PG&G Hollister Transmission Line Reconstruction Project (Nov 2009)

Daily Construction Emissions

	Construction Emissions (pounds per day)					
Construction Phase	ROG	NOX	CO	SO2	PM10 Fugitive Dust	DPM Exhaust
1 Hollister Tower Segment	8	68	40	0	31	3
Staging areas	4	35	20	0	20	2
Tower and transmission line	4	33	20	0	11	1
2 Hollister Pole Segment	9	80	44	0	31	4
Staging areas	4	35	20	0	20	2
Tower and transmission line	5	45	24	0	11	2
3 Hollister Substation	2	18	6	0	0	1
4 Helicopter Operation	2	122	41	8	0	8
Maximum daily emissions	17	202	85	8	62	12

Daily Construction Emissions with Mitigation APM AIR-2

	Construction Emissions (pounds per day)					
Construction Phase	ROG	NOX	CO	SO2	PM10 Fugitive Dust	DPM Exhaust
1 Hollister Tower Segment	7	61	36	0	31	3
Staging areas	4	31	18	0	20	2
Tower and transmission line	3	30	18	0	11	1
2 Hollister Pole Segment	8	72	40	0	31	3
Staging areas	4	31	17	0	20	1
Tower and transmission line	4	41	23	0	11	2
3 Hollister Substation	2	16	6	0	0	1
4 Helicopter Operation	2	122	41	8	0	8
Maximum daily emissions	15	194	81	8	62	11

Operation of off-road construction equipment is assumed to be reduced by one hour per day by minimizing idling time to 5 minutes.

PG&G Hollister Transmission Line Reconstruction Project (Nov 2009)

CO2 Construction Emissions

	Construction Phase	CO2 Emissions (total tons per phase)	CO2 Emissions with Mitigation APM AIR-2 (total tons per phase)	CO2 Reduction Factor w/ Mitigation APM AIR-3	CO2 Emissions with APM AIR-2 and APM AIR-3 (total tons per phase)
	2011				
1	Hollister Tower Segment	352	318		286
	Off-Road Diesel[1,2]	272	238	10%	214
	On-Road Diesel	39	39		39
	Worker Trips	41	41	20%	33
2	Hollister Pole Segment	465	430		398
	Off-Road Diesel[1,2]	280	245	10%	221
	On-Road Diesel	146	146		146
	Worker Trips[3]	39	39	20%	31
3	Hollister Substation	21	19		18
	Off-Road Diesel[1,2]	16	14	10%	13
	On-Road Diesel	4	4		4
	Worker Trips[3]	1	1	20%	1
4	Helicopter Operation	1773	1773		1773
	2012				
1	Hollister Tower Segment	32	29		26
	Off-Road Diesel[1,2]	24	21	10%	19
	On-Road Diesel	4	4		4
	Worker Trips	4	4	20%	3
	Total CO2 (tons for project)	**2643**	**2569**		**2501**

Mitigation APM AIR-2

[1] Operation of off-road construction equipment is assumed to be reduced by one hour per day by minimizing idling time to 5 minutes.

Mitigation APM AIR-3

[2] Construction contractors are assumed to use B20 biodiesel (20% biodiesel and 80% diesel) for all off-road construction equipment.

[2] 20% of workers are assumed to carpool.

PG&G Hollister Tap Power Line Reconductoring Project Preliminary Construction Estimations

Table 1. Preliminary Project Construction Schedule

Construction Phase	Length	Year	Approximate Duration (months)	Approximate progression rate (feet/month)
Hollister Tower Segment	7 miles	2011		
Establish staging area Road construction			1 week per area	
Tower installation Transmission line reconductoring			13	660 (assume 56 weeks)
Hollister Pole Segment	9 miles	2011		
Establish staging area Road construction			1 week per area	
Pole installation Transmission line reconductoring			12	900 (assume 52 weeks)
Hollister Substation construction		2010	1	

Table 2. Preliminary Estimates of Project Earthwork Requirements

Construction Phase	Estimated Maximum Daily Grading (acres)	Estimated Total (acres)	Estimated Maximum Daily Excavation (cubic yards)	Estimated Total Excavation (cubic yards)
Hollister Tower Segment				
Establish staging area Road construction	2	45	0	0
Tower installation Transmission line reconductoring	1	2	10	10
Hollister Pole Segment				
Establish staging area Road construction	2	40		
Pole installation Transmission line reconductoring	4	6	10	50
Hollister Substation construction	N/A	N/A	N/A	N/A

Table 3. Preliminary Estimates of Project Soil and Concrete Requirements

Construction Phase	Estimated Maximum Daily Exported Soil (cubic yards)	Estimated Maximum Daily Imported Concrete (cubic yards)	Estimated Total Exported Soil (cubic yards)	Estimated Total Imported Concrete (cubic yards)
Hollister Tower Segment				
Establish staging area Road construction	Utilized and spread at the project site	0	Utilized and spread at the project site	0
Tower installation Transmission line reconductoring	Utilized and spread at the project site	100	Utilized and spread at the project site	1,000
Hollister Pole Segment				
Establish staging area Road construction	Utilized and spread at the project site	0	Utilized and spread at the project site	0
Tower installation Transmission line reconductoring	Utilized and spread at the project site	200	Utilized and spread at the project site	460
Hollister Substation construction	N/A	N/A	N/A	N/A

Table 4. Preliminary Estimates of Project Construction Equipment and Usage

Construction Phase	Equipment Type	Approximate Hours/Day	Approximate Days/Year
Hollister Tower Segment			
Establish staging area Road construction	Light truck, pick-up truck, water truck	10	N/A
Tower installation Transmission line reconductoring	Grader/cat, helicopters, line trucks, pull rigs, pick-up trucks, tension device, fuel trucks, water trucks, line dolly, cranes, rewind trailers, bucket truck, cement mixer, hole digger, light truck, flat bed truck, fork lift, backhoe, dump truck, vibrating compactor.	10	180
Hollister Pole Segment			
Establish staging area Road construction	Light truck, pick-up truck, water truck	10	N/A
Tower installation Transmission line reconductoring	Grader/cat, helicopters, line trucks, pull rigs, pick-up trucks, tension device, fuel trucks, water trucks, line dolly, cranes, rewind trailers, bucket truck, cement mixer, hole digger, light truck, flat bed truck, fork lift, backhoe, dump truck, vibrating compactor	10	180
Hollister Substation construction	Bucket truck, pick-up truck, line truck	10	20

Table 5. Preliminary Estimates of Helicopter Utilization

Helicopter Type	Number/Type	Approximate Operation Hours/Day	Approximate Operation Days/Year	Approximate Total Hours for Project
Light duty	2 / Hughs 500	10	120	1,200
Heavy duty	2 / Hughs 204/205/214	10	120	1,200

Table 6. Preliminary Estimates of Equipment and Material Delivery Trucks (On-Road Class)

Construction Phase	Estimated Maximum Daily Delivery Trucks	Estimated Total Delivery Trucks for Project
Hollister Tower Segment		
Establish staging area Road construction	3	3 per area
Tower installation Transmission line reconductoring	6	200
Hollister Pole Segment		
Establish staging area Road construction	3	3 per area
Tower installation Transmission line reconductoring	25	200
Hollister Substation construction	2	4

Note: No dump truck traffic (hauling away soil) is expected from project construction. Estimates do not include trucks used for concrete deliveries.

Table F-7. Preliminary Estimates of Construction Workers

Construction Phase	Estimated Maximum Daily Workers
Hollister Tower Segment	23
Establish staging area Road construction	5
Tower installation Transmission line reconductoring	23
Hollister Pole Segment	23
Establish staging area Road construction	5
Tower installation Transmission line reconductoring	23
Hollister Substation construction	10

PG&G Hollister Tap Power Line Reconductoring Project
Helicopter Emission Calculation

Helicopter Type and Usage

Type	Piece	Engine	Power (hp)	Fuel Consumption (gallon/hr)	Operation hrs/day	Operation Days
Bell 214ST	2	GECT7-2A	3250	133	10	120
MD 500D/E	2	Alison 250-C20B	420	28	10	120

Source: Fuel Consumption is obtained from the U.S. Department of Interior National Business Center (2006).

Helicopter Emission Factor

Type	HC (lbs/hr)	NOx (lbs/hr)	CO (lbs/hr)	SOx (lbs/hr)	PM10 (lbs/hr)	CO2 (lbs/gallon)
Bell 214ST	0.13	10.49	2.02	0.65	0.72	18.355
MD 500D/E	0.08	1.75	2.07	0.14	0.10	18.355

Source: Emission factors for HC, NOx, CO, and SOx were obtained from the California Public Utilities Commission (2007); PM10 emission factors were obtained from the CPUC (2006); and CO2 emission factor for aviation gasoline was obtained from the U.S. Department of Energy (2008).

Note:
Emission factors for Bell 214STwere derived from the emission factors for H-53 Super Stallion (T64-GE-416 Turboshaft 4,380 hp engine). Emission factors for take-off and climb-out modes were used.
Emission factors for MD 500D/E were derived from the emission factors for Bell 206 Jet Ranger (Alison 250-C20 Turboshaft 420 hp engine). Emission factors for take-off mode were used.

Helicopter Emission

Type	HC (lbs/day)	NOx (lbs/day)	CO (lbs/day)	SOx (lbs/day)	PM10 (lbs/day)	CO2 (total tons)
Bell 214ST	1.3	104.9	20.2	6.5	7.2	1,465
MD 500D/E	0.8	17.5	20.7	1.4	1.0	308
Total	2	122	41	8	8	1,773

Reference

California Public Utilities Commission (CPUC). 2006. Southern California Edison. Antelope-Pardee 500-kV Transmission Line Project. Environmental Impact Report. Appendix C for Air Quality Calculation. Available: <http://www.cpuc.ca.gov/Environment/info/aspen/antelopepardee/antelopepardee.htm>. Accessed: September 2008.

California Public Utilities Commission (CPUC). 2007. Sierra Pacific Power Company. Hirschdale Power Line Project. Initial Study/Mitigated Negative Declaration. Appendix B for Air Emission Estimates. Available:

<http://www.cpuc.ca.gov/Environment/info/esa/sppc-hirschdale/dmnd_toc.shtml>. Accessed: September 2008.

U.S. Department of Energy. 2008. Energy Information Administration. Voluntary Reporting of Greenhouse Gases Program - Fuel and Energy Source Codes and Emission Coefficients. Available: <http://www.eia.doe.gov/oiaf/1605/coefficients.html>. Accessed: September 2008.

U.S. Department of Interior National Business Center. 2006. Aviation Management Directorate. Aircraft Rental Agreement, Exhibit 2. Available: <http://amd.nbc.gov/akro/akflight/fccindex.htm>. Accessed: September 2008.

US Department of Interior National Business Center 2006.

EXHIBIT 2

HELICOPTER FUEL CONSUMPTION AND WEIGHT REDUCTION CHART

		Fuel Consumption	Load Calculation
		Gallon/Hour	Weight Reduction-Lb
EUROCOPTER	AS-330J	179	NOT ESTABLISHED
	AS-332L-1	160	NOT ESTABLISHED
	AS-350B	45	130
	AS-350B-1	46	160
	AS-350B-2	48	160
	AS-350B-3	50	175
	AS-350D	38	130
	AS-355F-1	58	140
	AS-355F-2	58	140
	AS-365N-1	87	275
	BK-117	77	160
	BO-105CBS	55	180
	SA-315B	58	180
	SA-316B	58	170
	SA-318C	56	80
	SA-319B	55	NOT ESTABLISHED
	SA-341G	56	170
	EC-135	64	220
BELL	47	17A	90
	47/SOLOY	23	120
	204B (UH-1 SERIES)	88	200
	205A-1	89	260
	206B-II	25	100
	206B-III	27	130
	206L-1	32	150
	206L-3 (Incl L-1 C30P)	38	180
	206L-4	38	180
	212	100	390
	214B	160	380
	214ST	133	NOT ESTABLISHED
	222A	70	NOT ESTABLISHED
	222B	83	NOT ESTABLISHED
	222UT	83	NOT ESTABLISHED
	407	45	155
	412	110	390
	412HP	110	390
MD	500C	23	110
	500D/E	28	120
	520N	32	100
	530F	34	120
	600N	41	155
	900/902	69	210
HILLER	UH-12	17A	90
	UH-12/SOLOY	23	100
SIKORSKY	S-55T	47	170
	S-58D/E	83A	OGE 000 IGE 400
	S-58T/PT6T-3	115	OGE 000 IGE 400
	S-58T/PT6T-6	115	OGE 000 IGE 460
	S-62A	70	300
	S-70	160	N/A
ROBINSON	R-44	15A	75
	R-44-II	15A	75
SCHWEIZER	269/300	15A	80
	330/333	26	100

"A" after the gallons indicates Avgas; all others are turbine. 12/01

CPUC 2007
Hirschdale Power Line Project

Appendix B
Air Emission Estimates

ESA

PROPOSED PROJECT DAILY EMISSIONS

ONSITE				Emission factor (lbs/hour)			Daily Emissions lbs		
		HP	Hours/day	NOx	PM	VOC	NOx	PM	VOC
Site Preperation									
Hydroax		250	10	1.931	0.064	0.171	19.31	0.64	1.71
Fugitive Dust		acres	months		(ton/acre-month)				
		0.5	0.033333		0.77			25.67	
						Total:	19.31	26.31	1.71
Pole Installation		HP	Hours/day						
Drill Rig/Generator		175	10	1.6938	0.0795	0.1944	16.94	0.80	1.94
Line Truck		250	10	1.9993	0.0709	0.1933	19.99	0.71	1.93
Skycrane Helicopter (2 engines)		4800 (2)	4	30.99863	2.13	0.39284	123.99	8.52	1.57
						Total:	160.93	10.02	5.45
Conductor Installation									
Line Truck		250	10	1.9993	0.0709	0.1933	19.99	0.71	1.93
Tension Machine		120	10	1.0579	0.0896	0.1711	10.58	0.90	1.71
Wire Puller		175	10	1.231	0.0641	0.1464	12.31	0.64	1.46
Bell 206 Helicopter		420	10	1.749553	0.1	0.079525	17.50	1.00	0.80
						Total:	60.38	3.25	5.90
OFFSITE	Round			Emission factor (g/mile or start)					
	trips/day	miles/trip	grams to lbs	NOx	PM	VOC	NOx	PM	VOC
Semi-Truck (running)	5	40	0.002205	16.299	0.539	0.836	7.19	0.24	0.37
Semi-Truck (starting)	5		0.002205	4.854	0.008	18.13	0.05	0.00	0.20
Semi-Truck (tire wear)	5	40	0.002205		0.031			0.01	
Semi-Truck (break wear)	5	40	0.002205		0.025			0.01	
						Total:	7.24	0.26	0.57
Pick-Up Truck (running)	26	20	0.002205	0.689	0.014	0.106	0.79	0.02	0.12
Pick-Up Truck (starting)	26		0.002205	0.371	0.001	0.306	0.02	0.00	0.02
Pick-Up Truck (tire wear)	26	20	0.002205		0.008			0.01	
Pick-Up Truck (break wear)	26	20	0.002205		0.013			0.01	
						Total:	0.81	0.04	0.14
						Offsite Total:	8.05	0.30	0.71
				Maximum Day (pounds)			**168.98**	**26.61**	**6.61**

MITIGATED EMISSIONS

				Emission factor (lbs/hour)			Daily Emissions lbs		
		HP	Hours/day	NOx	PM	VOC	NOx	PM	VOC
ONSITE									
Pole Installation									
Line Truck		250	4	1.9993	0.0709	0.1933	8.00	0.28	0.77
Skycrane Helicopter (2 engines)		4800 (2)	4	30.99863	2.13	0.39284	123.99	8.52	1.57
					Onsite Total:		131.99	8.80	2.34
OFFSITE	Round			Emission factor (g/mile or start)					
	trips/day	miles/trip	grams to lbs	NOx	PM	VOC	NOx	PM	VOC
Pick-Up Truck (running)	26	20	0.002205	0.689	0.014	0.106	0.79	0.02	0.12
Pick-Up Truck (starting)	26		0.002205	0.371	0.001	0.306	0.02	0.00	0.02
Pick-Up Truck (tire wear)	26	20	0.002205		0.008			0.01	
Pick-Up Truck (break wear)	26	20	0.002205		0.013			0.01	
					Offsite Total:		0.81	0.04	0.14
				Maximum Day (pounds)			**132.80**	**8.84**	**2.48**

Sources: Onsite construction equipment emission factors are for year 2007, obtained from SCAQMD and Offsite emission factors were obtained from Emfac2007. Helicopter emission factors for VOC and NOx were obtained from FAA, 2005 and helicopter emission factors for PM10 were obtained from CPUC, 2006.

Federal Aviation Administration, Office of Environment and Energy (FAA). 2005. Emissions and Dispersion Modeling System Version 4.4, Released November 21, 2005.

California Public Utilities Commission (CPUC), 2006. Antelope-Pardee 500-kV Transmission Line Project Environmental Impact Report, July 2006.

HELICOPTER EMISSION FACTOR DERIVATION

SKYCRANE

	kg/s	g/kg	g/s	g/hour	4380 hp lb/hour	4800 hp lb/hour	Skycrane 2 - 4800 hp
CO	0.2053	1.67	0.342851	1234.2636	2.72108545	2.98201146	5.96402291
HC	0.2053	0.11	0.022583	81.2988	0.17923317	0.19641992	0.39283983
NOx	0.2053	8.68	1.782004	6415.2144	14.1431268	15.499317	30.9986341
Sox	0.2053	0.54	0.110862	399.1032	0.87987194	0.96424323	1.92848645

$\times \frac{3250}{4800 \times 2}$

used T64-GE-416 Turboshaft 4,380 hp engine from the H-53 Super Stallion. Take off and climb out mode were used for fuel flow

HUGHES 500

	kg/s	g/kg	g/s	g/hour	lb/hour
CO	0.0334	7.81	0.260854	939.0744	2.07030467
HC	0.0334	0.3	0.01002	36.072	0.07952515
NOx	0.0334	6.6	0.22044	793.584	1.74955324
Sox	0.0334	0.54	0.018036	64.9296	0.14314526

used Allison 250-C20 420 hp engine from the Bell 206 Jet Ranger. Takeoff mode was used for fuel flow.

CPUC 2006
Antelope-Pardee 500-kV

Appendix 3. Air Quality Calculations

Helicopter Emission Calculations

Emission Factor Derivation

Approach/Climbout (i.e. Working)			Emissions lbs/hour				
Equiv. Engs	Engine HP	Number	HC	CO	NOx	SOx	PM
T53-L-11D	1100	1	0.20	2.04	5.00	0.04	0.27
T58-GE-5 (2)	1500	2	1.40	9.92	12.79	0.11	0.71

Note: SOx increased to assume 30 ppm sulfur Jet A fuel Sulfur Conten

Idle			Emissions lbs/hour				
Equiv. Engs	Engine HP	Number	HC	CO	NOx	SOx	PM
T53-L-11D	1100	1	9.00	4.21	0.20	0.01	0.01
T58-GE-5 (2)	1500	2	25.86	45.12	0.40	0.02	0.03

Source: FAEED database
FAEED - FAA Aircraft Engine Emission Database

Relating Factors to Potential Construction/Operating Helicopters by Ratio of Engine Horsepowe

			Emissions lbs/hour				
Approach/Climbout	Engine HP	Number	HC	CO	NOx	SOx	PM
Hughes 500	420	1	0.08	0.78	1.91	0.02	0.10
Eurocopter	847	1	0.15	1.57	3.85	0.03	0.21
Skycrane	4500	2	4.20	29.76	38.37	0.32	2.13

x 3x50 ÷ (4800x2)

			Emissions lbs/hour				
Idle	Engine HP	Number	HC	CO	NOx	SOx	PM
Hughes 500	420	1	3.44	1.61	0.08	0.00	0.01
Eurocopter	847	1	6.93	3.24	0.15	0.01	0.01
Skycrane	4500	2	77.59	135.36	1.20	0.05	0.08

Construction Assumptions:
Only the Hughes 500 size helicopters are used during conductor installation for the proposed project
Two Hughes helicopters are in operation during line stringing for 2.5 hours/day each
The Eurocopter would be used to ferry personnel and small specialized loads for towers that undergo "helicopter construction'
Maximum Daily Basis - Full day each for the one small and one large helicopter noted in SCE response to Question AQ-02
Maximum Annual Basis - Engineering Estimate (SCE response to Question AQ-02 could not be deciphered to figure out maximum day or annual basis for large and small helicopters
SCE response to Question AQ-02 was not used as it did not provide a way to figure out maximum daily and annual large and small helicopter use The estimate basis given in th
AQ-02 response tables conflicted with the text response noting that only one small and one large helicopter would be used and also noted that it was an "order of magnitude" estimat
Idle time is 10% of working time for small helicopters and negligible for the Skycrane
Assumes helicopters stay within 3000 feet of the ground
Alternatives 1, 4, and 5 helicopter use is based on ratio of the number of towers installed vs. the proposed projec
Alternative 2 additional helicopter use based on engineering estimate for incremental medium and large helicopter use of 1 and 3 hours per tower noted to be constructed by helicopte

Proposed Project Emissions

Peak Day (any Jurisdiction or Air Basin)			Emissions lbs/day					
	Working hours	Idle hr/hr	CO	NOx	PM	SOx	VOC	
Hughes 500	8	0.1	7.51	15.33	0.83	0.13	3.35	lb/day
Eurocopter	0	0.1	0.00	0.00	0.00	0.00	0.00	lb/day
Skycrane	8	0	238.09	306.96	17.01	2.55	33.59	lb/day
		Totals	245.60	322.29	17.84	2.68	36.94	lb/day

Alternative 2

Peak Day (any Jurisdiction or Air Basin)			Emissions lbs/day					
	Working hours	Idle hr/hr	CO	NOx	PM	SOx	VOC	
Hughes 500	8	0.1	7.51	15.33	0.83	0.13	3.35	lb/day
Eurocopter	2	0.1	3.79	7.73	0.42	0.06	1.69	lb/day
Skycrane	16	0	476.17	613.92	34.01	5.10	67.17	lb/day
		Totals	487.47	636.99	35.27	5.29	72.22	lb/day

Proposed Project Annual Emissions
Total Emissions

2008			Emissions tons/year				
	Hours Total	Idle hr/hr	CO	NOx	PM	SOx	VOC
Hughes	800	0.1	0.38	0.77	0.04	0.01	0.17
Eurocopter	0	0.1	0.00	0.00	0.00	0.00	0.00
Skycrane	400	0	5.95	7.67	0.43	0.06	0.84
		Totals	6.33	8.44	0.47	0.07	1.01

SCAB	4.88	6.52	0.36	0.05	0.78	t/yr
MDAB	1.44	1.93	0.11	0.02	0.23	t/yr

Helicopter Emission Calculations

Alternative 1 Annual Incremental SCAQMD Emissions - 2008
Twenty eight fewer towers - assume total baseline helicopter use decreases by this facto

Total Emissions	Towers						
2008	-28		Emissions tons/year				
SCAB	Hours Total	Idle hr/hr	CO	NOx	PM	SOx	VOC
Hughes	-196	0.1	-0.09	-0.19	-0.01	0.00	-0.04
Eurocopter	0	0.1	0.00	0.00	0.00	0.00	0.00
Skycrane	-98	0	-1.46	-1.88	-0.10	-0.02	-0.21
		Totals	-1.55	-2.07	-0.11	-0.02	-0.25

Alternative 2 Annual Incremental SCAQMD Emissions
Eight additional towers - assume total baseline helicopter use increases by this facto
Thirty seven towers are assumed to be "helicopter constructed" - increasing helicopter use using the assumptions for helicopter constructio

Total Emissions	Towers						
	8	additional					
2008	37	heli const	Emissions tons/year				
SCAB	Hours Total	Idle hr/hr	CO	NOx	PM	SOx	VOC
Hughes	56	0.1	0.03	0.05	0.00	0.00	0.01
Eurocopter	37	0.1	0.04	0.07	0.00	0.00	0.02
Skycrane	139	0	2.07	2.67	0.15	0.02	0.29
		Totals	2.13	2.79	0.15	0.02	0.32

Alternative 3 - no change in helicopter use

Alternative 4
One additional tower - assume total baseline helicopter use increases by this facto

Total Emissions	Towers						
2008	1						
SSAB			Emissions tons/year				
Hughes	7	0.1	0.00	0.01	0.00	0.00	0.00
Eurocopter	0	0.1	0.00	0.00	0.00	0.00	0.00
Skycrane	4	0	0.06	0.08	0.00	0.00	0.01
		Totals	0.06	0.08	0.00	0.00	0.01

Alternative 5 - SCAQMD 2008
Twenty two additional towers - assume total baseline helicopter use increases by this facto

Total Emissions	Towers						
2008	22						
SSAB			Emissions tons/year				
Hughes	154	0.1	0.07	0.15	0.01	0.00	0.03
Eurocopter	0	0.1	0.00	0.00	0.00	0.00	0.00
Skycrane	77	0	1.15	1.48	0.08	0.01	0.16
		Totals	1.22	1.62	0.09	0.01	0.19

Alternative 5 - AVAQMD 2009
Thirty two additional towers - assume total baseline helicopter use increases by this facto

Total Emissions	Towers						
2008	32						
SSAB			Emissions tons/year				
Hughes	225	0.1	0.11	0.22	0.01	0.00	0.05
Eurocopter	0	0.1	0.00	0.00	0.00	0.00	0.00
Skycrane	112	0	1.67	2.15	0.12	0.02	0.24
		Totals	1.77	2.36	0.13	0.02	0.28

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Independent Statistics and Analysis

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Voluntary Reporting of Greenhouse Gases Program (Fuel and Energy Source Codes and Emission Coefficients)

Voluntary Reporting of Greenhouse Gases Program
Fuel and Energy Source Codes and Emission Coefficients

Fuel	Code	Emission Coefficients		
		Pounds CO2 per Unit Volume or Mass		Pounds CO2 per Million Btu
Petroleum Products				
Aviation Gasoline	AV	18.355	per gallon	152.717
		770.916	per barrel	
Distillate Fuel (No. 1, No. 2, No. 4 Fuel Oil and Diesel)	DF	22.384	per gallon	161.386
		940.109	per barrel	
Jet Fuel	JF	21.095	per gallon	156.258
		885.98	per barrel	
Kerosene	KS	21.537	per gallon	159.535
		904.565	per barrel	
Liquified Petroleum Gases (LPG)	LG	12.805	per gallon	139.039
		537.804	per barrel	
Motor Gasoline	MG	19.564	per gallon	156.425
		822.944	per barrel	
Petroleum Coke	PC	32.397	per gallon	225.130
		1356.461	per barrel	
		6768.667	per short ton	
Residual Fuel (No. 5 and No. 6 Fuel Oil)	RF	26.033	per gallon	173.906
		1,093.384	per barrel	
Natural Gas and Other Gaseous Fuels				
Methane	ME	116.376	per 1000 ft3	115.258
Landfill Gas	LF	1	per 1000 ft3	115.258
Flare Gas	FG	133.759	per 1000 ft3	120.721
Natural Gas (Pipeline)	NG	120.593	per 1000 ft3	117.080

Propane	PR	12.669	per gallon	139.178
		532.085	per barrel	
Electricity	EL	Varies depending on fuel used to generate electricity		
Electricity Generated from Landfill Gas	LE	Varies depending on heat rate of the power generating facility		
Coal	CL			
Anthracite	AC	5685.00	per short ton	227.400
Bituminous	BC	4931.30	per short ton	205.300
Subbituminous	SB	3715.90	per short ton	212.700
Lignite	LC	2791.60	per short ton	215.400
Renewable Sources				
Biomass	BM	Varies depending on the composition of the biomass		
Geothermal Energy	GE	0		0
Wind	WN	0		0
Photovoltaic and Solar Thermal	PV	0		0
Hydropower	HY	0		0
Tires/Tire-Derived Fuel	TF	6160	per short ton	189.538
Wood and Wood Waste [2]	WW	3812	per short ton	195.0
Municipal Solid Waste [2]	MS	1999	per short ton	199.854
Nuclear	NU	0		0
Other	ZZ	0		0

1 For a landfill gas coefficient per thousand standard cubic foot, multiply the methane factor by the share of the landfill gas that is methane.

2 These biofuels contain "biogenic" carbon. Under international greenhouse gas accounting methods developed by the Intergovernmental Panel on Climate Change, biogenic carbon is part of the natural carbon balance and it will not add to atmospheric concentrations of carbon dioxide.[3] Reporters may wish to use an emission factor of zero for wood, wood waste, and other biomass fuels in which the carbon is entirely biogenic. Municipal solid waste, however, normally contains inorganic materials principally plastics that contain carbon that is not biogenic. The proportion of plastics in municipal solid waste varies considerably depending on climate, season, socio-economic factors, and waste management practices. As a result, EIA does not estimate a non-biogenic carbon dioxide emission factor for municipal solid waste. The U.S. Environmental Protection Agency estimates that, in 1997, municipal solid waste in the United States contained 15.93 percent plastics and the carbon dioxide emission factor for these materials was 5,771 lbs per ton.[4] Using this information, a proxy for a national average non-biogenic emission factor of 919 lbs carbon dioxide per short ton of municipal solid waste can be derived. This represents 91.9 lbs carbon dioxide per million Btu, assuming the average energy content of municipal solid waste is 5,000 Btu/lb.

3 Intergovernmental Panel on Climate Change. *Greenhouse Gas Inventory Reference Manual: Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, Vol. 3, Pg. 6.28, (Paris France 1997).

4 U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-1998*, EPA 236-R-00-001, Washington, DC, April 2000.