

APPENDIX 2

Air Quality – Supporting Documentation

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CRITERIA POLLUTANT EMISSION CALCULATIONS

Off-Road Emissions - Heavy Equipment

Equipment (HP)	ROG		CO		NOX		SO2		PM10		PM2.5	
	EF lbs/hr	lb/day	EF lbs/hr	lb/day	EF lbs/hr	lb/day	EF lbs/hr	lb/day	EF lbs/hr	lb/day	EF lbs/hr	lb/day
Rubber Tired Dozers (500)	0.3614	2.89	1.7426	13.94	3.2079	25.66	0.0026	0.02	0.1366	1.09	0.1257	1.01
Excavators (500)	0.1984	1.59	0.6160	4.93	1.9280	15.42	0.0023	0.02	0.0710	0.57	0.0653	0.52
Total (pounds per day)		4.48		18.87		41.09		0.04		1.66		1.53
Total (tons per year)		0.07		0.28		0.62		0.00		0.02		0.02

Off-road Assumptions:

No. of dozers	1
No. of excavators	1
Hours per day for each	8
breach days per year	30

Note: PM10 and PM2.5 emissions are based on PM emissions factors from the Offroad model with PM10 and PM2.5 fractions applied to the PM EF (SCAQMD, 2006)

On-Road Emissions - Worker Vehicles and Equipment Haul Trucks

	Veh type and speed (mph)	g/mi		lb/mi		lb/day		lb/year		tons/year	
ROG	LD truck - 25	0.061	0.00013448	0.02	0.65	0.0003					
	LD truck - 45	0.032	7.0548E-05	0.01	0.34	0.0002					
	HD truck - 25	1.102	0.0024295	0.16	4.66	0.0023					
	HD truck - 45	0.562	0.001239	0.08	2.38	0.0012					
	Total			0.27	8.03	0.0040					
CO	LD truck - 25	2.716	0.00598776	0.96	28.74	0.0144					
	LD truck - 45	1.987	0.00438059	0.70	21.03	0.0105					
	HD truck - 25	5.889	0.01298303	0.83	24.93	0.0125					
	HD truck - 45	3.594	0.00792342	0.51	15.21	0.0076					
	Total			3.00	89.91	0.0450					
NOX	LD truck - 25	0.432	0.0009524	0.15	4.57	0.0023					
	LD truck - 45	0.366	0.00080689	0.13	3.87	0.0019					
	HD truck - 25	13.675	0.03014824	1.93	57.88	0.0289					
	HD truck - 45	12.557	0.02768347	1.77	53.15	0.0266					
	Total			3.98	119.48	0.0597					
SO2	LD truck - 25	0.005	1.1023E-05	0.00	0.05	0.0000					
	LD truck - 45	0.003	6.6139E-06	0.00	0.03	0.0000					
	HD truck - 25	0.019	4.1888E-05	0.00	0.08	0.0000					
	HD truck - 45	0.016	3.5274E-05	0.00	0.07	0.0000					
	Total			0.01	0.23	0.0001					
PM10	LD truck - 25	0.049	0.00010803	0.02	0.52	0.0003					
	LD truck - 45	0.037	8.1571E-05	0.01	0.39	0.0002					
	HD truck - 25	0.466	0.00102735	0.07	1.97	0.0010					
	HD truck - 45	0.366	0.00080689	0.05	1.55	0.0008					
	Total			0.15	4.43	0.0022					
PM2.5	LD truck - 25	0.045	0.00010025	0.02	0.48	0.0002					
	LD truck - 45	0.034	7.5698E-05	0.01	0.36	0.0002					
	HD truck - 25	0.429	0.00094517	0.06	1.81	0.0009					
	HD truck - 45	0.337	0.00074234	0.05	1.43	0.0007					
	Total			0.14	4.08	0.0020					

On-road Assumptions:

light-duty trips/day	5
heavy-duty trips/day	2
breach days per year	30
miles at 25 mph	32
miles at 45 mph	32

It is assumed that each roundtrip would have a length of 64 miles (from Santa Rosa) and vehicles would travel 32 miles at 25 mph and 32 miles at 45 mph.

Greenhouse Gas Emissions

Off-road Emissions

Equipment (HP)	CO2		CH4		N2O		CO2e	
	EF lbs/hr	M tons/yr	EF lbs/hr	M tons/yr	EF lbs/hr	M tons/yr	M tons/yr	
Rubber Tired Dozers	264.36	28.78	0.03	0.00	0.01	0.00	0.00	29.09
Excavators	234.00	25.47	0.02	0.00	0.01	0.00	0.00	25.72
Total (metric tons)		54.25		0.01		0.00		54.80

Off-road Assumptions:

No. of dozers	1
No. of excavators	1
Hours per day for each	8
breach days per year	30

For N2O: Diesel emission of GHG (CCAR, 2009)

10150 g CO2/gal	
0.26 g N2O/gal	
N2O emissions =	0.000026 ratio of N2O emission to CO2 Emissions

On-road Emissions	Veh type and speed (mph)	g/mi	lb/mi	lb/day	(CO2e) metric tons
CO2	LD truck - 25	483.86	1.07	170.68	2.32
	LD truck - 45	357.86	0.79	126.23	1.72
	HD truck - 25	1977.04	4.36	697.38	9.49
	HD truck - 45	1640.55	3.62	578.69	7.87
				Sub Total	21.40
CH4	LD truck - 25	0.04	0.00	0.01	0.00
	LD truck - 45	0.03	0.00	0.01	0.00
	HD truck - 25	0.01	0.00	0.00	0.00
	HD truck - 45	0.00	0.00	0.00	0.00
				Sub Total	0.01
N2O	LD truck - 25	0.07	0.00	0.03	0.10
	LD truck - 45	0.05	0.00	0.02	0.08
	HD truck - 25	0.01	0.00	0.00	0.01
	HD truck - 45	0.00	0.00	0.00	0.01
				Sub Total	0.19
CO2e				Total	21.61

On-road Assumptions

Trips per day LD Truck	5	Project Total	76.41
Trips per day HD Truck	5	Net increase	48.40
breach days per year	30		
Miles at 25 mph	32		
Miles at 45 mph	32		

Gasoline emission of GHG (CCAR, 2009)

420.8595 g CO2/mile	Offroad average for 25 and 45 mph
0.0346 g CH4/mile	(CCAR, 2009)
0.0621 g NO2/mile	(CCAR, 2009)
CH4 emissions =	0.000082 ratio of CH4 emission to CO2 Emissions
N2O emissions =	0.000148 ratio of N2O emission to CO2 Emissions

Diesel emission of GHG (CCAR, 2009)

1808.7915 g CO2/mile	Offroad average for 25 and 45 mph
0.0048 g CH4/mile	(CCAR, 2009)
0.0051 g NO2/mile	(CCAR, 2009)
CH4 emissions =	0.000003 ratio of CH4 emission to CO2 Emissions
N2O emissions =	0.000003 ratio of N2O emission to CO2 Emissions

It is assumed that each roundtrip would have a length of 64 miles (from Santa Rosa) and vehicles would travel 32 miles at 25 mph and 32 miles at 45 mph.

Global Warming Potential for CH4 = 25; GWP for N2O = 296.