

APPENDIX E
MEMORANDUM FROM MICHAEL BRANDMAN ASSOCIATES ON
GREENHOUSE GAS EMISSIONS MITIGATION MEASURE
ANALYSIS FOR ROCKLIN COMMONS



Memo

Date: November 4, 2009

To: Hal Bear Enterprises

From: Dave Mitchell, Air Quality Services Manager

Subject: **Greenhouse Gas Emissions Mitigation Measure Analysis for Rocklin Commons**

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Michael Brandman Associates (MBA) has reviewed the mitigation measures proposed for the Rocklin Commons project and identified several measures that although included in the project have no percentage reduction identified in the CAPCOA mitigation measure list. MBA has identified ways to quantify the potential reductions from these measures that are described below.

Methodology

Water Savings: The project includes a number of water saving features that are expected to reduce water consumption by at least 20%. Water transport and treatment is a large consumer of electric power. MBA utilized a power consumption rate per million gallons of water provided in the California Energy Commission Public Interest Energy Research Program Report, Refining Estimates of Water-Related Energy Use in California, December 2006 for Northern California's water system to determine the power consumption required to provide the estimated project water use of 105 acre feet per year. The following table provides the energy and emission calculations for water transport and savings:

Water Transport										
Greenhouse Gas	Emission Factor (pounds per MWh)	Project Water Use (Acre Feet/Year)	Project Water Use (millions of gallons)	Electricity Water Factor (KWh/MG)	Project Water Electricity Use (KWh)	Emissions (pounds/year)	Emissions (tons/year)	Emissions (metric tons/year)	Global Warming Potential	CO2e (metric tons/yr)
Carbon dioxide	724.12	105	342.14355	5411	1851338.749	1,340,591	670	608.09	1	608.09
Methane	0.00302	105	342.14355	5411	1851338.749	6	0.00	0.00	21	0.05
Nitrous oxide	0.0081	105	342.14355	5411	1851338.749	15	0.01	0.01	310	2.11
Total CO2e										610.25

	Emissions from Water Transport (CO2e metric tons/yr)	Water Use Reduction (%)	Emission Reduction CO2e (metric tons/yr)
Emission Reduction from 20% Reduction in Water Consumption	610.25	0.2	122.05

Convert Tons to Metric Tonnes by multiplying Tons by 0.9072
 Electricity water factor from: California Energy Commission Public Interest Energy Research Program Report, Refining Estimates of Water-Related Energy Use in California, December 2006
 Greenhouse gas emission factors from CCAR General Reporting Protocol Ver 3.1, January 2009
 Water use rate of 105 acre feet per year from the Project Draft EIR

Project emission reduction measures:

- Water efficient fixtures/appliances including:
 - Low flow faucets and toilets
 - Sensor operated faucets
- Water efficient drought tolerant landscaping
- Smart Water Management weather based irrigation controls

MBA estimated that the project would achieve at least a 20% water consumption reduction in comparison with the water consumption estimated in the project EIR. The amount of water reported in the EIR would be considered business as usual. The water rate used in the EIR uses a generic commercial use factor that does not account for recent regulations. Therefore,

reductions to comply with any current regulation would be subtracted from the baseline. The reductions in this analysis are based on the following data:

- Estimates from the Draft EIR that low flow devices would reduce water usage by up to 84% for low flow faucets and 20% for sensor controlled units¹.
- A sustainability assessment prepared for Claremont College (Environmental Audit of the Claremont Colleges - A Claremont Colleges Sustainability Initiative)² provided estimated water savings from conversions to drought tolerant plants on the Harvey Mudd Campus. The analysis stated that drought tolerant landscaping uses 78.8% less water than typical plants such as ivy or jasmine based on the following water consumption:
 - Landscape turf: 1.97 ft/year
 - Ivy or jasmine 1.56 ft/year (20.8% less than turf)
 - Drought tolerant landscape: 0.33 ft/year (78.8% less than ivy or jasmine)

The project's landscape plan will be prepared by landscape architect meeting the requirements of the Water Conservation in Landscaping Act. (Cal. Gov't Code, § 65591, et seq.) With the combination of interior water savings of 20 to 84 percent and savings from drought tolerant landscaping and smart irrigation system of 21 to 79 percent, MBA concluded that an overall reduction of 20 percent would provide a conservative estimate of project water reductions.

Parking Lot Shading: The project will plant trees in the project parking lots that are expected to provide 50% coverage within 10 years as described in CAPCOA mitigation measure T-14 – Parking Area Tree Cover. The measure description indicates that this measure will achieve an annual net CO₂ reduction of 3.1 kg/m³ of canopy/year. The following calculations use this rate to determine an emission reduction for the project.

Emission reductions from Tree Canopy

SF/Acre	43560
Parking Area (Acres)	30.14
Parking Area (Square Feet)	1312898
Meters/SF	0.0929
Parking Area (Square Meters)	121968.3
50% canopy (square meters)	60984.13
Emission Reduction Rate (kg CO ₂ /m ²)	3.1
Emission Reduction (kg CO ₂)	189050.8
Convert to Lbs (2.2 lbs/kg)	2.2
Reduction in Lbs CO ₂ /yr	415911.8
Reductions in tons CO ₂ /yr	207.9559
Reductions in metric tons CO ₂ /yr	188.6576

Based on the CAPCOA reduction rate of 3.1 kilogram of CO₂ per square meter of coverage, parking lot shading proposed for the project would result in a CO₂ emission reduction of 188.7 metric tons per year.

¹ See Mitigation Measure GCC-1, Draft EIR, p. 6-48.

² Claremont Colleges Sustainability Team (Audit conducted during the Summer 2007, Final report completed October 16, 2007), "Sustainability Audit of the Campuses of the Claremont Colleges," Appendix B, <http://sustainability.claremont.edu/audit/index.html>.

Exceed Title 24 Insulation Requirement by 5 Percent: The project will exceed Title 24 insulation requirements to achieve a 5% reduction in building energy consumption for heating, cooling, and ventilation (HVAC). MBA used the California Energy Commission California Commercial End-Use Survey March 2006 estimates for energy consumption by end use for commercial development to isolate the power requirements and CO₂ emissions for only HVAC purposes. Project power requirements for the 415,000 square foot project are 9,213 kWh/year based on an Energy Information Agency electricity consumption rate of 22.3 kWh per square foot for enclosed and strip malls. The results of this analysis are as follows:

Project Electricity Use and CO₂ Emissions by End Usage

	Percent ¹	Project Energy Use ² (MWh/yr)	Weighted by End Use (MWh/yr)	CO ₂ Emissions ³ (lbs/MWh)	CO ₂ (lbs/year)	CO ₂ (tons/year)
Heating	1.6	9213	147.408	724.12	106741.1	53.4
Cooling	14.9	9213	1372.737	724.12	994026.3	497.0
Ventilation	11.9	9213	1.96.347	724.12	793886.8	396.9
Refrigeration	13.4	9213	1234.542	724.12	893956.6	447.0
Water Heating	0.9	9213	82.917	724.12	60041.9	30.0
Cooking	4.2	9213	386.946	724.12	280195.3	140.1
Interior Lighting/daylighting	28.7	9213	2644.131	724.12	1914668.1	957.3
Exterior Lighting	5.8	9213	534.354	724.12	386936.4	193.5
Office Equipment	7.2	9213	663.336	724.12	480334.9	240.2
Miscellaneous	5.8	9213	534.354	724.12	386936.4	193.5
Process	0.3	9213	27.639	724.12	20014.0	10.0
Motors	4.3	9213	396.159	724.12	286866.7	143.4
Air Compressors	1	9213	92.13	724.12	66713.2	33.4
Total	100		9213	724.12	6671317.6	3335.7

¹ Project end use percentages for commercial uses: California Energy Commission, California Commercial End-Use Survey March 2006 (CEC-400-2006-005), Table 8-6: All Commercial Electric EUIs, Fuel Shares, and EIs
² Project energy use rates from Energy Information Administration (EIA) 2003 CBECS Detailed Tables - Table C14A Electricity Consumption and Expenditure Intensities, Energy Use for Mercantile - Enclosed and Strip Malls = 22.3 kWh/sq. ft.
 Project energy use: 22.3 kWh/sq. ft. x 415,000 sq. ft. = 9,213,000 kWh/1000 = 9,213 MWh
³ CO₂ emission factor for electricity generation from CCAR General Reporting Protocol Ver 3.1, January 2009

The total CO₂ emissions from Heating, Ventilation, and Cooling from the above table are as follows:

- Heating: 53.4 tons/year
- Cooling: 497.0 tons/year
- Ventilation: 396.9 tons/year
- Total: 947.3 tons/year.

A 5 percent improvement in energy efficiency from improved insulation would result in a commensurate 5% reduction in energy consumption used for heating, cooling, and ventilation. This equates to a CO₂ reduction of:

$947.3 \text{ tons/year} \times 0.05 = 47.36 \text{ tons/year}$ or 42.97 metric tons/year.

Reduction Summary: Based on the total project unmitigated CO₂ emissions of 19,400 metric tons/year CO₂e identified in the Draft EIR at page 6-29, the three measures described above would result in the following total emission reduction:

Water Transport: 122.05 metric tons/year (0.63 percent reduction)

Parking Lot Shading: 188.7 metric tons/year (0.97 percent reduction)

Exceed Title 24 Insulation by 5%: 42.97 metric tons/year (0.22 percent reduction)

The total reduction from these three measures is 353.72 metric tons/year, which would provide a 1.82 percent overall reduction in project emissions.
