Greenhouse Gas Spreadsheets
for the Hesperia General Plan Update
Environmental Impact Report
City of Hesperia, California

Prepared by:

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May 19, 2010

Summary of Greenhouse Gas Inventory
City of Hesperia + Sphere of Influence (Existing and Proposed GP Change)
Prepared by Michael Brandman Associates

Business as Usual Emissions (MTCO2e/year)

Activity	2009	2020	2030
Transportation: Cars, light and medium du	0	733	1,227
Transportation: Heavy duty trucks	0	736	1,233
Transportation: Other	0	27	46
Natural Gas	0	3,300	5,509
Electricity	0	695	1,327
Solid Waste	0	145	277
Hearth	0	35	67
Refrigerants	0	1,986	3,313
Total	**0**	**7,658**	**12,998**
Population (City + Sphere)	0	526	1,005

Assumptions

City of Hesperia (Difference between Proposed and Existing General Plan)

Prepared by Michael Brandman Associates

Year	2005	% in 2009	2009	2020	2030
Population (City + Sphere)			0	526	1,005
SFR (City)		89%			
MFR (City)		11%			
SFR (City + Sphere)				96	184
MFR (City + Sphere)				12	23
Total Units			0	108	207
Commercial, Industrial, Office (sq. ft)	-		-	1,434,500	2,390,834
Office (sq. ft)	-		-	-	
Commercial/Retail (sq. ft)	-		-	1,807,958	3,013,263
Industrial (sq. ft)	-		-	(373,457)	(622,429)

Abbreviations:
SFR = single family residential, MFR = multi family residential, SOI = sphere of influence
EIR = Environmental Impact Report for the City of Hesperia General Plan Update (2010)

Commercial/retail square feet was estimated by assuming a floor area ratio of 0.25 applied to 276.7 acres
Industrial square feet was estimated by assuming a floor area ratio of 0.33 (the average) applied to 43.3 acres
The acreage is from Table 2-2 of the EIR for the Hesperia General Plan Update

It is assumed that the proposed General Plan would have 276.7 more acres of commercial, 44.3 fewer acres of industrial, 207 more dwelling units, and 1005 more people

Electricity - Indirect Emissions

Project: City of Hesperia
Prepared by: Michael Brandman Associates
Prepared on: 4/27/2010

2007 and 2009 Electricity: City of Hesperia (not including sphere of influence)

Rate Group	2007 Electricity Use (kWh/year)	2009 Electricity Use (kWh/year)	2009 Percentage
Time of use agricultural pumping	28,203,637	25,431,749	7%
Domestic	211,472,892	205,309,988	58%
General service non demand (GS-1)	24,971,913	23,633,195	7%
General service demand (GS-2)	60,725,631	58,163,740	16%
Street lighting	6,048,440	6,510,808	2%
Time of use general service (TOU-GS)	29,226,347	33,810,940	10%
Total (kWh/year)	**360,648,860**	**352,860,420**	
Total (MWh/year)	**360,649**	**352,860**	

Greenhouse Gas	Emission Factor (pounds per MWh)	2009 Emissions (pounds/year)	2009 Emissions (tons/year)	2009 Emissions (MTCO2e/year)
Carbon dioxide	724.12	255,513,287	127,757	115901
Methane	0.0302	10656	5.33	102
Nitrous oxide	0.0081	2858	1.43	402
Total: City only		*255,526,802*	*127,763*	*116,404*
Population: City only				*88,184*
Per capita emissions in 2009 (MTCO2e/person/year)				*1.32*

Interpolation Based on Per Capita City Emissions in 2009

Area	Year	Estimated Population	MTCO2e/year
City + Sphere	2009	0	0
City + Sphere	2020	526	695
City + Sphere	2030	1,005	1,327

Notes:

Emission factor source: California Climate Action Registry. General Reporting Protocol. Reporting Entity-Wide Greenhouse Gas Emissions. Version 3.1, January 2009. Table C.2
www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf

Electricity use source for 2007: Southern California Edison. Electricity Use Report for Hesperia, Year 2007. Version 5.0. April 26, 2010.

Electricity source for 2009: Southern California Edison. Electricity Use Report for Hesperia, Year 2009. Version 5.0. April 26, 2010. Summary of Results, Table C, January 1, 2009 - December 31, 2009

Natural Gas Combustion

Industrial
City of Hesperia Greenhouse Gas Inventory
Prepared by Michael Brandman Associates

Year	Gas	Type of Land Use	Square Feet	Annual Natural Gas Usage Factor* (kBTU/sf)	Natural Gas Usage for Project (MMBTU/year)	Emission Factor (kg/MMBTU)**	Emissions (kg/year)	Emissions (tons/year)	Emissions (MTCO2e/year)
2009	Methane	All warehouses	0	3.44	0	0.005	0	0.000	0
	Nitrous Oxide	All warehouses	0	3.44	0	0.0001	0	0.0000	0
	Carbon Dioxide	All warehouses	0	3.44	0	71.42	0	0	0
	Total								***0***
2020	Methane	All warehouses	-373457.3	3.44	-1285	0.005	-6	-0.007	0
	Nitrous Oxide	All warehouses	-373457.3	3.44	-1285	0.0001	0	-0.0001	0
	Carbon Dioxide	All warehouses	-373457.3	3.44	-1285	71.42	-91753	-101	-92
	Total								***-92***
2030	Methane	All warehouses	-622428.8	3.44	-2141	0.005	-11	-0.012	0
	Nitrous Oxide	All warehouses	-622428.8	3.44	-2141	0.0001	0	-0.0002	0
	Carbon Dioxide	All warehouses	-622428.8	3.44	-2141	71.42	-152921	-168	-153
	Total								***-153***

Greenhouse Gas	Global Warming Potentials
Methane	21
Nitrous Oxide	310
Carbon Dioxide	1

* Natural gas usage: Table E-1 from California Energy Commission. California Commercial End-Use Survey. Consultant Report. March 2006. CEC-400-2006-005

** Emission factors: Table C.8 from California Climate Action Registry, General Reporting Protocol. Version 3.1, January 2009. www.climateregistry.org/tools/protocols/general-reporting-protocol.html

Table E-1: Overview of Energy Usage in the Statewide Service Area

Building Type	Floor Stock (kft^2)	Annual Energy Intensities			Total Annual Usage	
		Electricity (kWh/ft^2)	Natural Gas (therms/ft^2)	Natural Gas (kBtu/ft^2)	Electricity (GWh)	Natural Gas (Mtherms)
All Commercial	4,920,114	13.63	0.26	25.99	67077	1278.60
Small Office (<30k ft^2)	361,584	13.10	0.11	10.54	4736	38.10
Large Office (>=30k ft^2)	660,429	17.70	0.22	21.93	11691	144.80
Restaurant	148,892	40.20	2.10	209.96	5986	312.60
Retail	702,053	14.06	0.05	4.62	9871	32.50
Food Store	144,209	40.99	0.26	27.60	5911	39.80
Refrigerated Warehouse	95,540	20.02	0.06	5.60	1913	5.30
Unrefrigerated Warehouse	554,166	4.45	0.03	3.07	2467	17.00
School	445,106	7.46	0.16	15.97	3322	71.10
College	205,942	12.26	0.34	34.24	2524	70.50
Health	232,606	19.61	0.76	75.53	4561	175.70
Lodging	270,044	12.13	0.42	42.40	3275	114.50
Miscellaneous	1,099,544	9.84	0.23	23.34	10817	256.60
All Offices	1,022,012	16.08	0.18	17.90	16430	182.90
All Warehouses	649,706	6.74	0.03	3.44	4380	22.40

Natural Gas Combustion

Commercial and Office
City of Hesperia Greenhouse Gas Inventory
Prepared by Michael Brandman Associates

Year	Gas	Type of Land Use	Square Feet	Annual Natural Gas Usage Factor* (kBTU/sf)	Natural Gas Usage for Project (MMBTU/year)	Emission Factor (kg/MMBTU)**	Emissions (kg/year)	Emissions (tons/year)	Emissions (MTCO2e/year)
2009	Methane	All commercial	0	25.99	0	0.005	0.0	0.000	0
	Nitrous Oxide	All commercial	0	25.99	0	0.0001	0.0	0.0000	0
	Carbon Dioxide	All commercial	0	25.99	0	71.42	0	0	0
	Total								***0***
2020	Methane	All commercial	1807957.8	25.99	46989	0.005	234.9	0.258	5
	Nitrous Oxide	All commercial	1807957.8	25.99	46989	0.0001	4.7	0.0052	1
	Carbon Dioxide	All commercial	1807957.8	25.99	46989	71.42	3355942	3692	3349
	Total								***3355***
2030	Methane	All commercial	3013263	25.99	78315	0.005	391.6	0.431	8
	Nitrous Oxide	All commercial	3013263	25.99	78315	0.0001	7.8	0.0086	2
	Carbon Dioxide	All commercial	3013263	25.99	78315	71.42	5593236	6153	5582
	Total								***5592***

Greenhouse Gas	Global Warming Potentials
Methane	21
Nitrous Oxide	310
Carbon Dioxide	1

* Natural gas usage: Table E-1 from California Energy Commission. California Commercial End-Use Survey. Consultant Report. March 2006. CEC-400-2006-005

** Emission factors: Table C.8 from California Climate Action Registry, General Reporting Protocol. Version 3.1, January 2009.
www.climateregistry.org/tools/protocols/general-reporting-protocol.html

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		Electricity (kWh/ft^2)	Natural Gas (therms/ft^2)	Natural Gas (kBtu/ft^2)	Electricity (GWh)	Natural Gas (Mtherms)
All Commercial	4,920,114	13.63	0.26	25.99	67077	1278.60
Small Office (<30k ft^2)	361,584	13.10	0.11	10.54	4736	38.10
Large Office (>=30k ft^2)	660,429	17.70	0.22	21.93	11691	144.80
Restaurant	148,892	40.20	2.10	209.96	5986	312.60
Retail	702,053	14.06	0.05	4.62	9871	32.50
Food Store	144,209	40.99	0.26	27.60	5911	39.80
Refrigerated Warehouse	95,540	20.02	0.06	5.60	1913	5.30
Unrefrigerated Warehouse	554,166	4.45	0.03	3.07	2467	17.00
School	445,106	7.46	0.16	15.97	3322	71.10
College	205,942	12.26	0.34	34.24	2524	70.50
Health	232,606	19.61	0.76	75.53	4561	175.70
Lodging	270,044	12.13	0.42	42.40	3275	114.50
Miscellaneous	1,099,544	9.84	0.23	23.34	10817	256.60
All Offices	1,022,012	16.08	0.18	17.90	16430	182.90
All Warehouses	649,706	6.74	0.03	3.44	4380	22.40

Natural Gas Combustion

Residential Developments
City of Hesperia Greenhouse Gas Inventory
Prepared by Michael Brandman Associates

Global Warming Potentials	
Methane	21
Nitrous Oxide	310
Carbon Dioxide	1

Year	Gas	Units	Natural Gas Usage Factor* (therms/unit/year)	Natural Gas Usage (MMBTU/year)	Emission Factor (kg/MMBTU)**	Emissions (kg/year)	Emissions (tons per year)	Emissions (MTCO2e per year)
2009	Methane	0	471	0	0.005	0	0.0	0
	Nitrous Oxide	0	471	0	0.0001	0	0.0	0
	Carbon Dioxide	0	471	0	71.42	0	0	0
	Total							***0***
2020	Methane	108	471	511	0.005	3	0.0	0
	Nitrous Oxide	108	471	511	0.0001	0	0.0	0
	Carbon Dioxide	108	471	511	71.42	36474	40	36
	Total							***36***
2030	Methane	207	471	975	0.005	5	0.0	0
	Nitrous Oxide	207	471	975	0.0001	0	0.0	0
	Carbon Dioxide	207	471	975	71.42	69632	77	69
	Total							***70***

* California Energy Commission. Energy Almanac. California Residential Natural Gas Consumption. Average Therms in 2007, state average. http://energyalmanac.ca.gov/naturalgas/residential_natural_gas_consumption.html, Accessed April 29, 2010.

** Emission factors: Table C.8 from California Climate Action Registry, General Reporting Protocol. Version 3.1, January 2009. www.climateregistry.org/tools/protocols/general-reporting-protocol.html

Conversion factor for stationary combustion calculations from Table III.8.1 in California Climate Action Registry, General Reporting Protocol. Version 3.1, January 2009. www.climateregistry.org/tools/protocols/general-reporting-protocol.html. 1 therm of natural gas multiplied by 0.1 = MMBTU (one million British thermal units)

Fireplace Emissions
City of Hesperia + Sphere of Influence
Prepared by Michael Brandman Associates

Year	2009	2020	2030
Population	0	526	1,005
SFR	0	96	184
MFR	0	12	23

Wood Stove Assumptions	
Wood burned (cords/yr/stove)	0.49
Pounds in a cord of wood	2458
Percent noncatalytic	50%
Percent catalytic	50%

Emission Factors	CO2
Natural Gas (lbs/MMBTU)	117.6
Noncatalytic wood stove (lbs/ton fuel)	3400
Catalytic wood stove (lbs/ton fuel)	3400
Wood fireplace (lbs/ton fuel)	3400

Natural Gas Assumptions	BTU/year	MMBTU/ year
SFR	2250000	2.25
MFR	1500000	1.50

Wood Fireplace Assumptions	
Wood burned (cords/yr/fireplace)	0.22
Pounds in cord of wood (lbs)	2458

	2009 Percentage			2009			2020			2030		
Business as Usual	Wood stoves	Natural gas fireplaces	Wood Fireplaces	Wood stoves	Natural gas fireplaces	Wood Fireplaces	Wood stoves	Natural gas fireplaces	Wood Fireplaces	Wood stoves	Natural gas fireplaces	Wood Fireplaces
SFR	5%	40%	55%	0	0	0	5	39	53	9	74	101
MFR	5%	40%	55%	0	0	0	1	5	7	1	9	13
With Fireplace Ordinance												
SFR				0	0	0	0	96	0	0	184	0
MFR				0	0	0	0	12	0	0	23	0

CO2 Emissions (tons/year)	With Fireplace Ordinance			Business as Usual		
Year	**2009**	**2020**	**2030**	**2009**	**2020**	**2030**
Wood Stoves						
SFR - Noncatalytic	0	0	0	0	2	5
SFR - Catalytic	0	0	0	0	2	5
MFR - Noncatalytic	0	0	0	0	0	1
MFR - Catalytic	0	0	0	0	0	1
Natural Gas Fireplaces						
SFR	0	13	24	0	5	10
MFR	0	1	2	0	0	1
Wood Fireplaces						
SFR	0	0	0	0	24	47
MFR	0	0	0	0	3	6
Total (tons/year)	**0**	**14**	**26**	**0**	**38**	**73**
Total (MTCO2e/year)	**0**	**13**	**24**	**0**	**35**	**67**

Notes for Fireplace Emissions

SFR = single family residential dwelling unit; MFR = multi-family residential dwelling unit; MCF = million cubic feet

- Wood stove, natural gas, and fireplace assumptions from URBEMIS2007 (for San Bernardino County)
- Emission factors from URBEMIS2007
- 2009 percentage from personal conversation with City of Hesperia planning department.
- Natural gas emission factor: US EPA AP-42. Section 1.4, Natural Gas Combustion. www.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf
- If there was a fireplace ordinance prohibiting wood burning devices in new development, emissions would be reduced as shown. However, the City does not want to require an ordinance.

Fugitive Refrigerant Operating Emissions

City of Hesperia, Business as Usual

Prepared by Michael Brandman Associates

Global Warming Potentials	
Refrigerants	3785
A/C	1725

Type of Unit	Units	Type of System	Capacity of Unit (pounds)	Annual Leak Rate in percent of capacity	Emissions (pounds/year)	Emissions (tons/year)	Emissions (MTCO2e/yr)
Year 2009							
Refrigeration: Residential	-	RES	1	0.5%	0	0.00	-
Refrigeration: Commercial/Ind.	-	SRCU	122	14%	0	0.00	-
Refrigeration: Large Grocery Stores	-	LCS	2486	21%	0	0.00	-
A/C: Residential	-	RES	1	10%	0	0.00	-
A/C: Commercial	-	SU	100	11%	0	0.00	-
A/C: Industrial	-	SU	100	11%	0	0.00	-
Total					**0**	**0.00**	**-**
Year 2020							
Refrigeration: Residential	108	RES	1	0.5%	1	0.00	1
Refrigeration: Commercial/Ind.	14	SRCU	122	14%	245	0.12	421
Refrigeration: Large Grocery Stores	-	LCS	2486	21%	0	0.00	-
A/C: Residential	108	RES	1	10%	11	0.01	8
A/C: Commercial	181	SU	100	11%	1989	0.99	1,556
A/C: Industrial	(37)	SU	100	11%	-411	-0.21	(321)
Total					**2245**	**1.12**	**1,986**
Year 2030							
Refrigeration: Residential	207	RES	1	0.5%	1	0.00	2
Refrigeration: Commercial/Ind.	24	SRCU	122	14%	408	0.20	701
Refrigeration: Large Grocery Stores	-	LCS	2486	21%	0	0.00	-
A/C: Residential	207	RES	1	10%	21	0.01	16
A/C: Commercial	301	SU	100	11%	3315	1.66	2,594
A/C: Industrial	(62)	SU	100	11%	-685	-0.34	(536)
Total					**3745**	**1.87**	**3,313**

1 commercial/ind. Refrig. Unit per:	100000 square feet	1 commercial A/C unit per:	10000 square feet
1 industrial A/C unit per:	10000 square feet		

- Source for general methodology and residential A/C leak rates: U.S. Environmental Protection Agency, Climate Leaders. May 2008. Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment. EPA430-K-03-004. www.epa.gov/stateply/documents/resources/mfgrfg.pdf
- Global warming potential for refrigeration assumed to be R404a (GWP = 3300) from Forane 404a technical data sheet, April 2006, www.arkema-inc.com/tds/451.pdf; for A/C (air conditioning) assumed to be R410a (GWP = 1725).
- Assumed residential units have one refrigeration and A/C per unit.
- Annual leak rate (for all except residential A/C) in percent of capacity and capacity: California Air Resources Board. Public Hearing Notice and Related Material. Appendix B, California Facilities and Greenhouse Gas Emissions Inventory – High-Global Warming Potential Stationary Source Refrigerant Management Program www.arb.ca.gov/regact/2009/gwprmp09/refappb.pdf. Leak rates are from Table 8. Capacity is from information on pages 3 and 4 and Table 4.
- Type of System: LCS - large centralized refrigeration system; SRCU - small refrigeration condensing units; SU - small unitary air conditioning system; RES - residential.

Vehicle Emissions
Emission Inventory for City of Hesperia, CA
Prepared by Michael Brandman Associates

Total Vehicle Miles Traveled - 2008/2009

Daily rural+urban VMT in Hesperia	1,280,750	miles per day	Ref 1
Highway miles in Hesperia	24.7	miles	Ref 2
Highway miles in SB County	1,189	miles	Ref 1
% Hesperia highway miles in SB County	2.1%		
Total Daily highway VMT in SB County	35,884,050	miles per day	Ref 1
Highway daily VMT in Hesperia	745,202	miles per day	
Percent highway attributable to Hesperia	50%		
VMT in Hesperia	**1,653,351**	**miles per day**	
Annual rural+urban+highway VMT in Hesperia	603,473,150	miles per year	
% Hesperia rural+urban+highway of SB County highway	4.6%		

Assumption 1: VMT estimates in 2008 are applicable to 2009

Estimate of Vehicle Miles Traveled

Assumption 2: % Hesperia VMT to SB County is the same as % Hesperia VMT to MDAB
% Hesperia rural+urban+highway of SB County highway 4.6%

	(Ref 3)	(Ref 3)		
	MDAB VMT/day	**MDAB VMT/year**	**Hesperia VMT/day**	**Hesperia VMT /year**
2020	44,739,000	16,329,735,000	2,061,341	752,389,579
2030	54,122,000	19,754,530,000	2,493,661	910,186,387

EMFAC2007 BURDEN Calculations of Emissions and VMT for the MDAB - 2009 Ref 3

Pollutant	**MDAB Emissions (tons/day)**	**2009 MDAB VMT/day**	**Emission Factor (grams/mile)**
CO2	24770	33,821,000	665
CH4	1.89	33,821,000	0.05

Percentage of Emissions Based on Population difference - Existing and Proposed GP

	2009	2020	2030
Total Population	102896	176527	243465
Increase (GP)	0	526	1,005
Percent change	0.00%	0.30%	0.41%

On-road Vehicle Exhaust Emissions
(total emissions multiplied by the percent change)

Pollutant	**2009 (tons/year)**	**2020 (tons/year)**	**2030 (tons/year)**
CO2	-	1,643	2,752
CH4	-	0.13	0.21
N2O	-	0.011	0.019
Total	-	*1,643*	*2,752*
Total (MTCO2e)	-	*1,496*	*2,506*

Emissions per Vehicle Class (MTCO2e)

(Ref 4)

%	Vehicle Class	2009	2020	2030
20%	Automobiles	-	301	505
20%	Light Duty Trucks	-	304	508
9%	Medium Duty Trucks	-	128	214
49%	Heavy Duty Trucks	-	736	1,233
2%	Other	-	27	46
	Total	-	*1,497*	*2,506*

References for Vehicle Emissions Spreadsheet

Reference 1: California Department of Transportation, 2009. 2008 California Public Road Data; http://www.dot.ca.gov/hq/tsip/hpms/hpmslibrary/hpmspdf/2008PRD.pdf

Reference 2: Google Earth highway lengths in the City of Hesperia and Sphere of Influence

Reference 3: EMFAC2007 BURDEN Model for the Mojave Desert Air Basin; emission factors derived by the dividing the daily emission totals by the daily VMT from all vehicle classes

Reference 4: Vehicle percentages are from the EMFAC2007 BURDEN Model for the Mojave Desert Air Basin; see next spreadsheet

Abbreviations

MDAB = Mojave Desert Air Basin, VMT = vehicle miles traveled, SB = San Bernardino, CH4 = methane

MTCO2e = metric tons of carbon dioxide equivalents, calculated by multiplying the tons by the global warming potential (CH4 = 21) and converting to metric tons, multiplying by 0.9072

N2O = nitrous oxide (see separate worksheets for emissions estimations)

EMFAC Burden Carbon Dioxide Emissions

Title : Burden 2020 MDAB
Version : Emfac2007 V2.3 Nov 1 2006
Run Date : 2010/04/14 22:13:27
Scen Year: 2020 -- All model years in the range 1976 to 2020 selected
Season : January
Area : Mojave Desert Air Basin Average
I/M Stat : Enhanced Basic (2005) -- Using I/M schedule for area 69 San Bernardino (MD)
Emissions: Tons Per Day

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Emissions
Carbon Dioxide (000)

	LDA-TOT	LDT1-TOT	LDT2-TOT	MDV-TOT	LHDT1-TOT	LHDT2-TOT	MHDT-TOT	HHDT-TOT	OBUS-TOT	SBUS-TOT	UB-TOT	MH-TOT	MCY-TOT	ALL-TOT
Total Ex	6.71	2.67	4.09	2.85	0.67	0.24	0.68	14.81	0.05	0.14	0.06	0.21	0.15	33.32
Percent of total	20%	8%	12%	9%	2%	1%	2%	44%	0%	0%	0%	1%	0%	

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Summary

Automobiles	20%
Light Duty Trucks	20%
Medium Duty Trucks	9%
Heavy Duty Trucks	49%
Other	2%
Total	100%

Mobile Emissions - Nitrous Oxide

Year 2007 **Vehicle Miles Traveled** 1,280,750

Prepared by Michael Brandman Associates **Total Trips** 64038 (20 miles/trip)

	Pounds/day	Tons/day	Tons/year	MTCO2e/yr
Starting Emissions	16.50	0.0082	3.01	847
Running Emissions	0.00	0.0000	0.00	0
Total	16.50	0.0082	3.01	847

Vehicle Percentages

Vehicle Type	Percent	Non-Catalyst	Catalyst	Diesel
Automobile	20.1	0.6	99.2	0.2
Light and medium duty trucks	28.8	1.4	95.9	2.7
Heavy duty trucks and buses	49.2	0.4	99.6	0.0
Motorcycle	1.8	0.9	99.1	0.0

Running Emission Factors (mg/km)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	8	20	1
Light duty truck	9	26	1
Heavy duty trucks and buses	20	55	3
Motorcycle	3	3	3

Running Emission Factors (g/mile)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.0050	0.0124	0.0006
Light and medium duty trucks	0.0056	0.0162	0.0006
Heavy duty trucks and buses	0.0124	0.0342	0.0019
Motorcycle	0.0019	0.0019	0.0019

Running Emissions (pounds per day)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.02	7.00	0.00
Light and medium duty trucks	0.06	12.59	0.01
Heavy duty trucks and buses	0.07	47.21	0.00
Motorcycle	0.00	0.10	0.00

Starting Emission Factors (mg/start)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	**28**	72	0
Light duty truck	**9**	26	-1
Heavy duty trucks and buses	**70**	194	-2
Motorcycle	**12**	12	0

Starting Emission Factors (g/start)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.028	0.072	0
Light duty truck	0.009	0.026	-0.001
Heavy duty trucks and buses	0.07	0.194	-0.002
Motorcycle	0.012	0.012	0

Trip Distribution

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	77.4	12792.7	25.8
Light duty truck	258.6	17712.2	498.7
Heavy duty trucks and buses	126.1	31393.0	0.0
Motorcycle	10.6	1161.8	0.0

Starting Emissions (pounds per day)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Automobile	LDA	0.0048	2.0264	0.0000
Light duty truck	LDT1	0.0051	1.0131	-0.0011
Heavy duty trucks and buses	LDT2	0.0194	13.3985	0.0000
Motorcycle	MDV	0.0003	0.0307	0.0000
Total		0.0296	16.4687	-0.0011

Emission Factors (mg/km and mg/start): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 3.2.3, www.ipcc-nggip.iges.or.jp/EFDB/find_ef_main.php

Mobile Emissions - Nitrous Oxide

Year 2020 **Vehicle Miles Traveled** 1,596,795

Prepared by Michael Brandman Associates **Total Trips** 79840 (20 miles/trip)

	Pounds/day	Tons/day	Tons/year	MTCO2e/yr
Starting Emissions	20.57	0.0103	3.75	1056
Running Emissions	0.00	0.0000	0.00	0
Total	20.57	0.0103	3.75	1056

Vehicle Percentages

Vehicle Type	Percent	Non-Catalyst	Catalyst	Diesel
Automobile	20.1	0.6	99.2	0.2
Light duty truck	28.8	1.4	95.9	2.7
Heavy duty trucks and buses	49.2	0.4	99.6	0.0
Motorcycle	1.8	0.9	99.1	0.0

Running Emission Factors (mg/km)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	8	20	1
Light duty truck	9	26	1
Heavy duty trucks and buses	20	55	3
Motorcycle	3	3	3

Running Emission Factors (g/mile)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.0050	0.0124	0.0006
Light duty truck	0.0056	0.0162	0.0006
Heavy duty trucks and buses	0.0124	0.0342	0.0019
Motorcycle	0.0019	0.0019	0.0019

Running Emissions (pounds per day)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.02	8.72	0.00
Light duty truck	0.08	15.70	0.02
Heavy duty trucks and buses	0.09	58.86	0.00
Motorcycle	0.00	0.12	0.00

Starting Emission Factors (mg/start)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	**28**	72	0
Light duty truck	**9**	26	-1
Heavy duty trucks and buses	**70**	194	-2
Motorcycle	**12**	12	0

Starting Emission Factors (g/start)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.028	0.072	0
Light duty truck	0.009	0.026	-0.001
Heavy duty trucks and buses	0.07	0.194	-0.002
Motorcycle	0.012	0.012	0

Trip Distribution

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	96.5	15949.5	32.2
Light duty truck	322.4	22082.9	621.7
Heavy duty trucks and buses	157.2	39139.7	0.0
Motorcycle	13.2	1448.5	0.0

Starting Emissions (pounds per day)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Automobile	LDA	0.0059	2.5264	0.0000
Light duty truck	LDT1	0.0064	1.2631	-0.0014
Heavy duty trucks and buses	LDT2	0.0242	16.7048	0.0000
Motorcycle	MDV	0.0003	0.0382	0.0000
Total		0.0369	20.5326	-0.0014

Emission Factors (mg/km and mg/start): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 3.2.3, www.ipcc-nggip.iges.or.jp/EFDB/find_ef_main.php

Mobile Emissions - Nitrous Oxide

Year 2030 **Vehicle Miles Traveled** 1,931,687

Prepared by Michael Brandman Associates **Total Trips** 96584 (20 miles/trip)

	Pounds/day	Tons/day	Tons/year	MTCO2e/yr
Starting Emissions	24.88	0.0124	4.54	1277
Running Emissions	0.00	0.0000	0.00	0
Total	24.88	0.0124	4.54	1277

Vehicle Percentages

Vehicle Type	Percent	Non-Catalyst	Catalyst	Diesel
Automobile	20.1	0.6	99.2	0.2
Light duty truck	28.8	1.4	95.9	2.7
Heavy duty trucks and buses	49.2	0.4	99.6	0.0
Motorcycle	1.8	0.9	99.1	0.0

Running Emission Factors (mg/km)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	8	20	1
Light duty truck	9	26	1
Heavy duty trucks and buses	20	55	3
Motorcycle	3	3	3

Running Emission Factors (g/mile)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.0050	0.0124	0.0006
Light duty truck	0.0056	0.0162	0.0006
Heavy duty trucks and buses	0.0124	0.0342	0.0019
Motorcycle	0.0019	0.0019	0.0019

Running Emissions (pounds per day)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.03	10.55	0.00
Light duty truck	0.10	18.99	0.02
Heavy duty trucks and buses	0.10	71.20	0.00
Motorcycle	0.00	0.14	0.00

Starting Emission Factors (mg/start)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	**28**	72	0
Light duty truck	**9**	26	-1
Heavy duty trucks and buses	**70**	194	-2
Motorcycle	**12**	12	0

Starting Emission Factors (g/start)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	0.028	0.072	0
Light duty truck	0.009	0.026	-0.001
Heavy duty trucks and buses	0.07	0.194	-0.002
Motorcycle	0.012	0.012	0

Trip Distribution

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Automobile	116.7	19294.6	38.9
Light duty truck	390.0	26714.3	752.1
Heavy duty trucks and buses	190.2	47348.4	0.0
Motorcycle	15.9	1752.3	0.0

Starting Emissions (pounds per day)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Automobile	LDA	0.0072	3.0563	0.0000
Light duty truck	LDT1	0.0077	1.5281	-0.0017
Heavy duty trucks and buses	LDT2	0.0293	20.2083	0.0000
Motorcycle	MDV	0.0004	0.0463	0.0000
Total		0.0446	24.8389	-0.0017

Emission Factors (mg/km and mg/start): 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Table 3.2.3, www.ipcc-nggip.iges.or.jp/EFDB/find_ef_main.php

Waste - Year 2020

Prepared by: Michael Brandman Associates

Waste generated in 2008 (tons)	67,474
Population in 2008	87,260
Waste per capita (estimated from 2008)	0.773
Population in 2020	526
Waste (tons per year)	**407**

Alternative Scenario refers to diverting waste to 60%. In 2006, diversion was 53%. Thus, 8% is needed to divert to 60%, which is 33 tons

EPA Waste Reduction Model (WARM) Inputs

Material	% Generated	Tons Generated
Aluminum Cans	0.1%	0.4
Steel Cans	0.6%	2.4
Copper Wire		0.0
Glass	1.4%	5.7
HDPE	0.4%	1.6
LDPE		0.0
PET	0.5%	2.0
Corrugated Cardboard	4.8%	19.5
Magazines/Third-class Mail	0.7%	2.8
Newspaper	1.3%	5.3
Office Paper		0.0
Phonebooks	0.1%	0.4
Textbooks		0.0
Dimensional Lumber	14.5%	59.0
Medium-density Fiberboard	1.6%	6.5
Food Scraps	15.5%	63.1
Yard Trimmings	2.7%	11.0
Grass	1.9%	7.7
Leaves	1.9%	7.7
Branches	0.6%	2.4
Mixed Paper (general)	8.5%	34.6
Mixed Paper (primarily residential)		0.0
Mixed Paper (primarily from offices)	1.9%	7.7
Mixed Metals	4.0%	16.3
Mixed Plastics	8.7%	35.4
Mixed Recyclables		0.0
Mixed Organics	4.3%	17.5
Mixed MSW	18.8%	76.5
Carpet	3.2%	13.0
Personal Computers	0.5%	2.0
Clay Bricks		0.0
Concrete	1.2%	4.9
Fly Ash	0.1%	0.4
Tires	0.2%	0.8
Total	100.0%	407

- WARM - U.S. Environmental Protection Agency. November 2009. Waste Reduction Model. www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.htm
- Waste generation rate 2008: CalRecycle. Jurisdiction Profile for the City of Hesperia. www.calrecycle.ca.gov/Profiles/Juris/JurProfile2.asp?RG=C&JURID=196&JUR=Hesperia
- Population in 2008: State of California, Department of Finance, E-4 Population Estimates for Cities, Counties and the State, 2001-2009, with 2000 Benchmark. Sacramento, California, May 2009. www.dof.ca.gov/research/demographic/reports/estimates/e-4_2001-07/
- Percent waste generated: California Integrated Waste Management Board, prepared by Cascadia Consulting Group. August 2009. 2008 California Statewide Waste Characterization Study. (Table 7: Composition of California's Overall Waste Stream) www.calrecycle.ca.gov/Publications/General/2009023.pdf

GHG Emissions Analysis -- Summary Report

Version 10 (10/09)

GHG Emissions Waste Management Analysis for City of Hesperia 2020 - Existing General Plan Change

Prepared by: Michael Brandman Associates

Project Period for this Analysis: 01/01/20 to 12/31/20

Note: If you wish to save these results, rename this file (e.g., WARM-MN1) and save it. Then the "Analysis Inputs" sheet of the "WARM" file will be blank when you are ready to make another model run.

GHG Emissions from Baseline Waste Management ($MTCO_2E$): 145

Commodity	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Total $MTCO_2E$
Aluminum Cans	-	0.4	-	NA	0
Steel Cans	-	2.4	-	NA	0
Glass	-	5.7	-	NA	0
HDPE	-	1.6	-	NA	0
PET	-	2.0	-	NA	0
Corrugated Cardboard	-	19.5	-	NA	7
Magazines/third-class mail	-	2.8	-	NA	(1)
Newspaper	-	5.3	-	NA	(5)
Phonebooks	-	0.4	-	NA	(0)
Dimensional Lumber	-	59.0	-	NA	(29)
Medium Density Fiberboard	-	6.5	-	NA	(3)
Food Scraps	NA	63.1	-	-	45
Yard Trimmings	NA	11.0	-	-	(2)
Grass	NA	7.7	-	-	1
Leaves	NA	7.7	-	-	(4)
Branches	NA	2.4	-	-	(1)
Mixed Paper, Broad	-	34.6	-	NA	11
Mixed Paper, Office	-	7.7	-	NA	3
Mixed Metals	-	16.3	-	NA	1
Mixed Plastics	-	35.4	-	NA	1
Mixed Organics	NA	17.5	-	-	5
Mixed MSW	NA	76.5	-	NA	115
Carpet	-	13.0	-	NA	0
Personal Computers	-	2.0	-	NA	0
Concrete	-	4.9	NA	NA	0
Fly Ash	-	0.4	NA	NA	0
Tires	-	0.8	-	NA	0
					0
					0
					0
					0
					0
					0
					0

GHG Emissions from Alternative Waste Management Scenario ($MTCO_2E$): 90

Commodity	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Total $MTCO_2E$	Change (Alt - Base) $MTCO_2E$
Aluminum Cans	0.0	0.0	0.4	0.0	NA	0	0
Steel Cans	0.0	0.0	2.4	0.0	NA	0	0
Glass	0.0	1.1	4.6	0.0	NA	(0)	(0)
HDPE	0.0	0.3	1.3	0.0	NA	(0)	(0)
PET	0.0	0.4	1.6	0.0	NA	(1)	(1)
Corrugated Cardboard	0.0	3.9	15.6	0.0	NA	(6)	(14)
Magazines/third-class mail	0.0	0.6	2.2	0.0	NA	(2)	(2)
Newspaper	0.0	1.1	4.2	0.0	NA	(7)	(2)
Phonebooks	0.0	0.0	0.4	0.0	NA	(0)	(0)
Dimensional Lumber	0.0	5.9	53.1	0.0	NA	(41)	(12)
Medium Density Fiberboard	0.0	0.0	6.5	0.0	NA	(3)	0
Food Scraps	0.0	NA	53.6	0.0	9.5	36	(9)
Yard Trimmings	0.0	NA	8.8	0.0	2.2	(2)	(0)
Grass	0.0	NA	6.2	0.0	1.5	1	(1)
Leaves	0.0	NA	6.2	0.0	1.5	(4)	1
Branches	0.0	NA	1.9	0.0	0.5	(1)	0
Mixed Paper, Broad	NA	3.5	31.1	0.0	NA	(2)	(13)
Mixed Paper, Office	NA	0.8	6.9	0.0	NA	0	(3)
Mixed Metals	NA	0.0	16.3	0.0	NA	1	0
Mixed Plastics	NA	0.0	35.4	0.0	NA	1	0
Mixed Organics	NA	NA	17.5	0.0	0.0	5	0
Mixed MSW	NA	NA	76.5	0.0	NA	115	0
Carpet	0.0	0.0	13.0	0.0	NA	0	0
Personal Computers	0.0	0.0	2.0	0.0	NA	0	0
Concrete	NA	0.0	4.9	NA	NA	0	0
Fly Ash	NA	0.0	0.4	NA	NA	0	0
Tires	0.0	0.0	0.8	0.0	NA	0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0

Note: a negative value (i.e., a value in parentheses) indicates an emission reduction; a positive value indicates an emission increase.

Total Change in GHG Emissions: (55) $MTCO_2E$

This is equivalent to...

Removing	**10**	Passenger Cars from the Roadway Each Year
Conserving	**6,242**	Gallons of Gasoline
Conserving	**22,914**	Cylinders of Propane Used for Home Barbeques
Conserving	**0**	Railway Cars of Coal
	0.00000%	Annual CO_2 emissions from the U.S. transportation sector
	0.00000%	Annual CO_2 emissions from the U.S. electricity sector

a) For explanation of methodology, see the EPA report:
Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks (EPA530-R-06-004)
-- available on the Internet at http://epa.gov/climatechange/wycd/waste/downloads/fullreport.pdf (5.6 Mb PDF file).
b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.

Waste - Year 2030

Prepared by: Michael Brandman Associates

Waste generated in 2008 (tons)	67,474
Population in 2008	87,260
Waste per capita (estimated from 2008)	0.773
Population in 2030	1,005
Waste (tons per year)	**777**

EPA Waste Reduction Model (WARM) Inputs

Material	% Generated	Tons Generated
Aluminum Cans	0.1%	0.8
Steel Cans	0.6%	4.7
Copper Wire		0.0
Glass	1.4%	10.9
HDPE	0.4%	3.1
LDPE		0.0
PET	0.5%	3.9
Corrugated Cardboard	4.8%	37.3
Magazines/Third-class Mail	0.7%	5.4
Newspaper	1.3%	10.1
Office Paper		0.0
Phonebooks	0.1%	0.8
Textbooks		0.0
Dimensional Lumber	14.5%	112.7
Medium-density Fiberboard	1.6%	12.4
Food Scraps	15.5%	120.5
Yard Trimmings	2.7%	21.0
Grass	1.9%	14.8
Leaves	1.9%	14.8
Branches	0.6%	4.7
Mixed Paper (general)	8.5%	66.1
Mixed Paper (primarily residential)		0.0
Mixed Paper (primarily from offices)	1.9%	14.8
Mixed Metals	4.0%	31.1
Mixed Plastics	8.7%	67.6
Mixed Recyclables		0.0
Mixed Organics	4.3%	33.4
Mixed MSW	18.8%	146.1
Carpet	3.2%	24.9
Personal Computers	0.5%	3.9
Clay Bricks		0.0
Concrete	1.2%	9.3
Fly Ash	0.1%	0.8
Tires	0.2%	1.6
Total	100.0%	778

- WARM - U.S. Environmental Protection Agency. November 2009. Waste Reduction Model. www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.htm
- Waste generation rate 2008: CalRecycle. Jurisdiction Profile for the City of Hesperia. www.calrecycle.ca.gov/Profiles/Juris/JurProfile2.asp?RG=C&JURID=196&JUR=Hesperia
- Population in 2008: State of California, Department of Finance, E-4 Population Estimates for Cities, Counties and the State, 2001-2009, with 2000 Benchmark. Sacramento, California, May 2009. www.dof.ca.gov/research/demographic/reports/estimates/e-4_2001-07/
- Percent waste generated: California Integrated Waste Management Board, prepared by Cascadia Consulting Group. August 2009. 2008 California Statewide Waste Characterization Study. (Table 7: Composition of California's Overall Waste Stream) www.calrecycle.ca.gov/Publications/General/2009023.pdf

GHG Emissions Analysis -- Summary Report

Version 10 (10/09)

GHG Emissions Waste Management Analysis for City of Hesperia 2030 - Existing General Plan Difference

Prepared by: Michael Brandman Associates

Project Period for this Analysis: 01/01/30 to 12/31/30

Note: If you wish to save these results, rename this file (e.g., WARM-MN1) and save it. Then the "Analysis Inputs" sheet of the "WARM" file will be blank when you are ready to make another model run.

GHG Emissions from Baseline Waste Management ($MTCO_2E$): 277

Commodity	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Total $MTCO_2E$
Aluminum Cans	-	0.8	-	NA	0
Steel Cans	-	4.7	-	NA	0
Glass	-	10.9	-	NA	0
HDPE	-	3.1	-	NA	0
PET	-	3.9	-	NA	0
Corrugated Cardboard	-	37.3	-	NA	14
Magazines/third-class mail	-	5.4	-	NA	(2)
Newspaper	-	10.1	-	NA	(9)
Phonebooks	-	0.8	-	NA	(1)
Dimensional Lumber	-	112.7	-	NA	(56)
Medium Density Fiberboard	-	12.4	-	NA	(6)
Food Scraps	NA	120.5	-	-	86
Yard Trimmings	NA	21.0	-	-	(4)
Grass	NA	14.8	-	-	2
Leaves	NA	14.8	-	-	(8)
Branches	NA	4.7	-	-	(2)
Mixed Paper, Broad	-	66.1	-	NA	21
Mixed Paper, Office	-	14.8	-	NA	6
Mixed Metals	-	31.1	-	NA	1
Mixed Plastics	-	67.6	-	NA	3
Mixed Organics	NA	33.4	-	-	9
Mixed MSW	NA	146.1	-	NA	220
Carpet	-	24.9	-	NA	1
Personal Computers	-	3.9	-	NA	0
Concrete	-	9.3	NA	NA	0
Fly Ash	-	0.8	NA	NA	0
Tires	-	1.6	-	NA	0
					0
					0
					0
					0
					0
					0
					0

GHG Emissions from Alternative Waste Management Scenario ($MTCO_2E$): 172

Commodity	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Total $MTCO_2E$	Change (Alt - Base) $MTCO_2E$
Aluminum Cans	0.0	0.0	0.8	0.0	NA	0	0
Steel Cans	0.0	0.0	4.7	0.0	NA	0	0
Glass	0.0	2.2	8.7	0.0	NA	(0)	(1)
HDPE	0.0	0.6	2.5	0.0	NA	(1)	(1)
PET	0.0	0.8	3.1	0.0	NA	(1)	(1)
Corrugated Cardboard	0.0	7.5	29.8	0.0	NA	(12)	(26)
Magazines/third-class mail	0.0	1.1	4.3	0.0	NA	(5)	(3)
Newspaper	0.0	2.0	8.1	0.0	NA	(13)	(4)
Phonebooks	0.0	0.1	0.7	0.0	NA	(1)	(0)
Dimensional Lumber	0.0	11.3	101.4	0.0	NA	(78)	(22)
Medium Density Fiberboard	0.0	0.0	12.4	0.0	NA	(6)	0
Food Scraps	0.0	NA	102.4	0.0	18.1	70	(16)
Yard Trimmings	0.0	NA	16.8	0.0	4.2	(4)	(0)
Grass	0.0	NA	11.8	0.0	3.0	1	(1)
Leaves	0.0	NA	11.8	0.0	3.0	(7)	1
Branches	0.0	NA	3.8	0.0	0.9	(2)	0
Mixed Paper, Broad	NA	6.6	59.5	0.0	NA	(4)	(25)
Mixed Paper, Office	NA	1.5	13.3	0.0	NA	1	(6)
Mixed Metals	NA	0.0	31.1	0.0	NA	1	0
Mixed Plastics	NA	0.0	67.6	0.0	NA	3	0
Mixed Organics	NA	NA	33.4	0.0	0.0	9	0
Mixed MSW	NA	NA	146.1	0.0	NA	220	0
Carpet	0.0	0.0	24.9	0.0	NA	1	0
Personal Computers	0.0	0.0	3.9	0.0	NA	0	0
Concrete	NA	0.0	9.3	NA	NA	0	0
Fly Ash	NA	0.0	0.8	NA	NA	0	0
Tires	0.0	0.0	1.6	0.0	NA	0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0

Note: a negative value (i.e., a value in parentheses) indicates an emission reduction; a positive value indicates an emission increase.

Total Change in GHG Emissions: (105) $MTCO_2E$

This is equivalent to...

Removing	**19**	Passenger Cars from the Roadway Each Year
Conserving	**11,938**	Gallons of Gasoline
Conserving	**43,822**	Cylinders of Propane Used for Home Barbeques
Conserving	**1**	Railway Cars of Coal
	0.00001%	Annual CO_2 emissions from the U.S. transportation sector
	0.00000%	Annual CO_2 emissions from the U.S. electricity sector

a) For explanation of methodology, see the EPA report:
Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks (EPA530-R-06-004)
-- available on the Internet at http://epa.gov/climatechange/wycd/waste/downloads/fullreport.pdf (5.6 Mb PDF file).
b) Emissions estimates provided by this model are intended to support voluntary GHG measurement and reporting initiatives.