APPENDIX D

AIR QUALITY – URBEMIS OUTPUT FILES AND GHG MEMORANDUM

URBEMIS OUTPUT FILES

9/21/2009 9:43:05 AM

Urbemis 2007 Version 9.2.4

Summary Report for Annual Emissions (Tons/Year)

File Name: C:\Documents and Settings\equinn\Application Data\Urbemis\Version9a\Projects\Vacaville EWWTP\Vacaville EWWTP Phases I, II, and IV.urb924

Project Name: Vacaville EWWTP Phases I, II, and IV

Project Location: Yolo-Solano AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2011 TOTALS (tons/year unmitigated)	0.52	4.29	2.39	0.00	0.83	0.23	1.05	0.17	0.21	0.38	450.83
2012 TOTALS (tons/year unmitigated)	4.57	7.83	6.91	0.01	0.84	0.41	1.25	0.18	0.37	0.55	1,210.67

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\equinn\Application Data\Urbemis\Version9a\Projects\Vacaville EWWTP\Vacaville EWWTP Phases I, II, and IV.urb924

Project Name: Vacaville EWWTP Phases I, II, and IV

Project Location: Yolo-Solano AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2011 TOTALS (lbs/day unmitigated)	6.49	53.75	29.85	0.01	11.23	2.78	14.01	2.35	2.56	4.91	5,556.16
2012 TOTALS (lbs/day unmitigated)	144.48	131.31	130.46	0.13	11.75	6.76	18.51	2.53	6.20	8.73	22,749.55

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

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Time Slice 1/3/2011-11/14/2011 Active Days: 226	3.61	29.89	16.69	0.01	5.62	1.59	7.21	1.18	1.46	2.64	3,153.77
Mass Grading 01/01/2011-05/15/2012	3.61	29.89	16.69	0.01	5.62	1.59	7.21	1.18	1.46	2.64	3,153.77
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.29	26.37	13.94	0.00	0.00	1.44	1.44	0.00	1.32	1.32	2,533.84
Mass Grading On Road Diesel	0.28	3.45	1.43	0.00	0.02	0.15	0.17	0.01	0.14	0.14	492.01
Mass Grading Worker Trips	0.04	0.07	1.31	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.92
Time Slice 11/15/2011-12/30/2011 Active Days: 34	6.49	53.75	29.85	0.01	11.23	2.78	14.01	2.35	2.56	4.91	5,556.16
Fine Grading 11/15/2011-09/30/2012	2.89	23.86	13.16	0.00	5.61	1.19	6.80	1.17	1.10	2.27	2,402.39
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.83	23.44	11.96	0.00	0.00	1.17	1.17	0.00	1.08	1.08	2,247.32
Fine Grading On Road Diesel	0.03	0.37	0.15	0.00	0.00	0.02	0.02	0.00	0.01	0.02	52.74
Fine Grading Worker Trips	0.03	0.06	1.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.33
Mass Grading 01/01/2011-05/15/2012	3.61	29.89	16.69	0.01	5.62	1.59	7.21	1.18	1.46	2.64	3,153.77
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.29	26.37	13.94	0.00	0.00	1.44	1.44	0.00	1.32	1.32	2,533.84
Mass Grading On Road Diesel	0.28	3.45	1.43	0.00	0.02	0.15	0.17	0.01	0.14	0.14	492.01
Mass Grading Worker Trips	0.04	0.07	1.31	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.92

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Time Slice 1/2/2012-1/13/2012 Active Days: 10	6.15	50.16	28.60	0.01	11.23	2.54	13.77	2.35	2.33	4.68	5,556.26
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38
Mass Grading 01/01/2011-05/15/2012	3.41	27.83	15.98	0.01	5.62	1.45	7.07	1.18	1.33	2.51	3,153.82
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.11	24.67	13.48	0.00	0.00	1.31	1.31	0.00	1.21	1.21	2,533.84
Mass Grading On Road Diesel	0.26	3.10	1.30	0.00	0.02	0.13	0.15	0.01	0.12	0.13	492.01
Mass Grading Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97

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Time Slice 1/16/2012-2/14/2012 Active Days: 22	13.62	107.84	112.73	0.12	11.73	5.36	17.09	2.52	4.91	7.43	20,085.93
Building 01/15/2012-05/15/2012	7.47	57.68	84.14	0.11	0.50	2.83	3.32	0.17	2.57	2.75	14,529.67
Building Off Road Diesel	2.83	19.57	9.90	0.00	0.00	1.09	1.09	0.00	1.00	1.00	2,419.64
Building Vendor Trips	3.32	35.80	29.62	0.07	0.27	1.58	1.84	0.09	1.44	1.53	7,359.79
Building Worker Trips	1.32	2.31	44.62	0.05	0.23	0.16	0.39	0.08	0.13	0.21	4,750.25
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38
Mass Grading 01/01/2011-05/15/2012	3.41	27.83	15.98	0.01	5.62	1.45	7.07	1.18	1.33	2.51	3,153.82
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.11	24.67	13.48	0.00	0.00	1.31	1.31	0.00	1.21	1.21	2,533.84
Mass Grading On Road Diesel	0.26	3.10	1.30	0.00	0.02	0.13	0.15	0.01	0.12	0.13	492.01
Mass Grading Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97

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Time Slice 2/15/2012-3/14/2012 Active Days: 21	16.72	131.18	128.07	0.12	11.74	6.76	18.49	2.53	6.19	8.71	22,495.29
Building 01/15/2012-05/15/2012	7.47	57.68	84.14	0.11	0.50	2.83	3.32	0.17	2.57	2.75	14,529.67
Building Off Road Diesel	2.83	19.57	9.90	0.00	0.00	1.09	1.09	0.00	1.00	1.00	2,419.64
Building Vendor Trips	3.32	35.80	29.62	0.07	0.27	1.58	1.84	0.09	1.44	1.53	7,359.79
Building Worker Trips	1.32	2.31	44.62	0.05	0.23	0.16	0.39	0.08	0.13	0.21	4,750.25
Demolition 02/15/2012-09/15/2012	3.10	23.34	15.34	0.00	0.01	1.39	1.40	0.00	1.28	1.28	2,409.36
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Off Road Diesel	3.07	23.28	14.13	0.00	0.00	1.39	1.39	0.00	1.28	1.28	2,281.38
Demo On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38
Mass Grading 01/01/2011-05/15/2012	3.41	27.83	15.98	0.01	5.62	1.45	7.07	1.18	1.33	2.51	3,153.82
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.11	24.67	13.48	0.00	0.00	1.31	1.31	0.00	1.21	1.21	2,533.84
Mass Grading On Road Diesel	0.26	3.10	1.30	0.00	0.02	0.13	0.15	0.01	0.12	0.13	492.01
Mass Grading Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97
Time Slice 3/15/2012-5/15/2012 Active Days: 44	**144.48**	**131.31**	**130.46**	**0.13**	**11.75**	**6.76**	**18.51**	**2.53**	**6.20**	**8.73**	**22,749.55**

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Building 01/15/2012-05/15/2012	7.47	57.68	84.14	0.11	0.50	2.83	3.32	0.17	2.57	2.75	14,529.67
Building Off Road Diesel	2.83	19.57	9.90	0.00	0.00	1.09	1.09	0.00	1.00	1.00	2,419.64
Building Vendor Trips	3.32	35.80	29.62	0.07	0.27	1.58	1.84	0.09	1.44	1.53	7,359.79
Building Worker Trips	1.32	2.31	44.62	0.05	0.23	0.16	0.39	0.08	0.13	0.21	4,750.25
Coating 03/15/2012-05/31/2012	127.76	0.12	2.39	0.00	0.01	0.01	0.02	0.00	0.01	0.01	254.27
Architectural Coating	127.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.07	0.12	2.39	0.00	0.01	0.01	0.02	0.00	0.01	0.01	254.27
Demolition 02/15/2012-09/15/2012	3.10	23.34	15.34	0.00	0.01	1.39	1.40	0.00	1.28	1.28	2,409.36
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Off Road Diesel	3.07	23.28	14.13	0.00	0.00	1.39	1.39	0.00	1.28	1.28	2,281.38
Demo On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38
Mass Grading 01/01/2011-05/15/2012	3.41	27.83	15.98	0.01	5.62	1.45	7.07	1.18	1.33	2.51	3,153.82
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.11	24.67	13.48	0.00	0.00	1.31	1.31	0.00	1.21	1.21	2,533.84
Mass Grading On Road Diesel	0.26	3.10	1.30	0.00	0.02	0.13	0.15	0.01	0.12	0.13	492.01
Mass Grading Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97

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Time Slice 5/16/2012-5/31/2012 Active Days: 12	133.61	45.80	30.34	0.01	5.63	2.49	8.12	1.18	2.29	3.47	5,066.06
Coating 03/15/2012-05/31/2012	127.76	0.12	2.39	0.00	0.01	0.01	0.02	0.00	0.01	0.01	254.27
Architectural Coating	127.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.07	0.12	2.39	0.00	0.01	0.01	0.02	0.00	0.01	0.01	254.27
Demolition 02/15/2012-09/15/2012	3.10	23.34	15.34	0.00	0.01	1.39	1.40	0.00	1.28	1.28	2,409.36
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Off Road Diesel	3.07	23.28	14.13	0.00	0.00	1.39	1.39	0.00	1.28	1.28	2,281.38
Demo On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38

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Time Slice 6/1/2012-9/14/2012 Active Days: 76	5.85	45.67	27.95	0.00	5.61	2.48	8.10	1.17	2.28	3.46	4,811.79
Demolition 02/15/2012-09/15/2012	3.10	23.34	15.34	0.00	0.01	1.39	1.40	0.00	1.28	1.28	2,409.36
Fugitive Dust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Off Road Diesel	3.07	23.28	14.13	0.00	0.00	1.39	1.39	0.00	1.28	1.28	2,281.38
Demo On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Demo Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38
Time Slice 9/17/2012-9/28/2012 Active Days: 10	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading 11/15/2011-09/30/2012	2.75	22.33	12.61	0.00	5.61	1.09	6.70	1.17	1.00	2.17	2,402.44
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.69	21.95	11.51	0.00	0.00	1.07	1.07	0.00	0.99	0.99	2,247.32
Fine Grading On Road Diesel	0.03	0.33	0.14	0.00	0.00	0.01	0.02	0.00	0.01	0.01	52.74
Fine Grading Worker Trips	0.03	0.05	0.96	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.38

Phase Assumptions

Phase: Demolition 2/15/2012 - 9/15/2012 - Type Your Description Here

Building Volume Total (cubic feet): 54735

Building Volume Daily (cubic feet): 0

On Road Truck Travel (VMT): 0

Off-Road Equipment:

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1 Concrete/Industrial Saws (10 hp) operating at a 0.73 load factor for 8 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Fine Grading 11/15/2011 - 9/30/2012 - Default Paving Description

Total Acres Disturbed: 11.5

Maximum Daily Acreage Disturbed: 0.28

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 13.1

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Mass Grading 1/1/2011 - 5/15/2012 - Default Fine Site Grading Description

Total Acres Disturbed: 11.5

Maximum Daily Acreage Disturbed: 0.28

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 122.21

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Building Construction 1/15/2012 - 5/15/2012 - Default Building Construction Description

Off-Road Equipment:

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1 Air Compressors (106 hp) operating at a 0.48 load factor for 8 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 3/15/2012 - 5/31/2012 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 100

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 150

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 150

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 150

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Urbemis 2007 Version 9.2.4

Summary Report for Annual Emissions (Tons/Year)

File Name: C:\Documents and Settings\equinn\Application Data\Urbemis\Version9a\Projects\Vacaville EWWTP\Vacaville EWWTP Phase III.urb924

Project Name: Vacaville EWWTP Phase III

Project Location: Yolo-Solano AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2012 TOTALS (tons/year unmitigated)	0.14	1.07	0.63	0.00	0.24	0.06	0.30	0.05	0.05	0.10	115.56
2013 TOTALS (tons/year unmitigated)	0.57	4.26	2.56	0.00	0.70	0.22	0.92	0.15	0.20	0.35	533.29
2014 TOTALS (tons/year unmitigated)	0.46	2.11	1.38	0.00	0.00	0.12	0.12	0.00	0.11	0.11	334.04

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\equinn\Application Data\Urbemis\Version9a\Projects\Vacaville EWWTP\Vacaville EWWTP Phase III.urb924

Project Name: Vacaville EWWTP Phase III

Project Location: Yolo-Solano AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2
2012 TOTALS (lbs/day unmitigated)	3.16	24.89	14.75	0.00	5.61	1.32	6.93	1.17	1.22	2.39	2,687.49
2013 TOTALS (lbs/day unmitigated)	8.28	62.51	37.61	0.00	11.22	3.24	14.47	2.35	2.98	5.33	7,718.08
2014 TOTALS (lbs/day unmitigated)	5.37	16.91	11.10	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,686.50

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

ROG	NOx	CO	SO2	PM10 Dust	PM10 Exhaust	PM10	PM2.5 Dust	PM2.5 Exhaust	PM2.5	CO2

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Time Slice 9/3/2012-12/31/2012 Active Days: 86	3.16	24.89	14.75	0.00	5.61	1.32	6.93	1.17	1.22	2.39	2,687.49
Mass Grading 09/01/2012-06/01/2013	3.16	24.89	14.75	0.00	5.61	1.32	6.93	1.17	1.22	2.39	2,687.49
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	3.11	24.67	13.48	0.00	0.00	1.31	1.31	0.00	1.21	1.21	2,533.84
Mass Grading On Road Diesel	0.01	0.16	0.07	0.00	0.00	0.01	0.01	0.00	0.01	0.01	25.68
Mass Grading Worker Trips	0.04	0.06	1.20	0.00	0.01	0.00	0.01	0.00	0.00	0.01	127.97
Time Slice 1/1/2013-2/14/2013 Active Days: 33	2.98	23.29	14.21	0.00	5.61	1.21	6.81	1.17	1.11	2.28	2,687.55
Mass Grading 09/01/2012-06/01/2013	2.98	23.29	14.21	0.00	5.61	1.21	6.81	1.17	1.11	2.28	2,687.55
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	2.94	23.09	13.05	0.00	0.00	1.20	1.20	0.00	1.10	1.10	2,533.84
Mass Grading On Road Diesel	0.01	0.14	0.06	0.00	0.00	0.01	0.01	0.00	0.01	0.01	25.68
Mass Grading Worker Trips	0.03	0.06	1.10	0.00	0.01	0.00	0.01	0.00	0.00	0.01	128.03

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Time Slice 2/15/2013-5/14/2013 Active Days: 63	5.56	43.90	26.19	0.00	11.21	2.20	13.41	2.34	2.02	4.36	5,037.29
Fine Grading 02/15/2013-09/01/2013	2.58	20.61	11.98	0.00	5.60	0.99	6.59	1.17	0.91	2.08	2,349.74
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.55	20.56	11.10	0.00	0.00	0.99	0.99	0.00	0.91	0.91	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.04	0.88	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.42
Mass Grading 09/01/2012-06/01/2013	2.98	23.29	14.21	0.00	5.61	1.21	6.81	1.17	1.11	2.28	2,687.55
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	2.94	23.09	13.05	0.00	0.00	1.20	1.20	0.00	1.10	1.10	2,533.84
Mass Grading On Road Diesel	0.01	0.14	0.06	0.00	0.00	0.01	0.01	0.00	0.01	0.01	25.68
Mass Grading Worker Trips	0.03	0.06	1.10	0.00	0.01	0.00	0.01	0.00	0.00	0.01	128.03

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Time Slice 5/15/2013-5/31/2013 Active Days: 13	**8.28**	**62.51**	**37.61**	**0.00**	**11.22**	**3.24**	**14.47**	**2.35**	**2.98**	**5.33**	**7,718.08**
Building 05/15/2013-12/15/2014	2.73	18.61	11.42	0.00	0.01	1.05	1.06	0.00	0.96	0.97	2,680.79
Building Off Road Diesel	2.65	18.08	9.69	0.00	0.00	1.02	1.02	0.00	0.94	0.94	2,419.64
Building Vendor Trips	0.04	0.46	0.41	0.00	0.00	0.02	0.02	0.00	0.02	0.02	107.61
Building Worker Trips	0.04	0.07	1.32	0.00	0.01	0.01	0.01	0.00	0.00	0.01	153.55
Fine Grading 02/15/2013-09/01/2013	2.58	20.61	11.98	0.00	5.60	0.99	6.59	1.17	0.91	2.08	2,349.74
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.55	20.56	11.10	0.00	0.00	0.99	0.99	0.00	0.91	0.91	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.04	0.88	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.42
Mass Grading 09/01/2012-06/01/2013	2.98	23.29	14.21	0.00	5.61	1.21	6.81	1.17	1.11	2.28	2,687.55
Mass Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Mass Grading Off Road Diesel	2.94	23.09	13.05	0.00	0.00	1.20	1.20	0.00	1.10	1.10	2,533.84
Mass Grading On Road Diesel	0.01	0.14	0.06	0.00	0.00	0.01	0.01	0.00	0.01	0.01	25.68
Mass Grading Worker Trips	0.03	0.06	1.10	0.00	0.01	0.00	0.01	0.00	0.00	0.01	128.03

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Time Slice 6/3/2013-8/30/2013 Active Days: 65	5.30	39.22	23.40	0.00	5.62	2.04	7.65	1.18	1.87	3.05	5,030.53
Building 05/15/2013-12/15/2014	2.73	18.61	11.42	0.00	0.01	1.05	1.06	0.00	0.96	0.97	2,680.79
Building Off Road Diesel	2.65	18.08	9.69	0.00	0.00	1.02	1.02	0.00	0.94	0.94	2,419.64
Building Vendor Trips	0.04	0.46	0.41	0.00	0.00	0.02	0.02	0.00	0.02	0.02	107.61
Building Worker Trips	0.04	0.07	1.32	0.00	0.01	0.01	0.01	0.00	0.00	0.01	153.55
Fine Grading 02/15/2013-09/01/2013	2.58	20.61	11.98	0.00	5.60	0.99	6.59	1.17	0.91	2.08	2,349.74
Fine Grading Dust	0.00	0.00	0.00	0.00	5.60	0.00	5.60	1.17	0.00	1.17	0.00
Fine Grading Off Road Diesel	2.55	20.56	11.10	0.00	0.00	0.99	0.99	0.00	0.91	0.91	2,247.32
Fine Grading On Road Diesel	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fine Grading Worker Trips	0.03	0.04	0.88	0.00	0.00	0.00	0.01	0.00	0.00	0.00	102.42
Time Slice 9/2/2013-12/31/2013 Active Days: 87	2.73	18.61	11.42	0.00	0.01	1.05	1.06	0.00	0.96	0.97	2,680.79
Building 05/15/2013-12/15/2014	2.73	18.61	11.42	0.00	0.01	1.05	1.06	0.00	0.96	0.97	2,680.79
Building Off Road Diesel	2.65	18.08	9.69	0.00	0.00	1.02	1.02	0.00	0.94	0.94	2,419.64
Building Vendor Trips	0.04	0.46	0.41	0.00	0.00	0.02	0.02	0.00	0.02	0.02	107.61
Building Worker Trips	0.04	0.07	1.32	0.00	0.01	0.01	0.01	0.00	0.00	0.01	153.55
Time Slice 1/1/2014-1/14/2014 Active Days: 10	2.55	16.91	11.06	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,680.87
Building 05/15/2013-12/15/2014	2.55	16.91	11.06	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,680.87
Building Off Road Diesel	2.48	16.44	9.48	0.00	0.00	0.91	0.91	0.00	0.83	0.83	2,419.64
Building Vendor Trips	0.04	0.41	0.37	0.00	0.00	0.02	0.02	0.00	0.02	0.02	107.62
Building Worker Trips	0.03	0.06	1.20	0.00	0.01	0.01	0.01	0.00	0.00	0.01	153.61

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Time Slice 1/15/2014-5/30/2014 Active Days: 98	5.37	16.91	11.10	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,686.50
Building 05/15/2013-12/15/2014	2.55	16.91	11.06	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,680.87
Building Off Road Diesel	2.48	16.44	9.48	0.00	0.00	0.91	0.91	0.00	0.83	0.83	2,419.64
Building Vendor Trips	0.04	0.41	0.37	0.00	0.00	0.02	0.02	0.00	0.02	0.02	107.62
Building Worker Trips	0.03	0.06	1.20	0.00	0.01	0.01	0.01	0.00	0.00	0.01	153.61
Coating 01/15/2014-05/31/2014	2.82	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.62
Architectural Coating	2.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coating Worker Trips	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.62
Time Slice 6/2/2014-12/15/2014 Active Days: 141	2.55	16.91	11.06	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,680.87
Building 05/15/2013-12/15/2014	2.55	16.91	11.06	0.00	0.01	0.93	0.94	0.00	0.85	0.86	2,680.87
Building Off Road Diesel	2.48	16.44	9.48	0.00	0.00	0.91	0.91	0.00	0.83	0.83	2,419.64
Building Vendor Trips	0.04	0.41	0.37	0.00	0.00	0.02	0.02	0.00	0.02	0.02	107.62
Building Worker Trips	0.03	0.06	1.20	0.00	0.01	0.01	0.01	0.00	0.00	0.01	153.61

Phase Assumptions

Phase: Fine Grading 2/15/2013 - 9/1/2013 - Default Paving Description

Total Acres Disturbed: 11.5

Maximum Daily Acreage Disturbed: 0.28

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

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Phase: Mass Grading 9/1/2012 - 6/1/2013 - Default Fine Site Grading Description

Total Acres Disturbed: 11.5

Maximum Daily Acreage Disturbed: 0.28

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 6.38

Off-Road Equipment:

1 Graders (174 hp) operating at a 0.61 load factor for 6 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 6 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Building Construction 5/15/2013 - 12/15/2014 - Default Building Construction Description

Off-Road Equipment:

1 Air Compressors (106 hp) operating at a 0.48 load factor for 8 hours per day

2 Forklifts (145 hp) operating at a 0.3 load factor for 6 hours per day

1 Off Highway Trucks (479 hp) operating at a 0.57 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 1/15/2014 - 5/31/2014 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 100

Rule: Residential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 150

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 150

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 150

GHG TECHNICAL MEMORANDUM

GHG INVENTORY FOR PROJECT EIR

Easterly Wastewater Treatment Plant *12/29/09*

Reviewed by: Dave Reardon, P.E., Michael Falk, P.H.D, Lauren Casey

Prepared by: Ryan Hougham, E.I.T.

Background

This technical memorandum has been prepared to addresses potential changes in Greenhouse Gas (GHG) emissions that would result from the City of Vacaville's Easterly Wastewater Treatment Plant Tertiary Project (Tertiary Project). Four inventories were performed to develop a 2008 baseline and to project future operational gas discharges.

Inventory #1- Existing Conditions

The inventory analyzed GHG emissions resulting from the system as it currently operates. No cogeneration system is utilized in this inventory.

Inventory #2- 9 mgd w/ Nitrification/Denitrification & Cogeneration System

The inventory analyzed the current system flows with the addition of the new nitrification/denitrification process changes that would result from the Tertiary Project. The analysis assumes that the cogeneration system will be operating at this time.

Inventory #3- 15 mgd w/ Nitrification/Denitrification & Cogeneration System (Cumulative Year 2035)

The inventory analyzed the maximum system capacity flows (15 mgd) with the addition of the new nitrification/denitrification process changes resulting from the Tertiary Project. The analysis assumes that the cogeneration system will be operating at this time.

Inventory #4- 15 mgd using Current Processes (Cumulative Year 2035)

The inventory analyzed the maximum system capacity flows (15 mgd) using current processes (i.e. no denitrification or cogeneration).

Inventory #5- 9 mgd w/ Nitrification/Denitrification (No Cogeneration System)

The inventory analyzed the current system flows with the addition of the new nitrification/denitrification process changes that would result from the Tertiary Project. The analysis assumes that the cogeneration system will not be operating at this time.

Inventory #6- 15 mgd w/ Nitrification/Denitrification (No Cogeneration System) (Cumulative Year 2035)

The inventory analyzed the maximum system capacity flows (15 mgd) with the addition of the new nitrification/denitrification process changes resulting from the Tertiary Project. The analysis assumes that the cogeneration system will not be operating at this time.

Methodology

We used GHG inventory standards as put forth by The Climate Registry's General Reporting Protocol (Version 1.1) and the Local Government Operations Protocol (Version 1.0) Inventories were made of the various Scope One emissions (digester gas flaring, mobile sources, stationary combustion, and nitrification) and Scope Two emissions (electrical consumption). Carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) emissions were determined using the above protocols. The equivalent CO2 emissions were subsequently calculated using standard protocol conversions (see Basis of Calculations below). The total equivalent CO2 emissions were then compiled using the contributions from each source and summarized at the end of this document. Scope 1 and Scope 2 emissions were analyzed for these inventories.

Basis of Calculation

The inventory calculations were based on the following:

- The EWWTP fuel, electric, and digester gas consumption increases by a factor of 1.67 from the 9 MGD to 15 MGD levels
- The 2008 City of Vacaville population level was 96,450
- The 2035 City of Vacaville population level is estimated to be 132,300
- The digester gas electrical cogeneration facility will be operational during Inventory #2 and #3
- The digester gas electrical cogeneration facility would not be operational during Inventory #4, #5 and #6
- The CO2 equivalent multiplier is 21 for methane (CH4) and 310 for nitrous oxide (N2O)

Summary of Results

Using the GHG protocol methodology and basis of calculation above, the following GHG emissions were determined for the reviewed inventories:

Scenario	Results
Inventory #1: Existing Conditions	4,688 metric tons/year (equivalent CO2)
Inventory #2: 9 mgd w/ Nitrification/ Denitrification & Cogeneration System	4,552 metric tons/year (equivalent CO2)
Inventory #3: 15 mgd w/ Nitrification/Denitrification & Cogeneration System (Cumulative Year 2035)	7,538 metric tons/year (equivalent CO2)
Inventory #4: 15 mgd using Current Processes (Cumulative Year 2035)	7,775 metric tons/year (equivalent CO2)
Inventory #5: 9 mgd w/ Nitrification/Denitrification (No Cogeneration System)	5,169 metric tons/year (equivalent CO2)
Inventory #6: 15 mgd w/ Nitrification/Denitrification (No Cogeneration System) (Cumulative Year 2035)	8,569 metric tons/year (equivalent CO2)

Attachments

Appendix A- Inventory #1: Existing Conditions
Appendix B- Inventory #2: 9 mgd w/ Nitrification/Denitrification & Cogeneration System
Appendix C- Inventory #3: 15 mgd w/ Nitrification/Denitrification & Cogeneration System
Appendix D- Inventory #4: 15 mgd using Current Processes
Appendix E- Inventory #5: 9 mgd w/ Nitrification/Denitrification (No Cogeneration System)
Appendix F- Inventory #6: 15 mgd w/ Nitrification/Denitrification (No Cogeneration System)

Inventory #1: Existing Conditions

Easterly WWTP Estimated Greenhouse Gas Inventory 2008

CO2 (lb)/kWh=: 0.63567
(Source: The Climate Registry)

CH4 (lbs)/MWh=: 0.0302
(Source: The Climate Registry)

N2O (lbs)/MWh=: 0.0081
(Source: The Climate Registry)

CO2 (kg)/MMBTU-natural-gas=: 53.06
(Source: The Climate Registry)

CH4 (kg)/MMBTU-natural-gas=: 0.001
(Source: The Climate Registry)

N2O (kg)/MMBTU-natural-gas=: 0.0001
(Source: The Climate Registry)

kg CO2/ gallon of diesel fuel = 10.15
(Source: The Climate Registry)

kg CH4/ MMBTU of diesel fuel = 0.003
(Source: The Climate Registry)

kg N2O/ MMBTU of diesel fuel = 0.0006
(Source: The Climate Registry)

Facility / Source ID	Facility / Source Name	Indirect GHG emissions from imported electricity				Direct GHG emissions from natural gas combustion				Direct GHG emissions from diesel combustion in stationary engines				Direct GHG emissions from the incomplete combustion of digester gas				GHG as CO2eq			SUBTOTALS	
		Total kWh	CO2 (metric-tons)	CH4 Metric-tons	N2O Metric-tons	Total MMBTU	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total Gallons	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total SCF	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	CO2 eq Metric Tons	CH4 as CO2 eq Metric Tons	N2O as CO2 eq Metric Tons	CO2eq metric-tons	%
1-1	Treatment Plant	13,721,961	3,956.59	0.19	0.05	11,085	588.19	0.01	0.0011	3,527	35.80	0.00	0.00	33,953,538.40		4.14		4,581	91.10	16.03	4,688	100.0
1-2	Cogen																					
	Totals in Metric Tons	13,721,961	3,957	0.188	0.050	11,085	588	0	0.00	3,527	36	0	0	33,953,538	0	4		4,581	91	16	4,688	100
	Mectric tons CO2eq		3956.59	3.95	15.59		588.19	0.23	0.34		35.80	0.03	0.09	33,953,538	0.00	86.89						
	Indirect GHG from Imported Power	3,976			3,976																	
	Direct GHG Emissions from Fossil Fuel	625							589				36									
	Direct GHG Emissions from process	0																				
	Direct GHG Emissions from Biogenic Fuel	86.89															86.89					

TOTAL EQUIVALENT METRIC TONS CO2 EMITTED BY EWWTP DURING INVENTORY #1 4,688

* See detailed summary on De Minimis Sources page. De minimis emissions are not included in the total foolprint.

De Minimis Sources (includes CH4 and N2O emissions)

CO2 (kg)/gal-gasoline=:	8.81	CO2e (kg)/CH4(kg)=:	21
CO2 (kg)/gal-diesel=:	10.15	CO2e (kg)/N2O(kg)=:	310
(Source: The Climate Registry)		(Source: The Climate Registry)	

Facility / Source ID	Facility / Source Name	CO2 Emissions from mobile combustion (upper-bounded estimate)				CH4/N2O emissions from mobile combustion (upper-bounded estimate)			TOTAL
		Total gasoline (gallons)	Total diesel (gallons)	CO2 (metric-tons)	%	CH4 CO2e (metric-tons)	%	NO2 CO2e (metric tons)	%
1-1	Treatment Plant	2,146	577	26	0.5	0.01	0.00	0.3	0.01
1-2	Cogen								
TOTAL		2,146	577	26	0.5	0	0.0	0	0.006

De Minimis Vehicle Fuel Use

Fuel Use Estimate

Source ID	Gasoline (gal)	Diesel (gal)	CNG (gal)		CO2 Emissions (kg CO2)
1-1 (General)	2,146	137	111		21,086
1-1 (Sludge)		440			4,462
TOTAL	2,146	577	111		25,548

Source ID	Vehicle Classification - Fuel	Year	Mileage	CH4 Emissions (kgCO2,eq)	N2O Emissions (kgCO2,eq)
t-1	Light Duty - CNG		3,323		
	Light Duty Trucks - Gasoline	2002, 17 MPG	36,478	13.6	257.8
	Light Duty Trucks - Diesel	2002, 17 MPG	2,328	0.0	1.1
	Heavy Duty Trucks- Diesel	All Years, 7 MPG	3,077	0.3	4.6

Basis of Calculation:

The city fuel efficiency for a 2002 truck is 17 MPG

Sludga Hauling Basis of Calculation:

181 Loads from Truck 369

CO2 Emission Factors		
Fuel	kg CO2/gal	kg CO2/gal
Gasoline		8.81
Compressed Natural Gas	7.15	
Diesel		10.15

(Source: The Climate Registry,Table 13.1 and the EIA)

Vehicle Classification - Fuel	Year	CH4 Emission Factors (g CH4/mile)	N2O Emission Factors (g N2O/mile)
Light Duty - CNG	2002	0.737	0.05
Light Duty Trucks - Gasoline	2002	0.0178	0.0228
Light Duty Trucks - Diesel	2002	0.001	0.0015
Heavy Duty Trucks - Diesel	All Years	0.0051	0.0048

(Source: The Climate Registry, Tabla 13.4-5)

Digester Gas Combustion

All data obtained from Treatment Plant flowmeters

	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q	Units in SCF
1/31/2008	1558369	1880000	
2/29/2008	1455411	1960000	
3/31/2008	1564570	2210000	
4/30/2008	1407248	2050000	
5/31/2008	1363988	2100000	
6/30/2008	1058861	2020000	
7/31/2008	618185	1670000	
8/31/2008	609101	1350000	
9/30/2008	593383	1070000	
10/31/2008	667213	1480000	
11/30/2008	783727	1490000	
12/31/2008	803482	2190000	
TOTALS:	**12,483,538**	**21,470,000**	

Average Heat Exchanger Burn Rate
34201 scf/day

Average Waste Gas Burn Rate
58822 scf/day

Emissions Produced by Heat Exchanger
1.521223 Annual metric tons

Emissions Produced by Waste Gas
2.616298 Annual metric tons

Use Equation 10.2 for the Incomplete Combustion of Digester Gas (from LCOG protocol)

Annual CH4 emissions (metric tons) = Digester Gas x FCH4 x ρ(CH4) x (1-DE) x 0.0283 x 365.25 x 10-6
Digester Gas is the measured scf produced per day
Where DE is the destruction efficiency = 0.99
FCH4 is the fraction of CH4 in the biogas = 0.65
ρ(CH4) is the density of methane at standard conditions = 662

PG&E Natural Gas Detail

MMBTU/therm=: 0.099976
MMBTU/MMSCF=: 1020

Natural Gas Consumption by Source

Source ID	Total use (MMBTU)		
1-1A (South Plant)	6,364	PG&E SID	7640313822
		Use (Therms)	63,642
1-1B (North Plant)	4,721	PG&E SID	5693872005
		Use (Therms)	47,212

Total

PG&E Billing Data

The following data was obtained from the monthly PG&E billings.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	7640313822	Period ending	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	7469	6190	5633	5762	5693	4589	3828	4744	3155	5175	5607	5554	7117
Last month prorate	0.677419355															

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	5693872005	Period ending on	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	5962	6635	3606	3363	2724	1714	2135	3463	3242	3608	3883	5946	6768
Last month prorate	0.677419355															

PG&E Electricity Detail

Electric Consumption by Source

Source ID	Total use (kWh)	PG&E Services															
1-2	13,721,961	PG&E SID	9126771761														
		Use (kWh)	13,721,961														

PG&E Electric Billing Data

The following data was obtained using PG&E billing statements.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	9126771761	Period ending	12/12/2007	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2009
First month prorate	0.3871	Use (kWh)	N/A	1,152,000	1,142,400	1,132,800	1,104,000	1,195,200	1,108,800	1,099,200	1,137,600	1,195,200	1,099,200	1,084,800	1,219,200	1,118,400
Last month prorate	0.6774															

EMERGENCY STAND-BY POWER DIESEL GENERATORS

RUN HOURS FOR 2008

Facility ID	Facility Name	Engines	Break Horse Power	Fuel Usage (gal/hr)	2008 Run Time Hours	Total Fuel Gallons	CO2 (kg)	CH4 (kg)	N2O (kg)	CO2e (metric tons)
1-1	Treatment Plant	750 kW Gen		54.7	5.1	279	2,832	0.1	0.0	2.8
1-1	Treatment Plant	2 MW Gen		160.0	20.3	3,248	32,967	1.4	0.3	33.1
									TOTAL	35.9

kg CO2/ gallon of diesel fuel =	10.15
kg CH4/ MMBTU of diesel fuel =	0.003
kg N2O/ MMBTU of diesel fuel =	0.0006

Global Warming Potential of CO2 =	1
Global Warming Potential of CH4 =	21
Global Warming Potential of N20 =	310

Source: The Climale Registry

Inventory #2: 9 MGD w/ NDN and Filtration

Easterly WWTP Estimated Greenhouse Gas Inventory 2008

CO2 (ib)/kWh=: 0.63567
(Source: The Climate Registry)

CH4 (ibs)/MWh=: 0.0302
(Source: The Climate Registry)

N2O (ibs)/MWh=: 0.0081
(Source: The Climate Registry)

CO2 (kg)/MMBTU-natural-gas=: 53.06
(Source: The Climate Registry)

CH4 (kg)/MMBTU-natural-gas=: 0.001
(Source: The Climate Registry)

N2O (kg)/MMBTU-natural-gas=: 0.0001
(Source: The Climate Registry)

kg CO2/ gallon of diesel fuel = 10.15
(Source: The Climate Registry)

kg CH4/ MMBTU of diesel fuel = 0.003
(Source: The Climate Registry)

kg N2O/ MMBTU of diesel fuel = 0.0006
(Source: The Climate Registry)

Facility / Source ID	Facility / Source Name	Indirect GHG emissions from imported electricity				Direct GHG emissions from natural gas combustion				Direct GHG emissions from diesel combustion in stationary engines				Direct GHG emissions from natural nitrification/denitrification in receiving water				Direct GHG emissions from the incomplete combustion of digester gas				GHG as CO2eq			SUBTOTALS	
		Total kWh	CO2 (metric-tons)	CH4 Metric-tons	N2O Metric-tons	Total MMBTU	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total Gallons	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	NH3-N Pounds	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total SCF	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	CO2 eq Metric Tons	CH4 as CO2 eq Metric Tons	N2O as CO2 eq Metric Tons	CO2eq metric-tons	%
1-1	Treatment Plant	14,661,661	4,227.54	0.20	0.05	11,085	588.19	0	0	3,527	35.80	0.00	0.00				0.68					4,852	4.5	226	5,082	111.7
1-2	Cogen	-1,303,816	-375.94	-0.02	0.00	-4,514	-239.50	0.00	0.00									33,953,538		4.13		-615	4.1	0	-531	-11.7
	Totals in Metric Tons	13,357,845	3,852	0.183	0.049	6,572	349	0	0.00	3,527	36	0	0	0	0	0	0.68	33,953,538	0	4		4,236	9	226	4,552	100
	Mectric tons CO2eq		3851.60	3.85	15.18		348.69	0.14	0.20		35.80	0.03	0.09		0.00	0.00	209.30	33,953,538	0.00	86.83						
	Indirect GHG from Imported Power	3,871			3,871																					
	Direct GHG Emissions from Fossil Fuel	385							349				36													
	Direct GHG Emissions from process	209															209									
	Direct GHG Emissions from Biogenic Fuel	87																			87					

TOTAL EQUIVALENT METRIC TONS CO2 EMITTED BY EWWTP DURING INVENTORY #2 4,552

* See detailed summary on De Minimis Sources page. De minimis emissions are not included in the total footprint.

De Minimis Sources (includes CH4 and N2O emissions)

CO2 (kg)/gal-gasoline=:	8.81	CO2e (kg)/CH4(kg)=:	21
CO2 (kg)/gal-diesel=:	10.15	CO2e (kg)/N2O(kg)=:	310
(Source: The Climate Registry)		(Source: The Climate Registry)	

Facility / Source ID	Facility / Source Name	CO2 Emissions from mobile combustion (upper-bounded estimate)				CH4/N2O emissions from mobile combustion (upper-bounded estimate)			TOTAL
		Total gasoline gallons	Total diesel gallons	CO2 (metric-tons)	%	CH4 CO2e (metric-tons)	%	NO2 CO2e (metric tons)	%
1-2	Treatment Plant	2,146	577	26	0.6	0.0	0.00	0.3	0.01
1-3	Cogen								
	TOTAL	2,146	577	26	0.6	0	0.0	0	0.006

De Minimis Vehicle Fuel Use

Fuel Use Estimate

Source ID	Gasoline (gal)	Diesel (gal)	CNG (gal)		CO2 Emissions (kg CO2)
1-1 (General)	2,146	137	111		21,086
1-1 (Sludge)		440			4,462
TOTAL	2,146	577	111		25,548

Source ID	Vehicle Classification - Fuel	Year	Mileage	CH4 Emissions (kgCO2,eq)	N2O Emissions (kgCO2,eq)
1-1	Light Duty - CNG		3,323		
	Light Duty Trucks - Gasoline	2003, 17 MPG	36,478	13.6	257.8
	Light Duty Trucks - Diesel	2003, 17 MPG	2,328	0.0	1.1
	Heavy Duty Trucks- Diesel	All Years, 7 MPG	3,077	0.3	4.6

Basis of Calculation:

The city fuel efficiency for a 2002 truck is 17 MPG

Sludge Hauling Basis of Calculation:

CO2 Emission Factors		
Fuel	kg CO2/gal	kg CO2/gal
Gasoline		8.81
Compressed Natural Gas	7.15	
Diesel		10.15

(Source: The Climate Registry,Table 13.1 and the EIA)

Vehicle Classification - Fuel	Year	CH4 Emission Factors (g CH4/mile)	N2O Emission Factors (g N2O/mile)
Light Duty - CNG	2002	0.737	0.05
Light Duty Trucks - Gasoline	2002	0.0178	0.0228
Light Duty Trucks - Diesel	2002	0.001	0.0015
Heavy Duty Trucks - Diesel	All Years	0.0051	0.0048

(Source: The Climate Registry, Table 13.4-5)

Nitrification/Denitrification Contributions

Use Equation 10.7 for the Process Emissions from WWTP with Nitrification/Denitrification (from LCOG protocol)

Annual N2O emissions (metric tons) =
Ptotal x EF nit/denit x 10-6

Ptotal = total population that is served by the centralized WWTP adjusted for industrial discharge, if applicable [person]	user input
EF nit/denit = emmision factor for a WWTP with nitrification/denitrification [g N2O/person/year]	7

Annual N2O emmisions= 0.67515 metric tons

Digester Gas Combustion

All data obtained from Treatment Plant flowmeters

Basis of Calculations

320 kW Generator
30% Efficiency
80% Run-Time
10,000 scf/20 kW generated
45% waste heat recovery

Heat Exchanger Basis of Calculations

~Heat exchangers will use 100% waste heat from the cogeneration process in lieu of digester gas.
~There is enough DG production to cover the heat requirements.

Total Digester Gas Available Using 9 MGD Processes

92,960 scf/day

Present Conditions (2008)	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
1/31/2008	1558369	1880000
2/29/2008	1455411	1960000
3/31/2008	1564570	2210000
4/30/2008	1407248	2050000
5/31/2008	1363988	2100000
6/30/2008	1058861	2020000
7/31/2008	618185	1670000
8/31/2008	609101	1350000
9/30/2008	593383	1070000
10/31/2008	667213	1480000
11/30/2008	783727	1490000
12/31/2008	803482	2190000
TOTALS:	**12,483,538**	**21,470,000**

Units in SCF

Estimated Production For 9 MGD NDN Condition	Dig 3 Heat Exchanger Dig Gas Burned	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q	Cogen Gas Burner
January	0	0	0	2829462
February	0	0	0	2829462
March	0	0	0	2829462
April	0	0	0	2829462
May	0	0	0	2829462
June	0	0	0	2829462
July	0	0	0	2829462
August	0	0	0	2829462
September	0	0	0	2829462
October	0	0	0	2829462
November	0	0	0	2829462
December	0	0	0	2829462
TOTALS:	**0**	**0**	**0**	**33,953,538**

Units in SCF

Average Heat Exchanger Burn Rate
- scf/day

Average Waste Gas Burn Rate
- scf/day

Average Cogen Burn Rate
92,960 scf/day

Emissions Produced by Heat Exchanger
0 Annual metric tons

Emissions Produced by Waste Gas
0 Annual metric tons

Emissions Produced by Cogeneration Process
4.134689 Annual metric tons

Use Equation 10.2 for the Incomplete Combustion of Digester Gas (from LCOG protocol)

Annual CH4 emissions (metric tons) = Digester Gas x FCH4 x ρ(CH4) x (1-DE) x 0.0283 x 365.25 x 10-6
Digester Gas is the measured scf produced per day
Where DE is the destruction efficiency = 0.99
FCH4 is the fraction of CH4 in the biogas = 0.65
ρ(CH4) is the density of methane at standard conditions = 662

Cogeneration Production Output
149 kW Average Over Year

PG&E Natural Gas Detail

MMBTU/therm=: 0.099976
MMBTU/MMSCF=: 1020

Units are in therms

Natural Gas Consumption by Source

Source ID	Total use (MMBTU)			
1-1A (South Plant)	6,364	PG&E SID	7640313822	
		Use (Therms)	63,642	
1-1B (North Plant)	4,721	PG&E SID	5693872005	
		Use (Therms)	47,212	
1-2 Cogeneration	-4,514	GAS SAVINGS	45,138	The South and North Plant natural gas consumption will subsequently decrease because the heat exchanges will all use waste heat from cogeneration.
Total	6,572		110,854	

PG&E Billing Data

The following data was obtained from the monthly PG&E billings.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	7640313822	Period ending	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	7469	6190	5633	5762	5693	4589	3828	4744	3155	5175	5607	5554	7117
Last month prorate	0.677419355															

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	5693872005	Period ending on	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	5962	6635	3606	3363	2724	1714	2135	3463	3242	3608	3883	5946	6768
Last month prorate	0.677419355															

PG&E Electricity Detail

Electric Consumption by Source

Source ID	Total use (kWh)	PG&E Services															
1-1	13,721,961	PG&E SID	9126771761														
		Use (kWh)	13,721,961														
1-2	-1,303,816	SAVINGS		Electrical Production from Cogeneration													

Electric Consumption by Phase

	Flow (GPM)	Head (ft.)	Pump Efficiency	Motor Efficiency	VFD Efficiency	Total Annual Electrical Consumption (kWh)
NDN Recirculation (2.5Q)	15,625	20	0.8	0.92	0.97	722,846
Filtration (Q)	6,250	15	0.8	0.92	0.97	216,854

Q= 9 MGD

PG&E Electric Billing Data

The following data was obtained using PG&E billing statements.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	9126771761	Period ending	12/12/2007	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2009
First month prorate	0.3871	Use (kWh)	N/A	1,152,000	1,142,400	1,132,800	1,104,000	1,195,200	1,108,800	1,099,200	1,137,600	1,195,200	1,099,200	1,084,800	1,219,200	1,118,400
Last month prorate	0.6774															

EMERGENCY STAND-BY POWER DIESEL GENERATORS

RUN HOURS FOR 2008

Facility ID	Facility Name	Engines	Break Horse Power	Fuel Usage (gal/hr)	2008 Run Time Hours	Total Fuel Gallons	CO2 (kg)	CH4 (kg)	N2O (kg)	CO2e (metric tons)
1-1	Treatment Plant	750 kW Gen		54.7	5.1	279	2,832	0.1	0.0	2.8
1-1	Treatment Plant	2 MW Gen		160.0	20.3	3,248	32,967	1.4	0.3	33.1
									TOTAL	35.9

kg CO2/ gallon of diesel fuel =	10.15
kg CH4/ MMBTU of diesel fuel =	0.003
kg N2O/ MMBTU of diesel fuel =	0.0006

Global Warming Potential of CO2 =	1
Global Warming Potential of CH4 =	21
Global Warming Potential of N20 =	310

Source: California Climate Action Registry Online Reporting Tool.

Inventory #3: 15 MGD w/ NDN and Filtration

Easterly WWTP Estimated Greenhouse Gas Inventory 2008

CO2 (lb)/kWh=: 0.83567
(Source: The Climate Registry)

CH4 (lbs)/MWh=: 0.0302
(Source: The Climate Registry)

N2O (lbs)/MWh=: 0.0081
(Source: The Climate Registry)

CO2 (kg)/MMBTU-natural-gas=: 53.06
(Source: The Climate Registry)

CH4 (kg)/MMBTU-natural-gas=: 0.001
(Source: The Climate Registry)

N2O (kg)/MMBTU-natural-gas=: 0.0001
(Source: The Climate Registry)

kg CO2/ gallon of diesel fuel = 10.15
(Source: The Climate Registry)

kg CH4/ MMBTU of diesel fuel = 0.003
(Source: The Climate Registry)

kg N2O/ MMBTU of diesel fuel = 0.0006
(Source: The Climate Registry)

Facility / Source ID	Facility / Source Name	Indirect GHG emissions from imported electricity				Direct GHG emissions from natural gas combustion				Direct GHG emissions from diesel combustion in stationary engines				Direct GHG emissions from natural nitrification/denitrification in receiving water				Direct GHG emissions from the incomplete combustion of digester gas				GHG as CO2eq			SUBTOTALS	
		Total kWh	CO2 (metric-tons)	CH4 Metric-tons	N2O Metric-tons	Total MMBTU	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total Gallons	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	NH3-N Pounds	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total SCF	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	CO2 eq Metric Tons	CH4 as CO2 eq Metric Tons	N2O as CO2 eq Metric Tons	CO2eq metric-tons	%
1-1	Treatment Plant	24,481,868	7,059.10	0.34	0.09	18,513	982.28	0.02	0.00	5,890	59.78	0.00	0.00				0.93					8,101	7.5	316	8,424	111.8
1-2	Cogen	-2,177,373	-627.82	-0.03	-0.01	-7,538	-399.97	-0.01	0.00									56,702,409		6.90		-1,028	144.2	0	-886	-11.8
	Totals in Metric Tons	22,304,495	6,431	0.306	0.082	10,975	582	0	0.00	5,890	60	0	0	0	0	0	1	56,702,409	0	7		7,073	152	316	7,538	100
	Mectric tons CO2eq		6431.28	6.42	25.34		582.31	0.23	0.34		59.78	0.05	0.15		0.00	0.00	287.09	56,702,409	0.00	145.00						
	Indirect GHG from imported Power	6,463			6,463																					
	Direct GHG Emissions from Fossil Fuel	643							583				60													
	Direct GHG Emissions from process	287															287									
	Direct GHG Emissions from Biogenic Fuel	145.0																			145.0					

TOTAL EQUIVALENT METRIC TONS CO2 EMITTED BY EWWTP DURING INVENTORY #3 7,538

* See detailed summary on De Minimis Sources page. De minimis emissions are not included in the total footprint.

De Minimis Sources (includes CH4 and N2O emissions)

CO2 (kg)/gal-gasoline=:	8.81	CO2e (kg)/CH4(kg)=:	21
CO2 (kg)/gal-diesel=:	10.15	CO2e (kg)/N2O(kg)=:	310
(Source: The Climate Registry)		(Source: The Climate Registry)	

Facility / Source ID	Facility / Source Name	CO2 Emissions from mobile combustion (upper-bounded estimate)				CH4/N2O emissions from mobile combustion (upper-bounded estimate)			TOTAL
		Total gasoline gallons	Total diesel gallons	CO2 (metric-tons)	%	CH4 CO2e (metric-tons)	%	NO2 CO2e (metric tons)	%
1-2	Treatment Plant	3,583	963	43	0.6	0.02	0.00	0.4	0.01
1-3	Cogen								
	TOTAL	3,583	963	43	0.6	0	0.0	0	0.006

De Minimis Vehicle Fuel Use

Fuel Use Estimate

Source ID	Gasoline (gal)	Diesel (gal)	CNG (gal)		CO2 Emissions (kg CO2)
1-1 (General)	3,583	229	185		35,214
1-1 (Sludge)		734			7,451
TOTAL	3,583	963	165		42,665

Source ID	Vehicle Classification - Fuel	Year	Mileage	CH4 Emissions (kgCO2,eq)	N2O Emissions (kgCO2,eq)
1-1	Light Duty - CNG		5,550		
	Light Duty Trucks - Gasoline	2003, 17 MPG	60,919	22.8	430.6
	Light Duty Trucks - Diesel	2003, 17 MPG	3,888	0.1	1.8
	Heavy Duty Trucks- Diesel	All Years, 7 MPG	5,139	0.6	7.6

Basis of Calculation:

The city fuel efficiency for a 2002 truck is 17 MPG
The plant fuel usage increases by 1.67 from the 9 MGD levels

CO2 Emission Factors		
Fuel	kg CO2/gal	kg CO2/gal
Gasoline		8.81
Compressed Natural Gas	7.15	
Diesel		10.15

(Source: The Climate Registry,Table 13.1 and the EIA)

Vehicle Classification - Fual	Year	CH4 Emission Factors (g CH4/mile)	N2O Emission Factors (g N2O/mile)
Light Duty - CNG	2002	0.737	0.05
Light Duty Trucks - Gasoline	2002	0.0178	0.0228
Light Duty Trucks - Diesel	2002	0.001	0.0015
Heavy Duty Trucks - Diesel	All Years	0.0051	0.0048

(Source: The Climate Registry, Table 13.4-5)

Nitrification/Denitrification Contributions

Use Equation 10.7 for the Process Emissions from WWTP with Nitrification/Denitrification (from LCOG protocol)

Annual N2O emissions (metric tons) =
Ptotal x EF nit/denit x 10-6

Ptotal = total population that is served by the centralized WWTP adjusted for industrial discharge, if applicable [person]	user input
EF nit/denit = emmision factor for a WWTP with nitrification/denitrification [g N2O/person/year]	7

Annual N2O emmisions= 0.9261

Basis of Calculation- 2035 Population Level= 132,300

Digester Gas Combustion

All data obtained from Treatment Plant flowmeters

Cogen Assumptions

320 kW Generator
30% Efficiency
80% Run-Time
10,000 cfd/20 kW generated
45% waste heat recovery

Heat Exchanger Assumptions

~Heat exchangers will use 100% waste heat from the cogeneration process in lieu of digester gas.
~There is enough DG production to cover the heat requirements.

Present Conditions (2008)	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
1/31/2008	1558369	1880000
2/29/2008	1455411	1960000
3/31/2008	1564570	2210000
4/30/2008	1407248	2050000
5/31/2008	1363988	2100000
6/30/2008	1058861	2020000
7/31/2008	618185	1670000
8/31/2008	609101	1350000
9/30/2008	593383	1070000
10/31/2008	667213	1480000
11/30/2008	783727	1490000
12/31/2008	803482	2190000
TOTALS:	**12,483,538**	**21,470,000**

Units in SCF

Estimated Production For 15 MGD NDN Condition	Dig 3 Heat Exchanger Dig Gas Burned	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q	Cogen Gas Burner
January	0	0	0	4725201
February	0	0	0	4725201
March	0	0	0	4725201
April	0	0	0	4725201
May	0	0	0	4725201
June	0	0	0	4725201
July	0	0	0	4725201
August	0	0	0	4725201
September	0	0	0	4725201
October	0	0	0	4725201
November	0	0	0	4725201
December	0	0	0	4725201
TOTALS:	**0**	**0**	**0**	**56,702,409**

Units in SCF

155,243 scf/day

Total Digester Gas Available Using 9 MGD Processes

92,960 scf/day

Average Heat Exchanger Burn Rate
- scf/day

Average Waste Gas Burn Rate
- scf/day

Average Cogen Burn Rate
155,243 scf/day

Emissions Produced by Heat Exchanger
0 Annual metric tons

Emissions Produced by Waste Gas
0 Annual metric tons

Emissions Produced by Cogeneration Process
6.90493 Annual metric tons

Use Equation 10.2 for the Incomplete Combustion of Digester Gas (from LCOG protocol)

Annual CH4 emissions (metric tons) = Digester Gas x FCH4 x ρ(CH4) x (1-DE) x 0.0283 x 365.25 x 10-6
Digester Gas is the measured scf produced per day
Where DE is the destruction efficiency = 0.99
FCH4 is the fraction of CH4 in the biogas = 0.65
ρ(CH4) is the density of methane at standard conditions = 662

Cogeneration Production Output
248 kW Average Over Year

PG&E Natural Gas Detail

MMBTU/therm=: 0.099976 Units are in therms

MMBTU/MMSCF=: 1020 Basis of Calculation: All uses increase by 1.67 from the 9 MGD condition

Natural Gas Consumption by Source

Source ID	Total use (MMBTU)			
1-1A (South Plant)	10,628	PG&E SID	7640313822	
		Use (Therms)	106,283	
1-1B (North Plant)	7,884	PG&E SID	5693872005	
		Use (Therms)	78,843	
1-2 Cogeneration	-7,538	GAS SAVINGS	75,381	The South and North Plant natural gas consumption will subsequently decrease because the heat exchanges will all use waste heat from cogeneration.
Total	10,975		185,126	

PG&E Billing Data

The following data was obtained from the monthly PG&E billings.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	7640313822	Period ending	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	7469	6190	5633	5762	5693	4589	3828	4744	3155	5175	5607	5554	7117
Last month prorate	0.677419355															

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	5693872005	Period ending on	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	5962	6635	3606	3363	2724	1714	2135	3463	3242	3608	3883	5946	6768
Last month prorate	0.677419355															

PG&E Electricity Detail

Electric Consumption by Source

Source ID	Total use (kWh)			PG&E Services
1-1	22,915,675	PG&E SID	9126771761	
		Use (kWh)	22,915,675	Basis of Calculation- the 9 MGD demand increases by 1.67
1-2	-2,177,373	SAVINGS		Electrical Production from Cogeneration

Electric Consumption by Phase

	Flow (GPM)	Head (ft.)	Pump Efficiency	Motor Efficiency	VFD Efficiency	Total Annual Electrical Consumption (kWh)
NDN Recirculation (2.5Q)	26,042	20	0.8	0.92	0.97	1,204,758
Filtration (Q)	10,417	15	0.8	0.92	0.97	361,434

Q= 15 MGD

PG&E Electric Billing Data

The following data was obtained using PG&E billing statements.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	9126771761	Period ending	12/12/2007	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2009
First month prorate	0.3871	Use (kWh)	N/A	1,152,000	1,142,400	1,132,800	1,104,000	1,195,200	1,108,800	1,099,200	1,137,600	1,195,200	1,099,200	1,084,800	1,219,200	1,118,400
Last month prorate	0.6774															

EMERGENCY STAND-BY POWER DIESEL GENERATORS

RUN HOURS FOR 2008

Facility ID	Facility Name	Engines	Break Horse Power	Fuel Usage (gal/hr)	2008 Run Time Hours	Total Fuel Gallons	CO2 (kg)	CH4 (kg)	N2O (kg)	CO2e (metric tons)
1-1	Treatment Plant	750 kW Gen		54.7	8.5	466	4,729	0.2	0.0	4.7
1-1	Treatment Plant	2 MW Gen		160.0	33.9	5,424	55,055	2.3	0.5	55.2
									TOTAL	**60.0**

Assume the 9 MGD condition increases by 1.67

kg CO2/ gallon of diesel fuel = 10.15
kg CH4/ MMBTU of diesel fuel = 0.003
kg N2O/ MMBTU of diesel fuel = 0.0006

Global Warming Potential of CO2 = 1
Global Warming Potential of CH4 = 21
Global Warming Potential of N20 = 310

Source: California Climate Action Registry Online Reporting Tool.

Inventory #4: 15 MGD Using Existing Process

Easterly WWTP Estimated Greenhouse Gas Inventory 2008

CO2 (lb)/kWh=: 0.83567 (Source: The Climate Registry)

CH4 (lbs)/MWh=: 0.0302 (Source: The Climate Registry)

N2O (lbs)/MWh=: 0.0081 (Source: The Climate Registry)

CO2 (kg)/MMBTU-natural-gas=: 53.06 (Source: The Climate Registry)

CH4 (kg)/MMBTU-natural-gas=: 0.001 (Source: The Climate Registry)

N2O (kg)/MMBTU-natural-gas=: 0.0001 (Source: The Climate Registry)

kg CO2/ gallon of diesel fuel = 10.15 (Source: The Climate Registry)

kg CH4/ MMBTU of diesel fuel = 0.003 (Source: The Climate Registry)

kg N2O/ MMBTU of diesel fuel = 0.0006 (Source: The Climate Registry)

Facility / Source ID	Facility / Source Name	Indirect GHG emissions from imported electricity				Direct GHG emissions from natural gas combustion				Direct GHG emissions from diesel combustion in stationary engines				Direct GHG emissions from the incomplete combustion of digester gas				GHG as CO2eq			SUBTOTALS	
		Total kWh	CO2 (metric-tons)	CH4 Metric-tons	N2O Metric-tons	Total MMBTU	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total Gallons	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total SCF	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	CO2 eq Metric Tons	CH4 as CO2 eq Metric Tons	N2O as CO2 eq Metric Tons	CO2eq metric-tons	%
1-1	Treatment Plant	22,915,675	6,607.50	0.31	0.08	18,513	982.28	0.02	0.00	5,890	59.78	0.00	0.00	56,702,409.13		4.38		7,650	98.9	27	7,775	100.0
1-2	Cogen																					
	Totals in Metric Tons	22,915,675	6,608	0.314	0.084	18,513	982	0	0.00	5,890	60	0	0	56,702,409	0	4		7,650	99	27	7,775	100
	Mectric tons CO2eq		6607.50	6.60	26.04		982.28	0.39	0.57		59.78	0.05	0.15	56,702,409	0.00	91.90						
	indirect GHG from imported Power	6,640			6,640																	
	Direct GHG Emissions from Fossil Fuel	1,043							983				60									
	Direct GHG Emissions from process	0																				
	Direct GHG Emissions from Biogenic Fuel	91.9															91.9					

TOTAL EQUIVALENT METRIC TONS CO2 EMITTED BY EWWTP DURING INVENTORY #4	7,775

* See detailed summary on De Minimis Sources page. De minimis emissions are not included in the total footprint.

De Minimis Sources (includes CH4 and N2O emissions)

CO2 (kg)/gal-gasoline=:	8.81	CO2e (kg)/CH4(kg)=:	21
CO2 (kg)/gal-diesel=:	10.15	CO2e (kg)/N2O(kg)=:	310
(Source: The Climate Registry)		(Source: The Climate Registry)	

Facility / Source ID	Facility / Source Name	CO2 Emissions from mobile combustion (upper-bounded estimate)				CH4/N2O emissions from mobile combustion (upper-bounded estimate)			TOTAL
		Total gasoline gallons	Total diesel gallons	CO2 (metric-tons)	%	CH4 CO2e (metric-tons)	%	NO2 CO2e (metric tons)	%
1-2	Treatment Plant	3,583	963	43	0.6	0.02	0.00	0.4	0.01
1-3	Cogen								
TOTAL		3,583	963	43	0.6	0	0.0	0	0.006

De Minimis Vehicle Fuel Use

Fuel Use Estimate

Source ID	Gasoline (gal)	Diesel (gal)	CNG (gal)		CO2 Emissions (kg CO2)
1-1 (General)	3,583	229	185		35,214
1-1 (Sludge)		734			7,451
TOTAL	3,583	963	185		42,665

Source ID	Vehicle Classification - Fuel	Year	Mileage	CH4 Emissions (kgCO2,eq)	N2O Emissions (kgCO2,eq)
1-1	Light Duty - CNG		5,550		
	Light Duty Trucks - Gasoline	2003, 17 MPG	60,919	22.8	430.6
	Light Duty Trucks - Diesel	2003, 17 MPG	3,888	0.1	1.8
	Heavy Duty Trucks- Diesel	All Years, 7 MPG	5,139	0.6	7.6

Basis of Calculation:

The city fuel efficiency for a 2002 truck is 17 MPG
The plant fuel usage increases by 1.67 from the 9 MGD levels

CO2 Emission Factors		
Fuel	kg CO2/gal	kg CO2/gal
Gasoline		8.81
Compressed Natural Gas	7.15	
Diesel		10.15

(Source: The Climate Registry,Table 13.1 and the EIA)

Vehicle Classification - Fuel	Year	CH4 Emission Factors (g CH4/mile)	N2O Emission Factors (g N2O/mile)
Light Duty - CNG	2002	0.737	0.05
Light Duty Trucks - Gasoline	2002	0.0178	0.0228
Light Duty Trucks - Diesel	2002	0.001	0.0015
Heavy Duty Trucks - Diesel	All Years	0.0051	0.0048

(Source: The Climate Registry, Table 13.4-5)

Nitrification/Denitrification Contributions

Use Equation 10.7 for the Process Emissions from WWTP with Nitrification/Denitrification (from LCOG protocol)

Annual N2O emissions (metric tons) =
Ptotal x EF nit/denit x 10-6

Ptotal = total population that is served by the centralized WWTP adjusted for industrial discharge, if applicable [person]	user input
EF nit/denit = emmision factor for a WWTP with nitrification/denitrification [g N2O/person/year]	7

Annual N2O emmisions= 0.9261

Basis of Calculation- 2035 Population Level= 132,300

Digester Gas Combustion

All data obtained from Treatment Plant flowmeters

Cogen Assumptions
- 320 kW Generator
- 30% Efficiency
- 80% Run-Time
- 10,000 cfd/20 kW generated
- 45% waste heat recovery

Heat Exchanger Assumptions
- ~Heat exchangers will use 100% waste heat from the cogeneration process in lieu of digester gas.
- ~There is enough DG production to cover the heat requirements.

Present Conditions (2008)	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
1/31/2008	1558369	1880000
2/29/2008	1455411	1960000
3/31/2008	1564570	2210000
4/30/2008	1407248	2050000
5/31/2008	1363988	2100000
6/30/2008	1058861	2020000
7/31/2008	618185	1670000
8/31/2008	609101	1350000
9/30/2008	593383	1070000
10/31/2008	667213	1480000
11/30/2008	783727	1490000
12/31/2008	803482	2190000
TOTALS:	**12,483,538**	**21,470,000**

Units in SCF

Estimated Production For 15 MGD NDN Condition	Dig 3 Heat Exchanger Dig Gas Burned	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q	Cogen Gas Burner
January	0	0	0	4725201
February	0	0	0	4725201
March	0	0	0	4725201
April	0	0	0	4725201
May	0	0	0	4725201
June	0	0	0	4725201
July	0	0	0	4725201
August	0	0	0	4725201
September	0	0	0	4725201
October	0	0	0	4725201
November	0	0	0	4725201
December	0	0	0	4725201
TOTALS:	**0**	**0**	**0**	**56,702,409**

Units in SCF

155,243 scf/day

Total Digester Gas Available Using 9 MGD Processes

92,960 scf/day

Average Heat Exchanger Burn Rate
- scf/day

Average Waste Gas Burn Rate
- scf/day

Average Cogen Burn Rate
155,243 scf/day

Emissions Produced by Heat Exchanger
0 Annual metric tons

Emissions Produced by Waste Gas
0 Annual metric tons

Emissions Produced by Cogeneration Process
6.90493 Annual metric tons

Use Equation 10.2 for the Incomplete Combustion of Digester Gas (from LCOG protocol)

Annual CH4 emissions (metric tons) = Digester Gas x FCH4 x ρ(CH4) x (1-DE) x 0.0283 x 365.25 x 10-6

Digester Gas is the measured scf produced per day

Where DE is the destruction efficiency = 0.99

FCH4 is the fraction of CH4 in the biogas = 0.65

ρ(CH4) is the density of methane at standard conditions = 662

Cogeneration Production Output
248 kW Average Over Year

PG&E Natural Gas Detail

MMBTU/therm=: 0.099976
MMBTU/MMSCF=: 1020

Units are in therms
Basis of Calculation: All uses increase by 1.67 from the 9 MGD condition

Natural Gas Consumption by Source

Source ID	Total use (MMBTU)			
1-1A (South Plant)	10,628	PG&E SID	7640313822	
		Use (Therms)	106,283	
1-1B (North Plant)	7,884	PG&E SID	5693872005	
		Use (Therms)	78,843	
1-2 Cogeneration	-7,538	GAS SAVINGS	75,381	The South and North Plant natural gas consumption will subsequently decrease because the heat exchanges will all use waste heat from cogeneration.
Total	10,975		185,126	

PG&E Billing Data

The following data was obtained from the monthly PG&E billings.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	7640313822	Period ending	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	7469	6190	5633	5762	5693	4589	3828	4744	3155	5175	5607	5554	7117
Last month prorate	0.677419355															

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	5693872005	Period ending on	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	5962	6635	3606	3363	2724	1714	2135	3463	3242	3608	3883	5946	6768
Last month prorate	0.677419355															

PG&E Electricity Detail

Electric Consumption by Source

Source ID	Total use (kWh)	PG&E Services		
1-1	22,915,675	PG&E SID	9126771761	
		Use (kWh)	22,915,675	Basis of Calculation- the 9 MGD demand increases by 1.67
1-2	-2,177,373	SAVINGS		Electrical Production from Cogeneration

Electric Consumption by Phase

	Flow (GPM)	Head (ft.)	Pump Efficiency	Motor Efficiency	VFD Efficiency	Total Annual Electrical Consumption (kWh)
NDN Recirculation (2.5Q)	26,042	20	0.8	0.92	0.97	1,204,758
Filtration (Q)	10,417	15	0.8	0.92	0.97	361,434

Q= 15 MGD

PG&E Electric Billing Data

The following data was obtained using PG&E billing statements.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	9126771761	Period ending	12/12/2007	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2009
First month prorate	0.3871	Use (kWh)	N/A	1,152,000	1,142,400	1,132,800	1,104,000	1,195,200	1,108,800	1,099,200	1,137,600	1,195,200	1,099,200	1,084,800	1,219,200	1,118,400
Last month prorate	0.6774															

EMERGENCY STAND-BY POWER DIESEL GENERATORS

RUN HOURS FOR 2008

Facility ID	Facility Name	Engines	Break Horse Power	Fuel Usage (gal/hr)	2008 Run Time Hours	Total Fuel Gallons	CO2 (kg)	CH4 (kg)	N2O (kg)	CO2e (metric tons)
1-1	Treatment Plant	750 kW Gen		54.7	8.5	466	4,729	0.2	0.0	4.7
1-1	Treatment Plant	2 MW Gen		160.0	33.9	5,424	55,055	2.3	0.5	55.2
									TOTAL	60.0

Assume the 9 MGD condition increases by 1.67

kg CO2/ gallon of diesel fuel =	**10.15**
kg CH4/ MMBTU of diesel fuel =	**0.003**
kg N2O/ MMBTU of diesel fuel =	**0.0006**

Global Warming Potential of CO2 =	**1**
Global Warming Potential of CH4 =	**21**
Global Warming Potential of N20 =	**310**

Source: California Climate Action Registry Online Reporting Tool.

Inventory #5: 9 MGD w/ NDN and Filtration (No Cogeneration)

Easterly WWTP Estimated Greenhouse Gas Inventory 2008

CO2 (lb)/kWh=: 0.63567
(Source: The Climate Registry)

CH4 (lbs)/MWh=: 0.0302
(Source: The Climate Registry)

N2O (lbs)/MWh=: 0.0081
(Source: The Climate Registry)

CO2 (kg)/MMBTU-natural-gas=: 53.06
(Source: The Climate Registry)

CH4 (kg)/MMBTU-natural-gas=: 0.001
(Source: The Climate Registry)

N2O (kg)/MMBTU-natural-gas=: 0.0001
(Source: The Climate Registry)

kg CO2/ gallon of diesel fuel = 10.15
(Source: The Climate Registry)

kg CH4/ MMBTU of diesel fuel = 0.003
(Source: The Climate Registry)

kg N2O/ MMBTU of diesel fuel = 0.0006
(Source: The Climate Registry)

Facility / Source ID	Facility / Source Name	Indirect GHG emissions from imported electricity				Direct GHG emissions from natural gas combustion				Direct GHG emissions from diesel combustion in stationary engines				Direct GHG emissions from natural nitrification/denitrification in receiving water				Direct GHG emissions from the incomplete combustion of digester gas				GHG as CO2eq			SUBTOTALS	
		Total kWh	CO2 (metric-tons)	CH4 Metric-tons	N2O Metric-tons	Total MMBTU	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total Gallons	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	NH3-N Pounds	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total SCF	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	CO2 eq Metric Tons	CH4 as CO2 eq Metric Tons	N2O as CO2 eq Metric Tons	CO2eq metric-tons	%
1-1	Treatment Plant	14,661,661	4,227.54	0.20	0.05	11,085	588.19	0	0	3,527	35.80	0.00	0.00				0.68	33,953,538.40		4.14		4,852	91.4	226	5,169	100.0
1-2	Cogen																									
	Totals in Metric Tons	14,661,661	4,228	0.201	0.054	11,085	588	0	0.00	3,527	36	0	0	0	0	0	0.68	33,953,538	0	4		4,852	91	226	5,169	100
	Mectric tons CO2eq		4227.54	4.22	16.66		588.19	0.23	0.34		35.80	0.03	0.09		0.00	0.00	209.30	33,953,538	0.00	86.87						
	Indirect GHG from Imported Power	4,248			4,248																					
	Direct GHG Emissions from Fossil Fuel	625							589				36													
	Direct GHG Emissions from process	209															209									
	Direct GHG Emissions from Biogenic Fuel	87																			87					

TOTAL EQUIVALENT METRIC TONS CO2 EMITTED BY EWWTP DURING INVENTORY #2 5,169

* See detailed summary on De Minimis Sources page. De minimis emissions are not included in the total footprint.

De Minimis Sources (includes CH4 and N2O emissions)

CO2 (kg)/gal-gasoline=:	8.81	CO2e (kg)/CH4(kg)=:	21
CO2 (kg)/gal-diesel=:	10.15	CO2e (kg)/N2O(kg)=:	310
(Source: The Climale Registry)		(Source: The Climate Registry)	

Facility / Source ID	Facility / Source Name	CO2 Emissions from mobile combustion (upper-bounded estimate)				CH4/N2O emissions from mobile combustion (upper-bounded estimate)			TOTAL
		Total gasoline gallons	Total diesel gallons	CO2 (metric-tons)	%	CH4 CO2e (metric-tons)	%	NO2 CO2e (metric tons)	%
t-2	Treatment Plant	2,146	577	26	0.5	0.0	0.00	0.3	0.01
1-3	Cogen								
TOTAL		2,146	577	26	0.5	0	0.0	0	0.005

De Minimis Vehicle Fuel Use

Fuel Use Estimate

Source ID	Gasoline (gal)	Diesel (gal)	CNG (gal)		CO2 Emissions (kg CO2)
1-1 (General)	2,146	137	111		21,086
1-1 (Sludge)		440			4,462
TOTAL	**2,146**	**577**	**111**		**25,548**

Source ID	Vehicle Classification - Fuel	Year	Mileage	CH4 Emissions (kgCO2,eq)	N2O Emissions (kgCO2,eq)
1-1	Light Duty - CNG		3,323		
	Light Duty Trucks - Gasoline	2003, 17 MPG	36,478	13.6	257.8
	Light Duty Trucks - Diesel	2003, 17 MPG	2,328	0.0	1.1
	Heavy Duty Trucks- Diesel	All Years, 7 MPG	3,077	0.3	4.6

Basis of Calculation:

The city fuel efficiency for a 2002 truck is 17 MPG

Sludge Hauling Basis of Calculation:

CO2 Emission Factors		
Fuel	kg CO2/gal	kg CO2/gal
Gasoline		8.81
Compressed Natural Gas	7.15	
Diesel		10.15

(Source: The Climate Registry,Table 13.1 and the EIA)

Vehicle Classification - Fuel	Year	CH4 Emission Factors (g CH4/mile)	N2O Emission Factors (g N2O/mile)
Light Duty - CNG	2002	0.737	0.05
Light Duty Trucks - Gasoline	2002	0.0178	0.0228
Light Duty Trucks - Diesel	2002	0.001	0.0015
Heavy Duty Trucks - Diesel	All Years	0.0051	0.0048

(Source: The Climate Registry, Table 13.4-5)

Nitrification/Denitrification Contributions

Use Equation 10.7 for the Process Emissions from WWTP with Nitrification/Denitrification (from LCOG protocol)

Annual N2O emissions (metric tons) =
Ptotal x EF nit/denit x 10-6

Ptotal = total population that is served by the centralized WWTP adjusted for industrial discharge, if applicable [person]	user input
EF nit/denit = emmision factor for a WWTP with nitrification/denitrification [g N2O/person/year]	7

Annual N2O emmisions= 0.67515 metric tons

Digester Gas Combustion

All data obtained from Treatment Plant flowmeters

Basis of Calculations

320 kW Generator
30% Efficiency
80% Run-Time
10,000 scf/20 kW generated
45% waste heat recovery

Heat Exchanger Basis of Calculations

~Heat exchangers will use 100% waste heat from the cogeneration process in lieu of digester gas.
~There is enough DG production to cover the heat requirements.

Total Digester Gas Available Using 9 MGD Processes

92,960 scf/day

Present Conditions (2008)	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
1/31/2008	1558369	1880000
2/29/2008	1455411	1960000
3/31/2008	1564570	2210000
4/30/2008	1407248	2050000
5/31/2008	1363988	2100000
6/30/2008	1058861	2020000
7/31/2008	618185	1670000
8/31/2008	609101	1350000
9/30/2008	593383	1070000
10/31/2008	667213	1480000
11/30/2008	783727	1490000
12/31/2008	803482	2190000
TOTALS:	**12,483,538**	**21,470,000**

Units in SCF

Estimated Production For 9 MGD NDN Condition (Same as Present)	Dig 3 Heat Exchanger Dig Gas Burned	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
January	0	1558369	1880000
February	0	1455411	1960000
March	0	1564570	2210000
April	0	1407248	2050000
May	0	1363988	2100000
June	0	1058861	2020000
July	0	618185	1670000
August	0	609101	1350000
September	0	593383	1070000
October	0	667213	1480000
November	0	783727	1490000
December	0	803482	2190000
TOTALS:	**0**	**12,483,538**	**21,470,000**

Units in SCF

Average Heat Exchanger Burn Rate
34,178 scf/day

Average Waste Gas Burn Rate
58,822 scf/day

Emissions Produced by Heat Exchanger
1.52018164 Annual metric tons

Emissions Produced by Waste Gas
2.616297861 Annual metric tons

Use Equation 10.2 for the Incomplete Combustion of Digester Gas (from LCOG protocol)

Annual CH_4 emissions (metric tons) = Digester Gas x FCH_4 x $p(CH_4)$ x (1-DE) x 0.0283 x 365.25 x 10-6
Digester Gas is the measured scf produced per day
Where DE is the destruction efficiency = 0.99
FCH_4 is the fraction of CH_4 in the biogas = 0.65
$p(CH_4)$ is the density of methane at standard conditions = 662

PG&E Natural Gas Detail

MMBTU/therm=: 0.099976
MMBTU/MMSCF=: 1020

Units are in therms

Natural Gas Consumption by Source

Source ID	Total use (MMBTU)		
1-1A (South Plant)	6,364	PG&E SID	7640313822
		Use (Therms)	63,642
1-1B (North Plant)	4,721	PG&E SID	5693872005
		Use (Therms)	47,212
Total	11,085		110,854

PG&E Billing Data

The following data was obtained from the monthly PG&E billings.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	7640313822	Period ending	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	7469	6190	5633	5762	5693	4589	3828	4744	3155	5175	5607	5554	7117
Last month prorate	0.677419355															

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	5693872005	Period ending on	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	5962	6635	3606	3363	2724	1714	2135	3463	3242	3608	3883	5946	6768
Last month prorate	0.677419355															

PG&E Electricity Detail

Electric Consumption by Source

Source ID	Total use (kWh)	PG&E Services															
1-1	13,721,961	PG&E SID	9126771761														
		Use (kWh)	13,721,961														

Electric Consumption by Phase

	Flow (GPM)	Head (ft.)	Pump Efficiency	Motor Efficiency	VFD Efficienc	Total Annual Electrical Consumption (kWh)
NDN Recirculation (2.5Q)	15,625	20	0.8	0.92	0.97	722,846
Filtration (Q)	6,250	15	0.8	0.92	0.97	216,854

Q= 9 MGD

PG&E Electric Billing Data

The following data was obtained using PG&E billing statements.

Billing Address	6040 Vaca Station Road / Elmira / 95625																
Service ID	9126771761	Period ending	12/12/2007	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2009	
First month prorate	0.3871	Use (kWh)	N/A	1,152,000	1,142,400	1,132,800	1,104,000	1,195,200	1,108,800	1,099,200	1,137,600	1,195,200	1,099,200	1,084,800	1,219,200	1,118,400	
Last month prorate	0.6774																

EMERGENCY STAND-BY POWER DIESEL GENERATORS

RUN HOURS FOR 2008

Facility ID	Facility Name	Engines	Break Horse Power	Fuel Usage (gal/hr)	2008 Run Time Hours	Total Fuel Gallons	CO2 (kg)	CH4 (kg)	N2O (kg)	CO2e (metric tons)
1-1	Treatment Plant	750 kW Gen		54.7	5.1	279	2,832	0.1	0.0	2.8
1-1	Treatment Plant	2 MW Gen		160.0	20.3	3,248	32,967	1.4	0.3	33.1
									TOTAL	35.9

kg CO2/ gallon of diesel fuel =	10.15
kg CH4/ MMBTU of diesel fuel =	0.003
kg N2O/ MMBTU of diesel fuel =	0.0006

Global Warming Potential of CO2 =	1
Global Warming Potential of CH4 =	21
Global Warming Potential of N20 =	310

Source: California Climate Action Registry Online Reporting Tool.

Inventory #6: 15 MGD w/ NDN and Filtration (No Cogeneration)

Easterly WWTP Estimated Greenhouse Gas Inventory 2008

CO2 (lb)/kWh=: 0.63567
(Source: The Climate Registry)

CH4 (lbs)/MWh=: 0.0302
(Source: The Climate Registry)

N2O (lbs)/MWh=: 0.0051
(Source: The Climate Registry)

CO2 (kg)/MMBTU-natural-gas=: 53.06
(Source: The Climate Registry)

CH4 (kg)/MMBTU-natural-gas=: 0.001
(Source: The Climate Registry)

N2O (kg)/MMBTU-natural-gas=: 0.0001
(Source: The Climate Registry)

kg CO2/ gallon of diesel fuel = 10.15
(Source: The Climate Registry)

kg CH4/ MMBTU of diesel fuel = 0.003
(Source: The Climate Registry)

kg N2O/ MMBTU of diesel fuel = 0.0006
(Source: The Climate Registry)

Facility / Source ID	Facility / Source Name	Indirect GHG emissions from imported electricity				Direct GHG emissions from natural gas combustion				Direct GHG emissions from diesel combustion in stationary engines				Direct GHG emissions from natural nitrification/denitrification in receiving water				Direct GHG emissions from the incomplete combustion of digester gas				GHG as CO2eq			SUBTOTALS	
		Total kWh	CO2 (metric-tons)	CH4 Metric-tons	N2O Metric-tons	Total MMBTU	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total Gallons	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	NH3-N Pounds	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	Total SCF	CO2 metric-tons	CH4 Metric-tons	N2O Metric-tons	CO2 eq Metric Tons	CH4 as CO2 eq Metric Tons	N2D as CO2 eq Metric Tons	CO2eq metric-tons	%
1-1	Treatment Plant	24,481,868	7,059.10	0.34	0.09	18,513	982.28	0.02	0.00	5,890	59.78	0.00	0.00				0.93	56,702,409.13		6.9 t		8,101	152.6	316	8,569	100.0
1-2	Cogen																									
	Totals in Metric Tons	24,481,868	7,059	0.336	0.090	18,513	982	0	0.00	5,890	60	0	0	0	0	0	1	56,702,409	0	7		8,101	153	316	8,569	100
	Mectric tons CO2eq		7059.10	7.05	27.82		982.28	0.39	0.57		59.78	0.05	0.15		0.00	0.00	287.09	56,702,409	0.00	145.07						
	Indirect GHG from imported Power	7,094			7,094																					
	Direct GHG Emissions from Fossil Fuel	1,043							983				60													
	Direct GHG Emissions from process	287															287									
	Direct GHG Emissions from Biogenic Fuel	145.1																			145.1					

TOTAL EQUIVALENT METRIC TONS CO2 EMITTED BY EWWTP DURING INVENTORY #3 8,569

* See detailed summary on De Minimis Sources page. De minimis emissions are not included in the total footprint.

De Minimis Sources (includes CH4 and N2O emissions)

CO2 (kg)/gal-gasoline=:	8.81	CO2e (kg)/CH4(kg)=:	21
CO2 (kg)/gal-diesel=:	10.15	CO2e (kg)/N2O(kg)=:	310
(Source: The Climate Registry)		(Source: The Climate Registry)	

Facility / Source ID	Facility / Source Name	CO2 Emissions from mobile combustion (upper-bounded estimate)				CH4/N2O emissions from mobile combustion (upper-bounded estimate)			TOTAL
		Total gasoline gallons	Total diesel gallons	CO2 (metric-tons)	%	CH4 CO2e (metric-tons)	%	NO2 CO2e (metric tons)	%
1-2	Treatment Plant	3,583	963	43	0.5	0.02	0.00	0.4	0.01
1-3	Cogen								
TOTAL		3,583	963	43	0.5	0	0.0	0	0.005

De Minimis Vehicle Fuel Use

Fuel Use Estimate

Source ID	Gasoline (gal)	Diesel (gal)	CNG (gal)		CO2 Emissions (kg CO2)
1-1 (General)	3,583	229	185		35,214
1-1 (Sludge)		734			7,451
TOTAL	3,583	963	185		42,665

Source ID	Vehicle Classification - Fuel	Year	Mileage	CH4 Emissions (kgCO2,eq)	N2O Emissions (kgCO2,eq)
1-1	Light Duty - CNG		5,550		
	Light Duty Trucks - Gasoline	2003, 17 MPG	60,919	22.8	430.6
	Light Duty Trucks - Diesel	2003, 17 MPG	3,888	0.1	1.8
	Heavy Duty Trucks- Diesel	All Years, 7 MPG	5,139	0.6	7.6

Basis of Calculation:

The city fuel efficiency for a 2002 truck is 17 MPG
The plant fuel usege increases by 1.67 from the 9 MGD levels

CO2 Emission Factors		
Fuel	kg CO2/gal	kg CO2/gal
Gasoline		8.81
Compressed Natural Gas	7.15	
Diesel		10.15

(Source: The Climate Registry,Table 13.1 and the EIA)

Vehicle Classification - Fuel	Year	CH4 Emission Factors (g CH4/mile)	N2O Emission Factors (g N2O/mile)
Light Duty - CNG	2002	0.737	0.05
Light Duty Trucks - Gasoline	2002	0.0178	0.0228
Light Duty Trucks - Diesel	2002	0.001	0.0015
Heavy Duty Trucks - Diesel	All Years	0.0051	0.0048

(Source: The Climate Registry, Table 13.4-5)

Nitrification/Denitrification Contributions

Use Equation 10.7 for the Process Emissions from WWTP with Nitrification/Denitrification (from LCOG protocol)

Annual N2O emissions (metric tons) =
Ptotal x EF nit/denit x 10-6

Ptotal = total population that is served by the centralized WWTP adjusted for industrial discharge, if applicable [person]	user input
EF nit/denit = emmision factor for a WWTP with nitrification/denitrification [g N2O/person/year]	7

Annual N2O emmisions= 0.9261

Basis of Calculation- 2035 Population Level= 132,300

Digester Gas Combustion

All data obtained from Treatment Plant flowmeters

Cogen Assumptions

320 kW Generator
30% Efficiency
80% Run-Time
10,000 cfd/20 kW generated
45% waste heat recovery

Heat Exchanger Assumptions

~Heat exchangers will use 100% waste heat from the cogeneration process in lieu of digester gas.
~There is enough DG production to cover the heat requirements.

Present Conditions (2008)	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
1/31/2008	1558369	1880000
2/29/2008	1455411	1960000
3/31/2008	1564570	2210000
4/30/2008	1407248	2050000
5/31/2008	1363988	2100000
6/30/2008	1058861	2020000
7/31/2008	618185	1670000
8/31/2008	609101	1350000
9/30/2008	593383	1070000
10/31/2008	667213	1480000
11/30/2008	783727	1490000
12/31/2008	803482	2190000
TOTALS:	**12,483,538**	**21,470,000**

Units in SCF

Estimated Production For 15 MGD NDN Condition	Dig 3 Heat Exchanger Dig Gas Burned	Dig 1&2 Heat Exchanger Dig Gas Burned	Waste Gas Burner Q
January	0	2602477	3139600
February	0	2430536	3273200
March	0	2612832	3690700
April	0	2350104	3423500
May	0	2277860	3507000
June	0	1768297	3373400
July	0	1032370	2788900
August	0	1017199	2254500
September	0	990950	1786900
October	0	1114246	2471600
November	0	1308824	2488300
December	0	1341816	3657300
TOTALS:	**0**	**20,847,509**	**35,854,900**

Units in SCF

Total Digester Gas Available Using 9 MGD Processes

92,960 scf/day

Average Heat Exchanger Burn Rate
57,077 scf/day

Average Waste Gas Burn Rate
98,233 scf/day

Emissions Produced by Heat Exchanger
2.538703339 Annual metric tons

Emissions Produced by Waste Gas
4.369217428 Annual metric tons

Use Equation 10.2 for the Incomplete Combustion of Digester Gas (from LCOG protocol)

Annual CH_4 emissions (metric tons) = Digester Gas x FCH_4 x $\rho(CH_4)$ x (1-DE) x 0.0283 x 365.25 x 10-6
Digester Gas is the measured scf produced per day
Where DE is the destruction efficiency = 0.99
FCH_4 is the fraction of CH_4 in the biogas = 0.65
$\rho(CH_4)$ is the density of methane at standard conditions = 662

PG&E Natural Gas Detail

MMBTU/therm=: 0.099976
MMBTU/MMSCF=: 1020

Units are in therms
Basis of Calculation: All uses increase by 1.67 from the 9 MGD condition

Natural Gas Consumption by Source

Source ID	Total use (MMBTU)		
1-1A (South Plant)	10,628	PG&E SID	7640313822
		Use (Therms)	106,283
1-1B (North Plant)	7,884	PG&E SID	5693872005
		Use (Therms)	78,843
Total	18,513		185,126

PG&E Billing Data

The following data was obtained from the monthly PG&E billings.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	7640313822	Period ending	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	7469	6190	5633	5762	5693	4589	3828	4744	3155	5175	5607	5554	7117
Last month prorate	0.677419355															

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	5693872005	Period ending on	December	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2008
First month prorate	0.387096774	Use (therms)	N/A	5962	6635	3606	3363	2724	1714	2135	3463	3242	3608	3883	5946	6768
Last month prorate	0.677419355															

PG&E Electricity Detail

Electric Consumption by Source

Source ID	Total use (kWh)	PG&E Services		
1-1	22,915,675	PG&E SID	9126771761	
		Use (kWh)	22,915,675	Basis of Calculation- the 9 MGD demand increases by 1.67

Electric Consumption by Phase

	Flow (GPM)	Head (ft.)	Pump Efficiency	Motor Efficiency	VFD Efficiency	Total Annual Electrical Consumption (kWh)
NDN Recirculation (2.5Q)	26,042	20	0.8	0.92	0.97	1,204,758
Filtration (Q)	10,417	15	0.8	0.92	0.97	361,434

Q= 15 MGD

PG&E Electric Billing Data

The following data was obtained using PG&E billing statements.

Billing Address	6040 Vaca Station Road / Elmira / 95625															
Service ID	9126771761	Period ending	12/12/2007	1/12/2008	2/11/2008	3/12/2008	4/10/2008	5/12/2008	6/12/2008	7/11/2008	8/11/2008	9/10/2008	10/9/2008	11/7/2008	12/10/2008	1/9/2009
First month prorate	0.3871	Use (kWh)	N/A	1,152,000	1,142,400	1,132,800	1,104,000	1,195,200	1,108,800	1,099,200	1,137,600	1,195,200	1,099,200	1,084,800	1,219,200	1,118,400
Last month prorate	0.6774															

EMERGENCY STAND-BY POWER DIESEL GENERATORS

RUN HOURS FOR 2008

Facility ID	Facility Name	Engines	Break Horse Power	Fuel Usage (gal/hr)	2008 Run Time Hours	Total Fuel Gallons	CO2 (kg)	CH4 (kg)	N2O (kg)	CO2e (metric tons)
1-1	Treatment Plant	750 kW Gen		54.7	8.5	466	4,729	0.2	0.0	4.7
1-1	Treatment Plant	2 MW Gen		160.0	33.9	5,424	55,055	2.3	0.5	55.2
									TOTAL	60.0

Assume the 9 MGD condition increases by 1.67

kg CO2/ gallon of diesel fuel =	10.15
kg CH4/ MMBTU of diesel fuel =	0.003
kg N2O/ MMBTU of diesel fuel =	0.0006

Global Warming Potential of CO2 =	1
Global Warming Potential of CH4 =	21
Global Warming Potential of N20 =	310

Source: California Climate Action Registry Online Reporting Tool.