

APPENDIX B

Air Quality and Greenhouse Gas Emission Calculations

Carnegie State Vehicle Recreation Area General Plan/Draft EIR Emissions Estimates

		HC	CO	NOX	PM10	PM2.5	CO2	CO2e
		(tons/year)					(metric tons/year)	
2001	OHMC	18.2	46.7	0.8	0.1	0.1	111.7	117.5
	ATV	1.3	4.1	0.1	0.0	0.0	17.3	18.2
	4X4	0.0	0.1	0.0	0.0	0.0	7.7	8.1
	Fugitive Dust	-	-	-	127.1	12.5	-	-
	On-Road Vehicles	0.7	20.6	2.4	0.0	0.0	2017.1	2123.3
	Total (tons/year)	20.2	71.4	3.3	127.3	12.6	2153.8	2267.1
	Total (lb/day)	110.9	391.2	18.1	697.5	69.1	13008.9	13693.6
2010	OHMC	3.4	20.4	0.4	0.1	0.0	48.7	51.3
	ATV	0.2	1.4	0.0	0.1	0.0	4.8	5.0
	4X4	0.0	0.0	0.0	0.0	0.0	3.4	3.6
	Fugitive Dust	-	-	-	55.5	5.4	-	-
	On-Road Vehicles	0.3	8.5	1.0	0.0	0.0	892.6	939.6
	Total (tons/year)	4.0	30.3	1.4	55.6	5.5	949.5	999.5
	Total (lb/day)	21.8	166.2	7.7	304.7	30.1	5735.3	6037.2
2030	OHMC	8.50	49.05	1.19	0.18	0.14	150.19	158.10
	ATV	0.60	3.48	0.07	0.01	0.01	14.69	15.46
	4X4	0.00	0.02	0.00	0.00	0.00	7.15	7.52
	Fugitive Dust	-	-	-	170.97	16.78	-	-
	On-Road Vehicles	0.10	5.34	0.57	0.01	0.01	1879.03	1977.93
	Total (tons/year)	9.20	57.89	1.83	171.18	16.94	2051.06	2159.01
	Total (lb/day)	50.42	317.20	10.04	937.95	92.80	12388.53	13040.55
	2001-2030 Net Change (tons/year)	-11	-14	-1	44	4	-103	-108
	2001-2030 Net Change (lb/day)	-60	-74	-8	240	24	-620	-653
	2010-2030 Net Change (tons/year)	5	28	0.4	116	11	1102	1159
	2010-2030 Net Change (lb/day)	29	151	2	633	63	6653	7003

					Emission Factors (g/mile)						Emissions																		
											(lb/year)			(tons/year)				(metric tons/year)											
Vehicles	Average Miles Driven Roundtrip	VMT	Vehicles		ROG_RUN	CO_RUNE	NOX_RUN	PM10_RU	PM2_5_R	CO2_RUN	HC	CO	NOX	PM10	PM2.5	CO2	HC	CO	NOX	PM10	PM2.5	CO2	CO2e						
On-Road Vehicles	31,784	62	1,970,608	mi/yr	Light-Duty Trucks (0-3750 lbs)						0.238939	5.930207	0.582716	0.007333	0.006588	398.3067	284.7486	7067.162	694.4362	8.738984	7.851603	474671.1	0.14	3.53	0.35	0.00	0.00	215.31	226.64
					Light-Duty Trucks (3751-5750 lbs)						0.101579	3.133506	0.433065	0.003391	0.003081	473.6537	320.2431	9878.851	1365.302	10.69122	9.7145	1493265	0.16	4.94	0.68	0.01	0.00	677.33	712.98

Total OHMC Emissions =	3.43	20.38	0.35	0.06	0.04	48.75	51.31
Total ATV Emissions =	0.24	1.45	0.02	0.06	0.00	4.77	5.02
Total 4x4 Emissions =	0.00	0.03	0.00	0.00	0.00	3.40	3.57
On-Site Fugitive Dust Emissions =	-	-	-	55.49	5.45	-	-
On-Road Vehicle Emissions =	0.30	8.47	1.03	0.01	0.01	892.64	939.62
OHV Emissions (tons/year) =	3.67	21.9	0.38	0.12	0.05	56.9	59.9
Fugitive Dust Emissions (tons/year) =	-	-	-	55.5	5.45	-	-
On-Road Vehicle Emissions (tons/year) =	0.30	8.5	1.03	0.01	0.01	893	940
2030 Total Emissions (tons/year) =	3.98	30.3	1.41	55.6	5.50	950	1000
OHV Emissions (lb/day) =	20.1	120	2.09	0.64	0.26	312	328
Fugitive Dust Emissions (lb/day) =	-	-	-	304	29.8	-	-
On-Road Vehicle Emissions (lb/day) =	1.7	46	5.6	0.05	0.05	4891	5149
2030 Total Emissions (lb/day) =	21.8	166	7.7	305	30.1	5735.331	6037.191

Projected Future Year (2030)

											Emission Factors (g/mile)						Emissions																		
																	(lb/year)			(tons/year)				(metric tons/year)											
Vehicles	Vistors	OHVs	OHV Counts	Avg Activity Distance	Avg Activity Time	Avg Speed	Total VMT	Vehicle Type	Tech Group	HC	CO	NOX	Total PM	PM2.5	CO2	HC	CO	NOX	PM10	PM2.5	CO2	HC	CO	NOX	PM10	PM2.5	CO2	CO2e							
On-Site OHV Activity	97,932	195,863	146,898	OHMC												G2	34.2	54.1	0.01	0.42	-	79.58	14230	22510	4.2	157	118.8324	33112	7.11	11.25	0.00	0.08	0.06	15.02	15.81
				126,879	14.9	miles	3.4	hours	4.366	mi/hr	1,887,338	mi/yr	OHMC	G4 Pre-1998	3.59	39.1	0.49	0.06	-	79.58	269	2928	37	4	3.05569	5960	0.13	1.46	0.02	0.00	0.00	2.70	2.85		
														G4 1998+	0.68	19.8	0.64	0.06	-	79.58	2495	72663	2349	198	149.7288	292045	1.25	36.33	1.17	0.10	0.07	132.47	139.44		
				ATV									ATV	G2	34.2	54.1	0.01	0.42	-	109.63	1010	1598	0.30	11	8.435577	3238	0.51	0.80	0.00	0.01	0.00	1.47	1.55		
				14,886	9	miles	3.2	hours	2.8	mi/hr	133,977	mi/yr	ATV	G4 Pre-1998	3.59	39.1	0.64	0.06	-	109.63	19	208	3	0.3	0.216915	583	0.01	0.10	0.00	0.00	0.00	0.26	0.28		
														G4 1998+	0.68	19.8	0.49	0.06	-	109.63	177	5158	128	14.1	10.62883	28560	0.09	2.58	0.06	0.01	0.01	12.95	13.64		
				4X4										4X4	LDT1	0.018711	0.94561	0.096813	0.002352	0.002182	258.7942	0	13	1	0.0	0.03025	3588	0.00	0.01	0.00	0.00	0.00	1.63	1.71	
				5,133	4.5	miles	1.2	hours	3.857	mi/hr	23,098	mi/yr	4X4	LDT2	0.013763	0.741741	0.080754	0.00209	0.001939	328.4338	1	27	3	0.1	0.071861	12171	0.00	0.01	0.00	0.00	0.00	5.52	5.81		

								Emission Factors (lb/VMT)						Emissions														
														(lb/year)			(tons/year)				(metric tons/year)							
OHVs	Mean Vehicle Weight	Mean OHV Weight	Mean OHV Speed	Mean OHV VMT	HC	CO	NOX	PM10	PM2.5	CO2	HC	CO	NOX	PM10	PM2.5	CO2	HC	CO	NOX	PM10	PM2.5	CO2	CO2e					
On-Site Fugitive Dust	146,898	OHMC 0.11 tons	0.185	tons	4.2	mi/hr	13.9	miles			-	-	-	0.167255	0.016413	-	-	-	-	341939.1	33554	-	-	-	170.9695	16.777	-	-
		ATV 0.18 tons																										
		4X4 1.98 tons																										

					Emission Factors (g/mile)						Emissions																		
											(lb/year)			(tons/year)				(metric tons/year)											
Vehicles	Average Miles Driven Roundtrip	VMT	Vehicles		ROG_RUN	CO_RUNE	NOX_RUN	PM10_RU	PM2_5_R	CO2_RUN	HC	CO	NOX	PM10	PM2.5	CO2	HC	CO	NOX	PM10	PM2.5	CO2	CO2e						
On-Road Vehicles	97,932	62	6,071,784	mi/yr	Light-Duty Trucks (0-3750 lbs)						0.018711	0.94561	0.096813	0.002352	0.002182	258.7942	68.18791	3446.012	352.8089	8.570109	7.951648	943103.2	0.03	1.72	0.18	0.00	0.00	427.78	450.30
					Light-Duty Trucks (3751-5750 lbs)						0.013763	0.741741	0.080754	0.00209	0.001939	328.4338	134.0701	7225.71	786.6718	20.35918	18.88996	3199453	0.07	3.61	0.39	0.01	0.01	1451.25	1527.63

Total OHMC Emissions =	8.50	49.1	1.19	0.18	0.14	150.2	158.1
Total ATV Emissions =	0.60	3.48	0.07	0.01	0.01	14.69	15.46
Total 4x4 Emissions =	0.00	0.02	0.00	0.00	0.00	7.15	7.52
On-Site Fugitive Dust Emissions =	-	-	-	171.0	16.8	-	-
On-Road Vehicle Emissions =	0.10	5.34	0.57	0.01	0.01	1879	1978
OHV Emissions (tons/year) =	9.10	52.6	1.26	0.19	0.15	172.0	181.1
Fugitive Dust Emissions (tons/year) =	-	-	-	171	16.8	-	-
On-Road Vehicle Emissions (tons/year) =	0.10	5.34	0.57	0.01	0.01	1879	1978
2030 Total Emissions (tons/year) =	9.20	57.9	1.83	171	16.9	2051	2159
OHV Emissions (lb/day) =	49.9	288	6.92	1.06	0.80	943	992
Fugitive Dust Emissions (lb/day) =	-	-	-	937	91.9	-	-
On-Road Vehicle Emissions (lb/day) =	0.55	29.2	3.12	0.08	0.07	10296	10838
2030 Total Emissions (lb/day) =	50.4	317	10.0	938	92.79958	12388.53	13040.55

Conversion Factors and Assumptions:

1 pound =	453.6 grams
1 ton =	2000 pounds
1 metric ton =	2204.62 pounds
% of G2 vehicles in 2001 =	30%
% of G4 Pre-1998 vehicles in 2001 =	35%
% of G4 1998+ vehicles in 2001 =	35%
% of G2 vehicles in 2010 =	10%
% of G4 Pre-1998 vehicles in 2010 =	36%
% of G4 1998+ vehicles in 2010 =	54%
% of G2 vehicles in 2030 =	10%
% of G4 Pre-1998 vehicles in 2030 =	2% * Estimated based on the very old age of pre-1998 vehicles in 2030
% of G4 1998+ vehicles in 2030 =	88%
% of LDT1 in 2001 =	36%
% of LDT2 in 2001 =	64%
% of LDT1 in 2010 =	27%
% of LDT2 in 2010 =	73%
% of LDT1 in 2030 =	27%
% of LDT2 in 2030 =	73%

AP-42, Section 13.2.2 - Unpaved Road Fugitive Dust Equation Inputs

surface material silt content - public (%) =	5
surface material silt content - industrial (%) =	13.5
surface material moisture content (%) =	6.515
emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear (PM2.5) =	0.00036 lb/VMT
emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear (PM10) =	0.00047 lb/VMT
fugitive dust constant k (PM2.5) =	0.18 lb/VMT
fugitive dust constant k (PM10) =	1.8 lb/VMT
fugitive dust constant a =	1
fugitive dust constant c =	0.2
fugitive dust constant d =	0.5