# Appendix J

# Air Quality Assessment Technical Support Document

# Canyons of the Ancients National Monument Resource Management Plan and Environmental Impact Statement

## Air Quality Assessment Technical Support Document

## DRAFT

Prepared for

Bureau of Land Management
Canyons of the Ancients National Monument
Dolores, Colorado

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AAQS | Ambient Air Quality Standard |
| AEGL | Acute Exposure Guideline Level |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| AQRV | Air Quality Related Value |
| BACT | Best Achievable Control Technology |
| bbls | barrels |
| bscf | billion standard cubic feet |
| BLM | Bureau of Land Management |
| CFR | Code of Federal Regulations |
| CDPHE | Colorado Department of Public Health and Environment-Air Pollution Control Division |
| CO | carbon monoxide |
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| FLAG | Federal Land Managers Air Quality Related Values Workgroup |
| FLM | Federal Land Managers |
| GRI | Gas Research Institute |
| HAP | hazardous air pollutant |
| IDLH | immediately dangerous to life or health |
| IWAQM | Interagency Workgroup on Air Quality Modeling |
| kg/ha/yr | kilograms per hectare per year |
| LAC | level of acceptable change |
| LOP | life of project |
| MEI | maximally exposed individual |
| MLE | most likely exposure |
| mmscf | million standard cubic feet |
| Monument | Canyons of the Ancients National Monument |
| MRL | minimal risk level |
| MVNP | Mesa Verde National Park |
| N | nitrogen |
| NEPA | National Environmental Policy Act |
| NIOSH | National Institute for Occupational Safety and Health |
| NMED | New Mexico Environmental Department |
| $NO_2$ | nitrogen dioxide |
| $NO_3$ | nitrate ion |
| $NO_X$ | oxides of nitrogen |
| NPS | National Park Service |
| NSR | new source review |
| NWS | National Weather Service |
| $O_3$ | ozone |
| Operators | $CO_2$, Oil, and natural gas companies operating in the Monument |
| $PM_{10}$ | particulate matter less than or equal to 10 microns in size |
| $PM_{2.5}$ | particulate matter less than or equal to 2.5 microns in size |
| ppb | parts per billion |
| Project | Canyons of the Ancients National Monument fluid-minerals development |
| Protocol | Air Quality Impact Analysis Protocol |

| | |
|---|---|
| PSD | prevention of significant deterioration |
| QA/QC | quality assurance/quality control |
| RfC | reference concentration |
| RFD | reasonable foreseeable development: oil, natural gas, and carbon dioxide in Canyons of the Ancients National Monument |
| RMP | Resource Management Plan |
| ROD | Record of Decision |
| S | sulfur |
| SILs | significant impact levels |
| $SO_2$ | sulfur dioxide |
| SO4 | sulfate |
| TSD | technical support document |
| UDEQ-AQD | Utah Department of Environmental Quality-Air Quality Division |
| VOC | volatile organic compound |
| $\mu g/m^3$ | micrograms per cubic meter |

# 1.0 INTRODUCTION

Oil, natural gas, and carbon dioxide ($CO_2$) development activities may occur within Canyons of the Ancients National Monument (the Monument) over the next 20 years. The Monument encompasses approximately 165,000 acres of public lands in Montezuma and Dolores Counties, and is located about 90 miles west of Durango, 3 miles west of Cortez and 12 miles west of Mesa Verde National Park (see Figure 1). The BLM has prepared a Reasonable Foreseeable Development: Oil, Natural Gas, and Carbon Dioxide in Canyons of the Ancients National Monument document (RFD) that discusses the potential for fluid-minerals development activities within the Monument.

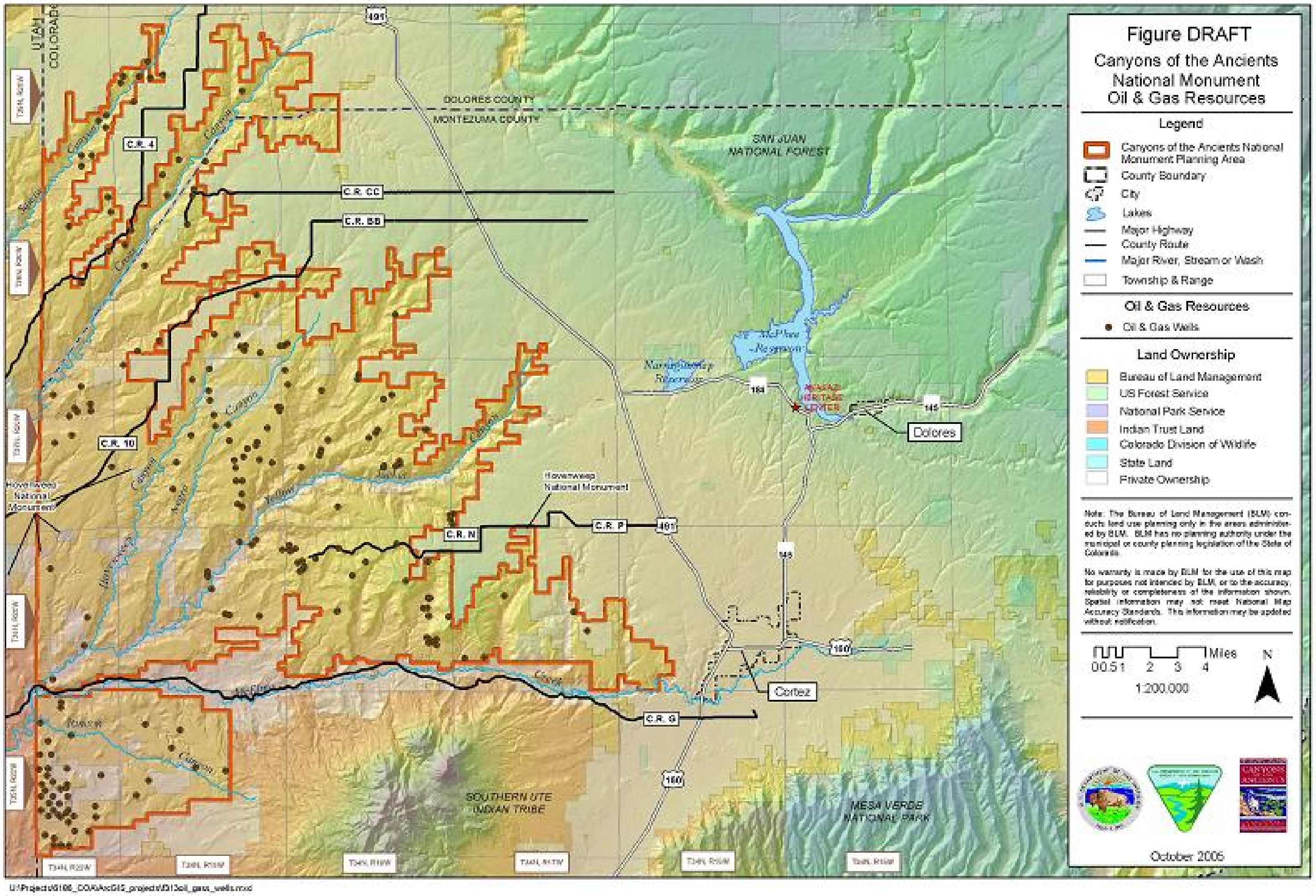
A Draft Resource Management Plan/Draft Environmental Impact Statement (DRMP/DEIS) is being prepared to evaluate alternatives and potential impacts of fluid-minerals development (the Project), including impacts to air quality resources. This document is the Draft Air Quality Assessment Technical Support Document (TSD), and presents the air quality impact analyses. The methodologies used were described in an air quality impact analysis protocol (the Protocol) prepared by Ecology & Environment, Inc. and by RTP Environmental Associates Inc. (2006), with input from the lead agency, U.S. Department of Interior Bureau of Land Management (BLM), and project stakeholders, including the U.S. Environmental Protection Agency (EPA), the National Park Service (NPS), and the Colorado Department of Public Health and Environment (CDPHE). This TSD supplements the Protocol with respect to analysis methodologies and data, as necessary, and presents the findings of the air quality analyses.

## 1.1 Site Description

The Monument is located within the geologic region known as the Paradox Basin. Approximately 81 percent of the Federal minerals within the Monument are leased, with 334 oil, natural gas, and $CO_2$ gas leases. Since the 1940s, 185 oil, natural gas, and $CO_2$ wells have been drilled in the Monument. Economic deposits of oil and natural gas occur in the Ismay and Desert Creek members at depths of about 6,000 feet. Large portions of the Monument are underlain by the largest $CO_2$ gas field in the United States. Monument lands remain open to continued oil and gas development under existing leases.

Total annual oil production in the Monument since 1970 has ranged from 200,000 to 1,200,000 barrels per year (bbls/yr), with 2000-2002 production averaging approximately 200,000 bbls/yr. Total natural gas production has ranged from 600 to 3,400 million cubic feet per year (MMcf/yr), with 2000-2002 production averaging approximately 2,200 MMcf/yr. Total $CO_2$ production since 1987 has ranged from approximately 0.5 to 1.0 billion cubic foot per day (bcf/day) with 2000-2002 production averaging approximately 0.75 bcf/day. There are currently approximately 125 operating wells within the Monument, about half of which are oil and gas wells. Historically, fluid-minerals development has resulted in approximately 1,165 acres of gross surface disturbance. The BLM estimates that 740 acres have been reclaimed, while 425 acres of surface disturbance remains in place. These 425 acres include producing well sites, access roads, and production facilities. The reclaimed areas include wells that have been plugged and abandoned, reclaimed access roads and pipelines, and portions of active well pads that have undergone interim reclamation.

**Figure 1 - Regional Map**




## 1.2 Project Description

For the purposes of this TSD, the RFD estimates that 150 additional wells may be developed in the Monument over the next 20 years, including 69 $CO_2$ wells and 81 oil and natural gas wells. The RFD estimates the potential oil and natural gas reserves that could be developed at up to 23 million bbls of oil and 72 bcf of natural gas. Over a 20 year period, this would result in annual production rates of 1.15 million bbls of oil per year and 3,600 MMcf of natural gas per year. These production rates are equal to the maximum annual production rates that have occurred during the lifetime of the field. $CO_2$ production is expected to increase by 40% over the current maximum annual production rate of 1.0 bcf/day.

The 150 new wells would require approximately 70 miles of new access roads, and 50 miles of new pipeline right-of-way. Gross surface disturbance would be approximately 882 acres for well pads, facilities, roads, and pipelines. The BLM also estimates that up to eight new production facilities will be built within the Monument to treat, store, compress, and transport the produced natural gas and $CO_2$ (four for $CO_2$, four for natural gas). It is important to note that the actual level of future oil and gas development will depend on the alternative selected, the specifics of lease stipulations, and on other protective measures associated with that alternative.

## 1.3 Regulatory Framework for Air Quality Analysis

Federal and State governments have established ambient-air-quality standards for criteria air pollutants, including carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than or equal to 10 microns in size (PM10), particulate matter less than or equal to 2.5 microns in size (PM2.5), ozone, and lead. Ozone is typically not emitted directly from emission sources, but at ground level it is created by a chemical reaction between ozone precursors, including oxides of nitrogen and volatile organic compounds (VOC). Therefore, the U. S. Environmental Protection Agency (EPA) also regulates emissions of VOCs.

The EPA classifies all locations in the United States as either “attainment” (including “unclassified”), “non-attainment”, or “maintenance” areas, with respect to National Ambient Air Quality Standards (NAAQS). These classifications are determined by comparing actual monitored air pollutant concentrations to their applicable Federal standards. Most counties in the Four Corners region are classified as attainment for all pollutants (only a small area around the city of Telluride, CO, is a PM10 Maintenance Area).

Through the Clean Air Act Amendments of 1977, Congress established a system for the prevention of significant deterioration (PSD) in order to protect areas that are not classified as non-attainment (i.e., cleaner than the NAAQS). A “PSD increment” classification system was implemented based on the amounts of additional NO2, particulate matter (PM), and SO2 degradation that would be allowed above existing baseline levels for various areas. A Class I area would have the greatest limitations, where virtually any degradation would be considered unacceptable. A Class II area would permit moderate deterioration and controlled growth. National Parks of more than 6,000 acres, and wilderness areas and memorial parks of more than 5,000 acres were defined as Mandatory Federal Class I areas under the 1977 Amendments. In addition to more stringent ambient air increments, Class I areas are also protected by the regulation of Air Quality Related Values (AQRVs) by the Federal Land Managers (FLMs) responsible for the areas. Typically, two impacts are used by FLMs to assess AQRVs: visibility, and the deposition of acidic species (e.g., nitrogen and sulfur). The mandatory Federal Class I areas closest to the Monument, and approximate distances from the locations in the Monument where development is likely to occur, are:

- Mesa Verde National Park, Colorado (40 kilometers [km]);
- Weminuche Wilderness Area, Colorado (112 km); and
- Canyonlands National Park, Utah (190 km).

The air quality impact analysis described in this TSD has compared the predicted direct and cumulative air impacts of the Project to State ambient air quality standards (AAQS), NAAQS, PSD Class I and II increments, significant impact levels (SILs), and AQRV criteria presented in Table 1.

**Table 1 - Air Quality Standards, Increments, Significant Impact Levels, and AQRV Criteria**

| Pollutant/AQRV | Averaging Interval | EPA Class II SILs (µg/m$^3$) | NAAQS (µg/m$^3$) | Class II PSD Increment (µg/m$^3$) | EPA Proposed Class I SILs (µg/m$^3$) | Class I PSD Increment (µg/m$^3$) | AQRV Thresholds |
|---|---|---|---|---|---|---|---|
| NO2 | Annual | 1 | 100 | 25 | 0.1 | 2.5 | -- |
| $SO_2$ | 3-Hour | 25 | 1300 | 512 | 1.0 | 25 | -- |
| | 24-Hour | 5 | 365 | 91 | 0.2 | 5 | -- |
| | Annual | 1 | 80 | 20 | 0.1 | 2 | -- |
| $PM_{10}$ | 24-Hour | 5 | 150 | 30 | 0.3 | 10 | -- |
| | Annual | 1 | 50 | 17 | 0.2 | 5 | -- |
| $PM_{2.5}$ | 24-Hour | -- | 65 | -- | -- | -- | -- |
| | Annual | -- | 15 | -- | -- | -- | -- |
| CO | 1-Hour | 2,000 | 40,000 | -- | -- | -- | -- |
| | 8-Hour | 500 | 10,000 | -- | -- | -- | -- |
| Ozone | 8-Hour | 100 tpy VOC | 0.08 ppm | -- | -- | -- | -- |
| Lead | Quarterly | 0.1 | 1.5 | -- | -- | -- | -- |
| Visibility (deciviews) | 24-Hour | -- | -- | -- | -- | -- | 1.0 |
| Nitrogen Deposition (kg/ha-yr) | Annual | -- | -- | -- | -- | -- | 3.0 |
| Sulfur Deposition (kg/ha-yr) | Annual | -- | -- | -- | -- | -- | 5.0 |

NOTE: The State of Colorado has also established a 3-hour $SO_2$ ambient air quality standard of 700 µg/m3, as well as a program similar to the Federal PSD increments limiting additional amounts of $SO_2$ above baseline conditions. The FLAG Guideline (FLAG 2000) has established visibility AQRV thresholds. The FLAG "just noticeable change" 1.0 deciview threshold is used to assess the significance of potential visibility impacts. The USDA Forest Service has established cumulative deposition impacts thresholds of concern (Fox et al. 1989).

The air quality analysis consists of several sequential steps:

1. A Protocol has been prepared so that the BLM and other parties can comment on the methods and data that are proposed for the analysis.
2. An emission inventory was compiled that represents a reasonable, although conservative, scenario for each relevant development alternative.
3. Representative meteorological, background air quality, and AQRV monitoring data were obtained. The background air quality and AQRV monitoring data are used to define the existing air quality impacts from sources in operation as of the date of the monitoring data.
4. A cumulative emission inventory within the study area was compiled. This inventory includes emissions from existing oil and gas production sources in the Monument. It also includes emissions from other existing sources and reasonably foreseeable proposed emission sources within the study area, whose impacts are not already represented in the background air quality and AQRV monitoring data (i.e., sources that were not yet in operation as of the date of the monitoring data).
5. Air quality dispersion models were used to estimate potential direct air quality impacts for each analyzed alternative, as well as the cumulative impacts.
6. The predicted impacts have been compared to relevant significance criteria, standards, PSD increments, and AQRV thresholds.
7. If the predicted impacts warrant consideration of mitigation measures, further modeling analyses may be conducted in order to evaluate the benefits of mitigation alternatives.

This National Environmental Policy Act (NEPA) analysis compares potential air quality impacts from the proposed Project to applicable air quality standards, PSD increments, SILs, and AQRVs; however, it does not represent a regulatory air quality permit analysis. Comparisons to the PSD Class I and II increments are intended to evaluate a “threshold of concern” for potentially significant direct Project impacts; however, they do not represent a cumulative regulatory PSD Increment Consumption Analysis. Such a regulatory PSD increment analysis is the responsibility of the State air quality agency (under EPA oversight), and would be conducted during the permitting process.

## 1.4 Relationship to Other Plans and Documents

The Federal Land Policy and Management Act (FLPMA) of 1976 calls for the preparation of a Resource Management Plan (RMP) for the Monument. As part of the DRMP/DEIS development, the BLM has prepared an Analysis of the Management Situation (AMS) and the RFD that discuss the potential for oil, natural gas, and $CO_2$ development activities within the Monument. The NEPA requires an EIS to analyze and disclose anticipated impacts of the development alternatives being considered. This TSD describes the methodologies and data that were used to evaluate direct and cumulative air quality impacts from potential fluid-minerals development on the Monument. The TSD will be included in the DRMP/DEIS as a stand-alone appendix.

# 2.0 EMISSION INVENTORY

Two inventories of air emissions were developed. The Project inventory considered foreseeable oil, natural gas, and $CO_2$ development activities in the Monument, and includes air emissions from both construction and production operations. The cumulative inventory considered emissions from other existing sources and reasonably foreseeable future sources within the study area that are not already represented in the background air quality and AQRV data. The air emissions of the following pollutants were inventoried: NOx (including $NO_2$), CO, $SO_2$, VOC, PM10, PM2.5, and the Hazardous Air Pollutant (HAP) formaldehyde.

## 2.1 Potential $CO_2$ Development

The existing Cortez $CO_2$ pipeline capacity of 1.0 bcf/day may be increased by 40% in order to meet future demand. This level of development could require up to 69 new $CO_2$ wells and 4 new processing facilities. The processing facilities would include dehydration units and gas compressors. Operator data on current $CO_2$ compression indicates that approximately 55,000 horsepower (hp) or 41 megawatts (MW) of compressor power is required for the existing production capacity of 1.0 bcf/day. Assuming a future capacity of 1.4 bcf/day, the increase in compression power requirements is 22,000 hp or 17 MW. According to the $CO_2$ operators, both the current and future compression power will be provided by electrically driven compressors using purchased power from the utility grid. Therefore, there will not be any air emissions associated with $CO_2$ compression.

Based on the RFD document and discussions with the BLM, a reasonable and conservative estimate for the construction schedule of the new $CO_2$ wells and processing facilities is:

- 14 new wells will be drilled in order to increase the capacity of the existing pipeline from 1.0 billion cubic feet per day (bcf/day) to 1.4 bcf/day (these wells will be drilled between Years 5 and 7 of the project);
- 40 new wells will be drilled over the 20-year period in order to sustain the existing $CO_2$ production;
- 15 new wells will be drilled over the 20-year period in order to sustain the increase in production; and
- four additional transmission/processing facilities will be built over the 20-year period in order to service the new wells.

Based on the above well-construction schedule, the peak construction activity would occur in Year 6, with 17 new $CO_2$ wells and one processing facility being constructed. A more typical level of construction activity would include three new $CO_2$ wells per year.

## 2.2 Potential Oil and Natural Gas Development

The BLM estimates that approximately 81 new oil and gas wells and 4 new gas-processing facilities could be developed over the next 20 years. The gas processing facilities would include separation and dehydration units, and gas compressors. The RFD estimates the potential oil and natural gas reserves that could be developed at up to 23 million bbls of oil and 72 bcf of natural gas. Over a 20-year period this would result in annual production rates of 1.15 million bbls of oil per year, and 3,600 MMcf of natural gas per year. Future increased natural gas compression requirements above the approximately 1,000 hp of installed capacity are estimated by the BLM at 350 hp. Assuming the new wells and processing facilities are built throughout the 20-year project period, a reasonable estimate of the construction schedule is four new oil and gas wells and one new processing facility in a year (it is conservatively assumed that this would occur during the same year as the peak $CO_2$ construction activity).

## 2.3 Project Emissions

Project activities that could potentially result in air emissions include both construction activities and production activities. The Project emission inventory was developed using reasonable, although conservative, scenarios for each activity. Based on the potential development schedule, Project construction emissions were calculated for the peak year in which the maximum level of construction activity would occur. Project production emissions were calculated based on full production activity. The annual Project emission inventory will sum the construction and production emissions, thereby reasonably and conservatively estimating the overall Project emissions. In addition to the annual emission calculations, short-term (hourly and/or 24-hour) emissions will be calculated for the air-modeling analyses based on estimated equipment capacities and on the reasonable and conservative operating assumptions.

### 2.3.1 Construction Emissions

Potential construction emission sources include:

- fugitive $PM_{10}$/$PM_{2.5}$ emissions (including wind erosion emissions) and large equipment tailpipe emissions from general construction activities (grading, scraping, etc.) for construction of well pads, processing facility pads, access roads, and pipelines;
- well drilling and completion, including drill-rig emissions and flaring emissions during completion activities; and
- Fugitive $PM_{10}$/$PM_{2.5}$ emissions and truck tailpipe emissions from vehicle travel during construction, drilling, and completion operations.

Fugitive $PM_{10}$/$PM_{2.5}$ emissions from general construction activities were calculated using AP-42 Section 13.2.3, "Heavy Construction Operations" factors and the estimated total gross disturbance area for well pads, facility pads, roadways, and pipelines listed in Table 2 (this is derived from Tables 10 and 11 of the RFD document). Fugitive $PM_{10}$/$PM_{2.5}$ emissions from wind erosion at construction areas were calculated using equations in EPA's "Control of Open Fugitive Dust Sources", Section 4.1.3, EPA-450/3-98-008. Fugitive PM10/PM2.5 emissions from vehicle travel during construction, drilling, and completion operations were calculated using AP-42 Section 13.2.2 "Unpaved Roads" equations. The round-trip travel distance for new "resource roads" (i.e., roads constructed to access the new wells and facilities) was estimated at 1.1 miles, and for the primary access roads it was conservatively estimated at 25 miles. It was assumed that adequate dust suppression (watering and/or dust suppressants) would be applied to resource roads and construction areas in order to achieve a fugitive PM emission control efficiency of 50%. It was also assumed that magnesium chloride dust suppressants (or similar treatment) would be applied to primary access roads in order to achieve a fugitive PM emission control efficiency of 85%. For all fugitive PM emission sources, $PM_{2.5}$ emissions were estimated as 10% of the calculated $PM_{10}$ emissions, based on data in "Analysis of the Fine Fraction of PM in Fugitive Dust", MRI Report 110397, October 12, 2005. Tailpipe emissions from construction and vehicle equipment for the pollutants CO, NOx, $SO_2$, VOC, and $PM_{10}$ were calculated using emission factors for large diesel equipment listed in AP-42 Volume II Mobile Sources.

Drilling-rig emissions were calculated using AP-42 Section 3.3 emission factors (Table 3.3-1, "Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines"). These AP-42 factors are very conservative and overstate the actual expected emissions. For example, the AP-42 NOx emission factor is equivalent to 14 gr/hp-hr, whereas NOx emissions from Tier 2 diesel engines likely to be found on new drill rigs are on the order of 4.8 gr/hp-hr. The size of rigs used to drill $CO_2$ wells are larger than those used to drill oil and gas wells, with total engine capacity of approximately 2100 hp. To simplify the emission calculations, it was conservatively assumed that all wells were drilled with these large 2100 hp rigs. Also, it was assumed that all wells were conventional, “straight drilled” wells. Flaring emissions for oil and gas wells were calculated based on AP-42 Section 13.5 factors for NOx and CO, assumed gas constituent analysis for VOC with a 50% flare-destruction efficiency, and operator data on flaring volumes.

Appendix A presents detailed emission calculation tables for each of the construction emission sources, and Table 3 presents a summary of construction emissions for both oil and gas and $CO_2$ development.

**Table 2 - Summary of Gross Surface Disturbance**

| Resource and Type of Activity | Number sites | Acres/site | Total acres |
|---|---|---|---|
| ***OIL AND GAS DEVELOPMENT*** | | | |
| Pads | 81 | 2.1 | 170.1 |
| Pipelines | 11.5 | 2.0 | 23.1 |
| Roads | 81 | 3.0 | 241.0 |
| Oil and Gas Pads, Pipelines, Roads Subtotal | | | 434.2 |
| Oil and Gas Pads, Pipelines, Roads Subtotal/81 wells | | | 5.4 per well |
| Facility Sites | 4 | 3.0 | 12 |
| Facility Pipelines | 4 | 18.2 | 72.8 |
| Oil and Gas Facility Subtotal | | | 84.8 |
| Oil and Gas Facility Subtotal/4 facilities | | | 21.2 per facility |
| ***$CO_2$ DEVELOPMENT*** | | | |
| Pads | 40 | 3.5 | 140.0 |
| Pipelines | 10 | 2.0 | 20.0 |
| Roads | 40 | 3.0 | 119.0 |
| $CO_2$ Pads, Pipelines, Roads Subtotal | | | 279.0 |
| $CO_2$ Pads, Pipelines, Roads Subtotal/40 wells | | | 7.0 per well |
| Facility Sites | 4 | 3.0 | 12.0 |
| Facility Pipelines | 4 | 18.2 | 72.8 |
| $CO_2$ Facility Subtotal | | | 84.8 |
| $CO_2$ Facility Subtotal / 4 facilities | | | 21.2 per facility |
| ***TOTAL OIL AND GAS AND $CO_2$ GROSS DISTURBANCE*** | | | ***882.8*** |

**Table 3 - Summary of Construction Emissions**

| **Oil and Gas Well Construction Emissions - Peak Construction Year** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **No. of New Wells/yr** | **4** | | **No. of New Processing Facilities/yr =** | | | | **1** | | | | |
| | Pad, Road, Pipeline Construction | | Rig Move and Drilling | | Completion and Flaring | | Subtotals per well pad | | Facility Construction | | **TOTAL** |
| | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/plant) | **(tons/yr)** |
| NOx | 12.27 | 0.25 | 27.53 | 9.91 | 30.03 | 1.21 | 69.83 | 11.36 | 12.50 | 0.64 | **46.1** |
| CO | 3.82 | 0.08 | 5.96 | 2.14 | 163.33 | 6.54 | 173.10 | 8.76 | 4.12 | 0.23 | **35.3** |
| SO2 | 1.46 | 0.03 | 1.82 | 0.65 | 0.0005 | 0.000137 | 3.28 | 0.68 | 1.47 | 0.07 | **2.8** |
| PM10 | 6.95 | 0.38 | 2.42 | 0.87 | 0.32 | 0.09 | 9.68 | 1.34 | 22.72 | 3.68 | **9.1** |
| PM2.5 | 1.82 | 0.06 | 2.02 | 0.73 | 0.05 | 0.01 | 3.89 | 0.81 | 2.32 | 0.44 | **3.7** |
| VOC | 0.92 | 0.02 | 2.23 | 0.80 | 4,472 | 58.78 | 4,476 | 59.60 | 1.03 | 0.06 | **238.5** |
| Formaldehyde | NA | NA | 1.05 | 0.38 | NA | NA | NA | NA | NA | NA | **1.5** |
| **$CO_2$ Well Construction Emissions - Peak Construction Year** | | | | | | | | | | | |
| **No. of New Wells/yr** | **17** | | **No. of New Processing Facilities/yr =** | | | | **1** | | | | |
| | Pad, Road, Pipeline Construction | | Rig Move and Drilling | | Completion | | Subtotals per well pad | | Facility Construction | | **TOTAL** |
| | (lb/hr) | (tons/pad) | (lb/hr) | (tons/pad) | (lb/hr) | (tons/pad) | (lb/hr) | (tons/well) | (lb/hr) | (tons/plant) | **(tons/yr)** |
| NOx | 12.50 | 0.28 | 27.53 | 9.91 | 0.02 | 0.00 | 40.05 | 10.19 | 12.50 | 0.64 | **173.9** |
| CO | 4.12 | 0.12 | 5.96 | 2.14 | 0.02 | 0.01 | 10.10 | 2.27 | 4.12 | 0.23 | **38.8** |
| SO2 | 1.47 | 0.03 | 1.82 | 0.65 | 0.0005 | 0.000137 | 3.29 | 0.69 | 1.47 | 0.07 | **11.7** |
| PM10 | 9.39 | 0.74 | 2.42 | 0.87 | 0.32 | 0.09 | 12.13 | 1.71 | 22.72 | 3.68 | **32.7** |
| PM2.5 | 2.11 | 0.12 | 2.02 | 0.73 | 0.05 | 0.01 | 4.18 | 0.86 | 2.32 | 0.44 | **15.0** |
| VOC | 1.03 | 0.03 | 2.23 | 0.80 | 0.01 | 0.00 | 3.27 | 0.84 | 1.03 | 0.06 | **14.3** |
| Formaldehyde | NA | NA | 1.05 | 0.38 | NA | NA | NA | NA | NA | NA | **6.4** |

### 2.3.2 Production Emissions

Potential production emission sources include:

- combustion source emissions at well heads and processing facilities (central gas compressor engines, small well head engines, and heaters for separators and dehydrators);
- Fugitive $PM_{10}/PM_{2.5}$ emissions and truck tailpipe emissions from vehicle travel related to well servicing and truck transport of oil and water; and
- VOC flashing emissions from separators, dehydrators and tank batteries.

IC engine emissions will be calculated using AP-42 Section 3.2 (Natural Gas-fired Reciprocating Engines) emission factors. These emission factors are very conservative and overstate the actual expected emissions. For example, the AP-42 NOx emission factor for a 350 hp engine is equivalent to 12 gr/hp-hr, whereas NOx emissions from 350 hp lean-burn 4-stroke natural gas fired compressor engines are typically on the order of 3 gr/hp-hr. In addition to the gas compressor engines, some of the new oil and gas wells may use small (50 hp) well head engines. Current operators have indicated that only a fraction of the existing wells are equipped with small well head IC engines; therefore, a reasonable and conservative assumption was made that 25% of the new oil and gas wells would include a 50 hp gas-fired well head engine.

The exact configuration of separator and dehydration heaters is not known. Some of these units may be at well head locations, while others may be centralized at the processing facilities. A reasonable and conservative assumption was made that one 0.25 MMBtu/hr gas-fired heater would be located at each of the 81 new oil and gas wells (heaters are not used at $CO_2$ wells, and it is assumed that the separator and dehydration heaters at the $CO_2$ production facilities would be electrically powered as are the current units). The annual operating level of well head heaters was adjusted so that the annual fuel consumption matched the existing typical well head fuel consumption of approximately 15 mcf/month per well, based on discussions with BLM staff.

Fugitive $PM_{10}/PM_{2.5}$ emissions from vehicle travel related to well servicing and truck transport of oil and water were calculated using AP-42 Section 13.2.2 "Unpaved Roads" equations. It was assumed that adequate dust suppression (watering and/or dust suppressants) would be applied to “resource roads” in order to achieve a control efficiency of 50%, and that magnesium chloride dust suppressants (or similar treatment) would be applied to primary access roads in order to achieve a fugitive PM emission control efficiency of 85%. The round-trip travel distance for resource roads was estimated at 1.1 miles, and for the primary access roads it was conservatively estimated to be 25 miles. The number of truck trips per oil and gas well was based on:

- maximum projected oil production rates of 1,150,000 bbls/yr for the 81 new wells;
- the capacity of a haul truck at 180 bbls;
- the assumption that water production rates are equal to oil production rates, and that all water is trucked offsite for disposal (some water would likely be disposed of via water disposal wells).

The calculated number of oil and water haul truck trips per well is 158 per year. The general well servicing (pickup truck) traffic assumed that each well was visited once per week (52 times per year); however, it was also assumed that each service trip included visits to multiple wells.

Therefore, the vehicle travel emissions were calculated assuming 52 roundtrips per year per well on each access road, but 10 roundtrips per year per well on each primary road.

Tailpipe emissions from oil and water haul trucks were calculated using the emission factors for large diesel equipment listed in AP-42 Volume II Mobile Sources.

The “per-well” fugitive VOC emissions for separator to storage tank flashing were estimated at 20 tpy per well. This estimate is based on the emission level that would require the storage tank battery to comply with upcoming CDPHE requirements to control VOC emission by 95%, and therefore, is a reasonable and conservative upper estimate on the future VOC emissions from condensate storage tanks. The fugitive VOC emissions from wellhead dehydrator still vents were estimated using emission test results and Gas Research Institute (GRI) GLYCalc estimates presented in “Glycol Dehydrator BTEX and VOC Emission Testing Results at Two Units in Texas and Louisiana”, EPA/600/SR-95/046 (these reported VOC emission rates were ratioed-down for the lower gas production rates per well at the Monument).

Appendix A presents detailed emission calculation tables for each of the production emission sources, and Table 4 presents a summary of production emissions for both oil and natural gas, and $CO_2$ development. Table 5 presents the overall summary of Project emissions.

## 2.4 Cumulative Emission Inventory

The cumulative inventory includes emissions from other existing sources and reasonably foreseeable proposed emission sources within the study area whose impacts are not already represented in the background air quality and AQRV monitoring data (i.e., sources that were not in operation as of the end date of the monitoring data, which was December 2004). The EPA recommends that the cumulative inventory includes nearby major or minor sources that result in a significant concentration gradient in the project area. The CDPHE recommends considering sources with emission rates greater than 100 tons per year as candidates for the cumulative source inventory, and sources with lower emission rates if they are within 5 kilometers of the project area.

The cumulative inventory area has been defined as the region within 50 km from the center of the Monument (approximate UTM coordinates 685 km E and 4145 km N, Zone 12, NAD83). The rational for the 50 km definition is:

- given the nature of the Project emission sources (stack heights on the order of 10 meters or less and ground-level fugitive releases), any significant Project impacts will be very localized near the emission sources, typically within a kilometer of the emission units;
- the 50 km distance will ensure that impacts even from distant large emission sources will be considered;
- the maximum transport distance recommended by the EPA for steady-state gaussian models, such as AERMOD is 50 km; and
- other, more distant, existing sources would be accounted for in the background concentration data.

**Table 4 - Summary of Production Emissions**

| Oil and Gas and $CO_2$ Production Emissions Summary | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ***No. of Oil and Gas (O&G) wells = 81*** | | | | | | | | | | | |
| ***No. of $CO_2$ wells = 69*** | | | | | | | | | | | |
| | **O&G Production Truck -per well** | | **$CO_2$ Production Truck - per well** | | **Wellhead Heaters and Flashing** | | **Wellhead Small Engines** | | **O&G Compression** | | **TOTAL** |
| | **(lb/hr)** | **(tons/well)** | **(lb/hr)** | **(tons/well)** | **(lb/hr)** | **(tons/well)** | **(lb/hr)** | **(tons/well)** | **(lb/hr)** | **(tons/yr)** | **(tons/yr)** |
| NOx | 0.040 | 0.0520 | 0.000 | 0.000 | 0.034 | 0.015 | 1.105 | 4.840 | 9.4 | 41.3 | 144.7 |
| CO | 0.052 | 0.0670 | 0.000 | 0.000 | 0.291 | 0.127 | 1.860 | 8.147 | 0.7 | 3.2 | 183.9 |
| SO2 | 0.001 | 0.0015 | 0.000 | 0.000 | 0.000 | 0.000 | 0.0003 | 0.001 | 0.0014 | 0.0060 | 0.2 |
| PM10 | 0.501 | 0.6511 | 0.013 | 0.017 | 0.003 | 0.001 | 0.010 | 0.042 | 0.0229 | 0.1003 | 55.0 |
| PM2.5 | 0.077 | 0.0998 | 0.002 | 0.003 | 0.003 | 0.001 | 0.010 | 0.042 | 0.0229 | 0.1003 | 9.3 |
| VOC | 0.020 | 0.0259 | 0.000 | 0.000 | 4.701 | 20.584 | 0.015 | 0.065 | 0.27 | 1.19 | 1671.9 |
| Formaldehyde | NA | NA | NA | NA | NA | NA | 0.010 | 0.045 | 0.122 | 0.53 | 2.4 |

**Table 5 - Summary of Project Emissions**

| Project Maximum Annual Emissions | | | |
|---|---|---|---|
| | Construction emissions (tpy) | Production emissions (tpy) | Total emissions (tpy) |
| NOx | 215.3 | 144.7 | 360.0 |
| CO | 48.7 | 183.9 | 232.6 |
| SO2 | 14.5 | 0.2 | 14.7 |
| PM10 | 41.8 | 55.0 | 96.8 |
| PM2.5 | 18.7 | 9.3 | 28.0 |
| VOC | 22.4 | 1671.9 | 1694.3 |
| Formaldehyde | 7.9 | 2.4 | 10.3 |

The inventory for other existing sources was developed using data obtained from the CDPHE and Utah Department of Environmental Quality-Air Quality Division (UDEQ). Only emission sources that were not operational as of the end of 2004 were included in the cumulative inventory. UDEQ data indicated that the only new source or modification in the area since 2004 was at a uranium processing mill in Blanding, located approximately 50 km from the Monument. The increase in emissions was 7.4 tpy of NOx, and less than 2 tpy for all other criteria pollutants. Given the large distance and the small emissions, this source was not included in the cumulative analysis. The CDPHE provided inventory data on seven new or modified emission units since the end of 2004. These sources included three new emission sources in the Monument (permitted by one of the oil and gas operators), a 261 hp compressor, a 142 hp engine, and a 170 kw generator, all natural gas fired IC engines. Other CDPHE cumulative sources included a Saturn T-1300 gas-fired turbine located 45 km distant (NOx emissions of 16 tpy), a 3.6 MMBtu boiler located 21 km distant (emissions less than 10 tpy of all pollutants), a concrete batch plant located 29 km distant (PM10 emissions less than 6 tpy), and a sand and gravel operation located 47 km distant (PM10 emissions less than 7 tpy). Based on the CDPHE cumulative inventory criteria, only the three emission sources located within the Monument were included in the cumulative emission inventory.

The cumulative inventory also addressed existing production emission sources in the Monument as follows. The maximum historical natural gas compression capacity in the Monument is known to be approximately 1,000 hp, therefore emissions for three 350-hp compressors were modeled to conservatively represent existing natural gas production (along with one new 350 hp compressor to represent increased Project natural gas production). The estimated Project oil production rates are five times greater than current oil production rates and equal to the historical maximum annual production rates for the Monument; in addition, it is known that many of the new oil wells would replace exhausted wells that cease production during the 20 year period. Therefore, the Project oil production emissions (including fugitive emissions from oil haul trucks and well servicing) effectively include existing oil production emissions. Finally, because existing $CO_2$ compression is electrical driven from the utility grid, there are no significant existing $CO_2$ production emissions.

Proposed BLM development projects within the cumulative inventory area that were not in operation as of the end of 2004 (these projects are classified as reasonable foreseeable development) were also considered in the cumulative inventory. Based on discussions with Colorado and the Utah State BLM offices, there is one reasonable foreseeable development project in the cumulative inventory area, the Monticello NEPA project in Utah (located approximately 50 km west of the Monument). The projected level of well development described in the Monticello RFD is five to 21 wells per year for 20 years over a 3.6 million acre management area. The Monticello EIS document will not include a compilation of air emissions or an air quality impact analysis, because air quality was not an area of concern during the EIS scoping process. Therefore, a simplified approach was used to include the Monticello NEPA project in the Monument cumulative analysis. Since the well-development rate and the total number of wells are similar between the Monticello and Monument projects, the total emissions for construction and production in the Monument were assigned to a 10 km square volume source located 50 km west of the Monument in order to represent emissions from the Monticello NEPA project. Note that the San Juan Basin NEPA project in New Mexico and the Moab NEPA project in Utah are outside of the cumulative inventory area; therefore, they were not included in the Monument cumulative analysis (the Moab project is approximately 80 km distant, and the San Juan project is approximately 100 km distant).

# 3.0 AIR QUALITY ANALYSIS METHODOLOGY

## 3.1 Model Selection

The pollutants $PM_{10}$, $PM_{2.5}$, $NO_X$, $SO_2$, CO, and formaldehyde were modeled using the EPA-approved air dispersion model AERMOD. Due to the complexity of the ozone formation at ground-level, ozone impacts cannot be predicted with a dispersion model. Therefore, ozone impacts were estimated from $NO_X$ and VOC emissions using a screening methodology developed by Scheffe (1988).

## 3.2 Class I Impact Analysis Procedures

The nearest Class I area to the Monument is Mesa Verde National Park, which is located approximately 40 km to the east of the locations on the Monument where development may occur. The next closest Class I area is the Weminuche Wilderness Area, which is located about 112 km from the Monument. Given the close proximity of Mesa Verde, versus the other Class I areas, it is highly likely that the Class I impacts of the Project will be the greatest at Mesa Verde. Therefore, the Class I analyses was performed only for Mesa Verde. Since Mesa Verde is within 50 km, AERMOD was used to evaluate both direct Project and cumulative Class I increment impacts and deposition AQRV analyses at Mesa Verde. VISCREEN was used to evaluate visibility impacts. The Class I PSD increment modeling included emissions only from production sources (EPA policy is that temporary construction sources do not consume increment), while the Class I sulfur and nitrogen deposition analysis included emissions from both construction and production sources.

The method for performing deposition AQRV analyses using AERMOD was based on the conservative Level 1 methodologies described in section 5.1.3 of the "Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 1 Recommendations" (1993). The conservative assumption was made that all $SO_2$ is converted to $SO_4$ and all $NO_X$ is converted to $NO_3$. The annual deposition rates of sulfur (S) and nitrogen (N) were then calculated using deposition velocities of 0.005 m/s for $SO_4$ and 0.05 m/s for $NO_3$, and were compared to threshold effects levels.

The Federal Land Managers' Air Quality Related Values Workgroup (FLAG) recommends that visibility analyses for sources located within 50 km of the Class I area use the VISCREEN model. However, VISCREEN is only designed to model one emission source at a time; whereas, the Project consists of numerous emission sources located throughout the Monument. Therefore, based on discussions with the NPS, VISCREEN was used to estimate Project visibility impacts at Mesa Verde using a "virtual point source" approach[1] in order to better account for the geographic separation of emissions. Given that the separation of Project emission sources is on the order of 10 kilometers, using the sigma y curve for F stability results in an increase in downwind distance of 80 km to account for the separation of emissions. Background visual range was based upon FLAG average reconstructed natural conditions; the natural background extinction value is 15.6 Mm-1, equivalent to a visual range of 251 km. A background 1-hour ozone concentration of 77 ppb was used, and primary sulfate emissions were estimated as two percent of the $SO_2$ emissions[2]. The cumulative visibility analysis included VISCREEN analyses for other cumulative sources (with distances adjusted, as necessary, in order to account for geographic separation of emission units at each source). The cumulative visibility impacts were then determined by summing the frequencies of impacts that are above the VISCREEN thresholds for all sources.

## 3.3 Background Air Quality and AQRV Data

The background air quality and AQRV monitoring data are used to define the current air quality impacts from sources in operation as of the date of the monitoring data. Modeled direct and cumulative impacts are added to these background concentration values in order to evaluate total impacts with respect to State AAQS and NAAQS. The background air quality and AQRV data are also used to define which sources will be included in the cumulative emission inventory (i.e., sources that were not yet in operation as of the date of the monitoring data, and, therefore, whose impacts are not already represented in the background data).

There are no air quality monitors operating in the Monument, but background air quality conditions in the project area can be determined from monitoring data collected at other representative locations throughout the region. All criteria air pollutants are monitored in the region by State and local air quality regulatory agencies, and AQRV monitoring in Mesa Verde is conducted by the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. Table 2 summarizes the background air quality and AQRV data that were used for the air quality analyses. The background data has been conservatively selected from the monitoring station with the highest concentrations during the reporting period.

**Table 6 - Background Air Quality and AQRV Data**

| Pollutant/AQRV Parameter | Background Data | Monitoring Station |
|---|---|---|
| $NO_2$ – Annual Concentration (ppb) | 9 | La Plata CO |
| $SO_2$ – Annual Concentration (ppb) | 2 | Farmington NM |
| $SO_2$ – 24-hour High-2$^{nd}$ High Concentration (ppb) | 8 | Farmington NM |
| $SO_2$ – 3-hour High-2$^{nd}$ High Concentration (ppb) | 26 | Farmington NM |
| CO – 8-hour High-2$^{nd}$ High Concentration (ppm) | 1.6 | Ignacio CO |
| CO – 1-hour High-2$^{nd}$ High Concentration (ppm) | 2.0 | Ignacio CO |
| $PM_{10}$ – Annual Concentration (μg/m$^3$) | 21 | La Plata CO |
| $PM_{10}$ – 24-hour High-2$^{nd}$ High Concentration (μg/m$^3$) | 64 | La Plata CO |
| $PM_{2.5}$ – Annual Concentration (μg/m$^3$) | 6.9 | Farmington NM |
| $PM_{2.5}$ – 24-hour High-2$^{nd}$ High Concentration (μg/m$^3$) | 22.5 | MVNP |

[1] Refer to Chapter 5, section on Area Sources in "Workbook of Atmospheric Dispersion Estimates", Bruce Turner, AP-26, 1974.
[2] See "Phase I Interim Data Report No. 3: Diesel Fuel Sulfur Effects on Particulate Matter Emissions", Diesel Emission Control–Sulfur Effects (DECSE) Program, U.S. Department of Energy, November, 1999.

| Pollutant/AQRV Parameter | Background Data | Monitoring Station |
|---|---|---|
| Ozone – 8-hour High-2$^{nd}$ Concentration (ppb) | 71 | MVNP |
| Ozone – 1-hour High-2$^{nd}$ Concentration (ppb) | 77 | MVNP |
| Nitrogen Deposition (kg/ha-yr) | 2.3 | MVNP |
| Sulfur Deposition (kg/ha-yr) | 1.2 | MVNP |
| Mesa Verde Visibility (annual average deciview) | 23.6 | MVNP |

## 3.4 AERMOD Source and Receptor Configurations

Three source-receptor configurations were modeled, a near-field configuration (3 km by 3 km sized receptor grid), a mid-field configuration (25 km by 25 km sized receptor grid), and a Class I configuration (using a receptor grid in Mesa Verde provided by the National Park Service).

### 3.4.1 Near-field Configuration

Given the nature of the emission sources associated with oil and gas development, it is known that the stack heights of the combustion sources are approximately 10 meters or less above ground level, and that the majority of PM emissions will occur as ground-level fugitive releases. Therefore, maximum air quality impacts are typically localized near the emission sources. Also, the exact location and layout of the new emission sources is not know with any certainty. Therefore, a near-field source-receptor configuration was developed using a generic layout of well pad, roadway, and processing facility sources, which represents a reasonable and conservative configuration. Due to the fact that this configuration focuses on near-field impacts and that the exact locations of the sources are not known, source and receptor elevations were not considered in the analysis.

Based on the discussion of potential future development levels in Section 2, and given that the typical well spacing density in the Monument is no greater than 160 acres per well (four wells per section), a conservative assumption for the density of construction is two new wells, two existing wells, and one new production facility per section. The construction emission sources for two new wells and a central processing facility were combined with production emissions from two existing wells in order to fully define the worst-case construction scenario. A separate production scenario was analyzed that considered emissions from four producing wells and from one central processing facility.

Point sources were used to model combustion source emissions from construction sources (drill rigs, flares, and heavy construction equipment tailpipe emissions) and production sources (well head IC engines and heaters, and central compressor emissions at the production facility). The well head IC engine and heater emissions were combined and modeled through an IC engine stack (this is a reasonable and conservative assumption based on the fact that the majority of the emissions are from the IC engine). Stack parameters used for these various point sources are presented in Table 7.

**Table 7 - Point Source Stack Parameters**

| Source Type | Stack Height (m) | Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) |
|---|---|---|---|---|
| Drill Rig | 6 | 750 | 20.0 | 0.2 |
| Flare | 5 | 1273 | 20.0 | 1.0 |
| Dozer Tailpipe | 2 | 750 | 20.0 | 0.2 |

| | | | | |
|---|---|---|---|---|
| 350 hp Compressor | 6 | 750 | 20.0 | 0.2 |
| Well Head IC engine | 2 | 500 | 4.0 | 0.2 |

Volume sources were used to model fugitive PM construction emissions, including general construction emissions at well pad, processing facility, pipeline, and roadway areas, as well as wind erosion emissions, at these construction areas. The construction emissions from a $CO_2$ well were conservatively used, since the disturbed area for a $CO_2$ well is slightly larger than for an oil and gas well (seven acres per well for total well pad, pipeline, and road disturbed area). Volume sources were also used to represent “line sources” of fugitive PM and tailpipe emissions from construction and production vehicle traffic. Hourly emission factors were applied to construction fugitive sources for the hours of 08:00 through 17:00 to represent the typical construction period (note that drill rigs were assumed to operate 24-hours per day).

The generic source-receptor configuration was laid out as illustrated in Figure 2. The two new well pads were arranged in the northwest and southeast corners of a 640-acre section, the existing wells were arranged in the northeast and southwest corners, and the processing facility pad was located in the center. Each new pad was modeled as a 100m by 100m volume source for fugitive PM construction emissions. Two line sources, representing the access roads for the two new wells, and for the two existing production wells, were modeled as a series of equally spaced volume sources. The separation of the volume sources that represent these two roads was one-half of the lateral dimension of 12.2 m (equivalent to a 40-foot-wide road), based on guidance in Table 3-1 of the AERMOD User’s Guide. The combustion point sources representing drill rig engines, flares, the heater and well head engines at the existing wells, the central compressor, and construction equipment tailpipe emissions were located at the center of the well pads and the processing facility.

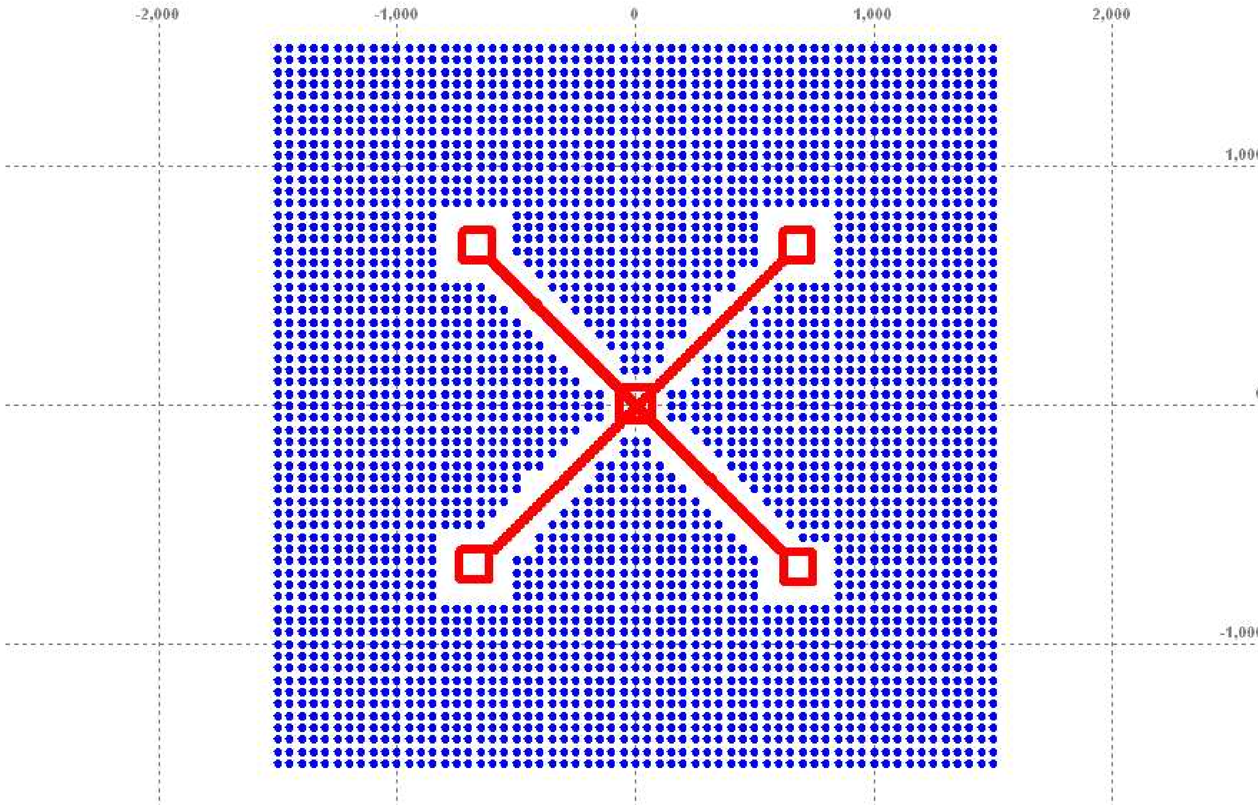
The total “per-well” fugitive PM construction and wind erosion emissions from pad, access road, and pipeline ground disturbance (corresponding to seven acres of total disturbance per well), and from “per-well” construction vehicle traffic, were allocated to the construction pad and roadway volume sources as follows. First, the 100m by 100m well pad volume source is 2.5 acres in size; therefore, the portion of the total fugitive PM emissions assigned to each well pad was 2.5/7. The remainder of the fugitive PM emissions were allocated to the roadway volume sources (along with construction tailpipe emissions). The second line source, representing the service road for the two existing production wells, was modeled using production vehicle fugitive PM and tailpipe emissions. Since the facility pad is the same size as the well pads in this generic layout, the same fugitive PM emission rates were used for the new facility pad.

For $PM_{10}$ and $PM_{2.5}$ analyses, the layout was modeled (for a single meteorological year) once at each of eight orientations (at 22.5 degree intervals), to ensure that impacts from all directional layouts and meteorological conditions were assessed. Since the layout is symmetrical, it was only necessary to model through 180 degrees in order to assess all possible wind direction effects.

Model receptors were located a minimum of 100 m from all emission sources, and a 100 m grid spacing was used throughout the section (3 km by 3 km total grid size).

Two source groups were defined to properly group the emission sources, CONSTRUC for the Project construction scenario, and PRODUCE for the Project and existing source production scenario.

**Figure 2 - Near-field AERMOD Layout of Emission Sources and Receptors**




NOTE: Distance units are meters relative to center of layout. Receptor locations are presented in blue. Roadway sources are represented by northwest/southeast red line (consisting of multiple volume sources). Red area sources at ends of roadway are new well pads. Red area source in center of layout is new processing facility.

### 3.4.2 Mid-field Configuration

The mid-field analysis assessed Project and cumulative impacts at locations within the Monument, as well as at other nearby PSD Class II areas. It expanded the geographical extent of the near-field analysis by utilizing a 25 km by 25 km sized receptor grid, centered in the Monument. Mid-field model receptors were based on a 1 km grid spacing, and were located a minimum of three km from all emission sources (impacts within this three km zone are assessed by the near-field analysis). USGS DEM elevation data was processed with AERMAP in order to derive elevation and hill height scale data. The mid-field source-receptor configuration is illustrated in Figure 3.

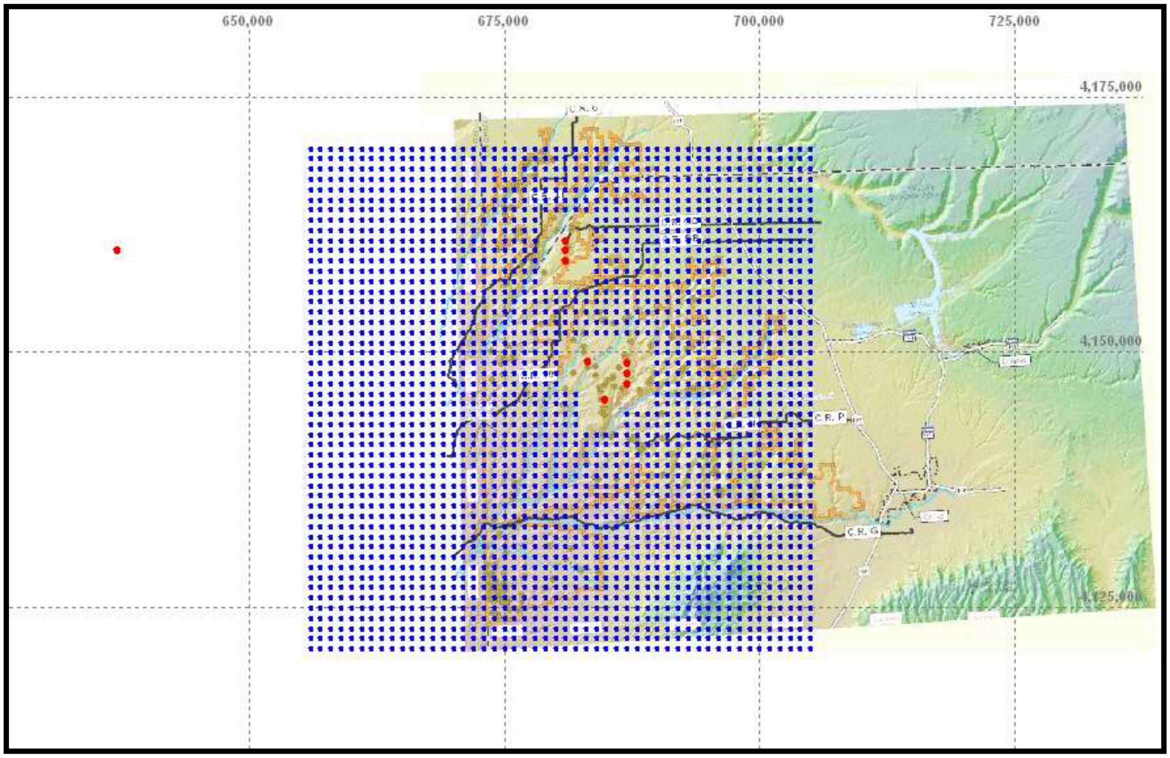
The mid-field Project construction source configuration is based on the peak year construction scenario of 17 new $CO_2$ wells, four new oil and gas wells, and two new processing facilities, along with full production emissions. Given that the duration for constructing a well (site preparation, drilling, and completion) is approximately two months per well, the average level of construction at any one time is four wells. Using the same assumption for well density as was used in the near-field analysis (two new wells per section and two existing wells per section), new well construction sources were located at two separate sections in the Monument where development is likely to occur (the Island Butte unit for oil and gas wells, and the Cutthroat area for $CO_2$ wells). The construction point sources (drill rigs, flares, and heavy construction equipment tailpipe emissions) were modeled at each of these two locations, along with two km square volume sources with fugitive PM construction emissions for the four new wells and the two new processing facilities.

The mid-field Project production source configuration is based on full production levels. Production point sources (central compressors and well head IC engines and heaters) were modeled at each of the two sections described above. Each of the two sections included two central 350 hp compressors, for a total of 1,400 hp total compression. Each of the two sections also included four well head heaters/IC engines, with the total emissions for the 81 new wells equally allocated to the eight engines (this modeling approach conservatively concentrates the production emissions from about 10 wells into one, and results in a modeling analysis with fewer sources). Finally, each of the two sections also included two km square volume sources with production fugitive PM emissions (oil and water haul trucks and well servicing traffic) for the full potential oil production rates.

The cumulative sources considered in the mid-field analysis included the three sources identified in the CDPHE cumulative inventory data, and in the Monticello NEPA project. A simplified methodology was used to model the Monticello air emission sources. The well development rate and total number of wells are similar between the Monticello and Monument projects; therefore, the Monticello total emissions were set equal to the Monument peak construction and full production in emissions, and were assigned to a 10 km square volume source located 50 km west of the Monument.

Four source groups were defined to properly group the emission sources: ProjNAQS for the Project construction scenario, ProjPSD for the Project production scenario, NAAQS for the cumulative analysis with Project construction emissions, and PSD for the cumulative analysis with Project production emissions.

**Figure 3 - Mid-field AERMOD Layout of Emission Sources and Receptors**




NOTE: Blue circles are receptors (25 by 25 km grid at one km density), and red circles are modeled sources. The northernmost sources are in the Island Butte unit, and the southernmost sources, along with the CDPHE cumulative sources, are in the Cutthroat Unit area. The one source located to the west of the main receptor grid is the Monticello Project.

### 3.4.3 Class I Configuration

The configuration and grouping of emission sources for the Class I AERMOD analysis was identical to the mid-field analysis. The receptor grid was based on the National Park Service receptor grid for Mesa Verde National Park. The AERMOD Class I source-receptor configuration is illustrated in Figure 4.

## 3.5 Meteorological Data

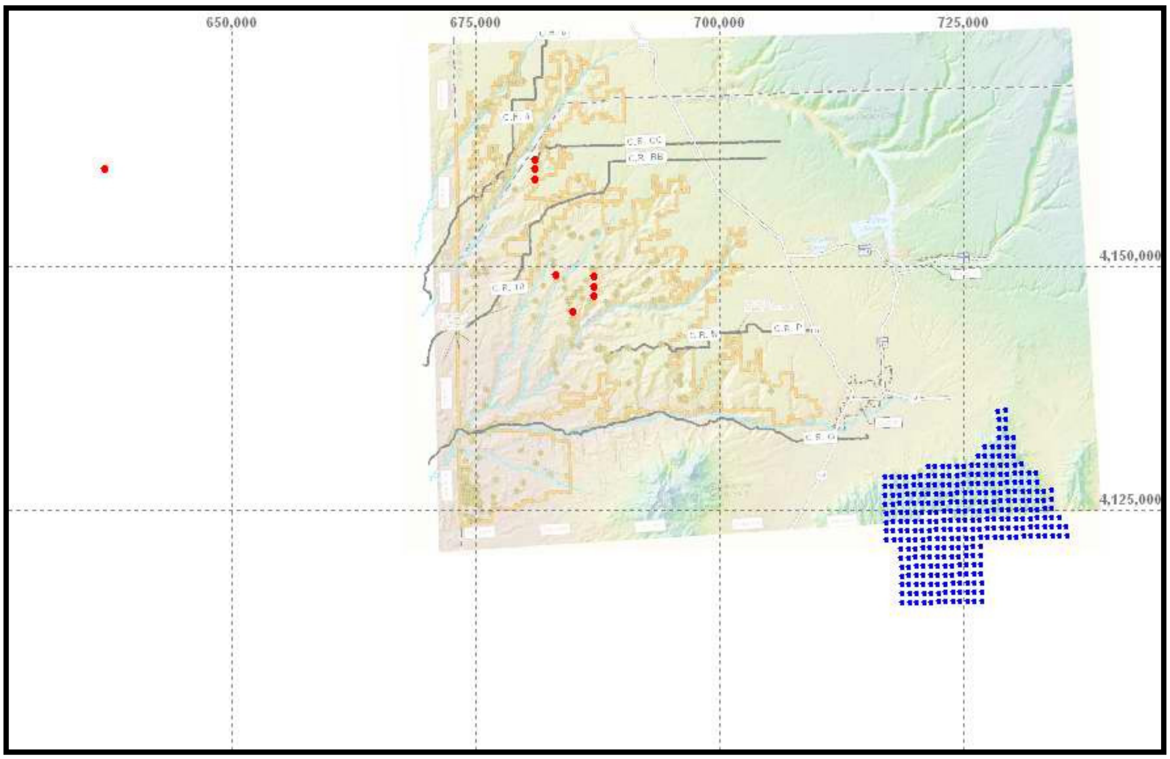
The Protocol described the data sets and processing procedures used for the meteorological data. Based on the Protocol analysis, the Mesa Verde National Park meteorological data was determined to be representative of conditions on the Monument. Since the Mesa Verde National Park meteorological data includes the data required by AERMET (10 m wind speed and direction and SRDT measurements at two and 10 meter levels), and meets a data capture rate goal of 90 percent or greater for the three-year period from 2001 through 2003, this three-year period of meteorological data was used for the AERMET data.

## 3.6 $NO_2$ Conversion Methodology

The majority of $NO_X$ emissions from combustion sources are in the form of nitric oxide (NO), for which the EPA has established AAQS for $NO_2$. Therefore, an approved methodology must be used to convert model estimates of ambient NO concentrations into equivalent ambient $NO_2$ concentrations. The EPA provides a three-tiered approach to calculating annual average $NO_2$ impacts. Tier 1 is the most conservative method, and assumes that all $NO_X$ emissions are in the form of $NO_2$. Tier 2 is the "Ambient Ratio Method" or ARM, and multiplies the Tier 1 impact by either an empirically-derived, annual national default ratio of 0.75, or by a site specific ratio determined with a pre-construction monitoring program. Tier 3 allows for the use of the most refined method, the "Ozone Limiting Method" or OLM, on a case-by-case basis.

The Tier 2 ARM method with the default ratio of 0.75 was used for the $NO_2$ modeling analyses.

**Figure 4 - Class 1 AERMOD Layout of Emission Sources and Receptors**




NOTE: Blue circles are receptors in Mesa Verde National Park, and red circles are modeled sources. The northernmost sources are in the Island Butte unit, and the southernmost sources, along with the CDPHE cumulative sources, are in the Cutthroat Unit area. The one source located to the west of the main Project area is the Monticello Project.

# 4.0 ASSESSMENT OF STANDARDS AND CLASS II IMPACTS

## 4.1 AERMOD Impact Analysis

The air quality analyses compare the predicted direct Project and cumulative air impacts to the Class II SILs, the PSD Class II increments, and to the State AAQS and NAAQS. The EPA and the State of Colorado have established the SILs in order to define a deminimus impact level that is considered “insignificant” and does not warrant further review. Under the PSD review process, a project that demonstrates, via modeling, that project-only emissions result in impacts that are below the SILs is exempt from additional modeling analyses for that pollutant. For this NEPA air quality analysis, the PSD review criteria are not directly applicable. However, the direct Project impacts are compared to the Class II SILs in Table 8 to evaluate the relative magnitude of the impacts. The $NO_2$, $PM_{10}$, and $SO_2$ impacts are greater than the Class II SILs.

**Table 8 - Comparison of Direct Project Impacts to Class II Significant Impact Levels**

| Pollutant/Avg | Project Near-Field Maximum | Project Mid-Field Maximum | Class II SILs | Greater than SIL? |
|---|---|---|---|---|
| CO - 1-hour | 357 | 802 | 2000 | No |
| CO - 8-hour | 184 | 147 | 500 | No |
| NOx - Annual | 20.5 | 3.7 | 1 | Yes |
| PM10 - 24-hour | 70.6 | 28.3 | 5 | Yes |
| PM10 - Annual | 12.6 | 3.9 | 1 | Yes |
| SO2 - 3-hour | 94.5 | 12.5 | 5 | Yes |
| SO2 - 24-hour | 26.9 | 2.7 | 25 | Yes |
| SO2 - Annual | 3.6 | 0.2 | 1 | Yes |

NOTE: Concentrations are in ug/m3.

The direct Project impacts (excluding temporary construction sources) were also evaluated by comparison to the Class II PSD Increments, and these results are presented in Table 9. This increment analysis is for information purposes only, and does not represent a cumulative regulatory PSD Increment Consumption Analysis. A regulatory PSD increment analysis is the responsibility of the State air quality agency, and would be conducted during the permitting process. The impacts are all less than the Class II PSD increments. Finally, the model’s predicted direct Project and cumulative impacts were added to the background data and then compared to the NAAQS in Table 10. The impacts are all less than the applicable NAAQS.

**Table 9 - Comparison of Project and Cumulative Impacts to Class II PSD Increments**

| Pollutant/Avg | Project Near -Field Maximum | Project Mid-Field Maximum | Cumulative Mid-Field Maximum | Overall Maximum | Class II PSD Increment | Percent (%)Increment |
|---|---|---|---|---|---|---|
| NOx - Annual | 20.0 | 1.7 | 4.9 | 20.0 | 25 | 80% |
| PM10 - 24-hour | 0.47 | 28.0 | 29.5 | 29.5 | 30 | 98% |
| PM10 - Annual | 0.11 | 3.6 | 4.0 | 4.0 | 17 | 23% |
| SO2 - 3-hour | 0.078 | 0.037 | 11.5 | 11.5 | 91 | 13% |
| SO2 - 24-hour | 0.025 | 0.0051 | 2.9 | 2.9 | 512 | 1% |
| SO2 - Annual | 0.004 | 0.0005 | 0.3 | 0.3 | 20 | 1% |

NOTE: Concentrations are in ug/m3.

**Table 10 - Comparison of Project and Cumulative Impacts to NAAQS**

| Pollutant/Avg | Project Near-Field Maximum | Project Mid-Field Maximum | Cumulative Mid-Field Maximum | Overall Max Impact | Background Concentration | Total Concentration | NAAQS | Percent (%) of NAAQS |
|---|---|---|---|---|---|---|---|---|
| CO - 1-hour | 357 | 802 | 1613 | 1612.8 | 2288 | 3901.2 | 40000 | 10% |
| CO - 8-hour | 184 | 147 | 300 | 300.5 | 1831 | 2131.1 | 10000 | 21% |
| NOx - Annual | 20.5 | 3.7 | 6.8 | 20.5 | 16.9 | 37.4 | 100 | 37% |
| PM10 - 24-hour | 70.6 | 28.3 | 30.1 | 70.6 | 64.0 | 134.6 | 150 | 90% |
| PM10 - Annual | 12.6 | 3.9 | 4.3 | 12.6 | 21.0 | 33.6 | 50 | 67% |
| PM25 - 24-hour | 29.7 | 5.9 | 6.7 | 29.7 | 22.5 | 52.2 | 65 | 80% |
| PM25 - Annual | 4.3 | 0.8 | 0.9 | 4.3 | 6.9 | 11.2 | 15 | 75% |
| SO2 - 3-hour | 94.5 | 12.5 | 12.6 | 94.5 | 68 | 162 | 365 | 45% |
| SO2 - 24-hour | 26.9 | 2.7 | 2.9 | 26.9 | 21 | 48 | 1300 | 4% |
| SO2 - Annual | 3.6 | 0.2 | 0.3 | 3.6 | 5 | 8.8 | 80 | 11% |

NOTE: Concentrations are in ug/m3.

# 5.0 ASSESSMENT OF CLASS I IMPACTS

The Class I air quality impact analyses compare the predicted direct and cumulative air impacts of the Project to the Class I SILs, the PSD Class I increments, and to the AQRV threshold values.

The EPA has proposed and Colorado has established Class I SILs in order to define a deminimus impact level for Class I areas that is considered “insignificant” and does not warrant further review under the PSD permitting process. For this NEPA air quality analysis, the PSD review criteria are not directly applicable. However, the direct Project impacts are compared to the Class I SILs in Table 11 in order to evaluate the relative magnitude of the impacts. The 24-hour $PM_{10}$, 3-hr $SO_2$, and annual $NO_2$ impacts are greater than the Class I SILs.

The direct Project impacts (excluding temporary construction sources) were also evaluated by comparison to the Class I PSD Increments, and these results are presented in Table 12. This increment analysis is for information purposes only, and does not represent a cumulative regulatory PSD Increment Consumption Analysis. The impacts are all substantially less than the Class I PSD increments.

**Table 11 - Comparison of Direct Project Impacts to Class I Significant Impact Levels**

| Pollutant/Avg | Project Maximum | Class I SILs | Greater than SIL? |
|---|---|---|---|
| NOx - Annual | 0.15 | 0.1 | Yes |
| PM10 - 24-hour | 1.1 | 0.3 | Yes |
| PM10 - Annual | 0.1 | 0.2 | No |
| SO2 - 3-hour | 0.5 | 0.2 | Yes |
| SO2 - 24-hour | 0.1 | 1.0 | No |
| SO2 - Annual | 0.01 | 0.1 | No |

NOTE: Concentrations are in ug/m3.

**Table 12 - Comparison of Project and Cumulative Impacts to Class I PSD Increments**

| Pollutant/Avg | Project Maximum | Cumulative Maximum | Overall Maximum | Class I PSD Increment | Percent (%) Increment |
|---|---|---|---|---|---|
| NOx - Annual | 0.034 | 0.360 | 0.360 | 3 | 14% |
| PM10 - 24-hour | 1.02 | 1.019 | 1.019 | 10 | 10% |
| PM10 - Annual | 0.07 | 0.162 | 0.162 | 5 | 3% |
| SO2 - 3-hour | 0.00061 | 0.967 | 0.967 | 5 | 19% |
| SO2 - 24-hour | 0.00008 | 0.126 | 0.126 | 25 | 0.5% |
| SO2 - Annual | 0.00001 | 0.017 | 0.017 | 2 | 0.8% |

NOTE: Concentrations are in ug/m3.

Direct and cumulative visibility impacts were determined using VISCREEN Level 1 with a “virtual point source” approach in order to better account for the geographic separation of emissions. Given that the separation of Project emission sources is on the order of 10 kilometers, using the sigma y curve for F stability results in an increase in downwind distance of 80 km to account for the separation of emissions (added to the actual distance of 35 km). Background visual range was based upon FLAG reconstructed natural background extinction of 15.6 Mm-1 (visual range of 251 km). A background 1-hour ozone concentration of 77 ppb was used, and primary sulfate emissions were estimated as two percent of the SO2 emissions. The total Project emissions (peak construction plus full production) were input to VISCREEN in order to conservatively assess visibility impacts. Appendix C presents the VISCREEN output results for the Monument analysis, which indicate that impacts are less than the screening criteria.

The cumulative visibility analysis also used VISCREEN to assess impacts for other cumulative sources (with distances adjusted, as necessary, in order to account for geographic separation of emission units at each source). Because the only cumulative source outside of the Monument was the Monticello NEPA project, it was modeled using an actual distance of 85 km added to a virtual point source increase in downwind distance of 80 km. Appendix C presents the VISCREEN output results for the Monticello analysis, which indicate that impacts are less than the screening criteria. Conservatively adding the Monument and Monticello impacts together in order to estimate cumulative impacts still results in cumulative visibility impacts less than the screening criteria.

Direct and cumulative Class I deposition impacts were determined using the Level 1 method described in section 5.1.3 of the “Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 1 Recommendations” (1993). This method uses the maximum modeled Project and cumulative PSD increment concentrations at Mesa Verde National Park with the conservative assumption that all $SO_2$ and NOx are converted and deposited. Table 13 compares deposition impacts to U. S. Department of Agriculture (USDA) Forest Service levels of concern, defined as five kilograms per hectare per year (kg/ha-yr) for Sulfur (S) and 3 kg/ha-yr for Nitrogen (N). All direct Project deposition impacts and the cumulative S deposition impact are less than the levels of concern. The cumulative N deposition impact is greater than the level of concern, but this is likely the result of the extremely conservative methodology used in this deposition analysis.

**Table 13 - Sulfur and Nitrogen Deposition Impacts**

| | Direct Project Sulfur Deposition | Direct Project Nitrogen Deposition | Cumulative Sulfur Deposition | Cumulative Nitrogen Deposition |
|---|---|---|---|---|
| $SO_2$ PSD Class I Annual Conc. (ug/m3) | 0.00971 | NA | 0.017 | NA |
| $NO_2$ PSD Class I Annual Conc. (ug/m3) | NA | 0.034 | NA | 0.360 |
| Mole Weight Adjustment Factor | 0.5 | 0.30 | 0.5 | 0.30 |
| Number seconds/year | 3.1536E+07 | 3.1536E+07 | 3.1536E+07 | 3.1536E+07 |
| Deposition Velocity | 0.005 | 0.05 | 0.005 | 0.05 |
| Dry Deposition (kg/ha/yr) | 0.05 | 1.1 | 0.09 | 12.1 |
| Effects Threshold (kg/ha/yr) | 5.0 | 3.0 | 5.0 | 3.0 |

# 6.0 HAZARDOUS AIR POLLUTANT ANALYSIS RESULTS

The Hazardous Air Pollutant (HAPs) analysis evaluated the formaldehyde direct Project impacts for both short-term (acute) and long-term (chronic) exposure assessment, as well as evaluated formaldehyde cancer risks.

Formaldehyde emissions for both the construction and production phases were modeled. The modeling methodology used the same near-field source layout and receptor configuration as previously described in Section 3.4. The maximum modeled hourly formaldehyde concentration was 16.9 ug/m3, and the maximum annual average concentration was 0.116 ug/m3.

The short-term analysis evaluated modeled impacts against the EPA Acute Exposure Guideline Level[3] (AEGL) level-1, 1-hour concentration threshold for formaldehyde of 0.90 ppm, equivalent to 1,107 ug/m3. The maximum modeled 1-hour concentration is 1.5% of the AEGL concentration.

The long-term analysis evaluates modeled annual impacts against a chronic threshold of concern. The EPA has not established a long-term Reference Concentration (RfC) for formaldehyde. However, the Agency for Toxic Substances and Disease Registry (ATSDR) has established a chronic inhalation minimal risk level (MRL) of 0.003 ppm, which is equivalent to 3.7 ug/m3 (ATSDR 1997). The MRL is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse non-cancer health effects over a specified duration of exposure. The maximum modeled annual concentration is 3.1% of the MRL concentration.

The incremental risk analysis considered exposure over a 70-year lifetime using the EPA's unit risk factor (ATSDR 1997) for formaldehyde ($1.3x10^{-5}$). The most likely exposure (MLE) scenario was considered. The duration of exposure for the MEI scenario is assumed to be 50 years, in order to represent the project (well-field) lifetime, corresponding to an exposure adjustment factor of 50/70 = 0.71. A second adjustment can be made for time spent at home versus time spent elsewhere, but the MEI scenario assumes that the individual is at home 100% of the time, for a final MEI adjustment factor of (0.71 x 1.0) = 0.71. To calculate the excess cancer risk, the maximum annual predicted formaldehyde concentration was multiplied by the adjustment factors, then by the unit risk factor. The resulting estimated cancer risk is $1.07x10^{-6}$, which is at the very low end of the generally accepted cancer risk range of $1 \times 10^{-6}$ to $100 \times 10^{-6}$ presented in the "Superfund" National Oil and Hazardous Substances Pollution Contingency Plan (EPA 1990).

# 7.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological Profile for Formaldehyde (Draft). Public Health Service. U.S. Department of Health and Human Services. Atlanta, Georgia.

Federal Land Managers' Air Quality Related Values Workgroup (FLAG). 2000. Phase I Report (dated December 2000). USDOI-National Park Service, Air Resources Division. Denver, Colorado.

[3] The AEGLs are intended to describe the risk to humans resulting from short-term (acute) exposure to airborne chemicals. Three different levels of AEGLs have been developed that represent varying degrees of severity of toxic effects. AEGL level-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects (Source: http://www.epa.gov/oppt/aegl/index.htm

IWAQM. 1993. Interagency Workshop on Air Quality Modeling Phase 1 Report. EPA-454/R-93-015. U.S. Environmental Protection Agency. Research Triangle Park, North Carolina.

Scheffe, R. D. 1988. VOC/NOx Point Source Screening Tables. EPA Office of Air Quality Planning and Standards. Technical Support Division, Source Receptor Analysis Branch. September

Turner, D.B. 1970. Workbook of Atmospheric Dispersion Estimates. PHS Publication No 999-AP-26. U.S. Department of Health, Education and Welfare, National Air Pollution Control Administration. Cincinnati, Ohio.

U.S. Environmental Protection Agency (EPA). 1985. Compilation of Air Pollution Emission Factors, Volume I. Stationary Point and Area Sources (AP-42). Fourth Edition (with subsequent supplements and updates). Office of Air Quality Planning and Standards (OAQPS). Research Triangle Park, North Carolina.

# APPENDIX A

## Detailed Project Emission Calculation Tables

## CANM Air Quality TSD - Appendix A - Detailed Project Emission Calculation Tables - Table of Contents

# Table A-1
## Oil and Gas Well - Well Pad, Resource Road (Access Road), and Pipeline Construction

**Project:** **Canyons of the Ancients**
**Activity:** **Well Pad, Resource Road (Access Road), and Pipeline Construction and Wind Erosion**
**Emissions:** **Fugitive Particulate Emissions**
**Date:** **7/10/2006**

| Ave. Disturbance per well [1] | TSP Emission Factor[2] | Construction Activity Duration | Construction Activity Duration | Emission Control Efficiency | $PM_{10}$ Emissions (controlled)[3] | $PM_{2.5}$ Emissions (controlled)[4] |
|---|---|---|---|---|---|---|
| (acres) | (tons/acre-month) | (days/well) | (hours/day) | (%) | (lb/pad) | (lb/pad) |
| General Construction Activity | | | | | | |
| 5.4 | 1.2 | 10 | 10 | 50 | 536.00 | 53.60 |
| Wind Erosion | | | | | | |
| 5.4 | 0.0289 | 10 | 10 | 50 | 12.91 | 1.29 |
| | | | | Construction Emissions (lb/pad ) | 548.91 | 54.89 |
| | | | | Construction Emissions (lb/hr/pad ) for hours of activity | 5.49 | 0.55 |

[1] Area = Total Pad, Roadway, and Pipeline Disturbance of 434.16 acres divided by 81 total wells; TSP = total suspended particulates.

[2] For construction, AP-42 (EPA 2004), Section 13.2.3, "Heavy Construction Operations".
For Wind Erosion, Control of Open Fugitive Dust Sources, Section 4.1.3, EPA-450/3-98-008, Silt = 5.1, 5% of time WS > 5.4 m/s

[3] AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads". The PM10 factor is calculated as 25% of the TSP factor.

[4] Assuming 10% of the PM10 is PM2.5, based on "Analysis of the Fine Praction of PM in Fugitive Dust, MRI Report 110397, Oct. 12 2005.

# Table A-2
# Oil and Gas Well - Pad/Road/Pipeline Construction Heavy Equipment Tailpipe

**Project:** Canyons of the Ancients
**Activity:** Pad/Road/Pipeline Construction
**Emissions:** Diesel Combustion Tailpipe Emissions From Heavy Construction Traffic
**Date:** 7/10/2006

| Heavy Equipment | Engine Horsepower | Number Required | Operating Load Factor[1] | Pollutant Emission Factor[2] | | | | | Operation Duration | Construction Activity Duration | Pollutant Emissions | | | | | Pollutant Emissions[4] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (hp) | | | (g/hp-hr) | | | | | (days/ equipment type) | (hours/day) | (lb/pad) | | | | | (lb/hr/pad) | | | | |
| | | | | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$ | | | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$[5] | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$[5] |
| Scraper | 700 | 2 | 0.4 | 2.45 | 7.46 | 0.901 | 0.55 | 0.789 | 4 | 10 | 120.99 | 368.40 | 44.49 | 27.16 | 38.96 | 3.02 | 9.21 | 1.11 | 0.68 | 0.97 |
| Motor Grader | 250 | 1 | 0.4 | 1.54 | 7.14 | 0.874 | 0.36 | 0.625 | 4 | 10 | 13.58 | 62.96 | 7.71 | 3.17 | 5.51 | 0.34 | 1.57 | 0.19 | 0.08 | 0.14 |
| D8 Dozer[3] | 210 | 1 | 0.4 | 2.15 | 7.81 | 0.851 | 0.75 | 0.692 | 4 | 10 | 15.93 | 57.85 | 6.30 | 5.56 | 5.13 | 0.40 | 1.45 | 0.16 | 0.14 | 0.13 |
| Total Heavy Equipment Tailpipe Emissions | | | | | | | | | | | 150.49 | 489.21 | 58.50 | 35.89 | 49.60 | 3.76 | 12.23 | 1.46 | 0.90 | 1.24 |

1 Taken from "Surface Mining" (Pfleider 1972) for average service duty.
2 AP-42 (EPA 1985), Volume II Mobile Sources.
3 Emission factor for track-type tractor.
4 Calculated as lb/well; days/equipment type; 10 hours/day.
5 $PM_{2.5}$ assumed equivalent to $PM_{10}$ for combustion sources.

# Table A-3
# Oil and Gas Well Pad/Resource Road/Pipeline Construction Traffic

**Project:** **Canyons of the Ancients**
**Activity:** **Well Pad/Resource Road/Pipeline Construction Traffic**
**Emissions:** **Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date:** **7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight [1] (lb) | Average Vehicle Speed (mph) | Silt Content[2] (%) | Moisture Content[3] (%) | RTs per Well | RT Distance (miles) | VMT [4] (VMT/pad) | Emission Control Efficiency (%) | $PM_{10}$ Emission Factor[5] (lb/VMT) | $PM_{2.5}$ Emission Factor[5] (lb/VMT) | $PM_{10}$ Emissions[6] (controlled) (lb/well) | $PM_{2.5}$ Emissions[6] (controlled) (lb/well) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gravel haul/Semis/transport, boom, equipment, trucks | Primary Access | magnesium chloride | 35,000 | 20 | 5.1 | 2.4 | 16 | 25 | 400 | 85 | 1.54 | 0.24 | 92.14 | 14.13 |
| | Resource | water | 35,000 | 15 | 5.1 | 2.4 | 16 | 1.1 | 18 | 50 | 1.54 | 0.24 | 13.51 | 2.07 |
| Light trucks/pickups | Primary Access | magnesium chloride | 7,000 | 25 | 5.1 | 2.4 | 24 | 25 | 600 | 85 | 0.51 | 0.076 | 45.88 | 6.86 |
| | Resource | water | 7,000 | 15 | 5.1 | 2.4 | 24 | 1.1 | 26 | 50 | 0.39 | 0.059 | 5.21 | 0.78 |
| Total Unpaved Road Traffic Emissions (lb/well) | | | | | | | | | | | | | 156.75 | 23.84 |
| Total Unpaved Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.22 | 0.03 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.026 | 0.0040 |

1 Average weight for gravel and semi trucks estimated at 35,000 lbs used for calculations
2 AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."
3 AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
4 Calculated as Round Trips per Vehicle Type x Round Trip Distance.
5 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
6 Calculated as lb/VMT x VMT/pad x control efficiency.
7 Calculated as (lb/well); 30 days/well; 24 hours/day.

# Table A-4
## Oil and Gas Well Pad/Resource Road/Pipeline Construction Traffic Tailpipe

**Project:** **Canyons of the Ancients**
**Activity:** **Well Pad/Resource Road/Pipeline Construction Traffic Tailpipe**
**Emissions:** **Diesel Combustion Tailpipe Emissions From Heavy Construction Traffic**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] | Total Haul Truck RTs | RT Distance | Total Haul Truck Miles Traveled | Haul Activity Duration | Haul Activity Duration | Emissions | Emissions[3] |
|---|---|---|---|---|---|---|---|---|
| | (g/mile) | (RTs/well) | (miles/RT) | (miles/well) | (days/well) | (hours/day) | (lb/well) | (lb/hr/well) |
| CO | 14.74 | 16 | 26.1 | 417.6 | 10 | 24 | 13.57 | 0.06 |
| $NO_x$ | 11.44 | 16 | 26.1 | 417.6 | 10 | 24 | 10.53 | 0.04 |
| $SO_2$[2] | 0.32 | 16 | 26.1 | 417.6 | 10 | 24 | 0.29 | 0.0012 |
| VOC | 5.69 | 16 | 26.1 | 417.6 | 10 | 24 | 5.24 | 0.02 |

1 AP-42 (EPA 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.
2 The $SO_2$ emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.
3 Calculated as lb/well dividied by haul duration days/well and hours/day.

## Table A-5
## CO2 Well - Well Pad, Resource Road (Access Road), and Pipeline Construction

**Project:** **Canyons of the Ancients**
**Activity:** **Well Pad, Resource Road (Access Road), and Pipeline Construction**
**Emissions:** **Fugitive Particulate Emissions**
**Date:** **7/10/2006**

| Ave. Disturbance per well [1] | Construction Activity TSP Emission Factor[2] | Construction Activity Duration | Construction Activity Duration | Emission Control Efficiency | $PM_{10}$ Emissions (controlled)[3] | $PM_{2.5}$ Emissions (controlled)[4] |
|---|---|---|---|---|---|---|
| (acres) | (tons/acre-month) | (days/well) | (hours/day) | (%) | (lb/well) | (lb/well) |
| General Construction Activity | | | | | | |
| 7.0 | 1.2 | 10 | 10 | 50 | 697.50 | 69.75 |
| Wind Erosion | | | | | | |
| 7.0 | 0.0289 | 10 | 10 | 50 | 16.80 | 1.68 |
| | | | Construction Emissions (lb/pad ) | | 714.30 | 71.43 |
| | | Construction Emissions (lb/hr/pad ) for hours of activity | | | 7.14 | 0.71 |

1 Area = Total Pad, Roadway, and Pipeline Disturbance of 279 acres divided by 40 new well pads; TSP = total suspended particulates.

2 For construction, AP-42 (EPA 2004), Section 13.2.3, "Heavy Construction Operations".
For Wind Erosion, Control of Open Fugitive Dust Sources, Section 4.1.3, EPA-450/3-98-008, Silt = 5.1, 5% of time WS > 5.4 m/s

3 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads". The PM10 factor is calculated as 25% of the TSP factor.

4 Assuming 10% of the PM10 is PM2.5, based on "Analysis of the Fine Praction of PM in Fugitive Dust, MRI Report 110397, Oct. 12 2005.

# Table A-6
## CO2 Well - Pad/Road/Pipeline Construction Heavy Equipment Tailpipe

**Project:** Canyons of the Ancients
**Activity:** Pad/Road/Pipeline Construction
**Emissions:** Diesel Combustion Tailpipe Emissions From Heavy Construction Traffic
**Date:** 7/10/2006

| Heavy Equipment | Engine Horsepower | Number Required | Operating Load Factor[1] | Pollutant Emission Factor[2] | | | | | Operation Duration | Construction Activity Duration | Pollutant Emissions | | | | | Pollutant Emissions[4] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (hp) | | | (g/hp-hr) | | | | | (days/ equipment type) | (hours/day) | (lb/pad) | | | | | (lb/hr/pad) | | | | |
| | | | | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$ | | | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$[5] | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$[5] |
| Scraper | 700 | 2 | 0.4 | 2.45 | 7.46 | 0.901 | 0.55 | 0.789 | 4 | 10 | 120.99 | 368.40 | 44.49 | 27.16 | 38.96 | 3.02 | 9.21 | 1.11 | 0.68 | 0.97 |
| Motor Grader | 250 | 1 | 0.4 | 1.54 | 7.14 | 0.874 | 0.36 | 0.625 | 4 | 10 | 13.58 | 62.96 | 7.71 | 3.17 | 5.51 | 0.34 | 1.57 | 0.19 | 0.08 | 0.14 |
| D8 Dozer[3] | 210 | 1 | 0.4 | 2.15 | 7.81 | 0.851 | 0.75 | 0.692 | 4 | 10 | 15.93 | 57.85 | 6.30 | 5.56 | 5.13 | 0.40 | 1.45 | 0.16 | 0.14 | 0.13 |
| Total Heavy Equipment Tailpipe Emissions | | | | | | | | | | | 150.49 | 489.21 | 58.50 | 35.89 | 49.60 | 3.76 | 12.23 | 1.46 | 0.90 | 1.24 |

1 Taken from "Surface Mining" (Pfleider 1972) for average service duty.
2 AP-42 (EPA 1985), Volume II Mobile Sources.
3 Emission factor for track-type tractor.
4 Calculated as lb/well; days/equipment type; 10 hours/day.
5 $PM_{2.5}$ assumed equivalent to $PM_{10}$ for combustion sources.

# Table A-7
# CO2 Well Pad/Resource Road/Pipeline Construction Traffic

**Project:** **Canyons of the Ancients**
**Activity:** **Well Pad/Resource Road/Pipeline Construction Traffic**
**Emissions:** **Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date:** **7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight [1] (lb) | Average Vehicle Speed (mph) | Silt Content[2] (%) | Moisture Content[3] (%) | RTs per Well | RT Distance (miles) | VMT [4] (VMT/pad) | Emission Control Efficiency (%) | $PM_{10}$ Emission Factor[5] (lb/VMT) | $PM_{2.5}$ Emission Factor[5] (lb/VMT) | $PM_{10}$ Emissions[6] (controlled) (lb/well) | $PM_{2.5}$ Emissions[6] (controlled) (lb/well) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gravel haul/Semis/transport, boom, equipment, trucks | Primary Access | magnesium chloride | 35,000 | 20 | 5.1 | 2.4 | 100 | 25 | 2,500 | 85 | 1.54 | 0.24 | 575.88 | 88.30 |
| | Resource | water | 35,000 | 15 | 5.1 | 2.4 | 100 | 1.1 | 110 | 50 | 1.54 | 0.24 | 84.46 | 12.95 |
| Light trucks/pickups | Primary Access | magnesium chloride | 7,000 | 25 | 5.1 | 2.4 | 30 | 25 | 750 | 85 | 0.51 | 0.076 | 57.36 | 8.57 |
| | Resource | water | 7,000 | 15 | 5.1 | 2.4 | 30 | 1.1 | 33 | 50 | 0.39 | 0.059 | 6.51 | 0.97 |
| Total Unpaved Road Traffic Emissions (lb/well) | | | | | | | | | | | | | 724.22 | 110.80 |
| Total Unpaved Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 1.01 | 0.15 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.126 | 0.0193 |

1 Average weight for gravel and semi trucks estimated at 35,000 lbs used for calculations
2 AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."
3 AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
4 Calculated as Round Trips per Vehicle Type x Round Trip Distance.
5 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
6 Calculated as lb/VMT x VMT/pad x control efficiency.
7 Calculated as (lb/well); 30 days/well; 24 hours/day.

# Table A-8
# CO2 Well Pad/Resource Road/Pipeline Construction Traffic Tailpipe

**Project:** **Canyons of the Ancients**
**Activity:** **Well Pad/Resource Road/Pipeline Construction Traffic Tailpipe**
**Emissions:** **Diesel Combustion Emissions from Heavy Equipment Tailpipes**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] | Total Haul Truck RTs | RT Distance | Total Haul Truck Miles Traveled | Haul Activity Duration | Haul Activity Duration | Emissions | Emissions[3] |
|---|---|---|---|---|---|---|---|---|
| | (g/mile) | (RTs/well) | (miles/RT) | (miles/well) | (days/well) | (hours/day) | (lb/well) | (lb/hr/well) |
| CO | 14.74 | 100 | 26.1 | 2610 | 10 | 24 | 84.81 | 0.35 |
| $NO_x$ | 11.44 | 100 | 26.1 | 2610 | 10 | 24 | 65.83 | 0.27 |
| $SO_2$[2] | 0.32 | 100 | 26.1 | 2610 | 10 | 24 | 1.83 | 0.0076 |
| VOC | 5.69 | 100 | 26.1 | 2610 | 10 | 24 | 32.74 | 0.14 |

1 AP-42 (EPA 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.
2 The $SO_2$ emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.
3 Calculated as lb/well dividied by haul duration days/well and hours/day.

# Table A-9
# Rig Move and Drilling Truck

**Project: Canyons of the Ancients**
**Activity: Rig Move and Drilling Truck Emissions**
**Emissions: Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date: 7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight (lb) | Average Vehicle Speed (mph) | Silt Content[2] (%) | Moisture Content[3] (%) | RTs per Well | RT Distance (miles) | VMT [4] (VMT/pad) | Emission Control Efficiency (%) | $PM_{10}$ Emission Factor[5] (lb/VMT) | $PM_{2.5}$ Emission Factor[5] (lb/VMT) | $PM_{10}$ Emissions[6] (controlled) (lb/well) | $PM_{2.5}$ Emissions[6] (controlled) (lb/well) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Semis-tractor/ trailer/mud/water/ fuel/cement trucks[1] | Primary Access | magnesium chloride | 44,000 | 20 | 5.1 | 2.4 | 10 | 25 | 250 | 85 | 1.70 | 0.26 | 63.83 | 9.79 |
| | Resource | water | 44,000 | 15 | 5.1 | 2.4 | 10 | 1.1 | 11 | 50 | 1.70 | 0.26 | 9.36 | 1.44 |
| Logging/mud trucks | Primary Access | magnesium chloride | 48,000 | 20 | 5.1 | 2.4 | 10 | 25 | 250 | 85 | 1.77 | 0.27 | 66.38 | 10.18 |
| | Resource | water | 48,000 | 15 | 5.1 | 2.4 | 10 | 1.1 | 11 | 50 | 1.77 | 0.27 | 9.74 | 1.49 |
| Vendors/marketers/ various | Primary Access | magnesium chloride | 7,000 | 30 | 5.1 | 2.4 | 80 | 25 | 2,000 | 85 | 0.56 | 0.083 | 167.56 | 25.05 |
| | Resource | water | 7,000 | 20 | 5.1 | 2.4 | 80 | 1.1 | 88 | 50 | 0.46 | 0.068 | 20.06 | 3.00 |
| Total Unpaved Road Traffic Emissions (lb/well) | | | | | | | | | | | | | 336.94 | 50.94 |
| Total Unpaved Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.47 | 0.07 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.054 | 0.0082 |

[1] Semi vehicle weight range is 28,000-60,000 lbs; average weight of 44,000 lbs used for calculations.
[2] AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."
[3] AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
[4] Calculated as Round Trips per Vehicle Type x Round Trip Distance.
[5] AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
[6] Calculated as lb/VMT x VMT/pad x control efficiency.
[7] Calculated as (lb/well); 30 days/well; 24 hours/day.

# Table A-10
# Rig Move and Drilling Truck Tailpipe

**Project:** **Canyons of the Ancients**
**Activity:** **Rig Move and Drilling Trucks - Tailpipe**
**Emissions:** **Diesel Combustion Emissions from Heavy Equipment Tailpipes**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] | Total Haul Truck RTs | RT Distance | Total Haul Truck Miles Traveled | Haul Activity Duration | Haul Activity Duration | Emissions | Emissions[3] |
|---|---|---|---|---|---|---|---|---|
| | (g/mile) | (RTs/well) | (miles/RT) | (miles/well) | (days/well) | (hours/day) | (lb/well) | (lb/hr/well) |
| CO | 14.74 | 20 | 26.1 | 522 | 22 | 24 | 16.96 | 0.03 |
| $NO_x$ | 11.44 | 20 | 26.1 | 522 | 22 | 24 | 13.17 | 0.02 |
| $SO_2$[2] | 0.32 | 20 | 26.1 | 522 | 22 | 24 | 0.37 | 0.0007 |
| VOC | 5.69 | 20 | 26.1 | 522 | 22 | 24 | 6.55 | 0.01 |

1 AP-42 (EPA 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.
2 The $SO_2$ emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.
3 Calculated as lb/well dividied by haul duration days/well and hours/day.

# Table A-11
# Drilling Rig Emissions

**Project:** **Canyons of the Ancients**
**Activity:** **Drilling Rigs**
**Emissions:** **Diesel Combustion Emissions from Drilling Engines - EPA AP-42**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] (lb/hp-hr) | Total Horsepower (hp) All Engines[2] (hp) | Overall Load Factor[3] | Drilling Activity Duration (days/well) | Drilling Activity Duration (hours/day) | Emissions (lb/well) | Emissions (lb/hr/well) |
|---|---|---|---|---|---|---|---|
| CO | 6.68E-03 | 2,100 | 0.42 | 30 | 24 | 4,267.32 | 5.93 |
| NOx | 0.031 | 2,100 | 0.42 | 30 | 24 | 19,803.42 | 27.50 |
| $SO_2$[4] | 2.05E-03 | 2,100 | 0.42 | 30 | 24 | 1,309.58 | 1.82 |
| VOC | 2.50E-03 | 2,100 | 0.42 | 30 | 24 | 1,597.05 | 2.22 |
| $PM_{10}$[5] | 2.20E-03 | 2,100 | 0.42 | 30 | 24 | 1,405.40 | 1.95 |
| Formaldehyde | 1.18E-03 | 2,100 | 0.42 | 30 | 24 | 753.81 | 1.05 |

**Stack Parameters**

| | |
|---|---|
| Height | 5 m |
| Temperature | 700 Kelvin |
| Diameter | 0.2 m |
| Velocity | 25 m/s |

5 x 5 x 5 m structure used to determine downwash parameters for the drilling rigs.

1 AP-42 (EPA 2004), Section 3.3, "Gasoline and Diesel Industrial Engines. Table 3.3-1, "Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines"; lb/hp-hr = pounds per horsepower-hour.

2 Drilling engine horsepower based on three engines, two at 800 hp and one at 500 hp.

3 The overall load factor is calculated based on average throttle setting of 65% and a load factor of 65%. Therefore, the overall load factor = 0.65 * 0.65 = 0.42.

4 The $SO_2$ emission factor is calculated assuming 26.4 gal/hr fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal. Fuel consumption rate calculated from Caterpillar's specification sheet for G3412, gas petroeleum drilling engine.

5 $PM_{2.5}$ assumed equivalent to $PM_{10}$ for drilling engines.

# Table A-12
# Completion/Testing Traffic

**Project: Canyons of the Ancients**
**Activity: Completion/Testing Traffic**
**Emissions: Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date: 7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight (lb) | Average Vehicle Speed (mph) | Silt Content[2] (%) | Moisture Content[3] (%) | RTs per Well | RT Distance (miles) | VMT[4] (VMT/well) | Emission Control Efficiency (%) | $PM_{10}$ Emissions[5] (lb/VMT) | $PM_{2.5}$ Emissions[5] (lb/VMT) | $PM_{10}$ Emissions[6] (controlled) (lb/well) | $PM_{2.5}$ Emissions[6] (controlled) (lb/well) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Semis/transport/ water/sand/frac trucks[1] | Primary Access | magnesium chloride | 54,000 | 20 | 5.1 | 2.4 | 10 | 25 | 250 | 85 | 1.87 | 0.29 | 70.00 | 10.73 |
| | Resource | water | 54,000 | 15 | 5.1 | 2.4 | 10 | 1.1 | 11 | 50 | 1.87 | 0.29 | 10.27 | 1.57 |
| Large Haul Trucks | Primary Access | magnesium chloride | 48,000 | 20 | 5.1 | 2.4 | 5 | 25 | 125 | 85 | 1.77 | 0.27 | 33.19 | 5.09 |
| | Resource | water | 48,000 | 15 | 5.1 | 2.4 | 5 | 1.1 | 6 | 50 | 1.77 | 0.27 | 4.87 | 0.75 |
| Light trucks/ pick-ups | Primary Access | magnesium chloride | 7,000 | 30 | 5.1 | 2.4 | 30 | 25 | 750 | 85 | 0.56 | 0.08 | 62.83 | 9.39 |
| | Resource | water | 7,000 | 20 | 5.1 | 2.4 | 30 | 1.1 | 33 | 50 | 0.46 | 0.07 | 7.52 | 1.12 |
| Total Unpaved Road Traffic Emissions (lb/well) | | | | | | | | | | | | | 188.68 | 28.66 |
| Total Unpaved Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.32 | 0.05 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.031 | 0.0048 |

1 Semi vehicle weight range is 28,000-80,000 lbs; average weight of 54,000 lbs used for calculations.
2 AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."
3 AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
4 Calculated as Round Trips per Vehicle Type x Round Trip Distance.
5 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
6 Calculated as lb/VMT x VMT/pad x control efficiency.
7 Calculated as lb/well; 35 days/well; 17 hours/day; and represents emissions for 9.5-mile segment of road.

# Table A-13
# Completion/Testing Heavy Equipment Tailpipe

**Project:** **Canyons of the Ancients**
**Activity:** **Completion/Testing Tailpipe**
**Emissions:** **Diesel Combustion Emissions from Heavy Equipment Tailpipes**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] | Total Haul Truck RTs | RT Distance | Total Haul Truck Miles Traveled | Haul Activity Duration | Haul Activity Duration | Emissions | Emissions[3] |
|---|---|---|---|---|---|---|---|---|
| | (g/mile) | (RTs/well) | (miles/RT) | (miles/well) | (days/well) | (hours/day) | (tons/well) | (lb/hr/well) |
| CO | 14.74 | 15 | 26.1 | 391.5 | 35 | 17 | 6.4E-03 | 0.021 |
| $NO_x$ | 11.44 | 15 | 26.1 | 391.5 | 35 | 17 | 4.9E-03 | 0.017 |
| $SO_2$[2] | 0.32 | 15 | 26.1 | 391.5 | 35 | 17 | 1.4E-04 | 0.0005 |
| VOC | 5.69 | 15 | 26.1 | 391.5 | 35 | 17 | 2.5E-03 | 0.008 |

1 AP-42 (EPA 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.

2 The $SO_2$ emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.

3 Calculated as lb/well dividied by haul duration days/well and hours/day.

## Table A-14
## Completion Flaring

**Project:** **Canyons of the Ancients**
**Activity:** **Oil and Gas Well Completion/Testing Flaring**
**Emissions:** **NOx, CO, and VOC**
**Date:** **7/12/2006**

**Flaring Specifications:**

| | | | |
|---|---|---|---|
| Total Volume of Gas Emitted | 1,000 | mcf | |
| Total Volume of Condensate Emitted (seperator) | 0 | bbls | |
| Average Heat Content | 1,093 | BTU/scf | |
| Flaring/Flowback Activity Duration | 0 | hrs/well | No Fracturing |
| Flaring Duration | 24 | hrs/well | |
| Pre-ignition Flow-back Duration | 0 | hrs/well | |
| Pre-ignition Flow-back Time Involving a Gas Stream | 0 | % | |
| Actual Hours Gas is Vented | 0 | hrs | |
| Total Hours in which Gas is Vented or Flared[1] | 24 | hrs | |
| Average Flowrate of Gas[2] | 41.67 | mcf/hr | |
| Total Volume of Gas Vented[3] | 166.67 | mcf | |
| Total Volume of Flared Gas[4] | 1,000.00 | mcf | |
| Average Flowrate of Condensate | 0.00 | bbls/hr | |
| Pre-flare Volume of Condensate | 0.00 | bbls | |
| Volume of Condensate Flared | 0.00 | bbls | |

| Activity | Volume | Volume | Pollutant | Emission | Emission | Emission Factor Source | Total (tons) | Duration (hours) | Hourly (lb/hr) |
|---|---|---|---|---|---|---|---|---|---|
| Flaring - Natural Gas | 1,000.00 | mcf | NOx | 0.068 | lb / 10^6 BTU | AP-42 Section 13.5 | 0.04 | 24 | 3.10 |
| | | | CO | 0.37 | lb / 10^6 BTU | AP-42 Section 13.5 | 0.20 | 24 | 16.85 |
| | | | VOC | 2.35 | lb / 1000 scf | Estimated Analysis - 50% Destruction | 1.17 | 24 | 97.84 |
| TOTAL FLARING EMISSIONS | | | NOx | | | | 0.04 | 24 | 3.10 |
| | | | CO | | | | 0.20 | 24 | 16.85 |
| NOTE: Sweet Gas without sulfur, so no SO2 emissions. | | | VOC | | | | 1.17 | 24 | 97.84 |

# Table A-15
# Processing Facility Construction

**Project:** **Canyons of the Ancients**
**Activity:** **Treatment Facility and Associated Pipelines Construction**
**Emissions:** **Fugitive Particulate Emissions**
**Date:** **7/10/2006**

| Ave. Disturbance per facility [1] | TSP Emission Factor[2] | Construction Activity Duration | Construction Activity Duration | Emission Control Efficiency | $PM_{10}$ Emissions (controlled)[3] | $PM_{2.5}$ Emissions (controlled)[4] |
|---|---|---|---|---|---|---|
| (acres) | (tons/acre-month) | (days/facility) | (hours/day) | (%) | (lb/facility) | (lb/pad) |
| General Construction Activity | | | | | | |
| 21.2 | 1.2 | 30 | 10 | 50 | 6360.00 | 636.00 |
| Wind Erosion | | | | | | |
| 21.2 | 0.0289 | 30 | 10 | 50 | 153.17 | 15.32 |
| | | | | Construction Emissions (lb/pad ) | 6513.17 | 651.32 |
| | | | | Construction Emissions (lb/hr/pad ) for hours of activity | 21.71 | 2.17 |

1 Area = 3 acres facility plus 18.2 acres pipeline; TSP = total suspended particulates.

2 For construction, AP-42 (EPA 2004), Section 13.2.3, "Heavy Construction Operations".
For Wind Erosion, Control of Open Fugitive Dust Sources, Section 4.1.3, EPA-450/3-98-008, Silt = 5.1, 5% of time WS > 5.4 m/s

3 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads". The PM10 factor is calculated as 25% of the TSP factor.

4 Assuming 10% of the PM10 is PM2.5, based on "Analysis of the Fine Praction of PM in Fugitive Dust, MRI Report 110397, Oct. 12 2005.

# Table A-16
## Facility Construction Heavy Equipment Tailpipe

**Project:** Canyons of the Ancients
**Activity:** Processing facility Pad/Road/Pipeline
**Emissions:** Diesel Combustion Tailpipe Emissions From Heavy Construction Traffic
**Date:** 7/12/2006

| Heavy Equipment | Engine Horsepower | Number Required | Operating Load Factor[1] | Pollutant Emission Factor[2] (g/hp-hr) | | | | | Operation Duration | Construction Activity Duration | Pollutant Emissions (lb/pad) | | | | | Pollutant Emissions[4] (lb/hr/pad) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (hp) | | | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$ | (days/ equipment type) | (hours/day) | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$[5] | CO | $NO_x$ | $SO_2$ | VOC | $PM_{10}$[5] |
| Scraper | 700 | 2 | 0.4 | 2.45 | 7.46 | 0.901 | 0.55 | 0.789 | 10 | 10 | 302.47 | 920.99 | 111.23 | 67.90 | 97.41 | 3.02 | 9.21 | 1.11 | 0.68 | 0.97 |
| Motor Grader | 250 | 1 | 0.4 | 1.54 | 7.14 | 0.874 | 0.36 | 0.625 | 10 | 10 | 33.95 | 157.41 | 19.27 | 7.94 | 13.78 | 0.34 | 1.57 | 0.19 | 0.08 | 0.14 |
| D8 Dozer[3] | 210 | 1 | 0.4 | 2.15 | 7.81 | 0.851 | 0.75 | 0.692 | 10 | 10 | 39.81 | 144.63 | 15.76 | 13.89 | 12.81 | 0.40 | 1.45 | 0.16 | 0.14 | 0.13 |
| Total Heavy Equipment Tailpipe Emissions | | | | | | | | | | | 376.23 | 1223.02 | 146.26 | 89.73 | 124.00 | 3.76 | 12.23 | 1.46 | 0.90 | 1.24 |

1 Taken from "Surface Mining" (Pfleider 1972) for average service duty.
2 AP-42 (EPA 1985), Volume II Mobile Sources.
3 Emission factor for track-type tractor.
4 Calculated as lb/well; days/equipment type; 10 hours/day.
5 $PM_{2.5}$ assumed equivalent to $PM_{10}$ for combustion sources.

# Table A-17
## Processing Facility Construction Traffic

**Project:** **Canyons of the Ancients**
**Activity:** **Facility Construction Traffic**
**Emissions:** **Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date:** **7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight [1] (lb) | Average Vehicle Speed (mph) | Silt Content[2] (%) | Moisture Content[3] (%) | RTs per Well Site | RT Distance (miles) | VMT [4] (VMT/pad) | Emission Control Efficiency (%) | $PM_{10}$ Emission Factor[5] (lb/VMT) | $PM_{2.5}$ Emission Factor[5] (lb/VMT) | $PM_{10}$ Emissions[6] (controlled) (lb/well) | $PM_{2.5}$ Emissions[6] (controlled) (lb/well) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gravel haul/Semis/transport, boom, equipment, trucks | Primary Access | magnesium chloride | 35,000 | 20 | 5.1 | 2.4 | 100 | 25 | 2,500 | 85 | 1.54 | 0.24 | 575.88 | 88.30 |
| | Resource | water | 35,000 | 15 | 5.1 | 2.4 | 100 | 1.1 | 110 | 50 | 1.54 | 0.24 | 84.46 | 12.95 |
| Light trucks/pickups | Primary Access | magnesium chloride | 7,000 | 25 | 5.1 | 2.4 | 30 | 25 | 750 | 85 | 0.51 | 0.076 | 57.36 | 8.57 |
| | Resource | water | 7,000 | 15 | 5.1 | 2.4 | 30 | 1.1 | 33 | 50 | 0.39 | 0.059 | 6.51 | 0.97 |
| Total Unpaved Road Traffic Emissions (lb/well) | | | | | | | | | | | | | 724.22 | 110.80 |
| Total Unpaved Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 1.01 | 0.15 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.126 | 0.0193 |

[1] Average weight for gravel and semi trucks estimated at 35,000 lbs used for calculations

[2] AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."

[3] AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."

[4] Calculated as Round Trips per Vehicle Type x Round Trip Distance.

[5] AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.

[6] Calculated as lb/VMT x VMT/pad x control efficiency.

[7] Calculated as (lb/well); 30 days/well; 24 hours/day.

## Table A-18
## Processing Facility Construction Truck Tailpipe

**Project:** **Canyons of the Ancients**
**Activity:** **Facility Construction Truck Tailpipe emissions**
**Emissions:** **Diesel Combustion Tailpipe Emissions From Heavy Construction Traffic**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] | Total Truck RTs | RT Distance | Total Haul Truck Miles Traveled | Haul Activity Duration | Haul Activity Duration | Emissions | Emissions[3] |
|---|---|---|---|---|---|---|---|---|
| | (g/mile) | (RTs/site) | (miles/RT) | (miles/well) | (days/well) | (hours/day) | (lb/well) | (lb/hr/well) |
| CO | 14.74 | 100 | 26.1 | 2610 | 10 | 24 | 84.81 | 0.35 |
| $NO_x$ | 11.44 | 100 | 26.1 | 2610 | 10 | 24 | 65.83 | 0.27 |
| $SO_2$[2] | 0.32 | 100 | 26.1 | 2610 | 10 | 24 | 1.83 | 0.0076 |
| VOC | 5.69 | 100 | 26.1 | 2610 | 10 | 24 | 32.74 | 0.14 |

1 AP-42 (EPA 1985), Volume II Mobile Sources. Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.
2 The $SO_2$ emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.001 lb/gal.
3 Calculated as lb/well dividied by haul duration days/well and hours/day.

# Table A-19
# O&G Production Traffic

**Project:** **Canyons of the Ancients**
**Activity:** **O&G Production Traffic**
**Emissions:** **Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date:** **7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight | Average Vehicle Speed | Silt Content[2] | Moisture Content[3] | RTs per Well | RT Distance | VMT[5] | Emission Control Efficiency | $PM_{10}$ Emission Factor[6] | $PM_{2.5}$ Emission Factor[6] | $PM_{10}$ Emissions[7] (controlled) | $PM_{2.5}$ Emissions[7] (controlled) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (lb) | (mph) | (%) | (%) | (RTs/yr) | (miles) | (VMT/well/yr) | (%) | (lb/VMT) | (lb/VMT) | (lb/well/yr) | (lb/well/yr) |
| Haul trucks (Oil/condensate/water)[1] | Primary Access | magnesium chloride | 54,000 | 20 | 5.1 | 2.4 | 158 | 25 | 3,950 | 85 | 1.87 | 0.29 | 1,105.96 | 169.58 |
| | Resource | water | 54,000 | 15 | 5.1 | 2.4 | 158 | 1.1 | 174 | 50 | 1.87 | 0.29 | 162.21 | 24.87 |
| Light trucks/ pickups/pumpers[8] | Primary Access | magnesium chloride | 7,000 | 30 | 5.1 | 2.4 | 10 | 25 | 250 | 85 | 0.56 | 0.08 | 20.94 | 3.13 |
| | Resource | water | 7,000 | 20 | 5.1 | 2.4 | 52 | 1.1 | 57 | 50 | 0.46 | 0.07 | 13.04 | 1.95 |
| Total Access and Unimproved Road Emissions (lb/well/yr) | | | | | | | | | | | | | 1,302.15 | 199.53 |
| Total Access and Unimproved Road Emissions (lb/hr/well) | | | | | | | | | | | | | 0.5008 | 0.0767 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.0674 | 0.0103 |

1 Haul trucks weight range is 28,000-80,000 lbs. Average weight of 54,000 lbs used for calculations.
2 AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."
3 AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
4
5 Calculated as Round Trips per Vehicle Type x Round Trip Distance
6 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
7 Calculated as lb/VMT x VMT/well x control efficiency.
8 Emissions based on trip frequency and miles traveled to one well in the field. During production, 20 wells could be visited per day. This assumption will be reflected in full-field modeled emissions.

# Table A-20
# O&G Production Heavy Equipment Tailpipe

**Project:** **Canyons of the Ancients**
**Activity:** **Oil and Gas Well Production Traffic - tailpipe Emissions**
**Emissions:** **Diesel Combustion Tailpipe Emissions From Heavy Truck Traffic**
**Date:** **7/10/2006**

| Pollutant | Pollutant Emission Factor[1] | Annual RTs per Well | Single Well Round Trip Distance | Single Well Annual VMT | Hourly Emissions Single Well | Annual Emissions Single Well |
|---|---|---|---|---|---|---|
| | (g/mi) | (RTs/well/yr) | (mi/RT) | (mi/well/yr) | (lb/hr) | (tpy) |
| CO | 14.74 | 158 | 26.1 | 4123.80 | 0.051541 | 0.06700 |
| $NO_x$ | 11.44 | 158 | 26.1 | 4123.80 | 0.040002 | 0.05200 |
| $SO_2$[2] | 0.32 | 158 | 26.1 | 4123.80 | 0.001123 | 0.00146 |
| VOC | 5.69 | 158 | 26.1 | 4123.80 | 0.019896 | 0.02586 |

[1] AP-42 (EPA 1985), Table 2.7.1 "Volume II Mobile Sources." Heavy duty diesel engine powered trucks, high altitude, 20 mph, "aged" with 50,000 miles, 1997+ model.

[2] The $SO_2$ emission factor is calculated assuming 10 mpg fuel consumption, with 0.05% sulfur content of #2 diesel fuel, and fuel density of 7.08 lb/gal.

Lb/hr rates based on 10 hours/day times 5 days/wk

## Table A-21
## Natural Gas Compressor Facility

**Project:** **Canyons of the Ancients**
**Activity:** **Natural Gas Compression Facility**
**Emissions:** **Compressor Natural Gas IC Engine Combustion Emissions**
**Date:** **7/10/2006**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Fuel Combustion Source:** | | | | | | |
| Unit Description | New Natural Gas Compression Requirements | | | | | |
| Engine design (hp/hr) | 350 | | | | | |
| **Operating Parameters:** | | | | | | |
| Operated | 24 | hr/day, | 7 | days/wk, | 365 | days/yr |
| Operating hours | 8,760 | | | | | |
| Capacity (%) | 100 | (while operating) | | | | |
| Annual Load (%) | Winter | 25 | Spring | 25 | | |
| | Summer | 25 | Fall | 25 | | |
| **Potential Fuel Combustion for the Year for Unit:** | | | | | | |
| Gas consumption rate | 6,601 | Btu/hp-hr | | | | |
| Heat Content | 1,000 | Btu/scf | | | | |
| Hourly Heat Input Rate: | 2.31 | MMBtu/hr | | | | |
| Volume of Natural Gas Combusted | 20.24 | MMSCF/yr | | | | |

| **Emission Data:** | lb/hr | tpy | Method of Determination | Emission Factor[1] | Units |
|---|---|---|---|---|---|
| $NO_x$ | 9.42623 | 41.287 | AP-42 | 4.08 | lb/MMBtu |
| CO | 0.73238 | 3.208 | AP-42 | 0.317 | lb/MMBtu |
| $SO_2$ | 0.00136 | 0.006 | AP-42 | 5.88E-04 | lb/MMBtu |
| $PM_{10}$ Including condensibles | 0.02290 | 0.100 | AP-42 | 9.91E-03 | lb/MMBtu |
| $PM_{2.5}$ including condensibles | 0.02290 | 0.100 | AP-42 | 9.91E-03 | lb/MMBtu |
| VOC | 0.27262 | 1.194 | AP-42 | 0.118 | lb/MMBtu |
| Formaldehyde | 0.12199 | 0.534 | AP-42 | 5.28E-02 | lb/MMBtu |

[1] Based on a 4-stroke lean burn engine, taken from AP-42 Table 3.2-2 (EPA 2004).

## Table A-22
## CO2 Production Traffic

**Project:** **Canyons of the Ancients**
**Activity:** **CO2 Production Traffic**
**Emissions:** **Fugitive Particulate Emissions from Traffic on Unpaved Roads**
**Date:** **7/10/2006**

| Vehicle Type | Road Type | Dust Control Method | Average Vehicle Weight | Average Vehicle Speed | Silt Content[2] | Moisture Content[3] | RTs per Well | RT Distance | VMT[5] | Emission Control Efficiency | $PM_{10}$ Emission Factor[6] | $PM_{2.5}$ Emission Factor[6] | $PM_{10}$ Emissions[7] (controlled) | $PM_{2.5}$ Emissions[7] (controlled) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (lb) | (mph) | (%) | (%) | (RTs/yr) | (miles) | (VMT/well/yr) | (%) | (lb/VMT) | (lb/VMT) | (lb/well/yr) | (lb/well/yr) |
| Light trucks/ pickups/pumpers[8] | Primary Access | magnesium chloride | 7,000 | 30 | 5.1 | 2.4 | 10 | 25 | 250 | 85 | 0.56 | 0.08 | 20.94 | 3.13 |
| | Resource | water | 7,000 | 20 | 5.1 | 2.4 | 52 | 1.1 | 57 | 50 | 0.46 | 0.07 | 13.04 | 1.95 |
| Total Access and Unimproved Road Emissions (lb/well/yr) | | | | | | | | | | | | | 33.99 | 5.08 |
| Total Access and Unimproved Road Emissions (lb/hr/well) | | | | | | | | | | | | | 0.013 | 0.002 |
| Total Unpaved Access Road Traffic Emissions (lb/hr/well)[7] | | | | | | | | | | | | | 0.0050 | 0.0007 |

1 Haul trucks weight range is 28,000-80,000 lbs. Average weight of 54,000 lbs used for calculations.
2 AP-42 (EPA 2004), Table 13.2.2-1, "Typical Silt Content Values of Surface Material on Industrial and Rural Unpaved Roads."
3 AP-42 (EPA 2004), Table 11.9-3, "Typical Values for Correction Factors Applicable to the Predictive Emission Factor Equations."
4
5 Calculated as Round Trips per Vehicle Type x Round Trip Distance
6 AP-42 (EPA 2004), Section 13.2.2 "Unpaved Roads", equations 1a and 1b.
7 Calculated as lb/VMT x VMT/well x control efficiency.
8 Emissions based on trip frequency and miles traveled to one well in the field. During production, 20 wells could be visited per day. This assumption will be reflected in full-field modeled emissions.

## Table A-23
## Well head Separator/Tank Flashing and Dehydrator Still Vent VOC Emissions

**Project:** **Canyons of the Ancients**
**Activity:** **Wellhead Separator to Oil Tank Flashing and Dehydrator Still Vent**
**Emissions:** **VOC emissions**
**Date:** **7/10/2006**

### Seperator to Storage Tank VOC Emissions

| | | |
|---|---|---|
| Estimated VOC Emissions per well | 20 | tpy |
| Number of New O&G Wells | 81 | |
| Total VOC Emissions at maximum production | 1,620 | total tpy |

### Dehydrator Still Vent VOC Emissions

| | | |
|---|---|---|
| EPA Consensus Testing Results and GRI-GLYCalc VOC Emissions for 3.6 mmscfd dehydrator | 21 | tpy |
| Ratioed for Estimated Throughtput for 0.1 mmscfd wellhead dehydrator | 0.58 | tpy/well |
| Number of New O&G Wells | 81 | |
| Total VOC Emissions at maximum production | 47 | total tpy |

### Combined VOC Emissions from Both Processes

| | | |
|---|---|---|
| VOC Emissions lb/hr per well (assuming 8760 hours per year) | 4.70 | lb/hr |
| VOC Emissions per well | 20.58 | tpy/well |
| Total VOC Emissions | 1,667 | tpy |

# Table A-24
# Well Head IC Engines

**Project:** **Canyons of the Ancients**
**Activity:** **Wellhead Gas Fired IC Engines**
**Emissions:** **Compressor Natural Gas IC Engine Combustion Emissions**
**Date:** **7/10/2006**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Fuel Combustion Source:** | | | | | | |
| Unit Description | Wellhead IC Engine | | | | | |
| Engine design (hp/hr) | 50 | | | | | |
| **Operating Parameters:** | | | | | | |
| Operated | 24 | hr/day, | 7 | days/wk, | 365 | days/yr |
| Operating hours | 8,760 | | | | | |
| Capacity (%) | 100 | (while operating) | | | | |

| | | |
|---|---|---|
| **Potential Fuel Combustion for the Year for Unit:** | | |
| Gas consumption rate | 10,000 | Btu/hp-hr |
| Heat Content | 1,000 | Btu/scf |
| Hourly Heat Input Rate: | 0.50 | MMBtu/hr |
| Volume of Natural Gas Combusted | 4.38 | MMSCF/yr |

| **Emission Data:** | lb/hr | tpy | Method of Determination | Emission Factor[1] | Units |
|---|---|---|---|---|---|
| $NO_x$ | 1.10500 | 4.840 | AP-42 | 2.21 | lb/MMBtu |
| CO | 1.86000 | 8.147 | AP-42 | 3.720 | lb/MMBtu |
| $SO_2$ | 0.00029 | 0.001 | AP-42 | 5.88E-04 | lb/MMBtu |
| $PM_{10}$ Including condensibles | 0.00970 | 0.042 | AP-42 | 1.94E-02 | lb/MMBtu |
| $PM_{2.5}$ including condensibles | 0.00970 | 0.042 | AP-42 | 1.94E-02 | lb/MMBtu |
| VOC | 0.01480 | 0.065 | AP-42 | 0.030 | lb/MMBtu |
| Formaldehyde | 0.01025 | 0.045 | AP-42 | 2.05E-02 | lb/MMBtu |

[1] Based on a 4-stroke rich burn engine, taken from AP-42 Table 3.2-2 (EPA 2004).

# Table A-25
# Well head Heaters

**Project:** Canyons of the Ancients
**Activity:** Production Well head Heaters
**Emissions:** Emissions from Wellhead Heaters (Indirect Heaters, Sep Heaters, Dehy Heaters)
**Date:** 7/10/2006

| | | | | |
|---|---|---|---|---|
| **Fuel Combustion Source:** | | | | |
| Unit Description | Wellhead Heater | | | |
| Design Firing Rate (MMBTU/hr) | 0.25 | | | |
| **Operating Parameters:** | | | | |
| Annual Operating Factor | 0.10 | | | |
| **Actual Fuel Combustion for the Year per Unit:** | | | | |
| Gas Heat Content | 1,000 | Btu/scf | | |
| Volume of Natural Gas Combusted | 0.22 | mmscf/yr | 18.25 | mscf/mo |
| **Building Size (approximate):** | | | | |
| Width | 8.00 | ft | | |
| Length | 15.00 | ft | | |
| Height | 7 | ft | | |

**Potential Emission Data:**

| | From Stack Testing (lb/hr) | Actual[2] (lb/hr) | Actual (tpy) | Method of Determination | Emission Factors | Units |
|---|---|---|---|---|---|---|
| $NO_x$ | 0.034 | 0.0340 | 0.015 | Stack test | | |
| CO | 0.291 | 0.2910 | 0.127 | Stack test | | |
| $SO_2$ | -- | 0.000 | 0.000 | Fuel Analysis | 0.0 | lb/MMscf |
| Total PM | -- | 0.003 | 0.001 | AP-42 | 12.0 | lb/MMscf |
| VOC | -- | 0.002 | 0.001 | AP-42 | 8.0 | lb/MMscf |
| Filterable Particulate | -- | 0.001 | 0.000 | AP-42 | 4.5 | lb/MMscf |
| Condensable Particulate | -- | 0.002 | 0.001 | AP-42 | 7.5 | lb/MMscf |

[1] Stack testing data for this heater was provided by EnCana and included five separate tests of $NO_x$ and CO emissions. NOx and CO were the only pollutants for which stack testing emission were provided. The maximum of the stack test emissions was used for calculations.

[2] Actual lb/hr stack testing data for NOx and CO

# Table A-26
# Construction Wind Erosion

**Project:** **Canyons of the Ancients**
**Activity:** **Construction Wind Erosion**
**Emissions:** **Wind Erosion Emissions from Construction Areas**
**Date:** **7/10/2006**

Reference: Control of Open Fugitive Dust Sources, Section 4.1.3, EPA-450/3-98-008 - [Wind Emissions From Continuously Active Piles]

E (lb TSP per day per acre) = 1.7 (s/1.5) (f/15)

where:

| | | |
|---|---|---|
| s = | 5.1 | silt content % AP-42 Table 13.2.2-1 |
| f = | 5.0 | percentage of time that wind speed exceeds 5.4 m/s [from MVNP wind data 3 year period] |
| E = | 1.9 | lb TSP per day per acre |
| E = | 0.0289 | TSP tons/acre/month |

**Canyons of the Ancients - Summary of Maximum Annual Air Emissions for Fluid Mineral Development and Production**

## Oil and Gas Well Construction Emissions - Peak Construction Year

**# of New Wells/yr =** 4 **# of New Processing Facilities/yr =** 1

| | Pad, Road, Pipeline Construction | | Rig Move and Drilling | | Completion and Flaring | | Subtotals per well pad | | Facility Construction | | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/plant) | **(tons/yr)** |
| NOx | 12.27 | 0.25 | 27.53 | 9.91 | 3.11 | 0.04 | 42.92 | 10.20 | 12.50 | 0.64 | **41.4** |
| CO | 3.82 | 0.08 | 5.96 | 2.14 | 16.87 | 0.21 | 26.65 | 2.43 | 4.12 | 0.23 | **10.0** |
| SO2 | 1.46 | 0.03 | 1.82 | 0.65 | 0.0005 | 0.000137 | 3.28 | 0.68 | 1.47 | 0.07 | **2.8** |
| PM10 | 6.95 | 0.38 | 2.42 | 0.87 | 0.32 | 0.09 | 9.68 | 1.34 | 22.72 | 3.68 | **9.1** |
| PM2.5 | 1.82 | 0.06 | 2.02 | 0.73 | 0.05 | 0.01 | 3.89 | 0.81 | 2.32 | 0.44 | **3.7** |
| VOC | 0.92 | 0.02 | 2.23 | 0.80 | 98 | 1.18 | 101 | 2.00 | 1.03 | 0.06 | **8.1** |
| Formaldehyde | NA | NA | 1.05 | 0.38 | NA | NA | NA | NA | NA | NA | **1.5** |

## CO2 Well Construction Emissions - Peak Construction Year

**# of New Wells/yr =** 17 **# of New Processing Facilities/yr =** 1

| | Pad, Road, Pipeline Construction | | Rig Move and Drilling | | Completion | | Subtotals per well pad | | Facility Construction | | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (lb/hr) | (tons/pad) | (lb/hr) | (tons/pad) | (lb/hr) | (tons/pad) | (lb/hr) | (tons/well) | (lb/hr) | (tons/plant) | **(tons/yr)** |
| NOx | 12.50 | 0.28 | 27.53 | 9.91 | 0.02 | 0.00 | 40.05 | 10.19 | 12.50 | 0.64 | **173.9** |
| CO | 4.12 | 0.12 | 5.96 | 2.14 | 0.02 | 0.01 | 10.10 | 2.27 | 4.12 | 0.23 | **38.8** |
| SO2 | 1.47 | 0.03 | 1.82 | 0.65 | 0.0005 | 0.000137 | 3.29 | 0.69 | 1.47 | 0.07 | **11.7** |
| PM10 | 9.39 | 0.74 | 2.42 | 0.87 | 0.32 | 0.09 | 12.13 | 1.71 | 22.72 | 3.68 | **32.7** |
| PM2.5 | 2.11 | 0.12 | 2.02 | 0.73 | 0.05 | 0.01 | 4.18 | 0.86 | 2.32 | 0.44 | **15.0** |
| VOC | 1.03 | 0.03 | 2.23 | 0.80 | 0.01 | 0.00 | 3.27 | 0.84 | 1.03 | 0.06 | **14.3** |
| Formaldehyde | NA | NA | 1.05 | 0.38 | NA | NA | NA | NA | NA | NA | **6.4** |

## Oil and Gas and CO2 Production Emissions Summary

**# of O&G wells =** 81
**# of CO2 wells =** 69

| | O&G Production Truck - per well | | CO2 Production Truck - per well | | Wellhead Heaters and Flashing | | Wellhead Small Engines | | O&G Compression | | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/well) | (lb/hr) | (tons/yr) | **(tons/yr)** |
| NOx | 0.040 | 0.0520 | 0.000 | 0.000 | 0.034 | 0.015 | 1.105 | 4.840 | 9.4 | 41.3 | 144.7 |
| CO | 0.052 | 0.0670 | 0.000 | 0.000 | 0.291 | 0.127 | 1.860 | 8.147 | 0.7 | 3.2 | 183.9 |
| SO2 | 0.001 | 0.0015 | 0.000 | 0.000 | 0.000 | 0.000 | 0.0003 | 0.001 | 0.0014 | 0.0060 | 0.2 |
| PM10 | 0.501 | 0.6511 | 0.013 | 0.017 | 0.003 | 0.001 | 0.010 | 0.042 | 0.0229 | 0.1003 | 55.0 |
| PM2.5 | 0.077 | 0.0998 | 0.002 | 0.003 | 0.003 | 0.001 | 0.010 | 0.042 | 0.0229 | 0.1003 | 9.3 |
| VOC | 0.020 | 0.0259 | 0.000 | 0.000 | 4.701 | 20.584 | 0.015 | 0.065 | 0.27 | 1.19 | 1671.9 |
| Formaldehyde | NA | NA | NA | NA | NA | NA | 0.010 | 0.045 | 0.122 | 0.53 | 2.4 |

## Project Maximum Annual Emissions

| | Construction emissons (tpy) | Production emissons (tpy) | Total emissons (tpy) |
|---|---|---|---|
| NOx | 215.3 | 144.7 | 360.0 |
| CO | 48.7 | 183.9 | 232.6 |
| SO2 | 14.5 | 0.2 | 14.7 |
| PM10 | 41.8 | 55.0 | 96.8 |
| PM2.5 | 18.7 | 9.3 | 28.0 |
| VOC | 22.4 | 1671.9 | 1694.3 |
| Formaldehyde | 7.9 | 2.4 | 10.3 |

**CANM Near-field Source Configurations**

The source configuration includes 2 new well pads (and roads/pipeline construction), one new processing facility, and 2 exiting wells (with roads) (four production wells for PSD increment).
Assume existing production wells are O&G wells, with higher production emissions because of oil and water trucking.
Assume the new facility has 350 hp gas-fired compression operating at the same time as construction (very conservative).

**TYPEs OF STACKS**

| Source Type | Stack Height (m) | Temperature (K) | Exit Velocity (m/s) | Stack Diameter (m) |
|---|---|---|---|---|
| Drill Rig | 6 | 750 | 20.0 | 0.2 |
| Flare | 5 | 1273 | 20.0 | 1.0 |
| Dozer | 2 | 750 | 20.0 | 0.2 |
| 350 hp Compress | 6 | 750 | 20.0 | 0.2 |
| Well Head IC eng | 2 | 500 | 4.0 | 0.2 |
| Well Head Heater | 2 | 298 | 0.5 | 0.1 |

## NOx, SO2, CO, and HAP Emissions - Point Source Configuration

For well construction, model rigs and flares as point sources.
For processing facility construction, use construction tailpipe emissions and model through a dozer exhaust stack.
For production emissions, add heater and small IC engine emissions and model through a IC engine stack - (the IC engine has majority of emissions).

| Source ID | Source Description | Easting (X) (m) | Northing (Y) (m) | Base Elevation (m) | Stack Height m | Temperature K | Exit Velocity mps | Stack Diameter m | Pm10 g/sec | SO2 g/sec | NOx g/sec | CO g/sec | PM25 g/sec | Formaldehyde g/sec | PM10 lb/hr | PM2.5 lb/hr | SO2 lb/hr | NOx **tpy** | CO lb/hr | Formaldehyde lb/hr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DrilR1 | Drill Rig 1 | 680 | 680 | 0 | 6 | 750 | 20 | 0.2 | 2.5E-01 | 2.3E-01 | 2.9E-01 | 7.5E-01 | 2.5E-01 | 1.3E-01 | 1.95 | 1.95 | 1.82 | 9.91 | 5.96 | 1.05 |
| DrilR2 | Drill Rig 2 | -680 | -680 | 0 | 6 | 750 | 20 | 0.2 | 2.5E-01 | 2.3E-01 | 2.9E-01 | 7.5E-01 | 2.5E-01 | 1.3E-01 | 1.95 | 1.95 | 1.82 | 9.91 | 5.96 | 1.05 |
| Flare1 | Flare 1 | 680 | 680 | 0 | 5 | 1273 | 20 | 1 | 0.0E+00 | 0.0E+00 | 1.2E-03 | 2.1E+00 | 0.0E+00 | 0.0E+00 | 0.00 | 0.00 | 0.00 | 0.04 | 16.87 | 0 |
| Flare2 | Flare 2 | -680 | -680 | 0 | 5 | 1273 | 20 | 1 | 0.0E+00 | 0.0E+00 | 1.2E-03 | 2.1E+00 | 0.0E+00 | 0.0E+00 | 0.00 | 0.00 | 0.00 | 0.04 | 16.87 | 0 |
| DozePipe | Dozer tailpipe | 0 | 0 | 0 | 2 | 750 | 20 | 0.2 | 1.6E-01 | 1.9E-01 | 1.9E-02 | 5.2E-01 | 1.6E-01 | 0.0E+00 | 1.24 | 1.24 | 1.47 | 0.64 | 4.12 | 0 |
| ProWell1 | Production Well 1 | 680 | -680 | 0 | 2 | 500 | 4.0 | 0.2 | 6.8E-04 | 9.3E-06 | 3.5E-02 | 9.5E-02 | 6.8E-04 | 3.2E-04 | 0.005 | 0.005 | 0.0001 | 1.22 | 0.76 | 0.00256 |
| ProWell2 | Production Well 2 | -680 | 680 | 0 | 2 | 500 | 4 | 0.2 | 6.8E-04 | 9.3E-06 | 3.5E-02 | 9.5E-02 | 6.8E-04 | 3.2E-04 | 0.005 | 0.005 | 0.0001 | 1.22 | 0.76 | 0.00256 |
| ProWell3 | Production Well 3 | 680 | 680 | 0 | 2 | 500 | 4 | 0.2 | 6.8E-04 | 9.3E-06 | 3.5E-02 | 9.5E-02 | 6.8E-04 | 3.2E-04 | 0.005 | 0.005 | 0.0001 | 1.22 | 0.76 | 0.00256 |
| ProWell4 | Production Well 4 | -680 | -680 | 0 | 2 | 500 | 4 | 0.2 | 6.8E-04 | 9.3E-06 | 3.5E-02 | 9.5E-02 | 6.8E-04 | 3.2E-04 | 0.005 | 0.005 | 0.0001 | 1.22 | 0.76 | 0.00256 |
| NewComp | New Compression | 0 | 0 | 0 | 6 | 750 | 20 | 0.2 | 2.9E-03 | 1.7E-04 | 1.2E+00 | 9.2E-02 | 2.9E-03 | 1.5E-02 | 0.02290 | 0.02290 | 0.00136 | 41.29 | 0.73 | 0.1220 |

## PM Emissions - Well Pad and Facility General Disturbance - Volume Source Calculations

Start with PM emissions for new CO2 pad/pipe/road construction, which are based on 7 acre disturbance.
Well pads are 100m by 100m volume sources, equal to 2.5 acres in size - so assign 2.5/7 of emissions to well pad, rest to roadway.
The new facility pad/pipeline/road distrubed area is 21 acres, far too large for a 100m volume source - simply assign the same emissions as for the new CO2 well pads.

Volume Source Data for new Well Pads and Facility Pad

| | PM10 lb/hr | PM2.5 lb/hr | PM10 g/sec | Pm2.5 g/sec | Hours of Operation |
|---|---|---|---|---|---|
| NewPad1 | 2.55 | 0.20 | 0.321434156 | 0.02470089 | 10 hrs/day |
| NewPad2 | 2.55 | 0.20 | 0.321434156 | 0.02470089 | 10 hrs/day |
| NewPadF | 2.55 | 0.20 | 0.321434156 | 0.02470089 | 10 hrs/day |

Use a volume source of 100 m square, so initial Sigma Y is *23.3*
Release ht is 3 m, sigma Z is 2.79, based on previous BLM Rohn analysis and CDPHE guidance.

## PM Emissions - Road & Pipeline - Volume Source Calculations

All construction roadways are modeled at 10 hours operation per day.
For roadway/pipeline, take CO2 well pad/pipe/road construction emissions, subtract out emissions assigned to well pad, then
double remainder (for 2 wells ) and assign to roadway.
It is nnot reasonable to assume traffic for 2 new wells AND new facility are all on the road at the same time.
For production roads, use O&G production traffic (because production emissions are higher than for CO2 wells).

Emission calculations

| Process | PM10 lb/hr | Pm2.5 lb/hr | SO2 | NOx | CO | PM10 g/sec | SO2 | NOx | CO | Pm2.5 g/sec |
|---|---|---|---|---|---|---|---|---|---|---|
| ***CONSTRUCTION*** | lb/hr | lb/hr | lb/hr | lb/hr | lb/hr | | g/sec | g/sec | g/sec | |
| CO2 Trucks | 0.12636 | 0.01934 | 0.00761 | 0.27427 | 0.35339 | | | | | |
| Drill Trucks | 0.05439 | 0.00823 | 0.00069 | 0.02493 | 0.03213 | | | | | |
| CompTrucks | 0.03147 | 0.00478 | 0.00046 | 0.01659 | 0.02138 | | | | | |
| FacilityTrucks | 0.12636 | 0.01934 | 0.00761 | 0.27427 | 0.35339 | | | | | |
| GeneralConstruct | 9.18383 | 1.03652 | | | | | | | | |
| ***Total CONST ROAD*** | 9.52241 | 1.08821 | 0.01638 | 0.59007 | 0.76029 | 1.199823221 | 0.002063877 | 0.074349258 | 0.095796159 | 0.137114159 |
| **Prod Road** | 0.06740 | 0.01032 | 0.00112 | 0.04000 | 0.05154 | 0.008492763 | 0.000141491 | 0.0050402 | 0.006494104 | 0.001299716 |

Volume Source Data
Use a volume source for road of 12.2 m square, so sigy is 2.8
Release ht is 3 m, sigma Z is 2.79, based on previous BLM analysis and CDPHE guidance.

| | Length/road (m) | Box size (m) | # boxes/seg | PER BOX -> | PM10 g/sec | SO2 g/sec | NOx g/sec | CO g/sec | Pm2.5 g/sec |
|---|---|---|---|---|---|---|---|---|---|
| Construction Road | 1650 | 12.2 | 67.6 | | 1.8E-02 | 3.1E-05 | 1.1E-03 | 1.4E-03 | 0.00205 |
| Production Road | 1650 | 12.2 | 67.6 | | 1.3E-04 | 2.1E-06 | 7.5E-05 | 9.7E-05 | 1.9E-05 |

## CANM Mid-Field and Class I Modeling - Source Configurations

The mid-field modeling configuration is based on peak year construction scenario of 17 new CO2 wells, 4 new O&G wells, two processing facilities, and full production emissions.

For 21 new wells at total rate of 60days/well, assume four new wells constructed at one time - two oil and gas with flares, two CO2.

Locate construction and operation sources at 2 areas where development could occur (2 new wells per area).

Use a single volume source to distribute fugitive PM construction and production emissions in each of the 2 development areas.

For full production emissions, model two 350 hp compressors at each of the 2 locations, and model 8 well head engines/heaters (each with emissions for 81/8 individual oil and gas w

**NOx, SO2, CO, and HAP Emissions - Point Source Configuration**

| Source ID | Source Description | Easting (X) (m) | Northing (Y) (m) | Base Elevation (m) | Stack Height m | Temperature K |
|---|---|---|---|---|---|---|
| DrilR1 | Drill Rig 1 | 687000 | 4149000 | 1850 | 6.0 | 750.0 |
| DrilR2 | Drill Rig 2 | 687000 | 4147000 | 1850 | 6.0 | 750.0 |
| DrilR3 | Drill Rig 3 | 681000 | 4161000 | 2040 | 6.0 | 750.0 |
| DrilR4 | Drill Rig 4 | 681000 | 4159000 | 2040 | 6.0 | 750.0 |
| Flare1 | Flare 1 | 687000 | 4149000 | 1850 | 5.0 | 1273.0 |
| Flare2 | Flare 2 | 681000 | 4161000 | 2040 | 5.0 | 1273.0 |
| NewComp1 | New Compression 1 | 687000 | 4148000 | 1850 | 6.0 | 750.0 |
| NewComp2 | New Compression 2 | 681000 | 4160000 | 2040 | 6.0 | 750.0 |
| NewPro1 | New Prod Well 1 | 687000 | 4149000 | 1850 | 2.0 | 298.0 |
| NewPro2 | New Prod Well 2 | 687000 | 4147000 | 1850 | 2.0 | 298.0 |
| NewPro3 | New Prod Well 3 | 681000 | 4161000 | 2040 | 2.0 | 298.0 |
| NewPro4 | New Prod Well 4 | 681000 | 4159000 | 2040 | 2.0 | 298.0 |
| ExtComp1 | Existing Compression 1 | 687000 | 4148000 | 1850 | 6.0 | 750.0 |
| ExtComp2 | Existing Compression 2 | 681000 | 4160000 | 2040 | 6.0 | 750.0 |
| ExtPro1 | Exist Prod Well 1 | 687000 | 4149000 | 1850 | 2.0 | 298.0 |
| ExtPro2 | Exist Prod Well 2 | 687000 | 4147000 | 1850 | 2.0 | 298.0 |
| ExtPro3 | Exist Prod Well 3 | 681000 | 4161000 | 2040 | 2.0 | 298.0 |
| ExtPro4 | Exist Prod Well 4 | 681000 | 4159000 | 2040 | 2.0 | 298.0 |
| Questar1 | 261HP MAINLINE COMP | 684846 | 4145360 | 1900 | 3.4 | 751.9 |
| Questar2 | NATGAS FIRED 142HP E | 684846 | 4145360 | 1900 | 2.4 | 872.4 |
| Questar3 | NATURAL GAS WAUKES | 683111 | 4149208 | 1900 | 2.4 | 872.4 |

Total Project Modeled (lb/hr)
Total Project Modeled tpy

**PM Emissions - Volume Source Configuration Calculations**
The 4 large volume Project sources (two for construction, two for production) will include the following fugitive PM emissions:
Construction - fugitive PM emissions for 2 $CO_2$ wells, 2 O&G wells, and two new facility pads.
Both new and existing O&G and $CO_2$ production traffic - PM emissions from all wells (tailpipe so small, not included).

| Process | PM10 lb/hr | PM2.5 lb/hr |
|---|---|---|
| Construction | 78.1 | 12.5 |
| Prod Truck Traffic | 41.5 | 6.35 |

| | PM10 lb/hr | PM2.5 lb/hr | PM10 g/sec | Pm2.5 g/sec | |
|---|---|---|---|---|---|
| ConV1 | 39.05 | 6.26 | 4.92 | 0.788 | 10 hrs/day |
| ConV2 | 39.05 | 6.26 | 4.92 | 0.788 | 10 hrs/day |
| ProV1 | 20.73 | 3.18 | 2.61 | 0.400 | 10 hrs/day |
| ProV2 | 20.73 | 3.18 | 2.61 | 0.400 | 10 hrs/day |

Use two 2km volume sources 2000 meters square. Sigma Y = 465.1
Release ht is 7 m, sigma Z is 3.26, based on previous BLM Rohn analysis and CDPHE guidance.

BEEST data for volume sources

| | | | | | | |
|---|---|---|---|---|---|---|
| ConV1 | Construct Vol Source 1 | 687000 | 4148000 | 1850 | 7 | 253.7 |
| ConV2 | Construct Vol Source 2 | 681000 | 4160000 | 2040 | 7 | 253.7 |
| ProV1 | Product Vol Source 1 | 687000 | 4148000 | 1850 | 7 | 253.7 |
| ProV2 | Product Vol Source 2 | 681000 | 4160000 | 2040 | 7 | 253.7 |
| MontNEPA | Monticello NEPA | 637000 | 4160000 | 1850 | 7 | 2325 |

SOURCE GROUP INFO -
ProjNAAQ
ProjPSD
NAAQS
PSD

| | X | Y | Z (m) |
|---|---|---|---|
| Location 1 | 687000 | 4148000 | 1850 |
| Location 2 | 681000 | 4160000 | 2040 |

wells and assuming 25% have a well head engine).

| Source ID | Exit Velocity | Stack Diameter | PM10 | SO2 | NOx | CO | PM25 |
|---|---|---|---|---|---|---|---|
| | mps | m | G/SEC | G/SEC | G/SEC | G/SEC | G/SEC |
| DrilR1 | 20.0 | 0.2 | 2.46E-01 | 2.29E-01 | 3.47E+00 | 7.51E-01 | 2.46E-01 |
| DrilR2 | 20.0 | 0.2 | 2.46E-01 | 2.29E-01 | 3.47E+00 | 7.51E-01 | 2.46E-01 |
| DrilR3 | 20.0 | 0.2 | 2.46E-01 | 2.29E-01 | 3.47E+00 | 7.51E-01 | 2.46E-01 |
| DrilR4 | 20.0 | 0.2 | 2.46E-01 | 2.29E-01 | 3.47E+00 | 7.51E-01 | 2.46E-01 |
| Flare1 | 20.0 | 1.0 | 0.00E+00 | 0.00E+00 | 3.92E-01 | 2.13E+00 | 0.00E+00 |
| Flare2 | 20.0 | 1.0 | 0.00E+00 | 0.00E+00 | 3.92E-01 | 2.13E+00 | 0.00E+00 |
| NewComp1 | 20.0 | 0.2 | 2.88E-03 | 1.71E-04 | 1.19E+00 | 9.23E-02 | 2.88E-03 |
| NewComp2 | 20.0 | 0.2 | 2.88E-03 | 1.71E-04 | 1.19E+00 | 9.23E-02 | 2.88E-03 |
| NewPro1 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| NewPro2 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| NewPro3 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| NewPro4 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| ExtComp1 | 20.0 | 0.2 | 2.88E-03 | 1.71E-04 | 1.19E+00 | 9.23E-02 | 2.88E-03 |
| ExtComp2 | 20.0 | 0.2 | 2.88E-03 | 1.71E-04 | 1.19E+00 | 9.23E-02 | 2.88E-03 |
| ExtPro1 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| ExtPro2 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| ExtPro3 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| ExtPro4 | 0.5 | 0.1 | 6.92E-03 | 9.38E-05 | 3.96E-01 | 9.64E-01 | 6.92E-03 |
| Questar1 | 26.8 | 0.2 | 0.00E+00 | 0.00E+00 | 1.18E+00 | 1.01E-01 | 0.00E+00 |
| Questar2 | 43.7 | 0.1 | 0.00E+00 | 0.00E+00 | 7.88E-01 | 5.52E-02 | 0.00E+00 |
| Questar3 | 43.7 | 0.1 | 0.00E+00 | 0.00E+00 | 4.03E-02 | 2.01E-02 | 0.00E+00 |

Total Project Modeled (lb/hr)
Total Project Modeled tpy

| | | PM10 g/sec | SO2 | NOx | CO | Pm2.5 g/sec |
|---|---|---|---|---|---|---|
| 3.26 | | 4.92 | | | | 0.79 |
| 3.26 | | 4.92 | | | | 0.79 |
| 3.26 | | 2.61 | | | | 0.40 |
| 3.26 | | 2.61 | | | | 0.40 |
| | 3.26 | 23.07 | 4.20 | 103.28 | 66.46 | 7.34 |

**TYPEs OF STACKS**

| Source Type | Stack Height m | Temperature K | Exit Velocity mps | Stack Diameter m |
|---|---|---|---|---|
| Drill Rig/Compres | 6 | 750 | 20 | 0.2 |
| Heater | 2 | 298 | 0.5 | 0.1 |
| Flare | 5 | 1273 | 20 | 1 |

| Source ID | Formaldehyde G/SEC | PM10 lb/hr | PM2.5 lb/hr | SO2 lb/hr | NOx lb/hr | CO lb/hr | Formaldehyde lb/hr |
|---|---|---|---|---|---|---|---|
| DrilR1 | 1.32E-01 | 1.95 | 1.95 | 1.82 | 27.5 | 5.96 | 1.05 |
| DrilR2 | 1.32E-01 | 1.95 | 1.95 | 1.82 | 27.5 | 5.96 | 1.05 |
| DrilR3 | 1.32E-01 | 1.95 | 1.95 | 1.82 | 27.5 | 5.96 | 1.05 |
| DrilR4 | 1.32E-01 | 1.95 | 1.95 | 1.82 | 27.5 | 5.96 | 1.05 |
| Flare1 | 0.00E+00 | 0.00 | 0.00 | 0.00 | 3.11 | 16.9 | 0.0 |
| Flare2 | 0.00E+00 | 0.00 | 0.00 | 0.00 | 3.11 | 16.9 | 0.0 |
| NewComp1 | 1.54E-02 | 0.0229 | 0.0229 | 0.00136 | 9.4 | 0.73 | 0.12 |
| NewComp2 | 1.54E-02 | 0.0229 | 0.0229 | 0.00136 | 9.4 | 0.73 | 0.12 |
| NewPro1 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| NewPro2 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| NewPro3 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| NewPro4 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| ExtComp1 | 1.54E-02 | 0.0229 | 0.0229 | 0.00136 | 9.4 | 0.73 | 0.12 |
| ExtComp2 | 1.54E-02 | 0.0229 | 0.0229 | 0.00136 | 9.4 | 0.73 | 0.12 |
| ExtPro1 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| ExtPro2 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| ExtPro3 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| ExtPro4 | 3.27E-03 | 0.055 | 0.055 | 0.001 | 3.14 | 7.65 | 0.0259 |
| Questar1 | 0.00E+00 | | | | 9.37 | 0.80 | 0.0 |
| Questar2 | 0.00E+00 | | | | 6.26 | 0.44 | 0.0 |
| Questar3 | 0.00E+00 | | | | 0.32 | 0.16 | 0.0 |
| Total Project Modeled (lb/hr) | | 8.0 | 8.0 | 7.3 | 141.5 | 74.4 | 4.5 |
| Total Project Modeled tpy | | 34.9 | 34.9 | 31.9 | 619.7 | 325.7 | 19.6 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | CO tpy | NOx tpy |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 3.52 | 41.04 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 1.92 | 27.4 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | 0.7 | 1.4 |
| | | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 8.6 | 7.1 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBII | 31.2 | 16.4 |
| 1/20/06 | | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | | |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | | |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | PM10 tpy | distance |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | | 0.2 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | | 0.2 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | | 4.4 |
| | | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 5.2 | 21.2 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBII | | 44.9 |
| 1/20/06 | | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 5.51 | 29.2 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 6.83 | 46.9 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | x_coordina | y_coordina |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 684.8467 | 4145.361 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 684.8467 | 4145.361 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | 683.1117 | 4149.208 |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 705.7738 | 4149.718 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | 679.5262 | 4189.715 |
| 1/20/06 | | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 713.3471 | 4138.07 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 731.0264 | 4154.948 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | exit_gas_fl | exit_gas_t |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 1034 | 894 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 750 | 1111 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | 750 | 1111 |
| | | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 6100 | 350 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | 31263 | 917 |
| 1/20/06 | | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 0 | 70 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 0 | 70 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | exit_gas_v | stack_dian |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 87.8 | 0.5 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 143.5 | 0.33 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | 0 | 0.3 |
| | | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 17.6 | 21.1 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBII | 264.5 | 1.5 |
| 1/20/06 | | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 0 | 0 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 0 | 0 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | stack_heig | unit_emis_limit1 |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 11 | |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 8 | |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | 8 | |
| | | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 32 | |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBII | 23 | |
| 1/20/06 | | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 0 | |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 0 | |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | unit_emis_limit1_units |
|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | |
| 1/20/06 | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | s |
|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | |
| | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | |
| 1/20/06 | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description |
|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET |
| | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI |
| 1/20/06 | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description |
|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET |
| | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI |
| 1/20/06 | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | normal_da | normal_ho |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 7 | 24 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 7 | 24 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 7 | 24 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | 7 | 24 |
| 1/20/06 | | | 7 | 24 |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 7 | 12 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 6 | 10 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | normal_ho | percent_th |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 8760 | 25 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 8760 | 25 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | | |
| | | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 8760 | 25 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBII | 8760 | 25 |
| 1/20/06 | | | 8760 | 25 |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 4368 | 20 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 3000 | 20 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | percent_th | percent_th |
|---|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 25 | 25 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 25 | 25 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 25 | 25 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | 25 | 25 |
| 1/20/06 | | | 25 | 25 |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 20 | 30 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 20 | 30 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | percent_throughput_fa |
|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | 25 |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | 25 |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | |
| | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | 25 |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | 25 |
| 1/20/06 | | | 25 |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | 30 |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | 30 |

CDPHE Cumulative Inventory Since December 31, 2004

| t_permit_last_issue_ | facility_name | emission_process_description | all |
|---|---|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | 261HP MAINLINE COMPRESSOR | |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA | NATGAS FIRED 142HP ENGINE | |
| | QUESTAR EXPLORATION & PROD - CUTTHROA | NATURAL GAS WAUKESHA 170 kw GENSET | |
| | | | |
| 2/16/06 | MUSCANELL MILLWORKS, INC. | DECTON BOILER RATED AT 3.6 MMBTU/HR | |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA | NAT GAS FIRED SOLAR SATURN T-1300 TURBI | |
| 1/20/06 | | | |
| 8/19/05 | SKY UTE SAND & GRAVEL | MCNEILUS CONCRETE BATCH PLANT | |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT | FUGITIVE EMISSIONS | |

# APPENDIX B

## Colorado Cumulative Inventory Sources

CDPHE Cumulative Inventory Since December 31, 2004

| st_permit_last_issue_ | facility_name |
|---|---|
| 5/3/06 | QUESTAR EXPLORATION & PROD - CUTTHROA |
| 5/2/06 | QUESTAR EXPLORATION & PROD - CUTTHROA |
| | QUESTAR EXPLORATION & PROD - CUTTHROA |
| 2/16/06 | MUSCANELL MILLWORKS, INC. |
| 2/8/06 | MID-AMERICA PIPELINE CO DOVE CR STA |
| 1/20/06 | |
| 8/19/05 | SKY UTE SAND & GRAVEL |
| 2/25/05 | MOUNTAIN STONE INC. - KOENIG PIT |

| emission_process_description | CO tpy | NOx tpy | PM10 tpy | Distance | X |
|---|---|---|---|---|---|
| 261HP MAINLINE COMPRESSOR | 3.52 | 41.04 | | 0.2 | 684.8467 |
| NATGAS FIRED 142HP ENGINE | 1.92 | 27.4 | | 0.2 | 684.8467 |
| NATURAL GAS WAUKESHA 170 kw GENSET | 0.7 | 1.4 | | 4.4 | 683.1117 |
| | | | | | |
| DECTON BOILER RATED AT 3.6 MMBTU/HR | 8.6 | 7.1 | 5.2 | 21.2 | 705.7738 |
| NAT GAS FIRED SOLAR SATURN T-1300 TURBI | 31.2 | 16.4 | | 44.9 | 679.5262 |
| | | | | | |
| MCNEILUS CONCRETE BATCH PLANT | | | 5.51 | 29.2 | 713.3471 |
| FUGITIVE EMISSIONS | | | 6.83 | 46.9 | 731.0264 |

| Y | exit_gas_fl | exit_gas_t | exit_gas_v | stack_dian | stack_height |
|---|---|---|---|---|---|
| 4145.361 | 1034 | 894 | 87.8 | 0.5 | 11 |
| 4145.361 | 750 | 1111 | 143.5 | 0.33 | 8 |
| 4149.208 | 750 | 1111 | 0 | 0.3 | 8 |
| | | | | | |
| 4149.718 | 6100 | 350 | 17.6 | 21.1 | 32 |
| 4189.715 | 31263 | 917 | 264.5 | 1.5 | 23 |
| | | | | | |
| 4138.07 | 0 | 70 | 0 | 0 | 0 |
| 4154.948 | 0 | 70 | 0 | 0 | 0 |

| county_fips | site_id | emission_unit_id | process_id | stack_id | pollutant_code | emission_process_description |
|---|---|---|---|---|---|---|
| 083 | 0028 | 001 | 01 | 001 | CO | 261HP MAINLINE COMPRESSOR |
| 083 | 0028 | 001 | 01 | 001 | NO2 | 261HP MAINLINE COMPRESSOR |
| 083 | 0028 | 001 | 01 | 001 | PM10 | 261HP MAINLINE COMPRESSOR |
| 083 | 0028 | 001 | 01 | 001 | SO2 | 261HP MAINLINE COMPRESSOR |
| 083 | 0028 | 002 | 01 | 002 | CO | NATGAS FIRED 142HP ENGINE |
| 083 | 0028 | 002 | 01 | 002 | NO2 | NATGAS FIRED 142HP ENGINE |
| 083 | 0028 | 002 | 01 | 002 | PM10 | NATGAS FIRED 142HP ENGINE |
| 083 | 0028 | 002 | 01 | 002 | SO2 | NATGAS FIRED 142HP ENGINE |
| 083 | 0070 | 001 | 01 | 001 | CO | DECTON BOILER RATED AT 3.6 MMBTU/HR |
| 083 | 0070 | 001 | 01 | 001 | NO2 | DECTON BOILER RATED AT 3.6 MMBTU/HR |
| 083 | 0070 | 001 | 01 | 001 | PM10 | DECTON BOILER RATED AT 3.6 MMBTU/HR |
| 033 | 0009 | 004 | 01 | 004 | CO | NAT GAS FIRED SOLAR SATURN T-1300 TURBINE |
| 033 | 0009 | 004 | 01 | 004 | NO2 | NAT GAS FIRED SOLAR SATURN T-1300 TURBINE |
| 033 | 0009 | 004 | 01 | 004 | PM10 | NAT GAS FIRED SOLAR SATURN T-1300 TURBINE |
| 033 | 0009 | 004 | 01 | 004 | SO2 | NAT GAS FIRED SOLAR SATURN T-1300 TURBINE |
| 083 | 0024 | 002 | 01 | 002 | CO | NATURAL GAS COMBUSTION |
| 083 | 0024 | 002 | 01 | 002 | NO2 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 002 | 01 | 002 | PM10 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 002 | 01 | 002 | SO2 | NATURAL GAS COMBUSTION |
| 083 | 0091 | 001 | 01 | 001 | PM10 | MCNEILUS CONCRETE BATCH PLANT |
| 083 | 0091 | 001 | 02 | 001 | PM10 | FUGITIVE EMISSIONS |
| 083 | 0055 | 002 | 01 | 002 | PM10 | FUGITIVE EMISSIONS |
| 083 | 0055 | 002 | 02 | 002 | PM10 | GRAVEL PIT |
| 083 | 0069 | 001 | 01 | 001 | PM10 | GRAVEL PIT-TRANSFER POINTS |
| 083 | 0069 | 001 | 02 | 000 | PM10 | FUGITIVE EMISSIONS |
| 033 | 0014 | 002 | 01 | 002 | CO | NATURAL GAS COMBUSTION |
| 033 | 0014 | 002 | 01 | 002 | NO2 | NATURAL GAS COMBUSTION |
| 033 | 0014 | 002 | 01 | 002 | PM10 | NATURAL GAS COMBUSTION |
| 033 | 0014 | 002 | 01 | 002 | SO2 | NATURAL GAS COMBUSTION |
| 083 | 0033 | 005 | 01 | 005 | CO | TURBINE SMB1683 GP20388-3 |
| 083 | 0033 | 005 | 01 | 005 | NO2 | TURBINE SMB1683 GP20388-3 |
| 083 | 0033 | 005 | 01 | 005 | PM10 | TURBINE SMB1683 GP20388-3 |
| 083 | 0033 | 005 | 01 | 005 | SO2 | TURBINE SMB1683 GP20388-3 |
| 083 | 0033 | 004 | 01 | 004 | CO | TURBINE #1 MD:10-T1302 |
| 083 | 0033 | 004 | 01 | 004 | NO2 | TURBINE #1 MD:10-T1302 |
| 083 | 0033 | 004 | 01 | 004 | PM10 | TURBINE #1 MD:10-T1302 |

| county_fips | site_id | emission_unit_id | process_id | stack_id | pollutant_code | emission_process_description |
|---|---|---|---|---|---|---|
| 083 | 0033 | 004 | 01 | 004 | SO2 | TURBINE #1 MD:10-T1302 |
| 083 | 0033 | 003 | 01 | 003 | CO | TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED |
| 083 | 0033 | 003 | 01 | 003 | NO2 | TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED |
| 083 | 0033 | 003 | 01 | 003 | PM10 | TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED |
| 083 | 0033 | 003 | 01 | 003 | SO2 | TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED |
| 083 | 0072 | 001 | 01 | 001 | CO | NATURAL GAS COMBUSTION |
| 083 | 0072 | 001 | 01 | 001 | NO2 | NATURAL GAS COMBUSTION |
| 083 | 0072 | 001 | 01 | 001 | PM10 | NATURAL GAS COMBUSTION |
| 083 | 0072 | 001 | 01 | 001 | SO2 | NATURAL GAS COMBUSTION |
| 083 | 0039 | 007 | 01 | 007 | CO | NATURAL GAS COMBUSTION |
| 083 | 0039 | 007 | 01 | 007 | NO2 | NATURAL GAS COMBUSTION |
| 083 | 0039 | 007 | 01 | 007 | PM10 | NATURAL GAS COMBUSTION |
| 083 | 0039 | 007 | 01 | 007 | SO2 | NATURAL GAS COMBUSTION |
| 083 | 0031 | 002 | 01 | 002 | CO | WAUKESHA F817GU 385876 |
| 083 | 0031 | 002 | 01 | 002 | NO2 | WAUKESHA F817GU 385876 |
| 083 | 0031 | 002 | 01 | 002 | PM10 | WAUKESHA F817GU 385876 |
| 083 | 0031 | 002 | 01 | 002 | SO2 | WAUKESHA F817GU 385876 |
| 083 | 0039 | 009 | 01 | * | CO | IC ENGINE |
| 083 | 0039 | 009 | 01 | * | NO2 | IC ENGINE |
| 033 | 0013 | 002 | 01 | 002 | CO | WAUKESHA VRG220U PUMPJACK |
| 033 | 0013 | 002 | 01 | 002 | NO2 | WAUKESHA VRG220U PUMPJACK |
| 033 | 0013 | 002 | 01 | 002 | PM10 | WAUKESHA VRG220U PUMPJACK |
| 033 | 0013 | 002 | 01 | 002 | SO2 | WAUKESHA VRG220U PUMPJACK |
| 033 | 0013 | 001 | 01 | 001 | CO | WAUKESHA F2895GU COMPRESR |
| 033 | 0013 | 001 | 01 | 001 | NO2 | WAUKESHA F2895GU COMPRESR |
| 033 | 0013 | 001 | 01 | 001 | PM10 | WAUKESHA F2895GU COMPRESR |
| 033 | 0013 | 001 | 01 | 001 | SO2 | WAUKESHA F2895GU COMPRESR |
| 033 | 0003 | 001 | 01 | 001 | CO | WAUKESHA F817G ICE |
| 033 | 0003 | 001 | 01 | 001 | NO2 | WAUKESHA F817G ICE |
| 033 | 0003 | 001 | 01 | 001 | PM10 | WAUKESHA F817G ICE |
| 033 | 0003 | 001 | 01 | 001 | SO2 | WAUKESHA F817G ICE |
| 083 | 0028 | 003 | 01 | 003 | CO | GENERATOR SET 198HP |
| 083 | 0028 | 003 | 01 | 003 | NO2 | GENERATOR SET 198HP |
| 083 | 0028 | 003 | 01 | 003 | PM10 | GENERATOR SET 198HP |
| 083 | 0028 | 003 | 01 | 003 | SO2 | GENERATOR SET 198HP |
| 083 | 0020 | 003 | 01 | 003 | CO | GLYCOL REBOILER H-102B |

| county_fips | site_id | emission_unit_id | process_id | stack_id | pollutant_code | emission_process_description |
|---|---|---|---|---|---|---|
| 083 | 0020 | 003 | 01 | 003 | NO2 | GLYCOL REBOILER H-102B |
| 083 | 0020 | 003 | 01 | 003 | PM10 | GLYCOL REBOILER H-102B |
| 083 | 0020 | 003 | 01 | 003 | SO2 | GLYCOL REBOILER H-102B |
| 083 | 0020 | 002 | 01 | 002 | CO | GLYCOL REBOILER H-102A |
| 083 | 0020 | 002 | 01 | 002 | NO2 | GLYCOL REBOILER H-102A |
| 083 | 0020 | 002 | 01 | 002 | PM10 | GLYCOL REBOILER H-102A |
| 083 | 0020 | 002 | 01 | 002 | SO2 | GLYCOL REBOILER H-102A |
| 083 | 0018 | 003 | 01 | 003 | CO | GLYCOL REBOILER H-102B |
| 083 | 0018 | 003 | 01 | 003 | NO2 | GLYCOL REBOILER H-102B |
| 083 | 0018 | 003 | 01 | 003 | PM10 | GLYCOL REBOILER H-102B |
| 083 | 0018 | 003 | 01 | 003 | SO2 | GLYCOL REBOILER H-102B |
| 083 | 0018 | 002 | 01 | 002 | CO | GLYCOL REBOILER H-102A |
| 083 | 0018 | 002 | 01 | 002 | NO2 | GLYCOL REBOILER H-102A |
| 083 | 0018 | 002 | 01 | 002 | PM10 | GLYCOL REBOILER H-102A |
| 083 | 0018 | 002 | 01 | 002 | SO2 | GLYCOL REBOILER H-102A |
| 083 | 0057 | 001 | 01 | 001 | PM10 | GRAVEL PIT-TRANSFER POINTS |
| 083 | 0057 | 001 | 02 | 000 | PM10 | FUGITIVE EMISSIONS |
| 083 | 0056 | 001 | 01 | 001 | CO | TOTAL NATURAL GAS COMBUSTION |
| 083 | 0056 | 001 | 01 | 001 | NO2 | TOTAL NATURAL GAS COMBUSTION |
| 083 | 0056 | 001 | 01 | 001 | PM10 | TOTAL NATURAL GAS COMBUSTION |
| 083 | 0056 | 001 | 01 | 001 | SO2 | TOTAL NATURAL GAS COMBUSTION |
| 083 | 0024 | 003 | 01 | 003 | CO | NATURAL GAS COMBUSTION |
| 083 | 0024 | 003 | 01 | 003 | NO2 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 003 | 01 | 003 | PM10 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 003 | 01 | 003 | SO2 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 001 | 01 | 001 | CO | NATURAL GAS COMBUSTION |
| 083 | 0024 | 001 | 01 | 001 | NO2 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 001 | 01 | 001 | PM10 | NATURAL GAS COMBUSTION |
| 083 | 0024 | 001 | 01 | 001 | SO2 | NATURAL GAS COMBUSTION |
| 033 | 0017 | 002 | 01 | 002 | CO | AJAX DPC 360LE, SNA: 8870 |
| 033 | 0017 | 002 | 01 | 002 | NO2 | AJAX DPC 360LE, SNA: 8870 |
| 033 | 0017 | 002 | 01 | 002 | PM10 | AJAX DPC 360LE, SNA: 8870 |
| 033 | 0017 | 002 | 01 | 002 | SO2 | AJAX DPC 360LE, SNA: 8870 |
| 083 | 0067 | 001 | 01 | 000 | PM10 | SAND & GRAVEL, FUGIT.EMIS |
| 083 | 0067 | 001 | 02 | 000 | PM10 | SAND & GRAVEL PIT OPRTNS |
| 083 | 0066 | 001 | 01 | 000 | PM10 | MATERIAL EXTRACTION |

| county_fips | site_id | emission_unit_id | process_id | stack_id | pollutant_code | emission_process_description |
|---|---|---|---|---|---|---|
| 083 | 0065 | 001 | 01 | 001 | CO | CREMATOR UNIT A11-1801 |
| 083 | 0065 | 001 | 01 | 001 | NO2 | CREMATOR UNIT A11-1801 |
| 083 | 0065 | 001 | 01 | 001 | PM10 | CREMATOR UNIT A11-1801 |
| 083 | 0065 | 001 | 01 | 001 | SO2 | CREMATOR UNIT A11-1801 |
| 083 | 0015 | 001 | 01 | 001 | CO | DIESEL USE |
| 083 | 0015 | 001 | 01 | 001 | NO2 | DIESEL USE |
| 083 | 0015 | 001 | 01 | 001 | PM10 | DIESEL USE |
| 083 | 0015 | 001 | 01 | 001 | SO2 | DIESEL USE |
| 083 | 0064 | 001 | 01 | 001 | PM10 | CONCRETE BATCH PLANT |
| 083 | 0064 | 001 | 02 | 000 | PM10 | FUGITIVE DUST ACTIVITIES |
| 083 | 0058 | 002 | 01 | 002 | CO | AJAX MOD DP60 |
| 083 | 0058 | 002 | 01 | 002 | NO2 | AJAX MOD DP60 |
| 083 | 0058 | 002 | 01 | 002 | PM10 | AJAX MOD DP60 |
| 083 | 0058 | 002 | 01 | 002 | SO2 | AJAX MOD DP60 |
| 083 | 0058 | 001 | 01 | 001 | CO | AJAX MOD DP 60 |
| 083 | 0058 | 001 | 01 | 001 | NO2 | AJAX MOD DP 60 |
| 083 | 0058 | 001 | 01 | 001 | PM10 | AJAX MOD DP 60 |
| 083 | 0058 | 001 | 01 | 001 | SO2 | AJAX MOD DP 60 |
| 083 | 0028 | 007 | 01 | 007 | CO | WAUKESHA ENG FOR INJ PUMP |
| 083 | 0028 | 007 | 01 | 007 | NO2 | WAUKESHA ENG FOR INJ PUMP |
| 083 | 0028 | 007 | 01 | 007 | PM10 | WAUKESHA ENG FOR INJ PUMP |
| 083 | 0028 | 007 | 01 | 007 | SO2 | WAUKESHA ENG FOR INJ PUMP |
| 083 | 0039 | 005 | 01 | 005 | CO | JW WILLIAMS INLET HEATER |
| 083 | 0039 | 005 | 01 | 005 | NO2 | JW WILLIAMS INLET HEATER |
| 083 | 0034 | 002 | 01 | 002 | CO | SOLAR T4500 TURBINE |
| 083 | 0034 | 002 | 01 | 002 | NO2 | SOLAR T4500 TURBINE |
| 083 | 0034 | 002 | 01 | 002 | PM10 | SOLAR T4500 TURBINE |
| 083 | 0034 | 001 | 01 | 001 | CO | SOLAR T4500 TURBINE #1 |
| 083 | 0034 | 001 | 01 | 001 | NO2 | SOLAR T4500 TURBINE #1 |
| 083 | 0034 | 001 | 01 | 001 | PM10 | SOLAR T4500 TURBINE #1 |
| 083 | 0027 | 002 | 01 | 002 | PM10 | S&G STORAGE AND HANDLING |
| 033 | 0005 | 001 | 01 | 001 | PM10 | DRY BEAN PROCESS-CLEAN |
| 083 | 0090 | 001 | 01 | 001 | CO | WAUKESHA, VRG155 ENG RATED AT 30HP |
| 083 | 0090 | 001 | 01 | 001 | NO2 | WAUKESHA, VRG155 ENG RATED AT 30HP |
| 083 | 0090 | 001 | 01 | 001 | PM10 | WAUKESHA, VRG155 ENG RATED AT 30HP |
| 083 | 0090 | 001 | 01 | 001 | SO2 | WAUKESHA, VRG155 ENG RATED AT 30HP |

| county_fips | site_id | emission_unit_id | process_id | stack_id | pollutant_code | emission_process_description |
|---|---|---|---|---|---|---|
| 083 | 0089 | 001 | 01 | 001 | CO | AJAX, E-42, SN: 66959 ENGINE RATED AT 50 HP |
| 083 | 0089 | 001 | 01 | 001 | NO2 | AJAX, E-42, SN: 66959 ENGINE RATED AT 50 HP |
| 083 | 0089 | 001 | 01 | 001 | PM10 | AJAX, E-42, SN: 66959 ENGINE RATED AT 50 HP |
| 083 | 0089 | 001 | 01 | 001 | SO2 | AJAX, E-42, SN: 66959 ENGINE RATED AT 50 HP |
| 083 | 0087 | 001 | 01 | 001 | CO | AJAX E-42 NATURALGAS ENG RATED AT 40 HP |
| 083 | 0087 | 001 | 01 | 001 | NO2 | AJAX E-42 NATURALGAS ENG RATED AT 40 HP |
| 083 | 0087 | 001 | 01 | 001 | PM10 | AJAX E-42 NATURALGAS ENG RATED AT 40 HP |
| 083 | 0087 | 001 | 01 | 001 | SO2 | AJAX E-42 NATURALGAS ENG RATED AT 40 HP |
| 083 | 0074 | 002 | 01 | 002 | CO | AJAX E-42 ICE SN:E-42-1 |
| 083 | 0074 | 002 | 01 | 002 | NO2 | AJAX E-42 ICE SN:E-42-1 |
| 083 | 0074 | 002 | 01 | 002 | PM10 | AJAX E-42 ICE SN:E-42-1 |
| 083 | 0074 | 002 | 01 | 002 | SO2 | AJAX E-42 ICE SN:E-42-1 |
| 083 | 0074 | 001 | 01 | 001 | CO | WAUKESHA ICE SN:364875 |
| 083 | 0074 | 001 | 01 | 001 | NO2 | WAUKESHA ICE SN:364875 |
| 083 | 0074 | 001 | 01 | 001 | PM10 | WAUKESHA ICE SN:364875 |
| 083 | 0074 | 001 | 01 | 001 | SO2 | WAUKESHA ICE SN:364875 |
| 033 | 0020 | 002 | 01 | 002 | CO | GEMINI G-26 ENGINE RATED AT 30 HP |
| 033 | 0020 | 002 | 01 | 002 | NO2 | GEMINI G-26 ENGINE RATED AT 30 HP |
| 033 | 0020 | 002 | 01 | 002 | PM10 | GEMINI G-26 ENGINE RATED AT 30 HP |
| 033 | 0020 | 002 | 01 | 002 | SO2 | GEMINI G-26 ENGINE RATED AT 30 HP |

| proc_emis_estim | proc_emis_estim_units | facility_name | site_emis_limit1 | site_emis_limit1_units | distance |
|---|---|---|---|---|---|
| 3.52 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 41.1 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.085 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.0051 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 2 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 27.4 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.049 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.00294 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 8.6 | TY | MUSCANELL MILLWORKS, INC. | | | 21.2 |
| 7.1 | TY | MUSCANELL MILLWORKS, INC. | | | 21.2 |
| 5.4 | TY | MUSCANELL MILLWORKS, INC. | | | 21.2 |
| 31.12 | TY | MID-AMERICA PIPELINE CO DOVE CR STA | | | 44.9 |
| 16.38 | TY | MID-AMERICA PIPELINE CO DOVE CR STA | | | 44.9 |
| 2.1 | TY | MID-AMERICA PIPELINE CO DOVE CR STA | | | 44.9 |
| 0.03 | TY | MID-AMERICA PIPELINE CO DOVE CR STA | | | 44.9 |
| 0.7 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 1.37 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.018816 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.002881 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.261 | TY | SKY UTE SAND & GRAVEL | | | 29.2 |
| 0.84 | TY | SKY UTE SAND & GRAVEL | | | 29.2 |
| 6.80025 | TY | MOUNTAIN STONE INC. - KOENIG PIT | | | 46.9 |
| 0.0285 | TY | MOUNTAIN STONE INC. - KOENIG PIT | | | 46.9 |
| 0.1 | TY | FOUR STATES AGGREGATES LLC - LINE CAMP | | | 35.4 |
| 3.9 | TY | FOUR STATES AGGREGATES LLC - LINE CAMP | | | 35.4 |
| 16 | TY | QUESTAR E&P - ISLAND BUTTE #3 | | | 15.6 |
| 30 | TY | QUESTAR E&P - ISLAND BUTTE #3 | | | 15.6 |
| 0.0714 | TY | QUESTAR E&P - ISLAND BUTTE #3 | | | 15.6 |
| 0.0044 | TY | QUESTAR E&P - ISLAND BUTTE #3 | | | 15.6 |
| 15.8 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 16.2 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 2.1 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 0.0297 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 15.8 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 16.2 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 2.1 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |

| proc_emis_estim | proc_emis_estim_units | facility_name | site_emis_limit1 | site_emis_limit1_units | distance |
|---|---|---|---|---|---|
| 0.0297 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 15.79866 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 16.20162 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 1.8396 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 0.02628 | TY | MID-AMERICA PIPELINE CO DOLORES STA | | | 41.9 |
| 0.888045 | TY | QUESTAR EXPLORATION - CUTTHROAT #5 | | | 0.2 |
| 14.200048 | TY | QUESTAR EXPLORATION - CUTTHROAT #5 | | | 0.2 |
| 0.002672 | TY | QUESTAR EXPLORATION - CUTTHROAT #5 | | | 0.2 |
| 0.001796 | TY | QUESTAR EXPLORATION - CUTTHROAT #5 | | | 0.2 |
| 52.73 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | 12.4 |
| 61.32 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | 12.4 |
| 0.020016 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | 12.4 |
| 0.01 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | 12.4 |
| 0.9 | TY | QUESTAR EXPLORATION - MCCLEAN BASIN #2 | | | 3.8 |
| 13.9 | TY | QUESTAR EXPLORATION - MCCLEAN BASIN #2 | | | 3.8 |
| 0.0275 | TY | QUESTAR EXPLORATION - MCCLEAN BASIN #2 | | | 3.8 |
| 0.00165 | TY | QUESTAR EXPLORATION - MCCLEAN BASIN #2 | | | 3.8 |
| 7.39 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | |
| 8.59 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | |
| 0.406 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 4.925 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 0.011835 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 0.001 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 3.3 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 40.014 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 0.436892 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 0.005 | TY | QUESTAR E&P - ISLAND BUTTE A | | | 16.1 |
| 1.460024 | TY | QUESTAR E&P -SPARGO #1-36 | | | 19.2 |
| 11.471626 | TY | QUESTAR E&P -SPARGO #1-36 | | | 19.2 |
| 0.053641 | TY | QUESTAR E&P -SPARGO #1-36 | | | 19.2 |
| 0.002299 | TY | QUESTAR E&P -SPARGO #1-36 | | | 19.2 |
| 2 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 21.1 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.0575 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.00345 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.9775 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |

| proc_emis_estim | proc_emis_estim_units | facility_name | site_emis_limit1 | site_emis_limit1_units | distance |
|---|---|---|---|---|---|
| 4.301 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 0.21114 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 8.42214 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 0.9775 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 4.301 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 0.21114 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 8.42214 | TY | KINDER MORGAN CO2 CO. -HOVENWEEP CENTRAL | | | 6.5 |
| 0.9775 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 4.5 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 0.21114 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 8.5 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 0.9775 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 4.5 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 0.21114 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 8.5 | TY | KINDER MORGAN CO2 CO. -YELLOW JACKET H10 | | | 11.1 |
| 0.050025 | TY | FOUR STATES AGGREGATES LLC-HAY CAMP PIT | | | 40.5 |
| 4.100025 | TY | FOUR STATES AGGREGATES LLC-HAY CAMP PIT | | | 40.5 |
| 15.589 | TY | SMITH ENERGY LP 1988 CACHE OIL FIELD | | | 23.3 |
| 22.32 | TY | SMITH ENERGY LP 1988 CACHE OIL FIELD | | | 23.3 |
| 0.059 | TY | SMITH ENERGY LP 1988 CACHE OIL FIELD | | | 23.3 |
| 0.0048 | TY | SMITH ENERGY LP 1988 CACHE OIL FIELD | | | 23.3 |
| 29.2 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 17.8 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.030144 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.004616 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 25.2 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 25.2 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.032484 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 0.004974 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT A | | | 4.4 |
| 2.810542 | TY | BURR OIL & GAS INC. - COMPRESSOR #1 | | | 20.6 |
| 14.05271 | TY | BURR OIL & GAS INC. - COMPRESSOR #1 | | | 20.6 |
| 0.00828 | TY | BURR OIL & GAS INC. - COMPRESSOR #1 | | | 20.6 |
| 0.005589 | TY | BURR OIL & GAS INC. - COMPRESSOR #1 | | | 20.6 |
| 1.01 | TY | MONTEZUMA COUNTY | | | 15.6 |
| 0.16 | TY | MONTEZUMA COUNTY | | | 15.6 |
| 5.265 | TY | STONE CRUSHING | | | 26.2 |

| proc_emis_estim | proc_emis_estim_units | facility_name | site_emis_limit1 | site_emis_limit1_units | distance |
|---|---|---|---|---|---|
| 0.07 | TY | ERTEL INC ERTEL FUNERAL HOME | | | 30.1 |
| 0.006 | TY | ERTEL INC ERTEL FUNERAL HOME | | | 30.1 |
| 0.033 | TY | ERTEL INC ERTEL FUNERAL HOME | | | 30.1 |
| 0.01 | TY | ERTEL INC ERTEL FUNERAL HOME | | | 30.1 |
| 0.022858 | TY | SOUTHWEST HEALTH SYSTEM | | | 30.7 |
| 0.09143 | TY | SOUTHWEST HEALTH SYSTEM | | | 30.7 |
| 0.009143 | TY | SOUTHWEST HEALTH SYSTEM | | | 30.7 |
| 0.129831 | TY | SOUTHWEST HEALTH SYSTEM | | | 30.7 |
| 0.240127 | TY | MOUNTAIN STONE INC | | | 27.7 |
| 0.170375 | TY | MOUNTAIN STONE INC | | | 27.7 |
| 0.881195 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 2.34986 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 0.005 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 0.0003 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 0.881195 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 2.34986 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 0.005 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 0.0003 | TY | GEODYNE RESOURCES INC | | | 28.4 |
| 0.333 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 2.614 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.012385 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.000743 | TY | QUESTAR EXPLORATION & PROD - CUTTHROAT B | | | 0.2 |
| 0.23 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | 12.4 |
| 1.1 | TY | QUESTAR E & P- ISLAND BUTTE - B | | | 12.4 |
| 0.04 | TY | NORTHWEST PIPELINE CORP PLEASANT VIEW | | | 22.8 |
| 0.92 | TY | NORTHWEST PIPELINE CORP PLEASANT VIEW | | | 22.8 |
| 0.01 | TY | NORTHWEST PIPELINE CORP PLEASANT VIEW | | | 22.8 |
| 0.04 | TY | NORTHWEST PIPELINE CORP PLEASANT VIEW | | | 22.8 |
| 0.92 | TY | NORTHWEST PIPELINE CORP PLEASANT VIEW | | | 22.8 |
| 0.01 | TY | NORTHWEST PIPELINE CORP PLEASANT VIEW | | | 22.8 |
| 0.6375 | TY | OLDCASTLE SW GROUP | | | 29.3 |
| 0.268125 | TY | ADOBE MILLING CO INC | | | 34.6 |
| 4.4004 | TY | QUESTAR EXPLORATION - CUTTHROAT #8 | | | 0.7 |
| 2.61 | TY | QUESTAR EXPLORATION - CUTTHROAT #8 | | | 0.7 |
| 0.012 | TY | QUESTAR EXPLORATION - CUTTHROAT #8 | | | 0.7 |
| 0.00072 | TY | QUESTAR EXPLORATION - CUTTHROAT #8 | | | 0.7 |

| proc_emis_estim | proc_emis_estim_units | facility_name | site_emis_limit1 | site_emis_limit1_units | distance |
|---|---|---|---|---|---|
| 1.27 | TY | QUESTAR EXPLORATION - CUTTHROAT #14 | | | 2.3 |
| 1.7 | TY | QUESTAR EXPLORATION - CUTTHROAT #14 | | | 2.3 |
| 0.0175 | TY | QUESTAR EXPLORATION - CUTTHROAT #14 | | | 2.3 |
| 0.00105 | TY | QUESTAR EXPLORATION - CUTTHROAT #14 | | | 2.3 |
| 1.3 | TY | QUESTAR EXPL AND PROD - CUTTHROAT #9 | | | 7 |
| 1.700001 | TY | QUESTAR EXPL AND PROD - CUTTHROAT #9 | | | 7 |
| 0.0175 | TY | QUESTAR EXPL AND PROD - CUTTHROAT #9 | | | 7 |
| 0.00105 | TY | QUESTAR EXPL AND PROD - CUTTHROAT #9 | | | 7 |
| 1.16 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 1.54 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 0.001155 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 0.00077 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 4.4 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 2.61 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 0.000864 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 0.000576 | TY | QUESTAR EXPLORATION - ISLAND BUTTE #7AH | | | 13.9 |
| 0.50001 | TY | DJ SIMMONS - PAPOOSE CANYON | | | 25.3 |
| 2.760009 | TY | DJ SIMMONS - PAPOOSE CANYON | | | 25.3 |
| 0.105 | TY | DJ SIMMONS - PAPOOSE CANYON | | | 25.3 |
| 0.0063 | TY | DJ SIMMONS - PAPOOSE CANYON | | | 25.3 |

| emission_release_pt_descript | exit_gas_flow_rate | exit_gas_temp | exit_gas_velocity | stack_diameter | stack_height |
|---|---|---|---|---|---|
| CATERPILLAR SN:6NB00535 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| CATERPILLAR SN:6NB00535 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| CATERPILLAR SN:6NB00535 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| CATERPILLAR SN:6NB00535 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| WAUKESHA SN:398948 | 750 | 1111 | 143.5 | 0.330000013 | 8 |
| WAUKESHA SN:398948 | 750 | 1111 | 143.5 | 0.330000013 | 8 |
| WAUKESHA SN:398948 | 750 | 1111 | 143.5 | 0.330000013 | 8 |
| WAUKESHA SN:398948 | 750 | 1111 | 143.5 | 0.330000013 | 8 |
| BOILER | 6100 | 350 | 17.60000038 | 21.10000038 | 32 |
| BOILER | 6100 | 350 | 17.60000038 | 21.10000038 | 32 |
| BOILER | 6100 | 350 | 17.60000038 | 21.10000038 | 32 |
| SOLAR SATURN T-1300 TURBINE | 31263 | 917 | 264.5 | 1.5 | 23 |
| SOLAR SATURN T-1300 TURBINE | 31263 | 917 | 264.5 | 1.5 | 23 |
| SOLAR SATURN T-1300 TURBINE | 31263 | 917 | 264.5 | 1.5 | 23 |
| SOLAR SATURN T-1300 TURBINE | 31263 | 917 | 264.5 | 1.5 | 23 |
| WAUKESHA F1197 SN:398947 | 750 | 1111 | 0 | 0.300000012 | 8 |
| WAUKESHA F1197 SN:398947 | 750 | 1111 | 0 | 0.300000012 | 8 |
| WAUKESHA F1197 SN:398947 | 750 | 1111 | 0 | 0.300000012 | 8 |
| WAUKESHA F1197 SN:398947 | 750 | 1111 | 0 | 0.300000012 | 8 |
| CUSTOM, TURCKMIX TYPE CONCRETE PLANT | 0 | 70 | 0 | 0 | 0 |
| CUSTOM, TURCKMIX TYPE CONCRETE PLANT | 0 | 70 | 0 | 0 | 0 |
| SAND AND GRAVEL PIT OPERATION | 0 | 70 | 0 | 0 | 0 |
| SAND AND GRAVEL PIT OPERATION | 0 | 70 | 0 | 0 | 0 |
| GRAVEL PIT OPERATION-TRANSFER POINTS | 0 | 70 | 0 | 0 | 0 |
| FUGITIVE EMISSIONS | 0 | 70 | 0 | 0 | 0 |
| CAT GENERATOR 7DB00725 | 0 | 590 | 0 | 0.670000017 | 10 |
| CAT GENERATOR 7DB00725 | 0 | 590 | 0 | 0.670000017 | 10 |
| CAT GENERATOR 7DB00725 | 0 | 590 | 0 | 0.670000017 | 10 |
| CAT GENERATOR 7DB00725 | 0 | 590 | 0 | 0.670000017 | 10 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |

| emission_release_pt_descript | exit_gas_flow_rate | exit_gas_temp | exit_gas_velocity | stack_diameter | stack_height |
|---|---|---|---|---|---|
| | 27813 | 890 | 262.2999878 | 1.5 | 20 |
| TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED | 24647 | 770 | 232.5 | 1.5 | 20 |
| TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED | 24647 | 770 | 232.5 | 1.5 | 20 |
| TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED | 24647 | 770 | 232.5 | 1.5 | 20 |
| TURBINE #3: SOLAR, SN: 0528521R, NATURAL GAS FIRED | 24647 | 770 | 232.5 | 1.5 | 20 |
| WAUKESHA ICE | 655 | 1120 | 125.0999985 | 2.5 | 7 |
| WAUKESHA ICE | 655 | 1120 | 125.0999985 | 2.5 | 7 |
| WAUKESHA ICE | 655 | 1120 | 125.0999985 | 2.5 | 7 |
| WAUKESHA ICE | 655 | 1120 | 125.0999985 | 2.5 | 7 |
| CATERPILLAR G3412TA-LCR, SN: 7DB00288, ENGINE | 2563 | 0 | 15.19999981 | 1 | 19 |
| CATERPILLAR G3412TA-LCR, SN: 7DB00288, ENGINE | 2563 | 0 | 15.19999981 | 1 | 19 |
| CATERPILLAR G3412TA-LCR, SN: 7DB00288, ENGINE | 2563 | 0 | 15.19999981 | 1 | 19 |
| CATERPILLAR G3412TA-LCR, SN: 7DB00288, ENGINE | 2563 | 0 | 15.19999981 | 1 | 19 |
| NATURAL GAS ENGINE | 510 | 1055 | 97.40000153 | 0.330000013 | 8 |
| NATURAL GAS ENGINE | 510 | 1055 | 97.40000153 | 0.330000013 | 8 |
| NATURAL GAS ENGINE | 510 | 1055 | 97.40000153 | 0.330000013 | 8 |
| NATURAL GAS ENGINE | 510 | 1055 | 97.40000153 | 0.330000013 | 8 |
| IC ENGINE RUNNING & WATER INJECTION PUMP | 50 | 1050 | 0 | 0.5 | 12 |
| IC ENGINE RUNNING & WATER INJECTION PUMP | 50 | 1050 | 0 | 0.5 | 12 |
| IC ENGINE RUNNING & WATER INJECTION PUMP | 50 | 1050 | 0 | 0.5 | 12 |
| IC ENGINE RUNNING & WATER INJECTION PUMP | 50 | 1050 | 0 | 0.5 | 12 |
| | 409 | 1050 | 0 | 0.829999983 | 12 |
| | 409 | 1050 | 0 | 0.829999983 | 12 |
| | 409 | 1050 | 0 | 0.829999983 | 12 |
| | 409 | 1050 | 0 | 0.829999983 | 12 |
| NATURAL GAS COMBUSTION ENGINE | 1883 | 168 | 0 | 0.300000012 | 7 |
| NATURAL GAS COMBUSTION ENGINE | 1883 | 168 | 0 | 0.300000012 | 7 |
| NATURAL GAS COMBUSTION ENGINE | 1883 | 168 | 0 | 0.300000012 | 7 |
| NATURAL GAS COMBUSTION ENGINE | 1883 | 168 | 0 | 0.300000012 | 7 |
| CATERPILLAR SN:71B900 | 900 | 1180 | 27.10000038 | 0.419999987 | 6 |
| CATERPILLAR SN:71B900 | 900 | 1180 | 27.10000038 | 0.419999987 | 6 |
| CATERPILLAR SN:71B900 | 900 | 1180 | 27.10000038 | 0.419999987 | 6 |
| CATERPILLAR SN:71B900 | 900 | 1180 | 27.10000038 | 0.419999987 | 6 |
| | 4700 | 700 | 0 | 2 | 20 |

| emission_release_pt_descript | exit_gas_flow_rate | exit_gas_temp | exit_gas_velocity | stack_diameter | stack_height |
|---|---|---|---|---|---|
| | 4700 | 700 | 0 | 2 | 20 |
| | 4700 | 700 | 0 | 2 | 20 |
| | 4700 | 700 | 0 | 2 | 20 |
| | 4700 | 700 | 0 | 2 | 20 |
| | 4700 | 700 | 0 | 2 | 20 |
| | 4700 | 700 | 0 | 2 | 20 |
| | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GLYCOL DEHYDRATOR | 4700 | 700 | 0 | 2 | 20 |
| GRAVEL PIT OPERATION-TRANSFER POINTS | 0 | 70 | 0 | 0 | 0 |
| FUGITIVE EMISSIONS | 0 | 70 | 0 | 0 | 0 |
| 8 INTERNAL COMBUSTION ENGINES, NAT. GAS FIRED | 929 | 0 | 78.69999695 | 5 | 10 |
| 8 INTERNAL COMBUSTION ENGINES, NAT. GAS FIRED | 929 | 0 | 78.69999695 | 5 | 10 |
| 8 INTERNAL COMBUSTION ENGINES, NAT. GAS FIRED | 929 | 0 | 78.69999695 | 5 | 10 |
| 8 INTERNAL COMBUSTION ENGINES, NAT. GAS FIRED | 929 | 0 | 78.69999695 | 5 | 10 |
| CAT G342TA SN:71B1982 | 900 | 1180 | 0 | 0.400000006 | 6 |
| CAT G342TA SN:71B1982 | 900 | 1180 | 0 | 0.400000006 | 6 |
| CAT G342TA SN:71B1982 | 900 | 1180 | 0 | 0.400000006 | 6 |
| CAT G342TA SN:71B1982 | 900 | 1180 | 0 | 0.400000006 | 6 |
| CAT G3408TA SN:6NB00490 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| CAT G3408TA SN:6NB00490 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| CAT G3408TA SN:6NB00490 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| CAT G3408TA SN:6NB00490 | 1034 | 894 | 87.80000305 | 0.5 | 11 |
| AJAX DPC 360LE, SN: 8870 | 0 | 70 | 0 | 0 | 0 |
| AJAX DPC 360LE, SN: 8870 | 0 | 70 | 0 | 0 | 0 |
| AJAX DPC 360LE, SN: 8870 | 0 | 70 | 0 | 0 | 0 |
| AJAX DPC 360LE, SN: 8870 | 0 | 70 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 |

| emission_release_pt_descript | exit_gas_flow_rate | exit_gas_temp | exit_gas_velocity | stack_diameter | stack_height |
|---|---|---|---|---|---|
| INCINERATOR | 2500 | 1600 | 20 | 1.700000048 | 18 |
| INCINERATOR | 2500 | 1600 | 20 | 1.700000048 | 18 |
| INCINERATOR | 2500 | 1600 | 20 | 1.700000048 | 18 |
| INCINERATOR | 2500 | 1600 | 20 | 1.700000048 | 18 |
| | 0 | 300 | 0 | 2 | 6 |
| | 0 | 300 | 0 | 2 | 6 |
| | 0 | 300 | 0 | 2 | 6 |
| | 0 | 300 | 0 | 2 | 6 |
| | 0 | 70 | 0 | 0 | 0 |
| FUGITIVE EMISSIONS | 0 | 70 | 0 | 0 | 0 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 500 | 0 | 23.79999924 | 0.699999988 | 7 |
| | 64 | 1100 | 12.5 | 0.330000013 | 12 |
| | 64 | 1100 | 12.5 | 0.330000013 | 12 |
| | 64 | 1100 | 12.5 | 0.330000013 | 12 |
| | 64 | 1100 | 12.5 | 0.330000013 | 12 |
| | 481 | 580 | 4.5 | 1.5 | 15 |
| | 481 | 580 | 4.5 | 1.5 | 15 |
| SOLAR CENTAUR TURBINE | 63592 | 985 | 102.6999969 | 4 | 52 |
| SOLAR CENTAUR TURBINE | 63592 | 985 | 102.6999969 | 4 | 52 |
| SOLAR CENTAUR TURBINE | 63592 | 985 | 102.6999969 | 4 | 52 |
| SOLAR CENTAUR TURBINE | 63592 | 985 | 102.6999969 | 4 | 52 |
| SOLAR CENTAUR TURBINE | 63592 | 985 | 102.6999969 | 4 | 52 |
| SOLAR CENTAUR TURBINE | 63592 | 985 | 102.6999969 | 4 | 52 |
| | 0 | 70 | 0 | 0 | 0 |
| | 0 | 70 | 0 | 0 | 0 |
| WATER INJECTION PUM ENGINE--WAUKESHA | 0 | 70 | 0 | 0 | 0 |
| WATER INJECTION PUM ENGINE--WAUKESHA | 0 | 70 | 0 | 0 | 0 |
| WATER INJECTION PUM ENGINE--WAUKESHA | 0 | 70 | 0 | 0 | 0 |
| WATER INJECTION PUM ENGINE--WAUKESHA | 0 | 70 | 0 | 0 | 0 |

| emission_release_pt_descript | exit_gas_flow_rate | exit_gas_temp | exit_gas_velocity | stack_diameter | stack_height |
|---|---|---|---|---|---|
| AJAX, E-42 NATURAL GAS ENGINE | 380 | 563 | 0.5 | 4.119999886 | 15 |
| AJAX, E-42 NATURAL GAS ENGINE | 380 | 563 | 0.5 | 4.119999886 | 15 |
| AJAX, E-42 NATURAL GAS ENGINE | 380 | 563 | 0.5 | 4.119999886 | 15 |
| AJAX, E-42 NATURAL GAS ENGINE | 380 | 563 | 0.5 | 4.119999886 | 15 |
| AJAX E-42, SN: 80029 NATURAL GAS ENGINE | 0 | 70 | 0 | 0 | 0 |
| AJAX E-42, SN: 80029 NATURAL GAS ENGINE | 0 | 70 | 0 | 0 | 0 |
| AJAX E-42, SN: 80029 NATURAL GAS ENGINE | 0 | 70 | 0 | 0 | 0 |
| AJAX E-42, SN: 80029 NATURAL GAS ENGINE | 0 | 70 | 0 | 0 | 0 |
| AJAX E-42 ICE SN:E-42-1 .XP | 162 | 800 | 13.69999981 | 0.5 | 10 |
| AJAX E-42 ICE SN:E-42-1 .XP | 162 | 800 | 13.69999981 | 0.5 | 10 |
| AJAX E-42 ICE SN:E-42-1 .XP | 162 | 800 | 13.69999981 | 0.5 | 10 |
| AJAX E-42 ICE SN:E-42-1 .XP | 162 | 800 | 13.69999981 | 0.5 | 10 |
| WAUKESHA VRG155 ICE SN:364875 .XP | 111 | 800 | 9.399999619 | 0.5 | 10 |
| WAUKESHA VRG155 ICE SN:364875 .XP | 111 | 800 | 9.399999619 | 0.5 | 10 |
| WAUKESHA VRG155 ICE SN:364875 .XP | 111 | 800 | 9.399999619 | 0.5 | 10 |
| WAUKESHA VRG155 ICE SN:364875 .XP | 111 | 800 | 9.399999619 | 0.5 | 10 |
| GEMINI, G-26 RECIPROCATING ENGINE | 0 | 70 | 0 | 0 | 0 |
| GEMINI, G-26 RECIPROCATING ENGINE | 0 | 70 | 0 | 0 | 0 |
| GEMINI, G-26 RECIPROCATING ENGINE | 0 | 70 | 0 | 0 | 0 |
| GEMINI, G-26 RECIPROCATING ENGINE | 0 | 70 | 0 | 0 | 0 |

| const_permit_last_issue_date | construction_permit_number | emission_unit_description | normal_days_per_week | normal_hours_per_day |
|---|---|---|---|---|
| 5/3/2006 0:00 | 87MN240-1 | CATERPILLAR,SN:6NB00535 | 7 | 24 |
| 5/3/2006 0:00 | 87MN240-1 | CATERPILLAR,SN:6NB00535 | 7 | 24 |
| 5/3/2006 0:00 | 87MN240-1 | CATERPILLAR,SN:6NB00535 | 7 | 24 |
| 5/3/2006 0:00 | 87MN240-1 | CATERPILLAR,SN:6NB00535 | 7 | 24 |
| 5/2/2006 0:00 | 87MN240-2 | WAUKESHA SN: 398948 | 7 | 24 |
| 5/2/2006 0:00 | 87MN240-2 | WAUKESHA SN: 398948 | 7 | 24 |
| 5/2/2006 0:00 | 87MN240-2 | WAUKESHA SN: 398948 | 7 | 24 |
| 5/2/2006 0:00 | 87MN240-2 | WAUKESHA SN: 398948 | 7 | 24 |
| 2/16/2006 0:00 | 02MN0146 | 7DECTON/BURNHAM BOILER | 7 | 24 |
| 2/16/2006 0:00 | 02MN0146 | 7DECTON/BURNHAM BOILER | 7 | 24 |
| 2/16/2006 0:00 | 02MN0146 | 7DECTON/BURNHAM BOILER | 7 | 24 |
| 2/8/2006 0:00 | 04DO0170 | SOLAR SATURN T-1300 | 7 | 24 |
| 2/8/2006 0:00 | 04DO0170 | SOLAR SATURN T-1300 | 7 | 24 |
| 2/8/2006 0:00 | 04DO0170 | SOLAR SATURN T-1300 | 7 | 24 |
| 2/8/2006 0:00 | 04DO0170 | SOLAR SATURN T-1300 | 7 | 24 |
| 1/20/2006 0:00 | 87MN241-2 | WAUKESHA F1197, SN:398947 | 7 | 24 |
| 1/20/2006 0:00 | 87MN241-2 | WAUKESHA F1197, SN:398947 | 7 | 24 |
| 1/20/2006 0:00 | 87MN241-2 | WAUKESHA F1197, SN:398947 | 7 | 24 |
| 1/20/2006 0:00 | 87MN241-2 | WAUKESHA F1197, SN:398947 | 7 | 24 |
| 8/19/2005 0:00 | 05MN0403 | CONCRETE BATCH PLANT | 7 | 12 |
| 8/19/2005 0:00 | 05MN0403 | CONCRETE BATCH PLANT | 7 | 12 |
| 2/25/2005 0:00 | 99MN0379F | GRAVEL PIT | 6 | 10 |
| 2/25/2005 0:00 | 99MN0379F | GRAVEL PIT | 6 | 10 |
| 9/24/2004 0:00 | 01MN0049F | GRAVEL PIT OPERATION | 6 | 15 |
| 9/24/2004 0:00 | 01MN0049F | GRAVEL PIT OPERATION | 6 | 15 |
| 9/26/2003 0:00 | 02DO0471 | CAT GENERATOR 7DB00725 | 7 | 24 |
| 9/26/2003 0:00 | 02DO0471 | CAT GENERATOR 7DB00725 | 7 | 24 |
| 9/26/2003 0:00 | 02DO0471 | CAT GENERATOR 7DB00725 | 7 | 24 |
| 9/26/2003 0:00 | 02DO0471 | CAT GENERATOR 7DB00725 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0661 | SOLAR SATURN 10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0661 | SOLAR SATURN 10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0661 | SOLAR SATURN 10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0661 | SOLAR SATURN 10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0660 | TURBINE #1 MD:10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0660 | TURBINE #1 MD:10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 97MN0660 | TURBINE #1 MD:10-T1302 | 7 | 24 |

| const_permit_last_issue_date | construction_permit_number | emission_unit_description | normal_days_per_week | normal_hours_per_day |
|---|---|---|---|---|
| 6/12/2003 0:00 | 97MN0660 | TURBINE #1 MD:10-T1302 | 7 | 24 |
| 6/12/2003 0:00 | 90MN208-3 | TURBINE SN:0528521R | 7 | 24 |
| 6/12/2003 0:00 | 90MN208-3 | TURBINE SN:0528521R | 7 | 24 |
| 6/12/2003 0:00 | 90MN208-3 | TURBINE SN:0528521R | 7 | 24 |
| 6/12/2003 0:00 | 90MN208-3 | TURBINE SN:0528521R | 7 | 24 |
| 3/7/2003 0:00 | 02MN1019 | WAUKESHA F817G | 7 | 24 |
| 3/7/2003 0:00 | 02MN1019 | WAUKESHA F817G | 7 | 24 |
| 3/7/2003 0:00 | 02MN1019 | WAUKESHA F817G | 7 | 24 |
| 3/7/2003 0:00 | 02MN1019 | WAUKESHA F817G | 7 | 24 |
| 3/27/2002 0:00 | 98MN0178 | CATERPILLAR G3412TA LCR | 7 | 24 |
| 3/27/2002 0:00 | 98MN0178 | CATERPILLAR G3412TA LCR | 7 | 24 |
| 3/27/2002 0:00 | 98MN0178 | CATERPILLAR G3412TA LCR | 7 | 24 |
| 3/27/2002 0:00 | 98MN0178 | CATERPILLAR G3412TA LCR | 7 | 24 |
| 3/27/2002 0:00 | 97MN0068 | WAUKESHA F817GU IC ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 97MN0068 | WAUKESHA F817GU IC ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 97MN0068 | WAUKESHA F817GU IC ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 97MN0068 | WAUKESHA F817GU IC ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 95MN1081.XP | 4 TANKS, 4000 BBL TOTAL | 7 | 24 |
| 3/27/2002 0:00 | 95MN1081.XP | 4 TANKS, 4000 BBL TOTAL | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-2.X | WAUKESHA VRG220U ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-2.X | WAUKESHA VRG220U ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-2.X | WAUKESHA VRG220U ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-2.X | WAUKESHA VRG220U ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-1 | WAUKESHA G2895GU ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-1 | WAUKESHA G2895GU ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-1 | WAUKESHA G2895GU ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1648-1 | WAUKESHA G2895GU ENGINE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1636 | WAUKESHA F817G ICE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1636 | WAUKESHA F817G ICE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1636 | WAUKESHA F817G ICE | 7 | 24 |
| 3/27/2002 0:00 | 93DO1636 | WAUKESHA F817G ICE | 7 | 24 |
| 3/27/2002 0:00 | 87MN240-3.CN | CATERPILLAR SN: 71B900 | 7 | 24 |
| 3/27/2002 0:00 | 87MN240-3.CN | CATERPILLAR SN: 71B900 | 7 | 24 |
| 3/27/2002 0:00 | 87MN240-3.CN | CATERPILLAR SN: 71B900 | 7 | 24 |
| 3/27/2002 0:00 | 87MN240-3.CN | CATERPILLAR SN: 71B900 | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-3 | GLYCOL REBOILER H-102B | 7 | 24 |

| const_permit_last_issue_date | construction_permit_number | emission_unit_description | normal_days_per_week | normal_hours_per_day |
|---|---|---|---|---|
| 1/16/2002 0:00 | 82MN411-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN411-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-3 | GLYCOL REBOILER H-102B | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 1/16/2002 0:00 | 82MN397-2 | GLYCOL REBOILER H-102A | 7 | 24 |
| 3/1/2001 0:00 | 95MN763F | GRAVEL PIT | 5 | 8 |
| 3/1/2001 0:00 | 95MN763F | GRAVEL PIT | 5 | 8 |
| 5/5/2000 0:00 | 95MN183 | 8 ENGINES | 7 | 24 |
| 5/5/2000 0:00 | 95MN183 | 8 ENGINES | 7 | 24 |
| 5/5/2000 0:00 | 95MN183 | 8 ENGINES | 7 | 24 |
| 5/5/2000 0:00 | 95MN183 | 8 ENGINES | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-3 | CATERPILLAR, SN:71B1982 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-3 | CATERPILLAR, SN:71B1982 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-3 | CATERPILLAR, SN:71B1982 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-3 | CATERPILLAR, SN:71B1982 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-1 | CAT G3408TA 6NB00490 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-1 | CAT G3408TA 6NB00490 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-1 | CAT G3408TA 6NB00490 | 7 | 24 |
| 2/2/2000 0:00 | 87MN241-1 | CAT G3408TA 6NB00490 | 7 | 24 |
| 5/3/1999 0:00 | 95DO002-2 | AJAX DPC 360LE, SN: 8870 | 7 | 24 |
| 5/3/1999 0:00 | 95DO002-2 | AJAX DPC 360LE, SN: 8870 | 7 | 24 |
| 5/3/1999 0:00 | 95DO002-2 | AJAX DPC 360LE, SN: 8870 | 7 | 24 |
| 5/3/1999 0:00 | 95DO002-2 | AJAX DPC 360LE, SN: 8870 | 7 | 24 |
| 6/4/1998 0:00 | 98MN0449 | SAND & GRAVEL PIT OPERATN | 4 | 7 |
| 6/4/1998 0:00 | 98MN0449 | SAND & GRAVEL PIT OPERATN | 4 | 7 |
| 6/4/1998 0:00 | 98MN0353F | GRAVEL PIT | 7 | 10 |

| const_permit_last_issue_date | construction_permit_number | emission_unit_description | normal_days_per_week | normal_hours_per_day |
|---|---|---|---|---|
| 2/3/1998 0:00 | 97MN0038 | CREMATOR A11-1801 | 7 | 24 |
| 2/3/1998 0:00 | 97MN0038 | CREMATOR A11-1801 | 7 | 24 |
| 2/3/1998 0:00 | 97MN0038 | CREMATOR A11-1801 | 7 | 24 |
| 2/3/1998 0:00 | 97MN0038 | CREMATOR A11-1801 | 7 | 24 |
| 6/4/1997 0:00 | 96MN939 | 2 CLEAVER BROOKS BOILERS | 7 | 24 |
| 6/4/1997 0:00 | 96MN939 | 2 CLEAVER BROOKS BOILERS | 7 | 24 |
| 6/4/1997 0:00 | 96MN939 | 2 CLEAVER BROOKS BOILERS | 7 | 24 |
| 6/4/1997 0:00 | 96MN939 | 2 CLEAVER BROOKS BOILERS | 7 | 24 |
| 6/4/1997 0:00 | 96MN776 | CUSTOM CONCRETE BTCH PLNT | 5 | 8 |
| 6/4/1997 0:00 | 96MN776 | CUSTOM CONCRETE BTCH PLNT | 5 | 8 |
| 1/2/1900 0:00 | 95MN924 | AJAX MOD DP 60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN924 | AJAX MOD DP 60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN924 | AJAX MOD DP 60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN924 | AJAX MOD DP 60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN923 | AJAX MDO DP60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN923 | AJAX MDO DP60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN923 | AJAX MDO DP60 | 7 | 24 |
| 1/2/1900 0:00 | 95MN923 | AJAX MDO DP60 | 7 | 24 |
| 1/2/1900 0:00 | 93MN1659 XP | WAUKESHA VRG155U | 7 | 24 |
| 1/2/1900 0:00 | 93MN1659 XP | WAUKESHA VRG155U | 7 | 24 |
| 1/2/1900 0:00 | 93MN1659 XP | WAUKESHA VRG155U | 7 | 24 |
| 1/2/1900 0:00 | 93MN1659 XP | WAUKESHA VRG155U | 7 | 24 |
| 1/2/1900 0:00 | 92MN878-5.XP | INLET HEATER | 7 | 24 |
| 1/2/1900 0:00 | 92MN878-5.XP | INLET HEATER | 7 | 24 |
| 1/2/1900 0:00 | 91MN343-2 | SOLAR CENTAUR SN: 4441C | 7 | 24 |
| 1/2/1900 0:00 | 91MN343-2 | SOLAR CENTAUR SN: 4441C | 7 | 24 |
| 1/2/1900 0:00 | 91MN343-2 | SOLAR CENTAUR SN: 4441C | 7 | 24 |
| 1/2/1900 0:00 | 91MN343-1 | SOLAR CENTAUR SN: 4440C | 7 | 24 |
| 1/2/1900 0:00 | 91MN343-1 | SOLAR CENTAUR SN: 4440C | 7 | 24 |
| 1/2/1900 0:00 | 91MN343-1 | SOLAR CENTAUR SN: 4440C | 7 | 24 |
| 1/2/1900 0:00 | 86MN265F | S&G STORAGE & HANDLING | 5 | 8 |
| 1/2/1900 0:00 | 86DO594 | DRY BEAN PROCESS-CLEAN | 5 | 8 |
| 1/2/1900 0:00 | 04MN0597 | WAUK, VRG155, SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 04MN0597 | WAUK, VRG155, SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 04MN0597 | WAUK, VRG155, SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 04MN0597 | WAUK, VRG155, SN:364875 | 7 | 24 |

| const_permit_last_issue_date | construction_permit_number | emission_unit_description | normal_days_per_week | normal_hours_per_day |
|---|---|---|---|---|
| 1/2/1900 0:00 | 04MN0334 XP | AJAX, E-42. SN: 66959 | 7 | 24 |
| 1/2/1900 0:00 | 04MN0334 XP | AJAX, E-42. SN: 66959 | 7 | 24 |
| 1/2/1900 0:00 | 04MN0334 XP | AJAX, E-42. SN: 66959 | 7 | 24 |
| 1/2/1900 0:00 | 04MN0334 XP | AJAX, E-42. SN: 66959 | 7 | 24 |
| 1/2/1900 0:00 | 03MN1122.XP | AJAX, E-42, SN: 80029 | 7 | 24 |
| 1/2/1900 0:00 | 03MN1122.XP | AJAX, E-42, SN: 80029 | 7 | 24 |
| 1/2/1900 0:00 | 03MN1122.XP | AJAX, E-42, SN: 80029 | 7 | 24 |
| 1/2/1900 0:00 | 03MN1122.XP | AJAX, E-42, SN: 80029 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0092.XP | AJAX E-42 ICE SN:E-42-1 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0092.XP | AJAX E-42 ICE SN:E-42-1 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0092.XP | AJAX E-42 ICE SN:E-42-1 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0092.XP | AJAX E-42 ICE SN:E-42-1 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0091.XP | WAUKESHA ICE SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0091.XP | WAUKESHA ICE SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0091.XP | WAUKESHA ICE SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 03MN0091.XP | WAUKESHA ICE SN:364875 | 7 | 24 |
| 1/2/1900 0:00 | 03DO0430 XP | GEMINI, G-26, SN: E1330 | 7 | 24 |
| 1/2/1900 0:00 | 03DO0430 XP | GEMINI, G-26, SN: E1330 | 7 | 24 |
| 1/2/1900 0:00 | 03DO0430 XP | GEMINI, G-26, SN: E1330 | 7 | 24 |
| 1/2/1900 0:00 | 03DO0430 XP | GEMINI, G-26, SN: E1330 | 7 | 24 |

| normal_hours_per_year | percent_throughput_winter | percent_throughput_spring | percent_throughput_summer | percent_throughput_fall |
|---|---|---|---|---|
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 4368 | 20 | 20 | 30 | 30 |
| 4368 | 20 | 20 | 30 | 30 |
| 3000 | 20 | 20 | 30 | 30 |
| 3000 | 20 | 20 | 30 | 30 |
| 3600 | 0 | 20 | 35 | 45 |
| 3600 | 0 | 20 | 35 | 45 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |

| normal_hours_per_year | percent_throughput_winter | percent_throughput_spring | percent_throughput_summer | percent_throughput_fall |
|---|---|---|---|---|
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |

| normal_hours_per_year | percent_throughput_winter | percent_throughput_spring | percent_throughput_summer | percent_throughput_fall |
|---|---|---|---|---|
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 1440 | 25 | 25 | 25 | 25 |
| 1440 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 336 | 0 | 0 | 1 | 99 |
| 336 | 0 | 0 | 1 | 99 |
| 0 | 10 | 30 | 30 | 30 |

| normal_hours_per_year | percent_throughput_winter | percent_throughput_spring | percent_throughput_summer | percent_throughput_fall |
|---|---|---|---|---|
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 2160 | 10 | 10 | 40 | 40 |
| 2160 | 10 | 10 | 40 | 40 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8736 | 25 | 25 | 25 | 25 |
| 8736 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 2080 | 25 | 25 | 25 | 25 |
| 2080 | 30 | 20 | 10 | 40 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |

| normal_hours_per_year | percent_throughput_winter | percent_throughput_spring | percent_throughput_summer | percent_throughput_fall |
|---|---|---|---|---|
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
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| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |
| 8760 | 25 | 25 | 25 | 25 |

| unit_emis_limit1 | unit_emis_limit1_units | street_line1 | x_coordinate | y_coordinate | scc_afs |
|---|---|---|---|---|---|
| 3.52 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| 41.04 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| 1.92 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| 27.4 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| 8.6 | TY | 20545 ROAD U | 705.7738382 | 4149.718375 | 10200906 |
| 7.1 | TY | 20545 ROAD U | 705.7738382 | 4149.718375 | 10200906 |
| 5.2 | TY | 20545 ROAD U | 705.7738382 | 4149.718375 | 10200906 |
| 31.2 | TY | NE SEC 9 T41N R19W | 679.5262249 | 4189.714783 | 20100201 |
| 16.4 | TY | NE SEC 9 T41N R19W | 679.5262249 | 4189.714783 | 20100201 |
| | | NE SEC 9 T41N R19W | 679.5262249 | 4189.714783 | 20100201 |
| | | NE SEC 9 T41N R19W | 679.5262249 | 4189.714783 | 20100201 |
| 0.7 | TY | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| 1.4 | TY | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| | | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| | | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| 5.51 | TY | 10400 ROAD 25 | 713.3470934 | 4138.07006 | 30501101 |
| 5.51 | TY | 10400 ROAD 25 | 713.3470934 | 4138.07006 | 30501101 |
| 6.83 | TY | NW SEC 34 T38N R14W NMPM | 731.026404 | 4154.947966 | 30502501 |
| 6.83 | TY | NW SEC 34 T38N R14W NMPM | 731.026404 | 4154.947966 | 30502501 |
| 4 | TY | 21944 HIGHWAY 145 | 720.1774581 | 4150.096491 | 30502501 |
| 4 | TY | 21944 HIGHWAY 145 | 720.1774581 | 4150.096491 | 30502501 |
| 16 | TY | SESW SEC 7 T38N R19W | 677.6794018 | 4158.981842 | 20100202 |
| 30 | TY | SESW SEC 7 T38N R19W | 677.6794018 | 4158.981842 | 20100202 |
| | | SESW SEC 7 T38N R19W | 677.6794018 | 4158.981842 | 20100202 |
| | | SESW SEC 7 T38N R19W | 677.6794018 | 4158.981842 | 20100202 |
| | | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 16.2 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 2.1 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| | | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 15.8 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 16.2 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 2.1 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |

| unit_emis_limit1 | unit_emis_limit1_units | street_line1 | x_coordinate | y_coordinate | scc_afs |
|---|---|---|---|---|---|
| | | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 15.8 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 16.2 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 1.84 | TY | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| | | SW SE SEC 31 T37N R14W | 727.0356801 | 4144.126852 | 20200201 |
| 0.9 | TY | SW NW SEC 26 T37N R19W | 684.8409584 | 4145.366963 | 20200254 |
| 14.2 | TY | SW NW SEC 26 T37N R19W | 684.8409584 | 4145.366963 | 20200254 |
| | | SW NW SEC 26 T37N R19W | 684.8409584 | 4145.366963 | 20200254 |
| | | SW NW SEC 26 T37N R19W | 684.8409584 | 4145.366963 | 20200254 |
| | | NW NE SEC 21 T38N R19W | 681.3553104 | 4157.025782 | 20200202 |
| | | NW NE SEC 21 T38N R19W | 681.3553104 | 4157.025782 | 20200202 |
| | | NW NE SEC 21 T38N R19W | 681.3553104 | 4157.025782 | 20200202 |
| | | NW NE SEC 21 T38N R19W | 681.3553104 | 4157.025782 | 20200202 |
| 0.9 | TY | SW NE SEC 15 T37N R19W | 683.1834625 | 4148.52666 | 20200202 |
| 13.9 | TY | SW NE SEC 15 T37N R19W | 683.1834625 | 4148.52666 | 20200202 |
| | | SW NE SEC 15 T37N R19W | 683.1834625 | 4148.52666 | 20200202 |
| | | SW NE SEC 15 T37N R19W | 683.1834625 | 4148.52666 | 20200202 |
| | | NW NE SEC 21 T38N R19W | | | 20200201 |
| | | NW NE SEC 21 T38N R19W | | | 20200201 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| | | NW SW SEC 7 T38N R19W | 677.9461644 | 4159.706294 | 20200202 |
| 1.5 | TY | SEC 36 T39N R20W | 676.7325458 | 4162.517307 | 20200201 |
| 11.5 | TY | SEC 36 T39N R20W | 676.7325458 | 4162.517307 | 20200201 |
| | | SEC 36 T39N R20W | 676.7325458 | 4162.517307 | 20200201 |
| | | SEC 36 T39N R20W | 676.7325458 | 4162.517307 | 20200201 |
| 2.67 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| 21.01 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |

| unit_emis_limit1 | unit_emis_limit1_units | street_line1 | x_coordinate | y_coordinate | scc_afs |
|---|---|---|---|---|---|
| 4.3 | TY | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| | | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| 8.5 | TY | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| | | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| 4.3 | TY | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| | | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| 8.5 | TY | SW SEC 6 T37N R18W | 687.2940823 | 4151.268364 | 10300501 |
| | | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 10300501 |
| 4.3 | TY | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 10300501 |
| | | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 10300501 |
| 8.32 | TY | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 10300501 |
| | | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 31000227 |
| 4.5 | TY | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 31000227 |
| | | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 31000227 |
| 8.5 | TY | NW SEC 13 T37N R18W | 695.3310039 | 4149.291289 | 31000227 |
| 4.15 | TY | SE SEC 13 T37N R15W | 725.382259 | 4149.118807 | 30502503 |
| 4.15 | TY | SE SEC 13 T37N R15W | 725.382259 | 4149.118807 | 30502501 |
| 5.8 | TY | SEC 34 & 35 T35N R20W | 674.9148599 | 4124.196402 | 20200202 |
| 40.2 | TY | SEC 34 & 35 T35N R20W | 674.9148599 | 4124.196402 | 20200202 |
| | | SEC 34 & 35 T35N R20W | 674.9148599 | 4124.196402 | 20200202 |
| | | SEC 34 & 35 T35N R20W | 674.9148599 | 4124.196402 | 20200202 |
| 29.2 | TY | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| 17.8 | TY | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| | | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| | | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| 25.2 | TY | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| 25.2 | TY | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| | | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| | | SW SE SEC 10 T37N R19W | 683.1116864 | 4149.208439 | 20200202 |
| 2.8 | TY | SE/SW SEC 30 T39N R19W | 677.7316207 | 4164.470453 | 20200202 |
| 14.1 | TY | SE/SW SEC 30 T39N R19W | 677.7316207 | 4164.470453 | 20200202 |
| | | SE/SW SEC 30 T39N R19W | 677.7316207 | 4164.470453 | 20200202 |
| | | SE/SW SEC 30 T39N R19W | 677.7316207 | 4164.470453 | 20200202 |
| | | SE NW SE SEC 36 T36N R18W | 696.3124103 | 4134.477222 | 30502501 |
| | | SE NW SE SEC 36 T36N R18W | 696.3124103 | 4134.477222 | 30502501 |
| | | NW NE SEC 13 T35N R17W | 706.4843364 | 4130.228454 | 30502501 |

| unit_emis_limit1 | unit_emis_limit1_units | street_line1 | x_coordinate | y_coordinate | scc_afs |
|---|---|---|---|---|---|
| | | 101 N MARKET ST | 713.8723437 | 4136.429317 | 50200505 |
| | | 101 N MARKET ST | 713.8723437 | 4136.429317 | 50200505 |
| | | 101 N MARKET ST | 713.8723437 | 4136.429317 | 50200505 |
| | | 101 N MARKET ST | 713.8723437 | 4136.429317 | 50200505 |
| | | 1311 N MILDRED RD | 714.945717 | 4137.970072 | 20100102 |
| | | 1311 N MILDRED RD | 714.945717 | 4137.970072 | 20100102 |
| | | 1311 N MILDRED RD | 714.945717 | 4137.970072 | 20100102 |
| | | 1311 N MILDRED RD | 714.945717 | 4137.970072 | 20100102 |
| 2 | TY | 6560 COUNTY RD 24.3 | 712.2568919 | 4140.098034 | 30501101 |
| 2 | TY | 6560 COUNTY RD 24.3 | 712.2568919 | 4140.098034 | 30501101 |
| 0.9 | TY | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| 2.3 | TY | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| | | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| | | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| 0.9 | TY | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| 2.3 | TY | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| | | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| | | SE NW SEC 15 T33.5N R20W | 676.375018 | 4118.21145 | 20200202 |
| 0.4 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| 2.6 | TY | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | SW NE SEC 26 T37N R19W | 684.846748 | 4145.360923 | 20200202 |
| | | NW NE SEC 21 T38N R19W | 681.3553104 | 4157.025782 | 10300603 |
| | | NW NE SEC 21 T38N R19W | 681.3553104 | 4157.025782 | 10300603 |
| 12.8 | TY | NW NW SEC 10 T38N R17W | 701.6144286 | 4160.829825 | 20200201 |
| 62.7 | TY | NW NW SEC 10 T38N R17W | 701.6144286 | 4160.829825 | 20200201 |
| 0.98 | TY | NW NW SEC 10 T38N R17W | 701.6144286 | 4160.829825 | 20200201 |
| 12.8 | TY | NW NW SEC 10 T38N R17W | 701.6144286 | 4160.829825 | 20200201 |
| 62.7 | TY | NW NW SEC 10 T38N R17W | 701.6144286 | 4160.829825 | 20200201 |
| 0.98 | TM | NW NW SEC 10 T38N R17W | 701.6144286 | 4160.829825 | 20200201 |
| | | 25350 ROAD L | 713.6563602 | 4138.732166 | 30502503 |
| | | 09006 E US HWY 666 | 687.1151172 | 4179.737482 | 30200782 |
| 4.43 | TY | SWSE SEC 26 T37N R19W | 684.8538541 | 4144.552519 | 20200253 |
| 2.63 | TY | SWSE SEC 26 T37N R19W | 684.8538541 | 4144.552519 | 20200253 |
| | | SWSE SEC 26 T37N R19W | 684.8538541 | 4144.552519 | 20200253 |
| | | SWSE SEC 26 T37N R19W | 684.8538541 | 4144.552519 | 20200253 |

| unit_emis_limit1 | unit_emis_limit1_units | street_line1 | x_coordinate | y_coordinate | scc_afs |
|---|---|---|---|---|---|
| | | SE SW SEC 35 T37N R19W | 684.4905234 | 4142.978545 | 20200202 |
| | | SE SW SEC 35 T37N R19W | 684.4905234 | 4142.978545 | 20200202 |
| | | SE SW SEC 35 T37N R19W | 684.4905234 | 4142.978545 | 20200202 |
| | | SE SW SEC 35 T37N R19W | 684.4905234 | 4142.978545 | 20200202 |
| | | SE NW SEC3 T37N R19W | 682.6568523 | 4151.84553 | 20200252 |
| 1.7 | TY | SE NW SEC3 T37N R19W | 682.6568523 | 4151.84553 | 20200252 |
| | | SE NW SEC3 T37N R19W | 682.6568523 | 4151.84553 | 20200252 |
| | | SE NW SEC3 T37N R19W | 682.6568523 | 4151.84553 | 20200252 |
| 1.2 | TY | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| 1.5 | TY | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| | | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| | | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| 4.4 | TY | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| 2.6 | TY | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| | | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| | | SEC 17 T38N R19W | 679.5512585 | 4158.014993 | 20200252 |
| | | SEC 7, T39N, R19W | 677.5348655 | 4169.318644 | 20200202 |
| 2.76 | TY | SEC 7, T39N, R19W | 677.5348655 | 4169.318644 | 20200202 |
| | | SEC 7, T39N, R19W | 677.5348655 | 4169.318644 | 20200202 |
| | | SEC 7, T39N, R19W | 677.5348655 | 4169.318644 | 20200202 |

| column | description |
| --- | --- |
| const_permit_last_issue_date | Construction permit latest issue date. |
| construction_permit_number | Construction permit number from CPTS. |
| county_fips | County FIPS code |
| county_fips | County FIPS code. |
| distance | Distance, in km, to the reference center point  entered in the data extraction selection criteria. |
| emission_process_description | A text description of the Emission Process. |
| emission_release_pt_descript | Emission release point (Stack) Description. |
| emission_unit_description | Emission unit description. |
| emission_unit_id | Unique emission unit ID reported consistently over time. |
| exit_gas_flow_rate | Numeric value of stack gas flow rate in (actual cubic feet per minute). |
| exit_gas_temp | The temperature of an exit gas stream (degree Fahrenheit). |
| exit_gas_velocity | The velocity of an exit gas stream (feet per second). |
| facility_name | The name of the facility. |
| normal_days_per_week | Normal Operating Schedule - Days per Week. |
| normal_hours_per_day | Normal Operating Schedule - Hours per Day. |
| normal_hours_per_year | Normal Operating Schedule - Hours per Year. |
| percent_throughput_fall | Seasonal throughput percentage - Fall (September-November). |
| percent_throughput_spring | Seasonal throughput percentage - Spring (March-May). |
| percent_throughput_summer | Seasonal throughput percentage - Summer (June-August). |
| percent_throughput_winter | Seasonal throughput percentage - Winter (December-January). |
| pollutant_code | Pollutant abbreviation or CAS registry number (consistant with AIRS). |
| proc_emis_estim | Process level estimated emissions in tons per year. |
| proc_emis_estim_units | Process level estimated emissions units. |
| process_id | Unique emission process ID reported consistently over time. |
| scc_afs | EPA Source Category Code (SCC) for point sources. |
| site_emis_limit1 | Site-wide emission limit. |
| site_emis_limit1_units | Site-wide emission limit units. |
| site_id | Unique site ID reported consistently over time. |
| stack_diameter | The diameter (in feet) of a stack. |
| stack_height | The hieght (in feet) of a stack. |
| stack_id | Unique emission release point ID reported consistently over time. |
| street_line1 | Line 1 of the site location address. |
| unit_emis_limit1 | Emission unit (Point) level emission limit. |
| unit_emis_limit1_units | Emission unit (Point) level emission limit units. |
| x_coordinate | Stack X-coordinate (proj=utm units=km datum=NAD83 zone=12). Plant coordinates will be substituded if no stack data available. |

| column | description |
|---|---|
| y_coordinate | Stack Y-coordinate (proj=utm units=km datum=NAD83 zone=12). Plant coordinates will be substituded if no stack data available. |

# APPENDIX C

## VISCREEN Modeling Results

```
          Visual Effects Screening Analysis for
                    Source: CANM
                       Class I Area: MVNP

       *** User-selected Screening Scenario Results ***
              Input Emissions for
            Particulates     96.80  TON/YR
            NOx (as NO2)    360.00  TON/YR
            Primary NO2        .00  TON/YR
            Soot               .00  TON/YR
            Primary SO4        .29  TON/YR

  **** Default Particle Characteristics Assumed

             Transport Scenario Specifications:
    Background Ozone:                    .08 ppm
    Background Visual Range:         251.00 km
    Source-Observer Distance:        115.00 km
    Min. Source-Class I Distance:    115.00 km
    Max. Source-Class I Distance:    135.00 km
  Plume-Source-Observer Angle:      11.25 degrees
                 Stability:   6
             Wind Speed:   1.00 m/s

                  R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

          Maximum Visual Impacts INSIDE  Class I Area
              Screening Criteria ARE NOT Exceeded
                                    Delta E        Contrast
                                  ===========    ============
Backgrnd Theta Azi Distance Alpha Crit  Plume    Crit  Plume
======== ===== === ======== ===== ====  =====    ====  =====
 SKY      10. 123.  135.0    45.  2.00   .619     .05   .010
 SKY     140. 123.  135.0    45.  2.00   .177     .05  -.004
 TERRAIN  10.  84.  115.0    84.  2.00   .804     .05   .008
 TERRAIN 140.  84.  115.0    84.  2.00   .065     .05   .001
```

Visual Effects Screening Analysis for
Source: Monticello NEPA Project
Class I Area: MVNP

*** User-selected Screening Scenario Results ***

Input Emissions for

| | | |
|---|---|---|
| Particulates | 96.80 | TON/YR |
| NOx (as NO2) | 360.00 | TON/YR |
| Primary NO2 | .00 | TON/YR |
| Soot | .00 | TON/YR |
| Primary SO4 | .29 | TON/YR |

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

| | |
|---|---|
| Background Ozone: | .08 ppm |
| Background Visual Range: | 251.00 km |
| Source-Observer Distance: | 165.00 km |
| Min. Source-Class I Distance: | 165.00 km |
| Max. Source-Class I Distance: | 185.00 km |
| Plume-Source-Observer Angle: | 11.25 degrees |
| Stability: | 6 |
| Wind Speed: | 1.00 m/s |

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area
Screening Criteria ARE NOT Exceeded

| | | | | | Delta E | | Contrast | |
|---|---|---|---|---|---|---|---|---|
| Backgrnd | Theta | Azi | Distance | Alpha | Crit | Plume | Crit | Plume |
| SKY | 10. | 114. | 185.0 | 54. | 2.00 | .349 | .05 | .006 |
| SKY | 140. | 114. | 185.0 | 54. | 2.00 | .083 | .05 | -.002 |
| TERRAIN | 10. | 84. | 165.0 | 84. | 2.00 | .339 | .05 | .004 |
| TERRAIN | 140. | 84. | 165.0 | 84. | 2.00 | .031 | .05 | .001 |