are not held to the same 5 percent change in extinction significant threshold. Therefore the results for Lake Mead NRA are provided for informational purposes.

Table D-24
Class I Area PSD Increment CALPUFF Modeling Results (2003-2005)

Pollutant	Class I Area	Average Period	Maximum Modeled Concentrations (μg/m^3) 2003	2004	2005	Class I SIL (μg/m^3)	PSD Class I Increment (μg/m^3)
SO_2	Capitol Reef National Park[1]	3-hour [3]	0.160	0.128	0.124	1.0	25
		24-hour	0.055	0.022	0.037	0.2	5
		Annual [4]	0.002	0.001	0.001	0.1	2
SO_2	Sycamore Canyon Wilderness[1]	3-hour [3]	0.104	0.075	0.096	1.0	25
		24-hour	0.019	0.014	0.016	0.2	5
		Annual [4]	0.001	0.0005	0.001	0.1	2
SO_2	Bryce Canyon National Park[2]	3-hour [3]	0.161	0.137	0.996	1.0	25
		24-hour	0.035	0.024	0.184	0.2	5
		Annual [4]	0.002	0.002	0.002	0.1	2
SO_2	Grand Canyon National Park [2]	3-hour [3]	0.637	0.858	0.856	1.0	25
		24-hour	0.111	0.161	0.150	0.2	5
		Annual [4]	0.004	0.005	0.004	0.1	2
SO_2	Zion National Park[2]	3-hour [3]	0.574	0.454	0.552	1.0	25
		24-hour	0.093	0.064	0.123	0.2	5
		Annual [4]	0.005	0.004	0.004	0.1	2
PM_{10}	Capitol Reef National Park[1]	24-hour	0.047	0.012	0.031	0.3	8
		Annual	0.002	0.001	0.001	0.2	4
PM_{10}	Sycamore Canyon Wilderness[1]	24-hour	0.013	0.012	0.014	0.3	8
		Annual	0.001	0.0004	0.001	0.2	4
PM_{10}	Bryce Canyon National Park[2]	24-hour	0.025	0.015	0.017	0.3	8
		Annual	0.001	0.001	0.001	0.2	4
PM_{10}	Grand Canyon National Park[2]	24-hour	0.069	0.124	0.079	0.3	8
		Annual	0.003	0.004	0.003	0.2	4
PM_{10}	Zion National Park[2]	24-hour	0.086	0.041	0.075	0.3	8
		Annual	0.004	0.003	0.003	0.2	4
NO_2	Capitol Reef National Park[1]	Annual	0.0003	0.0002	0.0003	0.1	2.5
NO_2	Sycamore Canyon Wilderness[1]	Annual	0.0001	0.00003	0.0001	0.1	2.5
NO_2	Bryce Canyon National Park[2]	Annual	0.0004	0.003	0.001	0.1	2.5
NO_2	Grand Canyon National Park[2]	Annual	0.002	0.002	0.002	0.1	2.5
NO_2	Zion National Park[2]	Annual	0.002	0.001	0.001	0.1	2.5

SOURCE: ENSR Corporation 2007d
NOTES: Results reflect the completed 2-km runs and specific periods for the 500-meter grid that would affect the overall peak impacts.

[1] Impacts assessed on the 2-km meteorological and computational grid.
[2] Impacts assessed on the 500-m meteorological and computational grid.
[3] 3-hour SO_2 concentrations reflect a 483.8 pounds/hour SO_2 limit.
[4] Annual SO_2 concentrations reflect 1,351 tons per year SO_2 limit.

μg/m3 = micrograms per cubic meter
SIL = Significant Impact Level
PSD = Prevention of Significant Deterioration
SO_2 = sulfur dioxide
PM_{10} = particulate matter equal to or less than 10 microns in diameter
NO_2 = nitrogen dioxide

Table D-25
Regional Haze CALPUFF Modeling Results – FLAG (2003-2005)

Class I Area	2003			2004			2005		
	Days > than N% Δ B_{ext}		MAX% Δ B_{ext}	Days > than N% Δ B_{ext}		MAX% Δ B_{ext}	Days > than N% B_{ext}		MAX% Δ B_{ext}
	5%	10%		5%	10%		5%	10%	
MVISBK=2, FLAG Background, 2-km grid									
Capitol Reef NP	0	0	3.04	0	0	1.42	0	0	2.17
Sycamore Canyon W	0	0	1.69	0	0	1.01	0	0	1.22
Lake Mead NRA [1]	27	0	9.83	46	10	14.70	28	5	16.37
MVISBK=2, FLAG Background, 0.5-km grid									
Bryce Canyon NP	0	0	4.03	0	0	0.91	0	0	1.85
Grand Canyon NP	0	0	2.75	0	0	4.33	0	0	3.32
Zion NP	0	0	4.70	0	0	1.95	0	0	4.61

SOURCE: ENSR Corporation 2007d

NOTES: Results reflect the completed 2-km runs and specific periods for the 500-m grid that would affect the overall peak impacts.

[1] Sensitive Class II areas are not held to the 5 percent change in extinction significant threshold. Results are provided for informational purposes.

NP = National Park, W =Wilderness Area, NRA = National Recreational Area

Table D-26
Regional Haze CALPUFF Modeling Results – Method 6 (2003-2005)

Class I Area	2003				2004				2005			
	Days > than N% Δ B_{ext}		MAX% Δ B_{ext}	8th Highest % Δ B_{ext}	Days > than N% Δ B_{ext}		MAX% Δ B_{ext}	8th Highest % Δ B_{ext}	Days > than N% Δ B_{ext}		MAX% Δ B_{ext}	8th Highest % Δ B_{ext}
	5%	10%			5%	10%			5%	10%		
MVISBK=6, 20% Best Natural Background, 2-km grid												
Capitol Reef NP	0	0	3.84	1.01	0	0	1.20	0.63	0	0	3.09	0.84
Sycamore Canyon W	0	0	1.19	0.53	0	0	1.11	0.49	0	0	1.00	0.44
Lake Mead NRA [1]	64	10	14.85	10.68	74	22	18.88	13.55	67	13	19.77	11.34
MVISBK=6, 20% Best Natural Background, 500-m grid												
Bryce Canyon NP	0	0	2.85	0.74	0	0	0.88	0.55	0	0	1.71	0.52
Grand Canyon NP	0	0	3.00	1.82	0	0	3.99	2.49	0	0	2.93	1.96
Zion NP	1	0	5.06	1.97	0	0	2.04	1.50	1	0	5.24	1.37
MVISBK=6, Annual Average Natural Background, 2-km grid												
Capitol Reef NP	0	0	2.97	0.78	0	0	0.93	0.49	0	0	2.39	0.65
Sycamore Canyon W	0	0	0.92	0.41	0	0	0.86	0.38	0	0	0.77	0.34
Lake Mead NRA [1]	42	3	11.50	8.27	52	8	14.62	10.49	43	5	15.31	8.78
MVISBK=6, Annual Average Natural Background, 500-m grid												
Bryce Canyon NP	0	0	2.20	0.58	0	0	0.68	0.43	0	0	1.33	0.40
Grand Canyon NP	0	0	2.32	0.1.41	0	0	3.09	1.93	0	0	1.52	1.5
Zion NP	0	0	3.91	1.52	0	0	1.58	1.16	0	0	4.05	1.06

SOURCE: ENSR Corporation 2007d

NOTES: Results reflect the completed 2-km runs and specific periods for the 500-m grid that would affect the overall peak impacts.

[1] Sensitive Class II areas are not held to the 5 percent change in extinction significant threshold. Results are provided for informational purposes.

km = kilometer, m = meter

NP = National Park, W =Wilderness Area, NRA = National Recreation Area

4.5.1.3 Deposition of Sulfates and Nitrates

Based on the CALPUFF model output files, ENSR prepared a table of predicted deposition rates for sulfates and nitrates, resulting from SO_2 and NO_x emitted by the proposed power plant. Table D-27 summarizes the maximum predicted deposition rates, and predicted locations relative to the main stack, for these chemical species. The modeling results indicate that the Proposed Action Alternative would have impacts below the DAT for sulfur and nitrogen deposition at all Class I areas, except for sulfur deposition at Zion, where the impact is only slightly above the DAT. The annual predicted impacts of sulfur and nitrogen deposition are conservative in the sense that a 100 percent annual capacity factor is assumed in the emission portion of the model input.

Table D-27
Deposition CALPUFF Modeling Results (2003-2005)

Pollutant	Class I Area	Averaging Period	Maximum Modeled Deposition Rate 2003 (kg/ha/yr)	2004 (kg/ha/yr)	2005 (kg/ha/yr)	NPS Class I Deposition Analysis Thresholds (kg/ha/yr)
Sulfur [3]	Capitol Reef NP[1]	Annual	0.0011	0.0012	0.0015	0.005
	Sycamore Canyon W[1]	Annual	0.0005	0.0006	0.0006	0.005
	Bryce Canyon NP[2]	Annual	0.0015	0.0018	0.0016	0.005
	Grand Canyon NP[2]	Annual	0.0012	0.0016	0.0018	0.005
	Zion NP[2]	Annual	0.0044	0.0045	0.0045	0.005
	Lake Mead NRA[1]	Annual	0.0081	0.0116	0.0117	-
Nitrogen	Capitol Reef NP[1]	Annual	0.0007	0.0008	0.0010	0.005
	Sycamore Canyon W[1]	Annual	0.0003	0.0005	0.0004	0.005
	Bryce Canyon NP[2]	Annual	0.0009	0.00011	0.0020	0.005
	Grand Canyon NP[2]	Annual	0.0007	0.00011	0.0010	0.005
	Zion NP[2]	Annual	0.0025	0.0025	0.0024	0.005
	Lake Mead NRA[1]	Annual	0.0057	0.0082	0.0077	-

SOURCE: ENSR Corporation 2007d

NOTES: Results reflect the completed 2-km runs and specific periods for the 500-meter grid that would affect the overall peak impacts. Lake Mead National Recreation Area results are provided for informational purposes.

[1] Impacts assessed on the 2-km meteorological and computational grid.

[2] Impacts assessed on the 500-m meteorological and computational grid.

[3] Annual sulfur deposition rates reflect 1,215 tons per year SO_2 limit.

kg/ha/yr = kilograms per hectare year

NPS = National Park System, NP = National Park, W =Wilderness Area, NRA = National Recreation Area

4.6 <u>Mitigation</u>

4.6.1 For Construction Emissions

Please refer to Section 4.7.2.2 of this document, as the mitigation measures for the Proposed Alternative would be the same as the No-Action Alternative.

4.6.1.1 For Plant Operations

The following text is excerpted from Section 7.1.8 of Appendix 7 (Description of Proposed Project) of the PSD Application. (ENSR 2006a):

Primary Power Plant Air Emissions Control

The air emissions control system for the [proposed project] will be designed to meet BACT requirements, as implemented under the air permitting regulations, to limit emissions. Emissions control will be provided for the main boiler and the coal and material handling systems. The determination of BACT is discussed in Appendix 10. [Appendix 10 refers to the PSD Application and can be found within the Administrative Record.]

The exhaust from the boiler will be treated by controls designed to minimize emission of pollutants to the atmosphere. The exhaust gases will pass through a SCR unit that will use NH_3 and a catalyst to convert NO_X into molecular nitrogen and water vapor. If needed, PAC then would be injected into the gas stream to capture trace amounts of mercury. PAC injection would be followed by a fabric filter, or baghouse, which would capture the reacted PAC and particulate emissions from the flue gas. The system then will route the exhaust gases through a wet scrubber where the flue gas will be passed through a sprayer system with an aqueous solution of saturated calcium oxide (hydrated lime). The chemical reaction between SO_2 in the gas and the calcium in the scrubber slurry will remove sulfur compounds from the flue gases. These systems are described below.

After treatment, boiler flue gases will be routed to a main stack for exhausting to the atmosphere. The following components will be installed to treat flue gases.

- Low-NO_X burners and an SCR system will be used for removal of NO_X from the gases. NO_X is formed during combustion and also is formed from nitrogen compounds in the fuel. The permit application proposed a controlled NO_X emission rate for the main boiler of 0.06 lb/MMBtu. The boiler will be designed to minimize NO_X formation; the exhaust will be treated to further reduce emissions. In the SCR system, a specifically designed catalyst will be installed, and NH_3 will be mixed with the exhaust gas in a ratio that will be adjusted for the NO_X in the flue gas. As the NH_3 and NO_X pass the catalyst, the NO_X will be reacted and reduced to form molecular nitrogen and water vapor. There is some minor amount of unreacted NH_3 "slip" in the exhaust; however, this emission will be minimized through operational controls.
- An activated carbon injection system is included in this application as an option for controlling mercury emissions, especially elemental mercury, in the flue gases. Mercury adsorbs to particles of activated carbon, which are then trapped in the fabric filter and routed to a landfill for disposal. If there are no customers for the fly ash, the existing fabric filter system may be used to capture the spent activated carbon. Alternately, a separate particulate removal device may be used to remove the fly ash prior to the injection of activated carbon. Mercury removal in this system will depend on the total amount of carbon used, flue gas temperature, mercury speciation, flue gas composition, and type and amount of activated carbon used. PAC storage and handling equipment and operations are included in this air permit application, but will not be installed unless required to meet mercury emission limits.
- A fabric filter system will collect particulate matter emissions (fly ash) from the flue gases. Fabric filters are capable of over 99 percent control efficiency. The permit application proposed a controlled PM_{10} emission rate for the main boiler of 0.02 lb/MMBtu, which includes condensables. The system will consist of multiple baghouse compartments, each containing an array of fabric bags that will be used to capture the fly ash as the flue gas passes through the filter bags. Periodically, each compartment will be cleaned by pulsing the bags to dislodge particulates into a fly ash hopper beneath the compartment. Once a

compartment is cleaned, cleaning will proceed to cycle through each remaining compartment. Collected fly ash will be routed from the fly ash hopper to a fly ash silo for storage, and ultimately for shipment offsite. Fly ash will be sold to customers in the concrete industry, or it may be mixed with other CCPs for landfill disposal.

- A FGD wet scrubber system will be installed to control emissions of SO_2 and smaller amounts of acid gases. Wet scrubbers are capable of 80 to 98 percent control efficiency. The wet scrubber at the proposed facility will operate at an approximate control efficiency of 98%. The permit application proposed a controlled SO_2 emission rate for the main boiler of 0.06 lb/MMBtu. SO_2 is formed during combustion from naturally occurring sulfur contained in coal. In the scrubber system, calcium oxide (Quicklime) will be dissolved in water to form scrubber slurry, which will be sprayed into a scrubber chamber. The flue gases will be transported through the chamber and mixed with the scrubber slurry spray. The design of the scrubber chamber will promote the mixing of the small slurry droplets with the flue gases, thereby promoting absorption of the SO_2 from the gas into the slurry spray droplets. The chemical reaction will form calcium sulfate (the basic component of gypsum, which is used in commercial wallboard or sheetrock). The scrubber slurry solution will be recycled in the system unit is reaches saturation. The scrubber slurry will be concentrated, filtered, and the gypsum that is generated will be dewatered for transportation offsite to gypsum customers or for disposal in the CCP landfill.

Support Systems Air Emissions Control

As previously discussed, Quicklime will be delivered to the site by truck or rail car and stored in silos for use in the wet scrubber system. NH_3 will be delivered by rail car or truck and stored in large pressurized storage tanks for feed into the SCR system. If used, activated carbon for the PAC system would be delivered to the site by truck, transferred to a silo for storage, and fed to the exhaust stream for control of mercury emissions in the flue gases.

In addition to the main unit at the power plant, air pollution controls will be applied to other potential sources of emissions. The controlled units will include the materials handling operations for coal, ash, Quicklime, and activated carbon. Emission reduction measures for the auxiliary boiler are discussed in Section 7.1.3, Auxiliary Boilers; [Attachment 5-A refers to the PSD Application and can be found within the Administrative Record].

Fugitive particulate emissions from coal handling will be controlled by selective water or fogging sprays and by baghouses that will be connected to the enclosed handling system. The baghouses will draw air through the coal handling operations and partially enclosed conveyors and capture the particles from that air stream by drawing it through the bag filters. Baghouses will be attached to the transfer house, coal crusher, and tripper conveyor system. Baghouses will be monitored for pressure drop to ensure that the individual bags are not breached or plugged. Material collected from the bag cleaning operations will be fed back into the coal stream and ultimately will be fed to the boiler.

Wet suppression techniques will be applied at several points in the handling of the coal. This technique will involve fogging sprays during coal unloading, and spraying the surface of the coal storage piles with water and surfactants to inhibit the formation of wind-blown dust (fugitive dust) from those piles. Shrouds will be used for all transfer conveyors to eliminate particulate emissions from these operations.

4.7 <u>Summary of Impacts</u>

During construction, both the No-Action and Proposed Alternatives would result in temporary and localized increases in ambient air concentrations of nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with aerodynamic diameter less than 10 microns (PM_{10}), particulate matter with aerodynamic diameter less than 2.5 microns ($PM_{2.5}$) and volatile organic compounds (VOCs) from exhaust emissions of worker vehicles, heavy construction equipment, diesel generators and other machinery and tools. In addition, fugitive dust emissions would result from vehicular travel on unpaved ground surfaces and from excavation and earthmoving activity. The No-Action Alternative is associated with fewer of these types of impacts because it would not require construction of the rail line included under the Proposed Alternative. These impacts would be mitigated through measures such as wet suppression, use of gravel on unpaved surfaces, and travel and speed restrictions.

The operation of the plant under either alternative would cause criteria pollutant emissions. The Proposed Alternative would result in higher emissions of NO_x, SO_2, PM_{10}, CO, and Pb during plant operations. Under both alternatives, none of the maximum predicted impacts from plant emissions would exceed the PSD Class II Increments (the maximum allowable ambient air quality deterioration allowed under the PSD program) or the NAAQS (the pollutant concentrations below which no adverse human health or environmental impacts would occur).

Table D-28 compares the maximum emissions due to construction activities from the No-Action and Proposed Action Alternatives. The emissions of CO, NO_x, and PM_{10} would be greater for the Proposed Action Alternative due to construction of the rail line. The majority of the PM_{10} emissions (~99 percent) would be due to earthmoving. Since these emissions would occur at ground level, it is unlikely that the emissions would be transported more than a few kilometers, except on unusually windy days. In addition, all of these emissions would be temporary, spatially distributed over a large area, and spread out over construction schedules ranging from 6 to 36 months. The mitigation measures would be expected to reduce these impacts.

Table D-29 compares the maximum emissions due to plant operations from the No-Action and Proposed Action Alternatives. Consequently, the total annual emissions of VOC, CO, NO_x, SO_2, and PM_{10} for the No-Action Alternative would be less than estimated for Proposed Action. The Proposed Action would have lower efficiency and higher emissions per unit of power produced.

Table D-28
Comparison of Maximum Pollutant Emissions for the Duration of Construction Activities

Criteria Pollutant	No-Action Alternative (1,100 MW Plant) (tons)	Proposed Action Alternative (750 MW Plant) (tons)
CO	24.7	486.2
NO_x	115.7	1,657.2
SO_2	17.8	1.5
PM_{10}	399.3	1,795.9

SOURCE: URS Corporation calculations (based on Bureau of Land Management 2003a), ENSR Corporation 2006a
NOTE: Construction activities and duration of project elements vary.
MW = megawatt
CO = carbon monoxide
NO_x = nitrogen oxides
SO_2 = sulfur dioxide
PM_{10} = particulate matter equal to or less than 10 microns in diameter

Table D-29
Comparison of Maximum Pollutant Emissions from Plant and Mine Operations

Criteria Pollutant	No-Action Alternative (1,100 MW Plant) (tons)	Proposed Action Alternative (750 MW Plant) (tons)
VOC	79	82
CO	967	2,656
NO_x	356	1,614
SO_2	202	1,352
PM_{10}	435	875
HAPs	19.4	87.1

SOURCE Bureau of Land Management 2003a, ENSR Corporation 2006a
NOTES: MW = megawatt
VOC = volatile organic compounds
CO = carbon monoxide
NO_x = nitrogen oxides
SO2 = sulfur dioxide
PM_{10} = particulate matter equal to or less than 10 microns in diameter
HAP = hazardous air pollutant

The operation of the plant under either alternative would cause criteria pollutant emissions. The Proposed Alternative would result in higher emissions of SO_2, PM_{10}, CO, and Pb during plant operations. However, NO_x emissions would be higher under the No-Action Alternative. Under both alternatives, none of the maximum predicted impacts from plant emissions would exceed the PSD Class II Increments (the maximum allowable ambient air quality deterioration allowed under the PSD program) or the NAAQS (the pollutant concentrations below which no adverse human health or environmental impacts would occur).

Under the Proposed Alternative, carbon dioxide emissions are predicted to total about 7 million tons per year and NH_3 emissions would reach a maximum rate of just under 118 tons annually. In addition, locomotive rail travel would emit criteria pollutants. Controls for mercury emissions are part of the Proposed Alternative project. Fugitive particulate emissions from coal handling would be controlled by wet suppression and by baghouses that would be connected to the enclosed handling system.

Potential impacts on regional haze or visibility were evaluated. Modeling efforts concluded that the No-Action Alternative would result in a 3.5 percent change in atmospheric light extinction, which is below the threshold of 5 percent at which a significant adverse impact would be recognized. Under the Proposed Alternative, impacts on regional haze also would be below the 5 percent threshold. Additional modeling for SO_2 will be performed at Zion and Grand Canyon National Parks.