APPENDIX J

AIR QUALITY SUPPORTING DOCUMENTATION

J1: Emissions Calculations

J2: Construction and Non-Permitting Air Regulations by State

J1 EMISSION CALCULATIONS

Table J1-1. Project Characteristics from Facilities Construction and Upgrades

Project Name	Duration [days]	Clearing Area [acres]	Building Area [sq ft]	Paving [acres]
Construct a new POE (clearing)	365	0.92	20,000	2.3
Modernize/upgrade existing POE (clearing)	365	0.69	15,000	1.96
Construct a new BPS (clearing)	365	1.15	25,000	0.23
Install SBInet monopole communications towers (clearing)	45	0.12	2,500	0.14
Set up permanent traffic checkpoints (clearing)	180	0.28	6,000	0.12
Construct facilities to support OAM operations (clearing)	365	0.92	20,000	0.12

Table J1-2. Construction Emissions Roll-up

Activity	CO [tons]	NOx [tons]	PM10 [tons]	PM2.5 [tons]	SO2 [tons]	VOC [tons]
Construct a new POE (clearing)	0.3	0.6	0.2	0.1	0.1	< 0.1
Construct a new POE (building)	1.2	1.5	0.1	0.1	0.2	0.2
Construct a new POE (paving)	0.4	0.8	0.1	0.1	0.1	0.1
Modernize/upgrade existing POE (clearing)	0.2	0.4	0.2	< 0.1	0.1	< 0.1
Modernize/upgrade existing POE (building)	0.9	1.1	0.1	0.1	0.1	0.2
Modernize/upgrade existing POE (paving)	0.4	0.7	< 0.1	< 0.1	0.1	0.1
Construct a new BPS (clearing)	0.4	0.7	0.3	0.1	0.1	< 0.1
Construct a new BPS (building)	1.5	1.8	0.1	0.1	0.2	0.3
Construct a new BPS (paving)	< 0.1	0.1	< 0.1	0.0	< 0.1	< 0.1
Install SBInet monopole communications towers (clearing)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Install SBInet monopole communications towers (building)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Install SBInet monopole communications towers (paving)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Set up permanent traffic checkpoints (clearing)	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Set up permanent traffic checkpoints (building)	0.2	0.2	< 0.1	< 0.1	< 0.1	< 0.1
Set up permanent traffic checkpoints (paving)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Construct facilities to support OAM operations (clearing)	0.3	0.6	0.1	< 0.1	0.1	< 0.1
Construct facilities to support OAM operations (building)	1.2	1.5	0.1	0.1	0.2	0.2
Construct facilities to support OAM operations (paving)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Table J1-3. Heavy Equipment Use from Facilities Construction and Upgrades

Clearing and Grading	New POE	Upgrade existing POE	New BPS	Monopole Communications Towers	Permanent traffic checkpoints	Construct OAM facilities
Scrapers	148	111	185	2	22	148
Graders	148	111	185	2	22	148
Off-highway trucks	148	111	185	2	22	148
Tractors/loaders/ backhoes	148	111	185	2	22	148
Crawler tractor/dozers	148	111	185	2	22	148
Building						
Generator sets	322	242	403	5	48	322
Air compressors	184	138	230	3	27	184
Plate compactors	368	276	460	6	54	368
Cement & mortar mixers	644	483	805	10	95	644
Cranes	644	483	805	10	95	644
Off-highway trucks	644	483	805	10	95	644
Tractors/loaders/ backhoes	644	483	805	10	95	644
Paving						
Pavers	370	315	37	3	9	19
Plate compactors	212	180	21	2	5	11
Rollers	741	630	74	5	18	37
Off-highway trucks	370	315	37	3	9	19

Table J1-4. Heavy Equipment Emissions from Facilities Construction and Upgrades

Project	CO [tons]	NOx [tons]	PM10 [tons]	PM2.5 [tons]	SO2 [tons]	VOC [tons]
Construct a new POE (clearing)	0.2297	0.5636	0.0406	0.0394	0.0945	0.0381
Construct a new POE (building)	0.5392	1.4296	0.0992	0.0966	0.1972	0.1188
Construct a new POE (paving)	0.3192	0.7906	0.0585	0.0568	0.1292	0.0546
Modernize/upgrade existing POE (clearing)	0.1723	0.4227	0.0305	0.0296	0.0709	0.0286
Modernize/upgrade existing POE (building)	0.4044	1.0722	0.0744	0.0724	0.1479	0.0891
Modernize/upgrade existing POE (paving)	0.2713	0.672	0.0497	0.0482	0.1098	0.0464
Construct a new BPS (clearing)	0.2872	0.7045	0.0508	0.0493	0.1182	0.0477
Construct a new BPS (building)	0.674	1.7871	0.124	0.1207	0.2465	0.1485
Construct a new BPS (paving)	0.0319	0.0791	0.0059	0.0057	0.0129	0.0055
Install SBInet monopole communications towers (clearing)	0.0035	0.0087	0.0006	0.0006	0.0015	0.0006
Install SBInet monopole communications towers (building)	0.0083	0.022	0.0015	0.0015	0.003	0.0018
Install SBInet monopole communications towers (paving)	0.0024	0.0058	0.0004	0.0004	0.001	0.0004
Set up permanent traffic checkpoints (clearing)	0.034	0.0834	0.006	0.0058	0.014	0.0056
Set up permanent traffic checkpoints (building)	0.0798	0.2115	0.0147	0.0143	0.0292	0.0176
Set up permanent traffic checkpoints (paving)	0.0079	0.0195	0.0014	0.0014	0.0032	0.0013
Construct facilities to support OAM operations (clearing)	0.2297	0.5636	0.0406	0.0394	0.0945	0.0381
Construct facilities to support OAM operations (building)	0.5392	1.4296	0.0992	0.0966	0.1972	0.1188
Construct facilities to support OAM operations (paving)	0.016	0.0395	0.0029	0.0028	0.0065	0.0027
Total non-road emissions	**3.85**	**9.91**	**0.7**	**0.68**	**1.48**	**0.76**

Table J1-5. Worker Trip Emissions from Facilities Construction and Upgrades

Project	Trips	VMT	CO [tons]	NOx [tons]	PM10 [tons]	PM2.5 [tons]	SO2 [tons]	VOC [tons]
Construct a new POE (clearing)	1	11,903	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Construct a new POE (building)	14	149,040	0.66	0.05	< 0.01	< 0.01	< 0.01	0.05
Construct a new POE (paving)	3	29,756	0.13	0.01	< 0.01	< 0.01	< 0.01	0.01
Modernize/upgrade existing POE (clearing)	1	8,927	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Modernize/upgrade existing POE (building)	11	111,780	0.5	0.04	< 0.01	< 0.01	< 0.01	0.04
Modernize/upgrade existing POE (paving)	2	25,293	0.11	0.01	< 0.01	< 0.01	< 0.01	0.01
Construct a new BPS (clearing)	1	14,878	0.07	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Construct a new BPS (building)	18	186,300	0.83	0.06	< 0.01	< 0.01	< 0.01	0.06
Construct a new BPS (paving)	0	2,976	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Install SBI*net* monopole communications towers (clearing)	0	183	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Install SBI*net* monopole communications towers (building)	2	2,297	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Install SBI*net* monopole communications towers (paving)	0	220	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Set up permanent traffic checkpoints (clearing)	0	1,761	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Set up permanent traffic checkpoints (building)	4	22,050	0.1	0.01	< 0.01	< 0.01	< 0.01	0.01
Set up permanent traffic checkpoints (paving)	0	734	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Construct facilities to support OAM operations (clearing)	1	11,903	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Construct facilities to support OAM operations (building)	14	149,040	0.66	0.05	< 0.01	< 0.01	< 0.01	0.05
Construct facilities to support OAM operations (paving)	0	1,488	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Source: USEPA, 2003; SQAQMD, 1993.

Table J1-6. Architectural Coating Emissions (Paint) from Facilities Construction and Upgrades

Project	Heated Area	Wall Surface	EFVOC [lbs/1000 Square Feet]	VOC [tons]
Construct a new POE (building)	20,000	40,000	55.5	0.04
Modernize/upgrade existing POE (building)	15,000	30,000	55.5	0.03
Construct a new BPS (building)	25,000	50,000	55.5	0.05
Install SBInet monopole communications towers (building)	2,500	5,000	55.5	0.01
Set up permanent traffic checkpoints (building)	6,000	12,000	55.5	0.01
Construct facilities to support OAM operations (building)	20,000	40,000	55.5	0.04

Source: SQAQMD, 1993.

Table J1-7. Paving Off-gas Emissions from Facilities Construction and Upgrades

Project	Paved Area [acres]	EFVOC [lbs/acre]	VOC [tons]
Construct a new POE (paving)	2.3	2.62	0.003
Modernize/upgrade existing POE (paving)	1.96	2.62	0.0026
Construct a new BPS (paving)	0.23	2.62	0.0003
Install SBI*net* monopole communications towers (paving)	0.14	2.62	0.0002
Set up permanent traffic checkpoints (paving)	0.12	2.62	0.0002
Construct facilities to support OAM operations (paving)	0.12	2.62	0.0002

Source: SQAQMD, 1993.

Table J1-8. Fugitive Dust Emissions from Facilities Construction and Upgrades

Project	PM10/ TSP	PM2.5/PM10	EFTSP [lbs/acre/day]	Capture Fraction	Duration of Grading [days]	Cleared Area [acres]	PM10 [tons]	PM2.5 [tons]
Construct a new POE (clearing)	0.45	0.15	80	0.5	230	0.92	0.19	0.03
Modernize/upgrade existing POE (clearing)	0.45	0.15	80	0.5	230	0.69	0.14	0.02
Construct a new BPS (clearing)	0.45	0.15	80	0.5	230	1.15	0.24	0.04
Install SBInet monopole communications towers (clearing)	0.45	0.15	80	0.5	28.36	0.12	< 0.1	< 0.1
Set up permanent traffic checkpoints (clearing)	0.45	0.15	80	0.5	113.42	0.28	0.03	< 0.1
Construct facilities to support OAM operations (clearing)	0.45	0.15	80	0.5	230	0.92	0.19	0.03

Source: USEPA, 1995; USEPA, 2005.

Table J1-9. Emissions from Fence Construction

Construction Equipment Use	Number of Units	Days on Site	Hours Per Day	Operating Hours			
Generator sets	2	365	8	5,840			
Tractors/loaders/backhoes	2	365	8	5,840			
Construction Equipment Emission Factors (lbs/hour)	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Cranes	0.6011	1.6100	0.1778	0.0014	0.0715	0.0715	128.7
Generator sets	0.3461	0.6980	0.1075	0.0007	0.0430	0.0430	61.0
Tractors/loaders/backhoes	0.4063	0.7746	0.1204	0.0008	0.0599	0.0599	66.8
Pavers composite	0.5874	1.0796	0.1963	0.0009	0.0769	0.0769	77.9
Paving equipment	0.0532	0.1061	0.0166	0.0002	0.0063	0.0063	12.6
Construction Equipment Emissions (tons)	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Generator sets	1.0106	2.0382	0.3138	0.0020	0.1256	0.1256	178.0986
Tractors/loaders/backhoes	1.1865	2.2617	0.3516	0.0023	0.1748	0.1748	195.0746
Total	**2.20**	**4.30**	**0.67**	**0.0043**	**0.30**	**0.30**	**373.17**

Source: CARB, 2007a; CARB 2007b.

Table J1-10. Emissions from Construction of Roads, Bridges, Culverts, & Low Water Crossings

Equipment Type	Number of Units	Days on Site	Hours Per Day	Operating Hours
Excavators composite	1	230	4	920
Rollers composite	1	230	8	1,840
Rubber tired dozers composite	1	230	8	1,840
Plate compactors composite	2	230	4	1,840
Trenchers composite	2	230	8	3,680
Air compressors	1	230	4	920
Cement & mortar mixer	2	230	6	2,760
Cranes	1	230	7	1,610
Generator sets	2	230	4	1,840
Tractors/loaders/backhoes	2	230	7	3,220
Pavers composite	2	230	8	3,680
Paving equipment	2	230	8	3,680

Construction Equipment Emission Factors (lbs/hour)							
Equipment	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Excavators composite	0.5828	1.3249	0.1695	0.0013	0.0727	0.0727	119.6
Rollers composite	0.4341	0.8607	0.1328	0.0008	0.0601	0.0601	67.1
Rubber tired dozers composite	1.5961	3.2672	0.3644	0.0025	0.1409	0.1409	239.1
Plate compactors composite	0.0263	0.0328	0.0052	0.0001	0.0021	0.0021	4.3
Trenchers composite	0.5080	0.8237	0.1851	0.0007	0.0688	0.0688	58.7
Air compressors	0.3782	0.7980	0.1232	0.0007	0.0563	0.0563	63.6
Cement and Mortar Mixers	0.0447	0.0658	0.0113	0.0001	0.0044	0.0044	7.2
Cranes	0.6011	1.6100	0.1778	0.0014	0.0715	0.0715	128.7
Generator sets	0.3461	0.6980	0.1075	0.0007	0.0430	0.0430	61.0
Tractors/loaders/backhoes	0.4063	0.7746	0.1204	0.0008	0.0599	0.0599	66.8
Pavers composite	0.5874	1.0796	0.1963	0.0009	0.0769	0.0769	77.9
Paving equipment	0.0532	0.1061	0.0166	0.0002	0.0063	0.0063	12.6

Construction Equipment Emissions (tons)							
Equipment	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Excavators composite	0.2681	0.6095	0.0780	0.0006	0.0335	0.0335	55.0074
Rollers composite	0.3994	0.7918	0.1222	0.0007	0.0553	0.0553	61.6887
Rubber tired dozers composite	1.4684	3.0058	0.3353	0.0023	0.1296	0.1296	219.9772
Plate compactors composite	0.0242	0.0302	0.0047	0.0001	0.0019	0.0019	3.9687
Trenchers composite	0.9347	1.5156	0.3405	0.0013	0.1267	0.1267	108.0472
Air compressors	0.1740	0.3671	0.0567	0.0003	0.0259	0.0259	29.2594
Cement and mortar mixers	0.0617	0.0907	0.0156	0.0001	0.0061	0.0061	10.0024
Cranes	0.4839	1.2961	0.1432	0.0011	0.0576	0.0576	103.5770
Generator sets	0.3184	0.6422	0.0989	0.0006	0.0396	0.0396	56.1133
Tractors/loaders/backhoes	0.6542	1.2470	0.1939	0.0012	0.0964	0.0964	107.5583
Pavers composite	1.0809	1.9865	0.3612	0.0016	0.1415	0.1415	143.4018
Paving equipment	0.0979	0.1952	0.0305	0.0003	0.0116	0.0116	23.2353
Total	5.97	11.78	1.78	0.0103	0.73	0.73	921.84

Source: CARB, 2007a; CARB, 2007b.

Table J1-11. Emissions from Heating

	POE	BPS	FOB			
Gross area	20,000	25,000	10,000	sf		
Heating requirements	99,000	99,000	99,000	btu/sf		
Total annual heat required	1,980	2,475	990	MMBTU		
Heating value	150	150	150	MMBtu/1000 Gallons		
Total #2 oil used	13.2	16.5	6.6	10^3 Gallons		
Pollutant	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Emission factor (lb/1000 gal)	5	24	2.493	0.1	2	2
POE	0.03	0.16	0.02	0.00	0.01	0.01
BPS	0.04	0.20	0.02	0.00	0.02	0.02
FOB	0.02	0.08	0.01	0.00	0.01	0.01

Source: USEPA, 1995.

1. Emission factors for all pollutants were obtained from U.S. EPA's AP-42, Section 1.3. Conservatively assume that PM10 = PM.

2. Assumed sulfur concentration 1%

3. Heating requirements obtained from Commercial Buildings Energy Consumption Survey, DOE, 2003.

Table J1-12. Emissions from Emergency Generators

Pollutant	CO	NOx	VOC	SOx	PM10	PM2.5
Emission Factor [lb/hp-hr]	0.0055	0.024	0.000705	0.00809	0.0007	0.0007
Generator Rating [kW]	**Estimated Run Time (hr/yr)**	**Annual Power Output [kw-hr/yr]**	**CO**	**NO_x**	**VOC**	**SO_x**
750	100	75000	0.28	1.21	0.04	0.41
Total Emissions [tpy]			0.28	1.21	0.04	0.41

Source: USEPA, 1995.

Table J1-13. Emissions from Worker Commutes

	POE	BPS	FOB
Number of workers	30	50	20
Number of trips	2	2	2
Mi per trip	30	30	30
Days of work	260	260	260
Total mi	468,000	780,000	312,000

Pollutant	CO	NOx	VOC	SOx	PM10	PM2.5
Emission Factor (lbs/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001
POE	2.47	0.26	0.25	0.00	0.02	0.01
BPS	4.11	0.43	0.42	0.00	0.03	0.02
FOB	1.65	0.17	0.17	0.00	0.01	0.01

Source: CARB, 2007.

Table J1-14. Emissions from Facilities (POE, BPS, FOB)

Activity/Source	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
POE						
Boiler emissions	0.03	0.16	0.02	0.00	0.01	0.01
Emergency generators	0.28	1.21	0.04	0.41	0.04	0.04
Worker commutes	2.47	0.26	0.25	0.00	0.02	0.01
Total Operational Emissions	**2.78**	**1.62**	**0.30**	**0.41**	**0.07**	**0.06**
BPS						
Boiler emissions	0.04	0.20	0.02	0.00	0.02	0.02
Emergency generators	0.28	1.21	0.04	0.41	0.04	0.04
Worker commutes	4.11	0.43	0.42	0.00	0.03	0.02
Total Operational Emissions	**4.43**	**1.84**	**0.48**	**0.41**	**0.08**	**0.07**
FOB						
Boiler emissions	0.02	0.08	0.01	0.00	0.01	0.01
Emergency generators	0.28	1.21	0.04	0.41	0.04	0.04
Worker commutes	1.65	0.17	0.17	0.00	0.01	0.01
Total Operational Emissions	**1.94**	**1.46**	**0.21**	**0.41**	**0.06**	**0.05**

Table J1-15. Emissions from UAS Missions

Number of aircraft	10
Maximum daily operations	1
Number of training days per year	230
Number of flights	2,300

	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$
LTO Emission Factors (kg/hour)	2.50	0.56	1.59	0.05	0.09	0.09
Time in mode/operation (min)	5	5	5	5	5	5
LTO Emission (tons)	0.11	0.02	0.07	0.00	0.00	0.00
Flight Emission Factors (kg/hour)	0.48	2.80	0	0.22	0.40	0.40
Time in mode/operation (min)	115	115	115	115	115	115
Flight Emissions (tons)	0.48	2.81	0.00	0.22	0.40	0.40
Total	**0.59**	**2.83**	**0.07**	**0.22**	**0.40**	**0.40**

Source: USAF, 2006.

Note: RQ-7B Shadow Used as Surrogate UAS

Table J1-16. Emissions from Manned Aerial Surveillance Patrols (New England Region)

No Action Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	13.8	1.2					
Number of days per year	230	230					
Number of flights	3174	276					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	7.55	0.33	0.09	0.09	0.13	3.96	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.28	0.03	0.01	0.01	0.01	0.42	tons
Total	**7.8**	0.4	**0.1**	**0.1**	**0.1**	**7.8**	tons
Surveillance and Communications Technology Expansion Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	21.16	1.84					
Number of days per year	230	230					
Number of flights	4866.8	423.2					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	10.46	kg/operation
LTO Emission (Citation)	11.57	0.51	0.13	0.13	0.20	11.57	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	4.385	kg/operation
LTO Emission (UH-60)	0.42	0.04	0.01	0.01	0.01	0.42	tons
Total	**12.0**	**0.6**	**0.1**	**0.1**	**0.2**	**12.0**	**tons**

Flexible Direction Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	18.4	1.6					
Number of days per year	230	230					
Number of flights	4232	368					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	11.57	0.51	0.13	0.13	0.20	6.07	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.42	0.04	0.01	0.01	0.01	0.42	tons
Total	**12.0**	**0.6**	**0.1**	**0.1**	**0.2**	**12.0**	**tons**

Source: EDMS, 2007.

Table J1-17. Emissions from Waterborne Patrols (New England Region)

No Action Alternative						
Number of watercraft	16					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	8.1	**0.3**	**0.0**	**0.0**	**0.0**	**0.3**
Surveillance and Communications Technology Expansion Alternative						
Number of watercraft	24					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	12.2	**0.4**	**0.0**	**0.0**	**0.0**	**0.5**
Flexible Direction Alternative						
Number of watercraft	24					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	12.2	**0.4**	**0.0**	**0.0**	**0.0**	**0.5**

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

Table J1-18. Emissions from Manned Aerial Surveillance Patrols (Great Lakes Region)

No Action Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	13.8	1.2					
Number of days per year	230	230					
Number of flights	3174	276					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	7.55	0.33	0.09	0.09	0.13	3.96	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.28	0.03	0.01	0.01	0.01	0.42	tons
Total	**7.8**	**0.4**	**0.1**	**0.1**	**0.1**	**4.4**	**tons**
Surveillance and Communications Technology Expansion Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	18.4	1.6					
Number of days per year	230	230					
Number of flights	4232	368					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	11.57	0.51	0.13	0.13	0.20	6.07	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.42	0.04	0.01	0.01	0.01	0.42	tons
Total	**12.0**	**0.6**	**0.1**	**0.1**	**0.2**	**6.5**	**tons**

Flexible Direction Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	21.16	1.84					
Number of days per year	230	230					
Number of flights	4866.8	423.2					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	11.57	0.51	0.13	0.13	0.20	6.07	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.42	0.04	0.01	0.01	0.01	0.42	tons
Total	**12.0**	**0.6**	**0.1**	**0.1**	**0.2**	**6.5**	**tons**

Source: EDMS, 2007.

Table J1-19. Emissions from Waterborne Patrols (Great Lakes Region)

No Action Alternative						
Number of watercraft	24					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	12.2	**0.4**	**0.0**	**0.0**	**0.0**	**0.5**
Surveillance and Communications Technology Expansion Alternative						
Number of watercraft	24					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	12.2	**0.4**	**0.0**	**0.0**	**0.0**	**0.5**
Flexible Direction Alternative						
Number of watercraft	24					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	12.2	**0.4**	**0.0**	**0.0**	**0.0**	**0.5**

Source: USEPA 2002; USEPA, 2010a, USEPA, 2010b.

Table J1-20. Emissions from Manned Aerial Surveillance Patrols (East of the Rockies)

No Action Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	18.4	1.6					
Number of days per year	230	230					
Number of flights	4232	368					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	10.06	0.44	0.12	0.12	0.17	5.28	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.37	0.04	0.01	0.01	0.01	0.56	tons
Total	**10.4**	**0.5**	**0.1**	**0.1**	**0.2**	**5.8**	**tons**
Surveillance and Communications Technology Expansion Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	27.6	2.4					
Number of days per year	230	230					
Number of flights	6348	552					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	15.09	0.66	0.18	0.18	0.26	7.92	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.55	0.05	0.01	0.01	0.02	0.56	tons
Total	**15.6**	**0.7**	**0.2**	**0.2**	**0.3**	**8.5**	**tons**

Flexible Direction Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	27.6	2.4					
Number of days per year	230	230					
Number of flights	6348	552					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	15.09	0.66	0.18	0.18	0.26	7.92	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.55	0.05	0.01	0.01	0.02	0.56	tons
Total	**15.6**	**0.7**	**0.2**	**0.2**	**0.3**	**8.5**	**tons**

Source: EDMS, 2007.

Table J1-21. Emissions from Waterborne Patrols (East of the Rockies Region)

No Action Alternative						
Number of watercraft	5					
Hours per year	50	Hours				
Power rating	150	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	2.5	**0.1**	**0.0**	**0.0**	**0.0**	**0.1**
Surveillance and Communications Technology Expansion Alternative						
Number of watercraft	10					
Hours per year	50	Hours				
Power rating	400	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	5.1	**0.2**	**0.0**	**0.0**	**0.0**	**0.2**
Flexible Direction Alternative						
Number of watercraft	10					
Hours per year	50	Hours				
Power rating	400	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	5.1	**0.2**	**0.0**	**0.0**	**0.0**	**0.2**

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

Table J1-22. Emissions from Manned Aerial Surveillance Patrols (West of the Rockies Region)

No Action Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	18.4	1.6					
Number of days per year	230	230					
Number of flights	4232	368					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	10.06	0.44	0.12	0.12	0.17	5.28	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.37	0.04	0.01	0.01	0.01	0.56	tons
Total	**10.4**	**0.5**	**0.1**	**0.1**	**0.2**	**5.8**	**tons**
Surveillance and Communications Technology Expansion Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	21.16	1.84					
Number of days per year	230	230					
Number of flights	4866.8	423.2					
	CO	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	11.57	0.51	0.13	0.13	0.20	6.07	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.42	0.04	0.01	0.01	0.01	0.56	tons
Total	**12.0**	**0.6**	**0.1**	**0.1**	**0.2**	**6.6**	**tons**

Flexible Direction Alternative							
	Cessna Citation	**UH-60**					
Maximum daily operations	21.16	1.84					
Number of days per year	230	230					
Number of flights	4866.8	423.2					
	CO	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**	
LTO Emission Factors (Citation)	10.46	0.46	0.122	0.122	0.18	5.49	kg/operation
LTO Emission (Citation)	11.57	0.51	0.13	0.13	0.20	6.07	tons
LTO Emission Factors (UH-60)	4.385	0.431	0.115	0.115	0.15	6.674	kg/operation
LTO Emission (UH-60)	0.42	0.04	0.01	0.01	0.01	0.56	tons
Total	**12.0**	**0.6**	**0.1**	**0.1**	**0.2**	**6.6**	**tons**

Source: EDMS, 2007.

Table J1-23. Emissions from Waterborne Patrols (West of the Rockies Region)

No Action Alternative						
Number of watercraft	14					
Hours per year	50	Hours				
Power rating	400	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	7.1	**0.2**	**0.0**	**0.0**	**0.0**	**0.3**
Surveillance and Communications Technology Expansion Alternative						
Number of watercraft	21					
Hours per year	50	Hours				
Power rating	400	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	10.7	**0.4**	**0.0**	**0.0**	**0.0**	**0.4**
Flexible Direction Alternative						
Number of watercraft	21					
Hours per year	50	Hours				
Power rating	400	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	153.7	5.350	0.06	0.06	0.00	5.88
	10.7	**0.4**	**0.0**	**0.0**	**0.0**	**0.4**

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

Table J1-24. Emissions from ATV Patrols

Number of ATVs	50					
Mileage per year	1608					
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/mile)	52.7	0.340	55.7	0.00	0.022	0.022
Total Emissions (tons)	**4.67**	**0.03**	**4.93**	**0.00**	**0.00**	**0.00**

Table J1-25. Emissions from Snowmobile Patrols

Number of snowmobiles	22					
Hours per year	57	Hours				
Power rating	100	hp				
Equipment/Tech Type	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (grams/hp-hour)	296.0	0.860	111.0	0.00	2.70	2.70
	40.88	**0.12**	**15.33**	**0.00**	**0.37**	**0.37**

Source: USEPA 2002; USEPA, 2010a; USEPA, 2010b.

Table J1-26. Emissions from On-road Vehicle Patrols

Number of Workers	30					
Number of Patrols Per Day	4					
Mi per trip	100					
Days of Work	230					
Total mi	2,760,000					
Pollutant	**CO**	**NOx**	**VOC**	**SOx**	**PM10**	**PM2.5**
Emission Factor (lbs/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001
Total Emissions	**14.56**	**1.52**	**1.49**	**0.01**	**0.12**	**0.07**

Source: CARB, 2007.

J2 CONSTRUCTION AND NON-PERMITTING AIR REGULATIONS BY STATE

TABLE J2-1. CONSTRUCTION AND NON-PERMITTING AIR REGULATIONS BY STATE

Operations and Construction Regulations	Non-permitting Requirements
Idaho Department of Administration http://adm.idaho.gov/adminrules/rules/idapa58/0101.pdf • Permit Requirements for New and Modified Stationery Sources (IDAPA 58.01.203) • Procedure and requirements for permits to construct (IDAPA 58.01.200)	• Rules for Control of Fugitive Dust (IDAPA 58.01.650) • Rules for Control of Open Burning (IDAPA 58.0106)
Maine Revised Statutes http://www.maine.gov/dep/blwq/delegation/t38toc.pdf • New Source performance standards (MSRA 38.2.143)	• Control of Visible Emissions (MSRA 38.2.101) • Reasonably Available Control Technology for Facilities that Emit VOC (MRSA 38.2.134) • Open Burning (MSRA 38.2.102)
Michigan Department of Natural Resources and Environment Air Pollution Control Rules (APCR) http://www.michigan.gov/deq/0,1607,7-135-3310_4108-97106--,00.html • New Source Review Rule (APCR 201) http://www.michigan.gov/deq/0,1607,7-135-3310_4108-97106--,00.html • Renewable Operating Permit (APCR 201) http://www.michigan.gov/deq/0,1607,7-135-3310_4108-97106--,00.html	• Emission Limitations and Prohibitions Particulate Matter (R 336.1115) • Emission Limitations and Prohibitions Existing sources of VOC (R 336.1601) • Open Burning Model Ordinance (R 336.1115)
Minnesota State Air Rules (MSAR) https://www.revisor.mn.gov/rules/?id=7007 • Sources required to obtain/ not obtain a permit (MAR 7007.0250-0300) • Source Operation During Transition (MAR 7007.0350)	• Air Pollution Abatement. (MSAR116.061) • VOC Material Balance (MAR 7019.3060) • Open Burning Regulations (MSAR 8816)
MT Dept of Environmental Quality (MDEQ) http://deq.mt.gov/AirQuality/AQPermits.mcpx • General Air Quality Operating Permits (ARM 17.8.1211) • Air Quality Operating Permit Program (ARM 17.8.1204)	• Visibility Impact Assessment (fugitive dust) (ARM Title 17.8-1106) • Open Burning (ARM Title 17.8-604)

Operations and Construction Regulations	Non-permitting Requirements
New Hampshire Air Program Rules (NHCAR) http://des.nh.gov/organization/commissioner/legal/rules/index.htm" \l "air • Statewide Permit System (Env-A 600) • Testing and Monitoring Procedures (Env-A 800)	• Fugitive Dust (Env-A 101.87) • VOC (Env-A 101.211) • Open Burning (Env-A 1001)
NYSDEC http://www.dec.ny.gov/regulations/50970.html • Requirements for Emissions Sources (Chapter III-Subpart 231-1) • Operations (Chapter III Subpart 231-3.2)	• Control of Particulate Emissions (NYSDEC Chapter III, Subpart 257-3) • Control of Organic Emissions (NYSDEC Chapter III, Subpart 212) • Control of Open Burning and Incineration (NYSDEC Chapter III, Part 215)
ND Air Pollution Control Rules http://www.legis.nd.gov/information/acdata/html/33-15.html • Permit to Construct (33-15-14) • Standards of Performance for NSS (33-15-12)	• Emissions of Particulate Matter Restrict Emissions (33-15-05) • Control of Organic Compounds (33-15-07) • Open Burning Restrictions (33-15-04)
Ohio Air Pollution Regulations http://www.epa.state.oh.us/dapc/regs/regs.aspx • Permits to Install New Sources (OAC 3645-31) • Air Permits to Operate and Variances (OAC 3645-35)	• Particulate Matter Standards (OAC 3745-17) • Open Burning Standards (OAC 3745-19) • NOx and VOC Emissions Statements (OAC 3745-24)
PA Air Pollution Regulations http://www.pacode.com/secure/data/025/chapter123/chap123toc.html • Construction, Modification, Reactivation and Operation of Sources (Article III Chapter 127)	• Fugitive Particulate Matter (PAC Article III, 123.2) • Open Burning Operations (PAC Article III, 123.1.6)
Vermont Air Pollution Control Regulations http://www.anr.state.vt.us/air/docs/apcregs.pdf • Review of Construction or Modification of Air Contaminant Sources (VAPCR 5-501) • Operations and Procedures (VAPCR 5-401-406)	• Prohibition of Particulate Matter (VAPCR 5-231) • Control of Volatile Organic Compounds (VAPCR 5-253) • Permissible Open Burning (VAPCR 5-202)
Washington Regulations for Air Pollution Sources http://apps.leg.wa.gov/wac/default.aspx?cite=173-400 • Operating permit regulation (173-401 WAC) • Construction, General regulation for Air Pollution (173-400 WAC)	• Ambient Air Quality Standards for Particulate Matter (WAC 173-470) • Outdoor Burning (WAC 173-425)

Operations and Construction Regulations	Non-permitting Requirements
Wisconsin Department of Natural Resources Air Rules http://www.legis.state.wi.us/rsb/code/nr/nr406.pdf • NR 406.03 Permit requirements and exemptions for construction permits. (NR 406.03) • Operations 440.01 Standards of Performance for New Stationery Sources (NR 440.01)	• Control of Particulate Emissions (WAC NR 415 • Control of Organic Compound Emissions from Surface Coating, Printing and Asphalt Paving Operations (WAC NR 419) • Malodorous Emissions and Open Burning (WAC NR 429)

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