November 9, 2010 (Revised)

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RE: **Air Quality Green House Gas Analysis TTM 34760**

The purpose of this Green House Gas Assessment (GHG) is to show substantial conformance to the California Global Warming Solutions Act of 2006 (AB32), which requires that by 2020 the state's greenhouse gas emissions be reduced to 1990 levels.

The proposed (TTM 34760) development project seeks to develop approximately 34 single family residential parcels with Open Space on an approximate 64 acre site located within the City of Corona and the County of Riverside. The project applicant is also seeking to annex the portion of the project located within the County of Riverside.

AB 32 in its entirety can be viewed at http://www.arb.ca.gov/cc/ab32/ab32.htm. The pertinate sections of this law are identified below:

Section 38560.5 states:

(A) On or before June 30, 2007, the state board shall publish and make available to the public a list of discrete early action greenhouse gas emission reduction measures that can be implemented prior to the measures and limits adopted pursuant to Section 38562.

(B) On or before January 1, 2010, the state board shall adopt regulations to implement the measures identified on the list published pursuant to subdivision (a).

Section 38562 states:

(A) On or before January 1, 2011, the state board shall adopt greenhouse gas emission limits and emission reduction measures by regulation to achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions in furtherance of achieving the statewide greenhouse gas emissions limit, to become operative beginning on January 1, 2012.

(B) In adopting regulations pursuant to this section and Part 5 (commencing with Section (38570), to the extent feasible and in furtherance of achieving the statewide greenhouse gas emissions limit, the state board shall do all of the following:

(1) Design the regulations, including distribution of emissions allowances where appropriate, in a manner that is equitable, seeks to minimize costs and maximize the total benefits to California, and encourages early action to reduce greenhouse gas emissions.

(2) Ensure that activities undertaken to comply with the regulations do not disproportionately impact low-income communities.

(3) Ensure that entities that have voluntarily reduced their greenhouse gas emissions prior to the implementation of this section receive appropriate credit for early voluntary reductions.

(4) Ensure that activities undertaken pursuant to the regulations complement, and do not interfere with, efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminant emissions.

(5) Consider cost-effectiveness of these regulations.

(6) Consider overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health.

(7) Minimize the administrative burden of implementing and complying with these regulations.

(8) Minimize leakage.

(9) Consider the significance of the contribution of each source or category of sources to statewide emissions of greenhouse gases.

c. In furtherance of achieving the statewide greenhouse gas emissions limit, by January 1, 2011, the state board may adopt a regulation that establishes a system of market-based declining annual aggregate emission limits for sources or categories of sources that emit greenhouse gas emissions, applicable from January 1, 2012, to December 31, 2020, inclusive, that the state board determines will achieve the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions, in the aggregate, from those sources or categories of sources.

d. Any regulation adopted by the state board pursuant to this part or Part 5 (commencing with Section 38570) shall ensure all of the following:

1. The greenhouse gas emission reductions achieved are real, permanent, quantifiable, verifiable, and enforceable by the state board.

2. For regulations pursuant to Part 5 (commencing with Section 38570), the reduction is in addition to any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission reduction that otherwise would occur.

3. If applicable, the greenhouse gas emission reduction occurs over the same time period and is equivalent in amount to any direct emission reduction required pursuant to this division.

The Climate Change Scoping plan lists the discrete early action greenhouse gas emission reduction measures, which will be enforceable January 1, 2010 (Climate Change Scoping Plan – California Air Resource Board – December 2008). The Board adopted nine discrete early action items which identified within the Scoping plan however, none of the discretionary measures relate to the project at hand. The nine measures are identified below:

Table 1: Scoping Plan Discrete Early Action Items

Row #	Scoping Plan Measure	Measure #	Page #
1	Ship Electrification at Ports	T-5	C-66
2	Limit High GWP Use in Consumer Products	H-4	C-179
3	Heavy-Duty Vehicle GHG Emission Reduction	T-7	C-73
4	Motor Vehicle Air Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Servicing	H-1	C-175
5	SF6 Limits in Non-Utility and Non-Semiconductor Applications	H-2	C-176
6	Reduction of Perfluorocarbons in Semiconductor Manufacturing	H-3	C-177
7	Tire Pressure Program	T-4	C-63
8	Low Carbon Fuel Standard	T-2	C-64
9	Landfill Methane Control Measure	RW-1	C-160

Additionally, as stated in section 38562-A of AB 32, the state board shall adopt greenhouse gas emission limits and emission reduction measures before January 1, 2011 and enforce these measures starting January 1, 2012. Currently, greenhouse gas emission limits for residential project such as the proposed project have not been adopted, however, Section 38562-B-3 encourages projects producing large quantities of GHGs to voluntarily identify greenhouse gas reductions and receive appropriate credit for early voluntary reductions.

The City of Corona suggests using a maximum threshold of 3,000 metric tons of GHGs, and requires all projects producing more than 3,000 metric tons would be required to provide reduction measures to reduce GHGs by at least 25%. Furthermore, all projects should try to

reach 25% from business as usual but is not mandatory. It should be noted that the City of Corona's significance thresholds for GHGs are in draft form, however, the 3,000 metric ton screening thresholds and a 25% reduction from business as usual can be utilized under CEQA.

Greenhouse Gasses contributed from the proposed project are Carbon Dioxide (CO_2), Methane (CH_4), and Nitrous Oxide (N_2O). For purposes of analysis, both CH_4 and N_2O can be converted to an equivalent amount of CO_2 (CO_2e) by multiplying the calculated levels of CH_4 and N2O by a Global Warming Potential (GWP). The U.S. Environmental Protection Agency publishes GWPs for various GHGs and reports that the GWP for CH_4 and N_2O is 21 and 310 respectively.

CO_2e emissions generated from the project include vehicular offsite contributions as well as onsite area emissions from combustion activities utilizing natural gas and indirect electricity use. However, the largest source of CO_2e is produced from the projects vehicular trip generation. The best way to reduce these emission levels would be to reduce vehicular miles traveled, reduce fossil fuel burning vehicles and improve the fuel efficiency of vehicles.

Offsite Project Related Vehicular Usage

It can be expected that government agencies through mandates and regulations will effectively reduce the carbon footprint of vehicles in the future. For example, the Energy Independence and Security Act of 2007 will require automakers to boost fleet wide gas mileage averages from the current 25 mpg to 35 mpg by 2020, which will reduce energy needs by 40%.

GHGs generated from project related offsite vehicular sources can be calculated by utilizing the assumption that the average one-way trip distance could be as high as 20-miles and that there could be as many as 340 daily trips (Source: Air Quality Conformity Assessment – TPM 34760 – Investigative Science and Engineering – May 22, 2008). Simply multiplying 340 daily trips by 20-miles per trip yields approximately 6,800 miles per day. Multiplying 6,800 per day by 365 days yields would identify that the project would be expected create 2,482,000 vehicle miles traveled each year and use 99,280 gallons of fuel each year or 2,482,000 Miles/ 25 mpg.

Utilizing methodologies within the California Climate Action Registry General Reporting Protocol Version 3.1- January 2009 (CCARGRPV3.1), CO_2, CH_4, and N_2O from vehicular travel can be estimated utilizing equations III.7c and Table C.3 the following equations within the CCARGRPV3.1 document:

Equation III.7c (CO_2)

$$CO2(Metric\ Tons) = Fuel\ Consumed(Gal) \times 8.81\ \left(\frac{kg\ CO2}{Gal}\right) \times .001(\frac{Metric\ ton}{kg})$$

Equation III.7d (CH_4)

$$NH4(Metric\ Tons) = Emission\ Factor\ \left(\frac{g}{mile}\right) \times Annual\ Mileage \times .000001(\frac{Metric\ ton}{g})$$

Equation III.7d (N_2O)

$$NO2(Metric\ Tons) = Emission\ Factor\ \left(\frac{g}{mile}\right) \times Annual\ Mileage \times .000001(\frac{Metric\ ton}{g})$$

A conservative estimate for the average vehicle fleet age for the proposed project could be estimated as the average between the year 2,000 and present and could assume to have a 50/50 mix between passenger vehicles and light duty trucks. Table 2 below calculates the Total Metric Tons of N_2O. Table 2 below:

Table 2: 2010 Total GHG Emissions (Mobile Vehicular Traffic)

GHG	Emission Factor		Average Emission Factor	Equation	Total (Metric Tons)	GWP	CO_2e (Metric Tons)
CO_2	8.81 (kg CO_2/gallon)		8.81	III.7c	8.81 * 99,280 *.001= 874.7	1	874.7
CH_4	Passenger Vehicle	.0178 (g/mile) - year 2000	.0432	III.7d	.0432 * 2.482e6 * 1e-6 = 0.10722	21	2.2516
		.1047 (g/mile) - Present					
	Light Duty Truck	.0346 (g/mile) – Year 2000					
		.0157 (g/mile) - Present					
N_2O	Passenger Vehicle	.0273 (g/mile) - year 2000	.0269	III.7d	.0269 * 2.482e6 * 1e-6 = 0.0668	310	20.69
		.0079 (g/mile) - Present					
	Light Duty Truck	.0621 (g/mile) – Year 2000					
		.0101 (g/mile) - Present					
Total							897.64

Indirect Electricity Usage

CO_2 generated from offsite sources in the production of electricity is much more difficult to mitigate however, taking steps to become more energy efficient and utilizing renewable non-carbon based energy sources can reduce a projects CO_2e footprint.

The environmental protection agency and the US department of Energy recommend building homes and habitable areas to achieve energy star compliance. as they are at least 15% more energy efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20–30% more efficient than standard homes (Source: www.energystar.gov).

Utilizing methodologies within the CCARGRPV3.1, CO_2, CH_4, and N_2O from electricity use can be calculated utilizing equations III.6B and Table C.2. Based upon South Coast Air Quality Management District's CEQA Air Quality Handbook (1993) the average Electricity Usage for a single-family residential unit per year is 5,626.5 KWh. Therefore, the proposed project would be expected to use 201,076 total KWh. The equivalent CO_2 emissions are calculated in Table 3 below.

Table 3: Total GHG Emissions Factors (Electricity Usage)

GHG	Emission Factor (eGRID Subregion WECC California (lbs/KWh)	Energy Usage (KWh)	Conversion lbs/metric ton	Total (Metric Tons)	GWP	CO_2e (Metric Tons)
CO_2	0.724	191,301	2204.62	62.823491	1	62.82349
CH_4	0.0000302	191,301	2204.62	0.0026205	21	0.055031
N_2O	0.0000081	191,301	2204.62	0.0007029	310	0.217886
Total						63.1

Project Related Natural Gas Usage

Utilizing methodologies within the CCARGRPV3.1, CO_2, CH_4, and N_2O from Natural Gas usage can be calculated utilizing equations III.8B and Table C.7. Based upon South Coast Air Quality Management District's CEQA Air Quality Handbook (1993) the average natural gas usage for a single family residential unit is 6,665 Cubic Feet/Unit/Month KWh. Therefore, the proposed project would be expected to use 2,719,320 Cubic Feet per year. Additionally, because

1MMBtu is equivalent to 1000 Cubic Feet of gas the project would yield 2,719.32 MMBtu of natural gas per year. The equivalent CO_2 emissions are calculated in Table 4 below.

Table 4: Total GHG Emissions Factors (Natural Gas Usage)

GHG	Emission Factor kg/MMBtu	Natural Gas Usage (MMBtu)	Conversion metric ton/kg	Total (Metric Tons)	GWP	CO_2e (Metric Tons)
CO_2	53.060	2719.32	0.001	144.29	1	144.29
CH_4	0.0050	2719.32	0.001	0.01360	21	0.29
N_2O	0.00010	2719.32	0.001	0.00027	310	0.08
Total						144.66

Based upon our analysis of daily operation activities for the proposed development, the proposed project would most likely produce 1105.4 metric tons of CO_2e and would require mitigation to show compliance with AB32.

Mitiagtion Measures

Offsite Vehicular Reductions

Political mitigation measures such as the Security Act of 2007 (Which will require automakers to boost fleet wide gas mileage averages from the current 25 mpg to 35 mpg by 2020) will reduce energy needs for these vehicles by up to 40%. Additionally, we can assume emission Factors will be equal or less than present requirements in the year 2020. This reduction would be expected to reduce project related CO_2e by 264.14 tons or 29.4% per year (See Table 5 below).

Table 5: Year 2020 Total GHG Emissions (Mobile Vehicular Traffic)

GHG	Emission Factor		Average Emission Factor	Equation	Total (Metric Tons)	GWP	CO_2e (Metric Tons)
CO_2	8.81 (kg CO_2/gallon)		8.81	III.7c	8.81 * 70,914 *.001= 624.75	1	625.75
CH_4	Passenger Vehicle	.1047 (g/mile) - Present.	.0152	III.7d	.0152 * 2.482e6 * 1e-6 = 0.0377	21	.8299
		<.1047 (g/mile) – Future 2020					
	Light Duty Truck	.0157 (g/mile) - Present					
		.0157 (g/mile) – Future 2020					
N_2O	Passenger Vehicle	.0079 (g/mile) - Present	.009	III.7d	.009 * 2.482e6 * 1e-6 = 0.0223	310	6.925
		<.0079 (g/mile) – Future 2020					
	Light Duty Truck	.0101 (g/mile) - Present					
		<.0101 (g/mile) – Future 2020					
2020 Total							633.50
2010 Total from Table 2 Above							897.64
%Reduction							29.4%

Indirect Electricity and Natural Gas Mitigation Measures

It is recommended that each residential unit achieve energy star compliance, as they would consume only 85% of the business as usual energy requirements. Once building permits are requested, the City of Corona should verify that design would meet the EPA's energy star compliance guidelines.

Based upon the following voluntary measures, it would be expected that the proposed mitigation and reduction credits would reduce CO_2e for both natural gas and electricity levels by 31.16 tons.

Mitigation Measure Summary

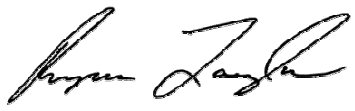
Combining all the mitigation measures, it would be expected that the proposed mitigation and reduction credits would reduce CO_2e from the project by 295.29 metric tons and would overall reduce the projects emissions from business as usual by 26.7 % which will meet the requirements of CEQA as currently defined. Table 6 below summarizes these mitigation measures.

Table 6: Year 2020 Total GHG Emissions

	(Tons per Year)	Mitigation Measure	Reduction Factor (%)	CO_2e Reduction	Total (Tons per Year) by 2020
Offsite Vehicular CO_2e Emissions	897.64	Political measure adopted and requires automakers to increase the fleet averages of vehicles from 25 MPH to 35 MPH by 2020	-	-264.14	633.5
Indirect Electricity Usage	63.1	Meet Energy Star Compliance Requirements for all buildings	15%	-9.46	53.63
Natrual Gas Usage	144.66	Meet Energy Star Compliance Requirements for all buildings	15%	-21.69	122.97
Total	1105.4			-295.29	810.1
Combined CO_2e Reduction (%)	-	-	-	-	**26.7**

Mitigation measures within this report should be verified by the City of Corona before issuance of building permits. Should you have any questions, please contact me.

Regards,



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