



APPENDIX I

Greenhouse Gas Data

Construction Emissions

Year 1

Mass Grading

Duration (days): 20

Equipment	Emission Factors			Hours/day	Quantity	Emissions (pounds/hour)			Emissions (tons/year)		
	CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Tractors/Loaders/Backhoes	66.8	0.0092	0.0017	7	1	66.8	0.0092	0.0017	4.6760	0.0006	0.0001
Rubber Tired Dozers	239.1	0.0305	0.0062	7	1	239.1	0.0305	0.0062	16.7370	0.0021	0.0004
Graders	132.7	0.0155	0.0035	7	6	796.2	0.0930	0.0210	55.7340	0.0065	0.0015
Off-Highway Trucks	260.1	0.0224	0.0067	8	3	780.3	0.0672	0.0201	62.4240	0.0054	0.0016
Total Emissions									139.5710	0.0147	0.0036

Total Construction Emissions - Year 2009

tons/year	139.57	0.01	0.00
metric tons/year	126.62	0.01	0.00
metric tons CO ₂ eq/year	126.62	4.12	0.07

Year 2

Fine Grading

Duration (days): 40

Equipment	Emission Factors			Hours/day	Quantity	Emissions (pounds/hour)			Emissions (tons/year)		
	CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Tractors/Loaders/Backhoes	66.8	0.0092	0.0017	7	1	66.8	0.0092	0.0017	4.6760	0.0006	0.0001
Scrapers	262.5	0.0289	0.0068	7	2	525.0	0.0578	0.0136	36.7500	0.0040	0.0010
Rubber Tired Dozers	239.1	0.0305	0.0062	6	1	239.1	0.0305	0.0062	14.3460	0.0018	0.0004
Graders	132.7	0.0155	0.0035	7	1	132.7	0.0155	0.0035	9.2890	0.0011	0.0002
Off-Highway Trucks	260.1	0.0224	0.0067	8	2	520.2	0.0448	0.0134	41.6160	0.0036	0.0011
Total Emissions									106.6770	0.0112	0.0028

Mass Grading

Duration (days): 160

Equipment	Emission Factors			Hours/day	Quantity	Emissions (pounds/hour)			Emissions (tons/year)		
	CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Tractors/Loaders/Backhoes	66.8	0.0092	0.0017	7	1	66.8	0.0092	0.0017	4.6760	0.0006	0.0001
Rubber Tired Dozers	239.1	0.0305	0.0062	7	1	239.1	0.0305	0.0062	16.7370	0.0021	0.0004
Graders	132.7	0.0155	0.0035	7	6	796.2	0.0930	0.0210	55.7340	0.0065	0.0015
Off-Highway Trucks	260.1	0.0224	0.0067	8	3	780.3	0.0672	0.0201	62.4240	0.0054	0.0016
Total Emissions									139.5710	0.0147	0.0036

Building

Duration (days): 40

Equipment	Emission Factors			Hours/day	Quantity	Emissions (pounds/hour)			Emissions (tons/year)		
	CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Tractors/Loaders/Backhoes	66.8	0.0092	0.0017	7	3	200.4	0.0276	0.0051	14.0280	0.0019	0.0004
Cranes	128.7	0.0144	0.0033	7	1	128.7	0.0144	0.0033	9.0090	0.0010	0.0002
Generator Sets	61	0.0087	0.0016	8	1	61.0	0.0087	0.0016	4.8800	0.0007	0.0001
Forklifts	54.4	0.0062	0.0014	8	3	163.2	0.0186	0.0042	13.0560	0.0015	0.0003
Welders	25.6	0.0073	0.0007	8	1	25.6	0.0073	0.0007	2.0480	0.0006	0.0001
Total Emissions									43.0210	0.0057	0.0011

Total Construction Emissions - Year 2010

tons/year	289.27	0.03	0.01
metric tons/year	262.42	0.03	0.01
metric tons CO ₂ eq/year	262.42	8.88	0.14

Year 3

Paving

Duration (days): 240

Equipment	Emission Factors			Hours/day	Quantity	Emissions (pounds/hour)			Emissions (tons/year)		
	CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Pavers	77.9	0.016	0.002	8	1	77.9	0.0160	0.0020	74.7840	0.0154	0.0019
Paving Equipment	68.9	0.012	0.0018	8	2	137.8	0.0240	0.0036	132.2880	0.0230	0.0035
Rollers	67.1	0.0106	0.0018	6	2	134.2	0.0212	0.0036	96.6240	0.0153	0.0026
Total Emissions									303.6960	0.0537	0.0080

Building

Duration (days): 220

Equipment	Emission Factors			Hours/day	Quantity	Emissions (pounds/hour)			Emissions (tons/year)		
	CO ₂	CH ₄	N ₂ O			CO ₂	CH ₄	N ₂ O	CO ₂	CH ₄	N ₂ O
Tractors/Loaders/Backhoes	66.8	0.0092	0.0017	7	3	200.4	0.0276	0.0051	14.0280	0.0019	0.0004
Cranes	128.7	0.0144	0.0033	7	1	128.7	0.0144	0.0033	9.0090	0.0010	0.0002
Generator Sets	61	0.0087	0.0016	8	1	61.0	0.0087	0.0016	4.8800	0.0007	0.0001
Forklifts	54.4	0.0062	0.0014	8	3	163.2	0.0186	0.0042	13.0560	0.0015	0.0003
Welders	25.6	0.0073	0.0007	8	1	25.6	0.0073	0.0007	2.0480	0.0006	0.0001
Total Emissions									43.0210	0.0057	0.0011

Total Construction Emissions - Year 2011

tons/year	346.72	0.06	0.01
metric tons/year	314.54	0.05	0.01
metric tons CO ₂ eq/year	314.54	16.70	0.17

Annualized

tons/year	775.56	0.11	0.02
metric tons/year	23.45	0.00	0.00
metric tons CO ₂ eq/year	23.45	0.99	0.01

Notes:

Construction Equipment Emission Factor Source: Provided by SCAQMD.

Refer to the URBEMIS 2007 assumptions and model output for construction equipment assumptions

Emissions From Natural Gas Consumed By Land Uses

Land Use	Amount	Cubic feet per unit/square feet/customer per month	Emissions Factor (lbs per million cubic feet)		
			CO ₂ 1.20E-04	N ₂ O 2.20E-09	CH ₄ 2.30E-09
Residential					
Single Family Units	99	6665	2.64	0.00	0.00
Multi-Family Units		4011.5	0.00	0.00	0.00
NonResidential					
Industrial		241611	0.00	0.00	0.00
Hotel/Motel		4.8	0.00	0.00	0.00
Retail/Shopping Center		2.9	0.00	0.00	0.00
Office		2	0.00	0.00	0.00
Blank		35	0.00	0.00	0.00
TOTAL - pounds per day	--	--	2.64	0.00	0.00
TOTAL - tons per year	--	--	0.4817	0.0000	0.0000
TOTAL - metric tons per year	--	--	4.37E-01	8.01E-06	8.38E-06

	CO ₂	N ₂ O	CH ₄
metric tons per year	0.44	0.00	0.00
metric tons CO₂eq per year	0.44	0.00	0.00

Notes:

- Usage rate; average for SCE and LADWP.
- Conversion from metric tons per year to metric tons of CO₂eq per year is based upon the EPA Greenhouse Gas Equivalencies Calculator; <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Source:

South Coast Air Quality Management District, *CEQA Air Quality Handbook*, November 1993, Table A9-12.

Natural Gas Reduction Calculations

Measure	Percent Reduction
2.1.1 15 percent below Title 24	15.0%
<i>Total</i>	<i>15.0%</i>
MTCO₂eq	
Total Unmitigated Emissions	342.02
Mitigated Emissions	290.72

Emissions From Electricity Consumed By Land Uses

Power Utility
Southern California Edison (SCE)

Land Use	Amount	kilowatt-hours per year ¹	Emissions Factor (lbs/kWh)		
			CO ₂ 0.641	N ₂ O 6.59E-06	CH ₄ 4.04E-05
Residential (Dwelling Units)	99	5626.5	978.22	0.01	0.06
Food Store (SF)		53.3	0.00	0.00	0.00
Restaurant (SF)		47.45	0.00	0.00	0.00
Hospitals (SF)		21.7	0.00	0.00	0.00
Retail (SF)		13.55	0.00	0.00	0.00
College/University (SF)		11.55	0.00	0.00	0.00
High School (SF)		10.5	0.00	0.00	0.00
Elementary School (SF)		5.9	0.00	0.00	0.00
Office (SF)		12.95	0.00	0.00	0.00
Hotel/Motel (SF)		9.95	0.00	0.00	0.00
Warehouse (SF)		4.35	0.00	0.00	0.00
Miscellaneous (SF)		10.5	0.00	0.00	0.00
Blank			0.00	0.00	0.00
TOTAL - pounds per day	--	--	978.22	0.01	0.06
TOTAL - tons per year	--	--	178.53	0.00	0.01
TOTAL - metric tons per year	--	--	161.96	0.00	0.01

	CO ₂	N ₂ O	CH ₄	Total MTCO ₂ eq
metric tons per year	161.96	0.0017	0.0102	
metric tons CO₂eq per year	161.96	0.52	0.21	162.69

Notes:

- Usage rate; average for SCE and LADWP.
- Conversion from metric tons per year to metric tons of CO₂eq per year is based upon the EPA Greenhouse Gas Equivalencies Calculator;
<http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Source for greenhouse gas emissions rates:

U.S. Energy Information Administration, *Domestic Electricity Emissions Factors 1999-2002*, October 2007. <http://www.eia.doe.gov/oiaf/1605/techassist.html>
 California Air Pollution Control Officers Association, *Quantifying Greenhouse Gas Mitigation Measures*, September 2010 and California Climate Action Registry (CCAR) Database, *Power/Utility Protocol (PUP) Report*, 2006.

Electricity Reduction Calculations

Measure	Percent Reduction
2.1.1 15 percent below Title 24	15.0%
2.1.4 Energy Star Appliances	4.22%
2.2.2 Lighting	4.0%
<i>Total</i>	23.2%
	MTCO₂eq
Total Unmitigated Emissions	162.69
Mitigated Emissions	124.91

Water Consumption - Indirect Emissions

Water Demand (MG/year):	589
Percent Local:	65%
Percent Import:	35%
Percent Indoor:	52%
Percent Outdoor:	48%

Energy Intensity of Water Use (kWh/MG): 7,595,120

Local Source:	Los Angeles4 groundwater
Import Source:	SWP to LA Basin surface water

Water Use Energy Factors (kWh/MG)						
Source	Supply and Conveyance	Treatment	Distribution	Outdoor Total	Wastewater Treatment	Indoor Total
Local	1,157	72	827	2,056	1,242	3,298
Import	2,914	39	445	3,398	669	4,067

Emissions:

	CO ₂	N ₂ O	CH ₄	Total MTCO ₂ eq
lbs/year	5,863,432.38	50.05	306.61	
MT/year	2,659.61	0.02	0.14	
MTCO ₂ eq/year	2,659.61	7.04	2.92	2,669.57

Abbreviations:

kWh = kilowatt hour
 MG = million gallons
 SWP = State Water Project
 WD = water district

Notes:

Proportion of local and import supplies is based on projections in Section 5.14, Water .

Sources:

California Air Pollution Control Officers Association, *Quantifying Greenhouse Gas Mitigation Measures*, September 2010.

CEC. 2006. Refining Estimates of Water-Related Energy Use in California. PIER Final Report. Prepared by Navigant Consulting, Inc. CEC-500-2006-118. December. Available at: <http://www.energy.ca.gov/2006publications/CEC-500-2006-118/CEC-500-2006-118.PDF>

CEC, 2005. California's Water-Energy Relationship. Final Staff Report. CEC 700-2005-011-SF. Available online at: <http://www.energy.ca.gov/2005publications/CEC-700-2005-011/CEC-700-2005-011-SF.PDF>

NRDC. 2004. Energy Down the Drain: The hidden Costs of California's Water Supply. Prepared by NRDC and the Pacific Institute. Available online at: <http://www.nrdc.org/water/conservation/edrain/edrain.pdf>

Water Reduction Calculations

Measure	Percent Reduction	
4.1.2 Graywater	1.70%	(outdoor only)
4.2.1 Install Low-Flow Water Fixtures	20.0%	(indoor only)
4.2.3 Water Efficient Landscapes	35.0%	(outdoor only)
4.2.4 Water Efficient Irrigation Syster	6.1%	(outdoor only)
<i>Total Indoor Reduction</i>	<i>20.0%</i>	
<i>Total Outdoor Reduction</i>	<i>42.8%</i>	
<i>Total Water Reduction Overall</i>	<i>30.9%</i>	added in and out
MTCO₂eq		
Total Unmitigated Emissions	2,669.57	
Mitigated Emissions	1,843.50	

Mobile Source Emissions Calculations

Project VMT: 9,572
Year: 2016

	Total	Breakdown of		Emission Factor		Emis Passeal	Emis Deliv	Passnger	Delivery	Total Emissions	
	VMT	Passnger	Delivery	Passnger	Delivery	pounds/day		tons/year		tons/year	metric tons/year
CO	9,572	4,977	4,595	0.0058	0.0108	28.66	49.65	5.23	9.06	14.29	12.96
NO _x	9,572	4,977	4,595	0.0006	0.0117	2.77	53.89	0.51	9.83	10.34	9.38
N ₂ O ¹	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.50	0.46
ROG	9,572	4,977	4,595	0.0006	0.0016	3.15	7.42	0.57	1.35	1.93	1.75
SO _x	9,572	4,977	4,595	0.0000	0.0000	0.05	0.13	0.01	0.02	0.03	0.03
PM ₁₀	9,572	4,977	4,595	0.0001	0.0005	0.47	2.14	0.09	0.39	0.48	0.43
PM _{2.5}	9,572	4,977	4,595	0.0001	0.0004	0.31	1.74	0.06	0.32	0.37	0.34
CH ₄	9,572	4,977	4,595	0.0001	0.0001	0.28	0.34	0.05	0.06	0.11	0.10
CO ₂	9,572	4,977	4,595	1.1068	2.8313	5,508.91	13,008.77	1,005.38	2,374.10	3,379.48	3065.81

	CO ₂	N ₂ O	CH ₄	Total
metric tons per year	3,065.81	0.46	0.10	MTCO ₂ eq
metric tons CO ₂ eq per year	3,065.81	141.71	2.15	3,209.66

Notes:

- VMT based upon URBEMIS 2007 model output.
- Emission Factor based upon EMFAC 2007 (version 2.3), *Highest (Most Conservative) Emission Factors for On-Road Passenger Vehicles and Delivery Trucks*.
- Breakdown of Passenger and Delivery Trucks assumes 52% auto and 48% truck based on the fleet mix for the project.
- Emission Factor for N₂O based upon a conversion ratio of 0.04873 from NO_x to N₂O. Based upon California Air Resources Board: *Estimates of Nitrous Oxide Emissions from Motor Vehicles and the Effects of Catalyst Composition and Aging*, 2005.
- Conversion from metric tons per year to metric tons of CO₂eq per year is based upon the EPA Greenhouse Gas Equivalencies Calculator; <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>

Mobile Source Reduction Calculations

Measure	Percent Reduction
3.1.2 Increase Location Efficiency	10.0%
3.1.4 Increase Destination Accessibility	15.0%
3.1.5 Increase Transit Accessibility	5.8%
3.1.8 Locate Near Bike Path/Lane	0.625%
3.2.1 Provide Ped. Network Improvements	2.0%
3.2.2 Provide Traffic Calming Measures	0.0%
3.2.3 Implement a NEV Network	0.0%
<i>Total</i>	33.5%

	MTCO ₂ eq
Total Unmitigated Emissions	1,731.67
Mitigated Emissions	1,152.27

3.1.2 Increase Location Efficiency

Suburban Center: 10% (representing VMT reductions for the average suburban center in California versus the statewide average VMT).

Percent Reduction = 10.00%

3.1.4 Increase Destination Accessibility

% VMT Reduction = Center Distance * B [not to exceed 30%]

Center Distance = 12 - Distance to downtown/job center for project/12

Dist to downtown/job center = 3

B = Elasticity of Demand = 0.2

% VMT Reduction = 15.00%

3.1.5 Increase Transit Accessibility

% VMT Reduction = Transit * B [not to exceed 30%]

Transit = Increase in transit mode share = % transit mode share for project - % transit mode share for typical ITE development (1.3%)

Dist. to Transit	Transit mode share calc. equation (where x = dist. of project to transit)
0 - 0.5 miles	-50*x+38
0.5 - 3 miles	-4.4*x+15.2
> 3 miles	no impact

B = adjustments from transit ridership increase to VMT (0.67)

% VMT Reduction = 5.83%

* Assumes distance to transit stations in project is 1.18 mile

3.1.8 Locate Project Near Bike Path/Bike Lane

The project must be located within 1/2 mile of an existing Class I or Class II bike lane.

When grouped with Strategy 3.1.4, the reduction in VMT would be 0.625%.

% VMT Reduction = 0.625%

3.2.1 Provide Pedestrian Network Improvements

% VMT Reduction = 2.000%

3.2.2 Provide Traffic Calming Measures

Although the proposed project would provide traffic calming improvements, the extent of these improvements are not yet known. Therefore a reduction is not quantifiable.