APPENDIX D

GLOBAL CLIMATE CHANGE

Greenhouse Gas Emissions Worksheet

Project Parameters		
	2013	
Vehicles (trips/day)	5,770	
Electricity used (MWh/year)	4,600	MWh = Megawatt hour
(mscf/year)	12.0	mscf = million standard cubic feet
Solid Waste (tonnes/year)	880	

Emission Source	Emissions (tonnes per year)				
	CO_2	CH_4	N_2O	CO_2eq	Percent of Total
Vehicles(1)	5,200	0.380	0.730	5,400	64
Electricity Production	1,300	0.014	0.008	1,300	15
Natural Gas Combustion	650	0.013	0.012	650	8
Solid Waste	--	--	--	1,100	13
Other Area Sources(2)	2	--	--	2	0
Total Annual Emissions	7,200	0.410	0.750	8,500	100

Note: Numbers in table may not appear to add up correctly due to rounding of all numbers to two significant digits.

(1) CO_2 emissions for Vehicles from URBEMIS 2007 outputs, if available.

(2) Includes CO_2 emissions for hearth combustion and landscaping equipment from URBEMIS 2007 outputs.

ton tonne

10 9.0702948

Global Warming Potential

Gas	Atmospheric Lifetime (years)	Global Warming Potential (100 year time horizon)
Carbon Dioxide	50-200	1
Methane	12 ± 3	25
Nitrous Oxide	120	298
HFC-23	264	14800
HFC-134a	14.6	1430
HFC-152a	1.5	124
PFC: Tetrafluoromethane (CF_4)	50000	7390
PFC: Hexafluoromethane (C_2F_6)	10000	12200
Sulfur Hexafluoride (SF_6)	3200	22800

Electricity Emissions Worksheet

Commercial Electricity Usage (2003 data):

Commercial Building Type	Electricity Consumption per Building by Building Type	Electricity Consumption per Square Foot by Building Type	Project Info (either # of bldgs or total sf, not both)		Annual Electricity Consumption
	thousand kWH	kWh	# of bldgs	total sf	MWh
All Buildings	226	**14**			0
Mercantile	327	**17.8**			0
Enclosed and Strip Malls	718	**21.1**		30000	633
Retail (Other than Mall)	139	14.3			0
Education	283	**10.7**			0
Food Sales	276	49.4		55000	2,717
Food Service	213	**31.8**			0
Health Care (All)	564	**20.1**			0
Inpatient Health	6,628	27.5			0
Outpatient Health	168	16.1			0
Lodging	483	**11.9**			0
Office	256	**14.6**			0
Other	510	22.5			0
Public Assembly	179	12.5			0
Public Order and Safety	237	15.3			0
Religious Worship	49	4.9			0
Service	73	**8**			0
Vacant	42	2.4			0
Warehouse and Storage	154	**5.9**			0

Note: Health Care (All) includes both "Inpatient Health" and "Outpatient Health".

Source: Energy Information Administration, www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html, Table C14A - Bold valu

Residential Energy Usage (2001 data):

	Mountain	Pacific	Total US.	Project Info # of units	Annual Consumption MWh
Single Family	9,926	7,622	10,656		0
Apartments (2-4 Units)			7,176	175	1,256
Apartments (5 or more Units)			6,204		0
Mobile Home			12,469		0
Total Residential (kWh)					1,256

Source: Energy Information Administration, Office of Energy Markets and End Use, Forms EIA-457 A-G of the 2001 Residential Energy Consumption Survey.

	CO_2			CH_4	N_2O
Electricity production emission factors for CA	lb/kWh 0.61	short tons/MWh 0.303	tons/MWh 0.275	lb/MWh 0.0067	lb/MWh 0.0037
U.S. Average	1.34	0.668	0.606	0.0111	0.0192

Source: Energy Information Administration, Updated State-and Regional-level Greenhouse Gas Emission Factors for Electricity (March 2002), http://www.eia.doe.gov/pub/oiaf/1605/cdrom/pdf/e-supdoc.pdf. (http://www.eia.doe.gov/oiaf/1605/ee-factors.html accessed 4/14/2008)

Water Usage Emissions Worksheet

	kWh/MG	
Select the appropriate location:	Project Location in California: ◉ Northern ○ Southern	
Water Supply and Conveyance	150	8,900
Water Treatment	100	100
Water Distribution	1,200	1,200
Wastewater Treatment	2,500	2,500
Totals	3,950	12,700

From California's Water Energy Relationship, CEC 2005

325,900 gallons/acre-feet

Project total usage 32.8 acre-feet/year

Water Supply and Conveyance	1,602.26	kWh/year
Water Treatment	1,068.17	kWh/year
Water Distribution	12,818.07	kWh/year
Wastewater Treatment	26,704.31	kWh/year
Total	42,192.81	kWh/year

Water usage calculator

Number of Residences		Total Gallons Per Day(1)	29,265
Estimated people per residence(1)		Gallons Per Year	10,681,725
Gallons/Resident/Day(2)	100	Total Acre-feet Per Year	32.78
Total Gallons Per Day	0		
Gallons Per Year	0		
Acre-feet Per Year	0		

(1) Lamon, John. BKF Engineers, 2009. Email communication with LSA Associates. April 17.

Total Square Footage	
Gallons/Square Foot/Year(3)	
Gallons Per Year	0
Acre-feet Per Year	0.0

Natural Gas Emissions Worksheet

Commercial Natural Gas Usage (2003 data):

Commercial Building Type	Natural Gas Consumption per Building by Building Type	Natural Gas Consumption per Square Foot by Building Type	Project Info (enter values on Electricity worksheet)		Annual Natural Gas Consumption
	thousand cf	cf	# of bldgs	total sf	thousand cf
All Buildings	782	**29.2**	0	0	0
Mercantile	653	**19.7**	0	0	0
Enclosed and Strip Malls	1142	33.4	0	30000	1,002
Retail (Other than Mall)	362	**11.4**	0	0	0
Education	1223	**34.8**	0	0	0
Food Sales	383	50.2	0	55000	2,761
Food Service	870	141.2	0	0	0
Health Care (All)	3283	**68.7**	0	0	0
Inpatient Health	28,222	109.8	0	0	0
Outpatient Health	574	50.2	0	0	0
Lodging	2432	**31.5**	0	0	0
Office	535	**14.2**	0	0	0
Other	1885	67.6	0	0	0
Public Assembly	678	36.4	0	0	0
Public Order and Safety	771	43.7	0	0	0
Religious Worship	362	30.3	0	0	0
Service	481	54.1	0	0	0
Vacant	557	23	0	0	0
Warehouse and Storage	687	23.4	0	0	0

Note: Health Care (All) includes both "Inpatient Health" and "Outpatient Health".

Source: Energy Information Administration, www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html, Table C24A - Bold values

Residential Energy Usage (2001 data):

	Mountain	Pacific	Total US.	Project Info # of units	Annual Consumption thousand cf
Single Family	67	48	70	0	0
Apartments (2-4 Units)(1)		48		175	8,400
Apartments (5 or more Units)			28	0	0
Mobile Home			58	0	0
Total Natural Gas Usage					8,400

(1) Single family natural gas consumption was used to represent 2-4 Unit Apartments, as the total U.S. number (70 thousand cf) would exceed the Pacific region single-family home consumption rates. Single-family and 2-4 Unit Apartments have consistent total U.S. consumption rates, so it is reasonable that regional rates would be consistent as well.

Source: Table CE1-12c. Total Energy Consumption in U.S. Households by West Census Region, 2001 (http://www.eia.doe.gov/emeu/recs/recs2

	CO_2	CH_4	N_2O
Natural gas combustion	lb/10^6 scf	lb/10^6 scf	lb/10^6 scf
	120,000	2.3	2.2

Source: EPA AP-42 Vol I Chapter 1.4, Table 1.4-2

Solid Waste Emissions Worksheet

Total Square Footage - Food Stores	55000
Disposal Rate (dry short tons/sq. ft./year)	0.0108
Retail Waste (Dry Short Tons/Year)	594
Total Square Footage - Retail	30000
Disposal Rate (dry short tons/sq. ft./year)	0.0024
Retail Waste (Dry Short Tons/Year)	72
Total Residents	233
Disposal Rate (pounds/person/day)(2)	5
Residential Waste (Dry Short Tons/Year)	213
Total Waste (Dry Short Tons/Year)	880
CO_2e Tonnes/Year	1100
Dry Short Tons/Wet Short Tons of MSW	0.84
MTCE/Wet Short Ton of MSW (4)	0.272
Tonnes of CO_2e/Wet Short Ton of MSW	1.007

(1) California Integrated Waste Management Board, 2009. Estimated Solid Waste Generation Rates for Commercial Establishments. Available at http://www.ciwmb.ca.gov/wastechar/wastegenrates/Commercial.htm.

(2) California Integrated Waste Management Board, 2009. Estimated Solid Waste Generation Rates for Institutions. Available at http://www.ciwmb.ca.gov/wastechar/wastegenrates/Institution.htm

(3) U.S. Environmental Protection Agency. 2006. *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks*, Exhibit 6-4. September.

(4) U.S. Environmental Protection Agency. 2006. *Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks*, Exhibit 6-6. September.

Vehicle Emissions Worksheet

avg. speed=	35	(mph)	avg trip length=	10	(miles)
2013		**CO_2**	**CH_4**	**N_2O**	**Fleet %**
LDA	CAT	307.422	0.016	0.032	69.3%
LDA	DSL	357.501	0.006	0.001	0.4%
LDT	CAT	385.614	0.022	0.042	27.0%
LDT	DSL	348.512	0.004	0.002	0.4%
HDT	CAT	503.539	0.0584	0.088	1.2%
HDT	DSL	945.332	0.0112	0.005	1.7%
Composite		342.096	0.018	0.035	100.0%

Notes:

CO_2 and CH_4 from EMFAC2007

N_2O from EPA *Update of Methane and Nitrous Oxide Emission Factors for On-Highway Vehicles*, November 2004, Table 28.

Fleet percentages from URBEMIS2007

	From URBEMIS2007		
	Vehicle Categories	Fleet %	Diesel %
LDA	Light Auto	53.7	0.2
	Light Truck < 3750 lbs	12.8	2.3
LDT	Light Truck 3751-5750 lbs	19.9	0
	Med Truck 5751-8500 lbs	6.6	0
HDT	Lite-Heavy Truck 8501-10,000 lbs	0.9	22.2
	Lite-Heavy Truck 10,001-14,000 lbs	0.6	50
	Med-Heavy Truck 14,001-33,000 lbs	1	80
	Heavy-Heavy Truck 33,001-60,000 lbs	0.4	100
LDT	Other Bus	0.1	100
	Urban Bus	0.1	100
LDA	Motorcycle	3.2	0
LDT	School Bus	0.1	100
	Motor Home	0.6	16.7
		100	