Pahrump Regional Planning District
PM10 Emissions Inventory
Area Sources

A. Mobile Sources

1. Vehicles (particulate emissions from vehicles)

a. On-road vehicle emissions: the emissions factors were developed using the MOBILE6.2 Mobile Source Emissions Factor Model for PM10. The models results are attached in Appendix A. The emissions for particulate from vehicles including vehicle exhaust, tire wear, and brake wear were calculated using the emission rates and vehicle miles traveled (VMT) data (Appendix A Table 1) obtained from Nevada Department of Transportation (NDOT). The traffic count information was also used to estimate VMT on local roads and additional arterial road. VMT data for Highways, Arterials, and Local roads are listed in Appendix A Table 2 and are summarized below:

Table A-1: Total Particulate Emissions from Vehicles

	VMT (vehicle-mi/day)	**Emission Factor** (grams/mile)	**Emission** (Tons/Yr)
Highways			
SO4	207,105.40	0.0020	0.1667
Exhaust PM	207,105.40	0.0601	5.0088
Brakewear	207,105.40	0.0125	1.0418
Tirewear	207,105.40	0.0097	0.8042
Arterial Roads			
SO4	126,330.00	0.0020	0.1017
Exhaust PM	126,330.00	0.0602	3.0578
Brakewear	126,330.00	0.0125	0.6355
Tirewear	126,330.00	0.0097	0.4906
Local Roads			
SO4	60,426.00	0.0021	0.0511
Exhaust PM	60,426.00	0.0603	1.4650
Brakewear	60,426.00	0.0125	0.3040
Tirewear	60,426.00	0.0097	0.2347
		TOTAL	**13.36**

C:/Pahrump Emissions Inventory/vehicle exhaust calculations.xls

b. Non-road vehicle emissions: the emissions were determined using the NONROAD2000 Model for exhaust PM10. The model was used to calculate the emissions for Nye County and 75% of that value was assumed to be from the Pahrump Valley, based on population and housing data (Appendix B Table 1). The fuel parameters used in the NONROAD2002 model were obtained from Vernon Miller, Sr. Petroleum Chemist, Nevada Department of Agriculture. The model input parameters and results are attached in Appendix B and are summarized below:

Table A-2: Total Non Road Exhaust PM10 Emissions

Season	Fuel RVP	Gas Sulfur %	Diesel Sulfur %	Exhaust PM10 Emission (tons/season)
Winter	10.0	0.005	0.02	1.47
Spring	9.5	0.005	0.02	2.43
Summer	9.5	0.005	0.02	3.74
Autumn	9.5	0.005	0.02	2.43
			Total	**10.07**

C:/Pahrump Emissions Inventory/vehicle exhaust calculations.xls

2. Roads (Fugitive Dust from Paved Roads)

a. Paved Road Dust: to calculate the particulate emissions (PM10) from paved roads in the HA162, Nevada Division of Environmental Protection, Bureau of Air Quality Planning (NDEP BAQP) used the emission factor equations provided in AP-42 13.2.1:

$$E=k(sL/2)^{0.65}(W/3)^{1.5}$$

Where:

E = particulate emission factor
k = particle size multiplier for particle size range and units of interest
sL= road surface silt loading
W= average weight (tons) of the vehicles traveling the road

b. The particle size multiplier (k) was extracted from AP42 Table 13.2-1.1 for PM-10 as .016 lb/VMT

c. The range for road surface silt loading (sL) using for this equation is 0.02-400 g/m^2. Table 13.2.1-2 Recommended Default silt loading values for public paved roads with low average daily traffic (ADT) and worse-case conditions with substantial mud/dirt carryout is 3.00 g/m^2. In their PM10 SIP for Clark County, silt loading factors were extracted from a study conducted by Dames & Moore in 1998. The silt loading factor extracted for arterial roads was 1.04 g/m^2 and for paved roads with unimproved shoulders 1.34 g/m^2 was used. The silt loading factor extracted for local and collector roads was 1.70 g/m^2 and for paved roads with unimproved

shoulders 24.7 g/m^2 was used. NDEP BAQP staff, using best engineering judgment, used 1.34 g/m^2 for highways and 24.7 g/m^2 for arterial and local paved roads.

d. The PART5 model default value for average weight of the vehicles traveling the road of 3.0 tons was used for lack of specific local data.

e. Paved Road Emission Factor Using AP-42 (Highways)

$$E=7.3\ g/VMT\ (1.34\ g/m^2/2)^{0.65}(3.0\ tons/3)^{1.5}$$

$$E= 0.0123\ lb/VMT$$

f. Paved Road Emission Factor Using AP-42 (Arterial and Local)

$$E=7.3\ g/VMT\ (24.7\ g/m^2/2)^{0.65}(3.0\ tons/3)^{1.5}$$

$$E= 0.0820\ lb/VMT$$

Roads (Fugitive Dust from Unpaved Roads)

g. Unpaved Road Dust: to calculate the particulate emissions (PM10) from paved roads in the HA162, NDEP BAQP used the emission factor equations provided in AP-42 13.2.2:

$$E= \frac{k\ (s/12)^a(W/3)^b}{(M/0.2)^c}$$

Where: k, a, b, and c are empirical constants references in AP-42 Table 13.2.2-2

E = size-specific emission factor
s = surface material silt content
W = mean vehicle weight
M = surface material moisture content

h. The constants for PM10 extracted from AP42 Table 13.2.2-2 are as follows: k = 2.6 lb/VMT, a = 0.8, b = 0.4, c = 0.3.

i. The range for surface material silt content in AP42 13.2.2 is 1.2 – 35%. In a report written by Desert Research Institute, *Fugitive Dust and Other Source Contributions to PM10 in Nevada's Las Vegas Valley*, April 1997, the average silt content measured for unpaved roads was about 16%. Due to lack of specific local data, 16% was also used for the Pahrump Valley surface material silt content.

j. The PART5 model default value for average weight (tons) of the vehicles traveling the road of 3.0 tons was used for lack of specific local data.

k. The range for surface moisture contents from AP-42 is 0.03% to 20% with 0.2% presented as the default value in the absence of appropriate site-specific information. Due to a lack of specific local data, the EPA default value of 0.2 percent was used.

l. Unpaved Road Emission Factor Using AP-42:

$$E = \frac{2.6 \text{ lb/VMT } (16\%/12)^{0.8}(3.0 \text{ tons}/3)^{0.5}}{(0.2\%/0.2)^{0.3}}$$

$$E = 3.27 \text{ lb/VMT}$$

The VMT for paved and unpaved roads were calculated using NDOT data as described above and map/survey data for road types (paved or unpaved). The VMT data is in Appendix A Table 2 and are summarized below:

Table A-3: Paved and Unpaved Road Emissions

	VMT (vehicle-mi/day)	**Emission Factor** (lb/VMT)	**Emissions** (Tons/Yr)
Paved Roads			
Highways	**207,105.40**	**.0123**	**464.90**
Arterials	**94,245.00**	**.0820**	**1,410.38**
Locals	**15,271.80**	**.0820**	**228.54**
		Total	**2,103.82**
Unpaved Roads			
Arterials	**32,085.00**	**3.27**	**19,147.53**
Locals	**45,154.20**	**3.27**	**26,946.90**
		Total	**46,094.42**

C:/Pahrump Emissions Inventory/avmt.xls (emissions calculations tab)

B. Fugitive Dust from Disturbed Vacant/Native Desert/Stabilized Vacant Lands

To calculate wind erosion emissions from unpaved surfaces in the Pahrump Valley emission rates from the Clark County PM10 SIP were used due to a lack of specific local data. After conversations with Russ Merle of Clark County Air District noting the similarities in the Las Vegas Valley and the Pahrump Valley regarding soil characteristics, wind speeds, and elevations, NDEP BAQP staff chose to use the emissions factors derived in the *Estimation of PM10 vacant land emissions factors for Unstable, Stable and Stabilized lands using data from 1995 and 1998-1999 UNLV wind tunnel studies of vacant and dust-suppressant treated lands, January 16, 2001-Second Final Report* (Appendix C in the Clark County PM10 SIP). To obtain the total acreages for disturbed lands, native desert and stabilized vacant land NDEP BAQP staff used hydrographic area mapping data from the Nevada Division of Water Resources. Acreage distribution was also estimated through a combination of survey results taken in January, 2003 and GIS data .

Table B-1: Fugitive Dust – Disturbed Vacant Lands

Wind Speed Category (mph)	# of Hours In Range	# of Days In Range	Sustained Winds Emission Factor (ton/acre/hr)	Spike Emissions Factor (ton/acre)	Emission Factor Of Unstable Land (ton/acre)
15-19.9	685	144	N/A	N/A	N/A
20-24.9	383	91	.00521	.000816	2.07
25-29.9	55	31	.00640	.00194	.4120
30-34.9	18	9	.00462	.00141	.0959
35-39.9	1	1	.00705	.00380	.0109
Total					2.59
(23,276.90 Acres) * (2.59 tons/acre) = **60,287.17 tons/yr**					

C:/Pahrump Emissions Inventory/landtype.xls (acres land type tab)

Table B-2: Fugitive Dust – Native Desert

Wind Speed Category (mph)	# of Days In Range	Sustained Winds Emission Factor (ton/acre/hour)	Spike Emissions Factor (ton/acre)	Emission Factor Of Unstable Land (ton/acre)
15-19.9	144	N/A	N/A	N/A
20-24.9	91	N/A	N/A	N/A
25-29.9	31	.00257	.000490*	0.0949
30-34.9	9	.00316	.000588*	0.0337
35-39.9	1	.00299	.000924*	0.0039
Total				0.1325 *
(30,390.20 Acres) * (.1325 tons/acre) = **4,026.70 tons/yr**				

C:/Pahrump Emissions Inventory/landtype.xls(acres land type tab)

*This emission factor was updated after the Clark County reviewed the updated 'all soils' data sets found in the 1998-1999 UNLV wind tunnel studies.

Table B-3: Fugitive Dust – Stabilized Vacant Land

Wind Speed Category (mph)	# of Days In Range	Sustained Winds Emission Factor (ton/acre/ hour)	Emission Factor Of Unstable Land (ton/acre)
15-19.9	144	0.00042	.06050
20-24.9	91	0.00034**	.03090
25-29.9	31	0.00019**	.00589
30-34.9	9	0.00019**	.00171
35-39.9	1	0.00019**	.00019
Total			.09900
(32,783.80 Acres) * (.0990 tons/acre) = **3,245.60 tons/yr**			

C:/Pahrump Emissions Inventory/landtype.xls(acres land type tab)

**These factors were corrected as per Clark County Staff, the cumulative emission factor remained the same.

C. Construction Activities

To calculate construction activity fugitive dust emissions a report on construction activities completed by Midwest Research Institute (MRI), *Improvement of Specific Emissions Factors March 1996*, was used to obtain emission factors. The emissions estimated derived by MRI were from onsite evaluations of construction operations within four serious PM10 nonattainment areas: Las Vegas, NV; Coachella Valley, CA; South Coast, CA; and San Joaquin Valley, CA.

Fugitive dust controls at construction sites are regulated by NDEP BAQP Compliance Branch. The Compliance Branch Supervisor supplied compliance rates for each type of construction activity in the Pahrump Valley as shown in the Table # below. The U.S. EPA assigns a 50% control efficiency to watering for control of particulate emissions from construction activities are summarized in Table # below.

a. Residential Construction

The number of new residential units for 2001 in the Pahrump Valley was obtained from the Nye County Planning and Assessor's Office. To estimate the total acres disturbed by construction, EPA recommends in *Appendix C - Methodologies for estimating 1999 NEI Emissions for Area Source Categories* the following conversion factors:

Table C-1: Residential Construction

	# Homes	Conversion	Acres Disturbed
Single Family Detached	312	¼ acre/bldg	78.0 acres
Single Family Attached	34	¼ acre/bldg	8.5 acres
Multi-Family Housing Units	13	½ acre/bldg	6.5 acres
		Total	**93.0 acres**

C:/Pahrump Emissions Inventory/construction calculations.xls (conversions # homes tab)

b. Commercial Construction

The total acres of non-residential construction activity for 2001 in the Pahrump Valley was obtained from information from the Nye County Building Department and the Nye County Assessor's Office:

Table C-2: Commercial Construction

Address	Acres
51 E Hwy 372	3.2
301 S Oxbow Ave	2.2
601 S. East Street	0.37
681 S Hwy 160	8.09
950 S PahrumpValley Blvd	0.35
1021 E Gamebird Rd	1.1
1041 S. Hwy 160	0.84
1070 E Irene St	2.3
1101 S. Hwy 160	2.55
1231 E Basin Ave	1.35
1240 E State St	1.63
1470 E. Calvada Blvd	0.17
1541 E Wahkiakum Ave	2.7
1700 P V Blvd	24.87
2201 E. Postal Dr	1.17
2281 E Postal Road	0.853
4061 E. Dandelion Street	3.77
4760 Pahrump Valley Blvd	2.17
5281 Vicki Ann Rd Building D	4.7
5441 S Vicki Ann	8.97
Total	**64.38**

C:/Pahrump Emission Inventory/construction calculations.xls(commercial tab)

3. Highway Construction: NDEP BAQP staff contacted Nevada Department of Transportation (Gus Michaels, District 1, Construction Department) and the Nye County Road Department (Dave Fanning, Road Foreman) to obtain the number of miles or acres disturbed for new highways/roads, widen projects, and shoulder work. Both offices reported *no* highway construction projects in 2001.

Table C-3: Construction Activity Emissions

Type of Construction	Number of Acres Under Active Construction in 2001	% of Sites Implementing Controls	Overall Control Efficiency	Months Under Active Construction	PM10 Emission Rate (tons/acre/ month)	PM10 Emissions for 2001 (tons)
Residential Homes	93	20%	10%	6	0.265	**133.08**
Commercial	65	20%	10%	3	0.265	**46.51**
Highway	0	20%	10%	12	0.42	**0.00**

C:/Pahrump Emission Inventory calculations (emission calc tab)

D. Fires

a. Residential Municipal Solid Waste (MSW) Burning: Emission estimates for residential MSW burning were developed by first estimating the amount of waste generated in the Pahrump Valley. The amount of waste generated was estimated using a state average per capita waste generation factor of 7.8 lb/person/day (NDEP Waste Management). This factor was applied to the population estimate for the Pahrump Valley. The amount of MSW received at the landfill was subtracted from this amount. The amount of waste generated not landfilled was then estimated for MSW Burning.

MSW calculations:
= (7.8 lb/person/day) x (33,461 people) x (365 days/yr) / (2000 lbs/ton)
= 47,631.73 tons MSW/yr for Pahrump Valley
\- 29,804.04 tons MSW landfilled
17,827.69 tons MSW not landfilled

b. Emission factors were extracted from AP42 Table 2.5-1 *Emission Factors for Open Burning of Municipal Refuse*. The emission factor for particulates is 16 lb/ton.

Table D-1: MSW Burning Emissions

MSW burned (tons/yr)	Emissions Factor (lb/ton)	Total Emission (ton/yr)
17,827.69	16	**142.62**

E. Stationary Sources

The Nevada Division of Environmental Protection, Bureau of Air Pollution Control (NDEP BAPC) tracks stationary point sources and issues permits to those sources that have a potential to emit 5.0 tons or more of PM10 emissions in a year. In 2001, the following table reflects ten permitted point sources located in Hydrographic Basin 162 and their reported PM10 emissions.

Table E – Permitted Stationary Sources

Permit No.	Company Name	PM10
Gold Ores		
AP10410837	SOUTHWEST DESERT RESOURCES LTD - Project is dormant	
Mining or quarrying crushed and broken stone		
AP14290988	FLOYD'S CONSTRUCTION INC - Shamrock Pit	0.13
Construction Sand and Gravel		
AP14420118.01	PAHRUMP CONCRETE INC	2.85
AP14420228.01	BOLLING CONSTRUCTION	0.52
AP14420802	ELITE CONCRETE CORP	1.90
AP14420890	DESERT SAND & GRAVEL INC-Mesquite Road East	0.25
AP14420909	RON MURPHY CONSTRUCTION CO, INC-East/West Pit	0.62
Industrial Sand		
AP14461155	BASIN SAND AND GRAVEL	
Highway and Street Construction		
AP16110519	WULFENSTEIN CONSTRUCTION CO INC	5.07
AP16110900	ACTION READY MIX	1.61
	Total	**12.95**

C:/Pahrump Emissions Inventory/state permitted sources/permitted sources w/o SAD's.xls

F. Agricultural Sources – PM10 emissions from agricultural sources are commonly calculated for agricultural tilling and burning. To calculate the emissions from agricultural tilling, current methodologies are used for crop types where seasonal tilling is a common practice. According to conversations with Mr. Tim Hafen, a local rancher, the main crop raised in the Pahrump Valley is alfalfa. Alfalfa fields do not require seasonal tilling and are not included in the current methodology emission calculations. Therefore, NDEP BAQP did not include this source in this inventory.

Also, agricultural field burning is not a common practice for alfalfa crops. After harvest, the fields are left with the stubs over the winter to freeze. Consequently, agricultural field burning was also not included in this PM10 Emission Inventory.

G. Residential Fuel Combustion. Fireplace emissions, caused mainly by incomplete combustion, are another source of PM10 emissions. The number of homes in the Pahrump Valley with fireplaces was estimated to be very minimal, due to the warm climate and the large number of modular homes. The main source of heat for the homes on this area is propane, which does not contribute significantly to PM10 emissions. Therefore, this source category was not included in this emission inventory for PM10.

Table F: Total Particulate Emissions for Pahrump Valley:

Area Source	Emission Factor	Emissions (Tons/Year)
MOBILE SOURCES		
Vehicle Exhaust Emissions– On-road	See Table A-1 & A-2	**13.36 tons/yr**
Vehicle Exhaust Emissions - Nonroad	See Table A-3	**10.07 tons/yr**
Fugitive Dust – Paved Roads	0.0123 lbs/VMT	**2,103.82 tons/yr**
Fugitive Dust – Unpaved Roads	3.27 lb/VMT	**46,094.42 tons/yr**
VACANT/DISTURBED LANDS		
Fugitive Dust – Disturbed Vacant Lands	2.59 tons/acre	**60,287.17 tons/yr**
Fugitive Dust – Native Desert Lands	.1270 tons/acre	**4,026.70 tons/yr**
Fugitive Dust – Stabilized Lands	.0990 tons/acre	**3,245.60 tons/yr**
CONSTRUCTION ACTIVITIES		
Fugitive Dust-Construction-Residential	0.265 tons/acre/month	**133.08 tons/yr**
Fugitive Dust-Construction-Commercial	0.265 tons/acre/month	**46.51 tons/yr**
Fugitive Dust-Construction-Highways	0.42 tons/acre/month	**0.00 tons/yr**
FIRES		
Fires – Residential MSW Burning	16 lb/ton	**142.62 tons/yr**
– Agriculture		
STATIONARY SOURCES		
Permitted Sources (excluding SAD's)		**12.95 tons/yr**
Total Particulate Emissions:		**116,116.30 tons/yr**