APPENDIX I

AIR QUALITY EMISSIONS CALCULATIONS

Road Construction Emissions Model, Version 5.1

Emission Estimates for -> Athens Connector Road

Project Phases (English Units)	ROG (lbs/day)	CO (lbs/day)	NOx (lbs/day)	PM10 (lbs/day)	Exhaust PM10 (lbs/day)	Fugitive Dust PM10 (lbs/day)	
Grubbing/Land Clearing	12	67	99	60	5	55	
Grading/Excavation	33	190	230	67	12	55	
Drainage/Utilities/Sub-Grade	29	182	224	67	12	55	
Paving	22	116	182	10	10	0	
Maximum (pounds/day)	33	190	230	67	12	55	
Total (tons/construction project)	2	10	14	4	1	3	<-tons

Notes:

Project Start Year ->	2004
Project Length (months) ->	6
Total Project Area (acres) ->	11
Maximum Area Disturbed/Day (acres) ->	11
Total Soil Imported/Exported (yd^3/day)->	500

PM10 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I.

Emission Estimates for -> Athens Connector Road

Project Phases (Metric Units)	ROG (kgs/day)	CO (kgs/day)	NOx (kgs/day)	PM10 (kgs/day)	Exhaust PM10 (kgs/day)	Fugitive Dust PM10 (kgs/day)	
Grubbing/Land Clearing	5	31	45	27	2	25	
Grading/Excavation	15	86	105	30	5	25	
Drainage/Utilities/Sub-Grade	13	83	102	30	5	25	
Paving	10	53	83	4	4	0	
Maximum (kilograms/day)	15	86	105	30	5	25	
Total (megagrams/construction project)	2	9	13	3	1	3	<-megagrams

Notes:

Project Start Year ->	2004
Project Length (months) ->	6
Total Project Area (hectares) ->	4
Maximum Area Disturbed/Day (hectares) ->	4
Total Soil Imported/Exported ($meters^3$/day)->	382

PM10 estimates assume 50% control of fugitive dust from watering and associated dust control measures if a minimum number of water trucks are specified.

Total PM10 emissions shown in column F are the sum of exhaust and fugitive dust emissions shown in columns H and I.

Road Construction Emissions Model
Data Entry Worksheet

Version 5.1

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Note: Required data input sections have a yellow background.
Optional data input sections have a blue background. Only areas with a yellow or blue background can be modified. Program defaults have a white background.
The user is required to enter information in cells C10 through C28.

To begin a new project, click this button to clear data previously entered. This button will only work if you opted not to disable macros when loading this spreadsheet.

Input Type

Project Name	Athens Connector Road	
Construction Start Year	2004	Enter a Year between 2000 and 2010 inclusive
Project Type	1	1 New Road Construction 2 Road Widening 3 Bridge/Overpass Construction
Project Construction Time	6	months
Predominate Soil/Site Type: Enter 1, 2, or 3	2	1. Sand Gravel 2. Weathered Rock-Earth 3. Blasted Rock
On-Road Emission Factors: Enter 1, 2, or 3	4	1. Emfac7fv1.1 4. Emfac2002 2. Emfac7G 3. Emfac2001
Project Length	2	miles
Total Project Area	11	acres
Maximum Area Disturbed/Day	11	acres
Water Trucks Used?	1	1. Yes 2. No
Soil Imported	500	yd^3/day
Soil Exported		yd^3/day
Average Truck Capacity	20	yd^3 (assume 20 if unknown)

The remaining sections of this sheet contain areas that can be modified by the user, although those modifications are optional.

Note: The program's estimates of construction period phase length can be overridden in cells C37 through C40.

Construction Periods	User Override of Construction Months	Program Calculated Months	2000	%	2001	%	2002
Grubbing/Land Clearing		0.6	0.00	0.00	0.00	0.00	0.00
Grading/Excavation		2.7	0.00	0.00	0.00	0.00	0.00
Drainage/Utilities/Sub-Grade		1.8	0.00	0.00	0.00	0.00	0.00
Paving		0.9	0.00	0.00	0.00	0.00	0.00
Totals	0	6					

Hauling emission default values can be overridden in cells C48 through C50.

Soil Hauling Emissions

User Input	User Override of Soil Hauling Defaults	Default Values
Miles/round trip	5	30
Round trips/day	25	25
Vehicle miles traveled/day (calculated)	125	750

Hauling Emissions	ROG	NOx	CO	PM10
Emission rate (grams/mile)	0.96	11.21	10.15	0.34
Pounds per day	0.3	3.1	2.8	0.1
Tons per contruction period	0.01	0.09	0.08	0.00

Worker commute default values can be overridden in cells C62 through C67.

Worker Commute Emissions

	User Override of Worker Commute Default Values	Default Values
Miles/ one-way trip		20
One-way trips/day		2
No. of employees: Grubbing/Land Clearing		13
No. of employees: Grading/Excavation		19
No. of employees: Drainage/Utilities/Sub-Grade		18
No. of employees: Paving		19

	ROG	NOx	CO	PM10
Emission rate (grams/mile)	0.43	0.81	8.77	0.04
Emission rate (grams/trip)	2.13	0.91	21.20	0.02
Pounds per day - Grubbing/Land Clearing	0.5	0.9	9.7	0.0
Tons per const. Period - Grub/Land Clear	0.0	0.0	0.1	0.0
Pounds per day - Grading/Excavation	0.7	1.3	14.5	0.1
Tons per const. Period - Grading/Excavation	0.0	0.0	0.4	0.0
Pounds per day - Drainage/Utilities/Sub-Grade	0.7	1.2	13.5	0.1
Tons per const. Period - Drain/Util/Sub-Grade	0.0	0.0	0.3	0.0
Pounds per day - Paving	0.7	1.3	14.5	0.1
Tons per const. Period - Paving	0.0	0.0	0.1	0.0
tons per construction period	0.0	0.1	0.9	0.0

Water truck default values can be overriden in cells C87 through C89 and E87 through E89.

Water Truck Emissions	Number of Water Trucks	Program Estimate of Number of Water Trucks	User Override of Water Truck Miles Traveled	Default Values Miles Traveled/Day	
Grubbing/Land Clearing - Exhaust		3		120	360
Grading/Excavation - Exhaust		3		120	360
Drainage/Utilities/Subgrade		2		80	160
	ROG	**NOx**	**CO**	**PM10**	
Emission rate (grams/mile)	0.96	11.21	10.15	0.34	
Pounds per day - Grubbing/Land Clearing	0.8	8.9	8.1	0.3	
Tons per const. Period - Grub/Land Clear	0.01	0.06	0.05	0.00	
Pound per day - Grading/Excavation	0.8	8.9	8.1	0.3	
Tons per const. Period - Grading/Excavation	0.02	0.26	0.24	0.01	
Pound per day - Drainage/Utilities/Subgrade	0.2	3.9	3.6	0.1	
Tons per const. Period - Drainage/Utilities/Subgrade	0.00	0.08	0.07	0.00	

Fugitive dust default values can be overridden in cells C104 and C105.

Fugitive PM10 Dust	User Override of Max Acrerage/Day	Default Maximum Acreage/Day	pounds/day	tons/per period
Fugitive Dust - Grubbing/Land Clearing		11	55.0	0.4
Fugitive Dust - Grading/Excavation		11	55.0	1.6
Fugitive Dust - Drainage/Utilities/Subgrade		11	55.0	1.1

Off road equipment default number of vehicles can be overridden in cells B115 through B224.

Off-Road Equipment Emissions

Grubbing/Land Clearing Override of Default Number of Vehicles	Default Number of Vehicles *Program-estimate*	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day
2		Backhoes	1.42	4.94	11.15	0.91
		Bore/Drill Rigs	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00
		Compactor	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00
2	3	Dozer	7.16	36.84	59.73	2.98
		Excavator	0.00	0.00	0.00	0.00
		Forklifts, Rough Terrain	0.00	0.00	0.00	0.00
		Grader	0.00	0.00	0.00	0.00
2		Loaders, Rubber Tired	1.84	7.65	18.02	0.98
		Off-Highway Trucks	0.00	0.00	0.00	0.00
		Other Construction Equip.	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00
0	3	Scrapper	0.00	0.00	0.00	0.00
0	4	Signal Boards	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00
		Tractors	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00
		pounds per day	10.4	49.4	88.9	4.9
		tons per period	0.1	0.3	0.6	0.0

Grading/Excavation Override of Default Number of Vehicles	Number of Vehicles *Program-estimate*	Type	ROG pounds/day	CO pounds/day	NOx pounds/day	PM10 pounds/day
2		Backhoes	1.42	4.94	11.15	0.91
		Bore/Drill Rigs	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00
3		Compactor	6.23	42.92	42.21	2.29
0	0	Cranes	0.00	0.00	0.00	0.00

		Crawler Tractors	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00
1		Dozer	3.58	18.42	29.87	1.49
2	3	Excavator	3.68	25.08	22.24	1.21
		Forklifts, Rough Terrain	0.00	0.00	0.00	0.00
2	3	Grader	2.53	10.45	25.49	1.37
1	3	Loaders, Rubber Tired	2.76	3.83	9.01	0.49
		Off-Highway Trucks	0.00	0.00	0.00	0.00
0	0	Other Construction Equip.	0.00	0.00	0.00	0.00
		Pavers	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00
		Rollers	0.00	0.00	0.00	0.00
3	2	Scrapper	10.78	58.91	76.74	3.89
0	4	Signal Boards	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00
		Tractors	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00
		max pounds per day	31.0	164.6	216.7	11.6
		tons per period	0.9	4.9	6.4	0.3

Drainage/Utilities/Subgrade	Number of Vehicles		ROG	CO	NOx	PM10
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day
1		Backhoes	0.71	2.47	5.57	0.45
		Bore/Drill Rigs	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00
3	3	Compactor	6.23	42.92	42.21	2.29
0		Cranes	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00
		Dozer	0.00	0.00	0.00	0.00
3		Excavator	5.52	37.62	33.36	1.81
		Forklifts, Rough Terrain	0.00	0.00	0.00	0.00
3	2	Grader	3.79	15.67	38.23	2.05
2		Loaders, Rubber Tired	1.84	7.65	18.02	0.98
		Off-Highway Trucks	0.00	0.00	0.00	0.00
1		Other Construction Equip.	2.08	14.31	14.07	0.76
		Pavers	0.00	0.00	0.00	0.00
		Paving Equipment	0.00	0.00	0.00	0.00
2		Rollers	1.17	4.88	11.48	0.62
2	2	Scrapper	7.19	39.27	51.16	2.59

0	4	Signal Boards	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00
		Tractors	0.00	0.00	0.00	0.00
0	3	Trenchers	0.00	0.00	0.00	0.00
		max pounds per day	28.5	164.8	214.1	11.6
		tons per period	0.6	3.3	4.2	0.2
Paving	Number of Vehicles		ROG	CO	NOx	PM10
Override of Default Number of Vehicles	*Program-estimate*	Type	pounds/day	pounds/day	pounds/day	pounds/day
		Backhoes	0.00	0.00	0.00	0.00
		Bore/Drill Rigs	0.00	0.00	0.00	0.00
		Concrete/Industrial Saws	0.00	0.00	0.00	0.00
		Compactor	0.00	0.00	0.00	0.00
		Cranes	0.00	0.00	0.00	0.00
		Crawler Tractors	0.00	0.00	0.00	0.00
		Crushing/Proc. Equipment	0.00	0.00	0.00	0.00
		Dozer	0.00	0.00	0.00	0.00
		Excavator	0.00	0.00	0.00	0.00
		Forklifts, Rough Terrain	0.00	0.00	0.00	0.00
3		Grader	3.79	15.67	38.23	2.05
		Loaders, Rubber Tired	0.00	0.00	0.00	0.00
		Off-Highway Trucks	0.00	0.00	0.00	0.00
		Other Construction Equip.	0.00	0.00	0.00	0.00
2	3	Pavers	1.86	7.73	18.19	0.98
2	3	Paving Equipment	1.74	7.21	18.84	0.98
5	5	Rollers	2.93	12.19	28.70	1.55
3		Scrapper	10.78	58.91	76.74	3.89
0	4	Signal Boards	0.00	0.00	0.00	0.00
		Skid Steer Loaders	0.00	0.00	0.00	0.00
		Surfacing Equipment	0.00	0.00	0.00	0.00
		Tractors	0.00	0.00	0.00	0.00
		Trenchers	0.00	0.00	0.00	0.00
		pounds per day	21.1	101.7	180.7	9.5
		tons per period	0.2	1.0	1.8	0.1
Total Emissions (tons per construction period)			1.8	9.5	13.1	0.7

Equipment default values for horsepower, load factor, and hours/day can be overridden in cells C235 through C256, E235 through E256, and G235 through G256.

Equipment		Default Values Horsepower		Default Values Load Factor		Default Values Hours/day
Bore/Drill Rigs		218		0.75		8
Concrete/Industrial Saws		84		0.73		8
Cranes		190		0.43		8
Crawler Tractors		143		0.575		8
Crushing/Proc. Equipment		154		0.78		8
Excavators		180		0.58		8
Graders		174		0.575		8
Off-Highway Tractors		255		0.41		8
Off-Highway Trucks		417		0.49		8
Other Construction Equipment		190		0.62		8
Pavers		132		0.59		8
Paving Equipment		111		0.53		8
Rollers		114		0.43		8
Rough Terrain Forklifts		94		0.475		8
Rubber Tired Dozers		352		0.59		8
Rubber Tired Loaders		165		0.465		8
Scrapers		313		0.66		8
Signal Boards		25		0.82		8
Skid Steer Loaders		62		0.515		8
Surfacing Equipment		437		0.49		8
Tractors/Loaders/Backhoes		79		0.465		8
Trenchers		82		0.695		8

Default load factors from SCAQMD CEQA Handbook, 1993.

Default horsepower values from Appendix B, California Air Resources Board's Offroad Model (see also Appendix B of this spreadsheet).

Signal board horsepower based on: U.S. EPA, 1998. Final Regulatory Impact Analysis: Control of Emissions from Nonroad Diesel Engines (EPA420-R-98-016).

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END OF DATA ENTRY SHEET