

# APPENDIX E

## AIR QUALITY EMISSIONS CALCULATIONS

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### AIR EMISSIONS ASSOCIATED WITH GTA UNITS AND SBCTS

**Table E-1 Total Estimated Construction Emissions, By Year (tons per year)**

Year	VOCs	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
2010	8.51	28.46	41.85	0.04	52.24	11.96
2011	8.23	26.38	39.16	0.04	52.14	11.87
2012	8.01	24.44	36.75	0.04	52.23	11.81
2013	7.79	22.50	34.34	0.04	52.13	11.72
2014	7.56	20.59	32.13	0.04	52.02	11.62
2015	7.34	18.71	30.06	0.04	51.93	11.54

Note: Estimates assume construction sites are mitigated by watering exposed surfaces two times daily.

**Table E-2 On-Post Air Emissions, Continuous Operation After Initial Construction**

Item	Number of New Homes	Annual VOC (tons)	Annual NO <sub>x</sub> (tons)	Annual CO (tons)	Annual SO <sub>2</sub> (tons)	Annual PM <sub>10</sub> (tons)	Annual PM <sub>2.5</sub> (tons)
New Residential Units	170						
Natural Gas		0.29	3.98	3.21	0	0.01	0.01
Landscape		0.13	0.02	1.18	0	0	0
Consumer Products		1.52	0	0	0	0	0
Architectural Coatings		2.74	0	0	0	0	0
<b>Total (tons/year)</b>		<b>4.68</b>	<b>4.00</b>	<b>4.39</b>	<b>0</b>	<b>0.01</b>	<b>0.01</b>

**AIR EMISSIONS ASSOCIATED WITH GTA UNITS AND SBCTS (continued)****Table E-3 Annual Air Emissions Associated with Vehicle Training by SBCT and GTA Units on Fort Lewis*****New emissions associated with three brigades and GTA vehicles***

Vehicle	Number of Vehicles <sup>1</sup>	Annual Miles Traveled /Vehicle <sup>2</sup>	Total Miles Traveled Annually	Annual CO Emissions (tons)	Annual NMHC + NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons)	Annual PM <sub>2.5</sub> Emissions (tons)
<b>SBCT Vehicles</b>							
Stryker – 1/2/3 roads	900	1,670	1,503,000				
Strykers – 4/5 roads	900	140	126,000				
Strykers – off-road	900	110	99,000				
Strykers - total	900	1,920	1,728,000	69.62	131.30	281.31	37.26
HMWWV – 1/2/3 roads	900	1,505	1,354,500				
HMWWV – 4/5 roads	900	125	112,500				
HMWWV – off-road	900	100	90,000				
HMWWV - total	900	1,730	1,557,000	33.29	43.94	251.72	31.98
Medium-Weight Trucks – 1/2/3 roads	450	1,505	677,250				
Medium-Weight Trucks – 4/5	450	125	56,250				
Medium-Weight Trucks – off-road	450	100	45,000				
Medium-Weight Trucks - total	450	1,730	778,500	25.99	49.01	126.35	16.47
Total Emissions SBCT (tons)				128.92	224.29	659.36	85.76
<b>GTA Vehicles</b>							
HMWWV – 1/2/3 roads	50	1,505	75,250				
HMWWV – 4/5 roads	50	125	6,250				
HMWWV – off-road	50	20	1,000				
HMWWV - total	50	1,650	82,500	1.76	2.33	4.30	0.57
Medium-Weight Trucks – 1/2/3 roads	5	1,505	7,525				
Medium-Weight Trucks – 4/5	5	125	625				
Medium-Weight Trucks – off-road	5	20	100				
Medium-Weight Trucks - total	5	1,650	8,250	0.28	0.52	0.43	0.06
Total Emissions GTA (tons)				2.04	2.85	4.73	0.63
<b>Total Emissions (tons)</b>				<b>130.96</b>	<b>227.14</b>	<b>664.09</b>	<b>86.39</b>

<sup>1</sup> Assumes 17 of 317 Stryker vehicles inoperable at any one time; number of HMWWV equal to number of Strykers; number of trucks = ½ number of Strykers; total vehicles for three brigades for SBCT.

<sup>2</sup> Based on information from Fort Lewis/YTC Public Works. A full list of assumptions used to determine annual miles is provided in Appendix B.

## AIR EMISSIONS ASSOCIATED WITH GTA UNITS AND SBCTS (continued)

Table E-4 Annual Air Emissions Associated with Vehicle Training by SBCT and GTA Units at Yakima Training Center

New emissions associated with three brigades and GTA vehicles

Vehicle	Number of Vehicles <sup>1</sup>	Annual Miles Traveled /Vehicle <sup>2</sup>	Total Miles Traveled Annually	Annual CO Emissions (tons) <sup>2</sup>	Annual NMHC + NO <sub>x</sub> Emissions (tons) <sup>2</sup>	Annual PM <sub>10</sub> Emissions (tons) <sup>2</sup>	Annual PM <sub>2.5</sub> Emissions (tons) <sup>2</sup>
<b>SBCT Vehicles</b>							
Stryker – 1/2/3 roads	900	690	621,000				
Strykers – 4/5 roads	900	330	297,000				
Strykers – off-road	900	260	234,000				
Strykers - total	900	1,280	1,152,000	46.42	87.53	1,233.14	128.00
HMWWV – 1/2/3 roads	900	620	558,000				
HMWWV – 4/5 roads	900	300	270,000				
HMWWV – off-road	900	230	207,000				
HMWWV - total	900	1,150	1,035,000	22.13	29.21	1,106.70	113.93
Medium-Weight Trucks – 1/2/3 roads	450	620	279,000				
Medium-Weight Trucks – 4/5	450	300	135,000				
Medium-Weight Trucks – off-road	450	230	103,500				
Medium-Weight Trucks - total	450	1,150	517,500	17.28	32.58	553.67	57.29
Total Emissions SBCT (tons)				85.81	149.28	2,893.49	299.22
<b>GTA Vehicles</b>							
HMWWV – 1/2/3 roads	50	620	31,000				
HMWWV – 4/5 roads	50	300	15,000				
HMWWV – off-road	50	50	2,500				
HMWWV - total	50	970	48,500	1.04	1.37	23.88	2.46
Medium-Weight Trucks – 1/2/3 roads	5	620	3,100				
Medium-Weight Trucks – 4/5	5	300	1,500				
Medium-Weight Trucks – off-road	5	50	250				
Medium-Weight Trucks - total	5	970	4,850	0.16	0.30	2.39	0.25
Total Emissions GTA (tons)				1.20	1.67	26.27	2.71
<b>Total Emissions (tons)</b>				<b>87.01</b>	<b>150.95</b>	<b>2,919.76</b>	<b>301.93</b>

<sup>1</sup> Assumes 17 of 317 Stryker vehicles inoperable at any one time; number of HMWWV equal to number of Strykers; number of trucks = ½ number of Strykers; total vehicles for three brigades for SBCT.

<sup>2</sup> Based on information from Fort Lewis/YTC Public Works. A full list of assumptions used to determine annual miles is provided in Appendix B.

**AIR EMISSIONS ASSOCIATED WITH GTA UNITS AND SBCTS (continued)**

**Table E-5 Annual Air Emissions Associated with Generator Usage on Fort Lewis (tons per year)**

Pollutant	Emissions
NO <sub>x</sub>	30.65
CO	6.61
SO <sub>x</sub>	2.03
PM <sub>2.5</sub>	2.18
PM <sub>10</sub>	2.18
VOCs	2.44

**Table E-6 Annual Air Emissions Associated with Generator Usage on Yakima Training Center (tons per year)**

Pollutant	Emissions
NO <sub>x</sub>	23.44
CO	5.05
SO <sub>x</sub>	1.55
PM <sub>2.5</sub>	1.66
PM <sub>10</sub>	1.66
VOCs	1.87

**Table E-7 Annual Air Emissions Associated with Commuting by New Soldiers Located On Fort Lewis**

Estimated Daily Commute Distance	Number of Vehicles	Daily Commute Miles	Total Miles per Year	MOBIL 6 Factor for NO <sub>x</sub> (g/VMT) <sup>1</sup>	MOBIL 6 Factor for CO (g/VMT)	MOBIL 6 Factor for VOC (g/VMT)	Factor <sup>3</sup> for PM <sub>10</sub> (g/VMT)	Annual NO <sub>x</sub> (tons)	Annual CO (tons)	Annual VOC (tons)	Annual PM <sub>10</sub> (tons)
On Post <sup>2</sup>	170	6	318,240	1.5	4.0	1.8	0.3	0.53	1.40	0.63	0.11
Off Post <sup>3</sup>	1,730	24	10,795,200	1.5	4.0	1.8	0.3	17.85	47.60	21.42	3.57

<sup>1</sup> VMT = Vehicle mile traveled.

<sup>2</sup> Assume that daily commute is 6 miles, and that soldiers drive on post six days per week.

<sup>3</sup> Assume that daily commute is 24 miles, and that soldiers drive from off post to on post five days per week.

## AIR EMISSIONS ASSOCIATED WITH GTA UNITS AND SBCTS (continued)

**Table E-8 Increased VOC Emissions From On-Post Gas Stations, Wastewater Treatment, and Military Vehicle/Aircraft Diesel Fuel Usage**

### A. Increased Population Contributing to Sewer Usage and On-Post Gas Station Usage (Fort Lewis)

Category	Current	Proposed Project Additional	Proposed New Total	Percent Change Due to Proposal
Soldiers Living in On-Post Family Housing <sup>1</sup>	<u>4,000</u>	<u>170</u>	<u>4,170</u>	4.25
Soldiers Living in Barracks	<u>11,670</u>	<u>0</u>	<u>11,670</u>	0
Soldiers Commuting from Off-Post	<u>13,830</u>	<u>1,730</u>	<u>15,560</u>	12.5
Dependents Living On-Post	<u>10,000</u>	<u>425</u>	<u>10,425</u>	4.25
Civilian Workers Commuting from Off-Post	11,630	0	11,630	0
<b>Total Population Contributing to Sewer System Loading</b>	<b>25,670</b>	<b>595</b>	<b>26,265</b>	<b>2.3</b>
<i>Total Population Contributing to On-Post Gas Station Usage</i>	<i><u>39,500</u></i>	<i><u>2,325</u></i>	<i><u>41,825</u></i>	<i><u>5.9</u></i>

**Bold items contribute to on-post sewer loading. Underlined items contribute to on-post gas station usage.**

### B. Increased On-Post Emissions from Wastewater Treatment Plant (Fort Lewis)

Reported 2007 VOC Emissions from Treatment Plant, tons	0.08	baseline tons VOC
Percent Increase In Population Contributing to Wastewater Loadings	2.32	population increase
Calculated Increase in VOC Emissions, tons	0.002	increase tons VOC

### C. Increased VOC Emissions From On-Post Gas Station Usage (Fort Lewis)

Station	VOC Control Method	2008 Throughput (gallons)	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
All gas stations on Fort Lewis	Stage II	3,550,145	3.1	
		2008 VOCs, tons	55.0	tons VOC
		Percent Increase from Proposed Project	5.89	increase in population and gas station usage
		Increased VOC Emissions from on-post Gas Stations Due to Proposed Project	3.23	tons VOC

### D. Increased On-Post VOC Emissions From Military Vehicle/Aircraft Diesel Usage (Fort Lewis)

Vehicle Miles	Mileage/Flight Hours	Estimated Annual Gas Usage <sup>1</sup>	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
Vehicles	5,071,000	1,014,200	3.1	1.57
Aircraft	0	0	3.1	0
		Annual Increase in VOCs, tons	1.57	tons VOC

<sup>1</sup> Assumes a mileage of 5 miles/gallon for vehicles.

### E. Increased On-Post VOC Emissions From Military Vehicle/Aircraft Diesel Usage (YTC)

Vehicle Miles	Mileage/Flight Hours	Estimated Annual Gas Usage <sup>1</sup>	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
Vehicles	2,961,925	592,385	3.1	0.92
Aircraft	0	0	3.1	0
		Annual Increase in VOCs, tons	0.92	tons VOC

<sup>1</sup> Assumes a mileage of 5 miles/gallon for vehicles.

**AIR EMISSIONS ASSOCIATED WITH CSS UNITS**

**Table E-9 Total Estimated Construction Emissions, By Year (tons per year)**

Year	VOCs	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
2010	2.50	9.71	9.40	0.01	10.49	02.62
2011	2.39	9.09	8.90	0.01	10.42	02.58
2012	2.31	8.55	8.49	0.01	10.41	02.55
2013	2.22	8.00	8.07	0.01	10.37	02.51

Note: Estimates assume construction sites are mitigated by watering exposed surfaces two times daily.

**Table E-10 On-Post Air Emissions, Continuous Operation After Initial Construction**

Item	Number of New Homes	Annual VOC (tons)	Annual NO <sub>x</sub> (tons)	Annual CO (tons)	Annual SO <sub>2</sub> (tons)	Annual PM <sub>10</sub> (tons)	Annual PM <sub>2.5</sub> (tons)
New Residential Units	90						
Natural Gas		0.05	0.62	0.45	0	0	0
Landscape		0.09	0.01	0.88	0	0	0
Consumer Products		0.80	0	0	0	0	0
Architectural Coatings		0.38	0	0	0	0	0
<b>Total (tons/year)</b>		<b>1.32</b>	<b>0.63</b>	<b>1.33</b>	<b>0</b>	<b>0</b>	<b>0</b>

### AIR EMISSIONS ASSOCIATED WITH CSS UNITS (continued)

**Table E-11 Annual Air Emissions Associated with Vehicle Training by CSS Units on Fort Lewis**

*New emissions associated with CSS vehicles*

Vehicle	Number of Vehicles <sup>1</sup>	Annual Miles Traveled /Vehicle <sup>1</sup>	Total Miles Traveled Annually	Annual CO Emissions (tons)	Annual NMHC + NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons)	Annual PM <sub>2.5</sub> Emissions (tons)
HMWWV – 1/2/3 roads	90	1,505	135,450				
HMWWV – 4/5 roads	90	125	11,250				
HMWWV – off-road	90	20	1,800				
HMWWV - total	90	1,650	148,500	3.17	4.19	13.34	1.76
Medium-Weight Trucks – 1/2/3 roads	110	1,505	165,550				
Medium-Weight Trucks – 4/5	110	125	13,750				
Medium-Weight Trucks – off-road	110	20	2,200				
Medium-Weight Trucks - total	110	1,650	181,500	6.06	11.43	16.39	2.26
<b>Total Emissions (tons)</b>				<b>9.23</b>	<b>15.62</b>	<b>29.78</b>	<b>4.03</b>

<sup>1</sup> Based on information from Fort Lewis/YTC Public Works. A full list of assumptions used to determine annual miles is provided in Appendix B.

**Table E-12 Annual Air Emissions Associated with Vehicle Training by CSS Units at Yakima Training Center**

*New emissions associated with CSS vehicles*

Vehicle	Number of Vehicles <sup>1</sup>	Annual Miles Traveled /Vehicle <sup>1</sup>	Total Miles Traveled Annually	Annual CO Emissions (tons)	Annual NMHC + NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons)	Annual PM <sub>2.5</sub> Emissions (tons)
HMWWV – 1/2/3 roads	90	290	26,100				
HMWWV – 4/5 roads	90	140	12,600				
HMWWV – off-road	90	25	2,250				
HMWWV - total	90	455	40,950	0.88	1.16	28.19	2.92
Medium-Weight Trucks – 1/2/3 roads	110	290	31,900				
Medium-Weight Trucks – 4/5	110	140	15,400				
Medium-Weight Trucks – off-road	110	25	2,750				
Medium-Weight Trucks - total	110	455	50,050	1.67	3.15	34.48	3.59
<b>Total Emissions (tons)</b>				<b>2.55</b>	<b>4.31</b>	<b>62.67</b>	<b>6.51</b>

<sup>1</sup> Based on information from Fort Lewis/YTC Public Works. A full list of assumptions used to determine annual miles is provided in Appendix B.

**AIR EMISSIONS ASSOCIATED WITH CSS UNITS (continued)**

**Table E-13 Annual Air Emissions Associated with Generator Usage on Fort Lewis (tons per year)**

<b>Pollutant</b>	<b>Emissions</b>
NO <sub>x</sub>	1.48
CO	0.32
SO <sub>x</sub>	0.10
PM <sub>2.5</sub>	0.15
PM <sub>10</sub>	0.15
VOCs	0.12

**Table E-14 Annual Air Emissions Associated with Generator Usage on Yakima Training Center (tons per year)**

<b>Pollutant</b>	<b>Emissions</b>
NO <sub>x</sub>	1.48
CO	0.32
SO <sub>x</sub>	0.11
PM <sub>2.5</sub>	0.10
PM <sub>10</sub>	0.10
VOCs	0.12

**Table E-15 Annual Air Emissions Associated with Commuting by New Soldiers Located On Fort Lewis**

<b>Estimated Daily Commute Distance</b>	<b>Number of Vehicles</b>	<b>Daily Commute Miles</b>	<b>Total Miles per Year</b>	<b>MOBIL 6 Factor for NO<sub>x</sub> (g/VMT)<sup>1</sup></b>	<b>MOBIL 6 Factor for CO (g/VMT)</b>	<b>MOBIL 6 Factor for VOC (g/VMT)</b>	<b>Factor<sup>3</sup> for PM<sub>10</sub> (g/VMT)</b>	<b>Annual NO<sub>x</sub> (tons)</b>	<b>Annual CO (tons)</b>	<b>Annual VOC (tons)</b>	<b>Annual PM<sub>10</sub> (tons)</b>
On Post <sup>2</sup>	90	6	168,480	1.5	4.0	1.8	0.3	0.28	0.74	0.33	0.06
Off Post <sup>3</sup>	910	24	5,678,400	1.5	4.0	1.8	0.3	9.39	25.04	11.27	1.88

<sup>1</sup> VMT = Vehicle mile traveled.

<sup>2</sup> Assume that daily commute is 6 miles, and that soldiers drive on post six days per week.

<sup>3</sup> Assume that daily commute is 24 miles, and that soldiers drive from off post to on post five days per week.

**AIR EMISSIONS ASSOCIATED WITH CSS UNITS (continued)**

**Table E-16 Increased VOC Emissions From On-Post Gas Stations, Wastewater Treatment, and Military Vehicle/Aircraft Diesel Fuel Usage**

**A. Increased Population Contributing to Sewer Usage and On-Post Gas Station Usage (Fort Lewis)**

Category	Current	Proposed Project Additional	Proposed New Total	Percent Change Due to Proposal
Soldiers Living in On-Post Family Housing <sup>1</sup>	<u>4,000</u>	<u>90</u>	<u>4,090</u>	2.3
Soldiers Living in Barracks	<u>11,670</u>	<u>0</u>	<u>11,670</u>	0
Soldiers Commuting from Off-Post	<u>13,830</u>	<u>910</u>	<u>14,740</u>	6.6
Dependents Living On-Post	<u>10,000</u>	<u>225</u>	<u>10,225</u>	2.3
Civilian Workers Commuting from Off-Post	11,630	0	11,630	0
<b>Total Population Contributing to Sewer System Loading</b>	<b>25,670</b>	<b>315</b>	<b>25,985</b>	<b>1.2</b>
<i>Total Population Contributing to On-Post Gas Station Usage</i>	<u>39,500</u>	<u>1,225</u>	<u>40,725</u>	<u>3.1</u>

Bold items contribute to on-post sewer loading. Underlined items contribute to on-post gas station usage

**B. Increased On-Post Emissions from Wastewater Treatment Plant (Fort Lewis)**

Reported 2007 VOC Emissions from Treatment Plant, tons	0.08	baseline tons VOC
Percent Increase In Population Contributing to Wastewater Loadings	1.23	population increase
Calculated Increase in VOC Emissions, tons	0.001	increase tons VOC

**C. Increased VOC Emissions From On-Post Gas Station Usage (Fort Lewis)**

Station	VOC Control Method	2008 Throughput (gallons)	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
All gas stations on Fort Lewis	Stage II	3,550,145	3.1	
2008 VOCs, tons			55.0	tons VOC
Percent Increase from Proposed Project			3.1	increase in population and gas station usage
Increased VOC Emissions from on-post Gas Stations Due to Proposed Project			1.71	tons VOC

**D. Increased On-Post VOC Emissions From Military Vehicle/Aircraft Diesel Usage (Fort Lewis)**

Vehicle Miles	Mileage/Flight Hours	Estimated Annual Gas Usage <sup>1</sup>	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
Vehicles	880,000	176,000	3.1	0.27
Aircraft	0	0	3.1	0
Annual Increase in VOCs, tons			0.27	tons VOC

<sup>1</sup> Assumes a mileage of 5 miles/gallon for vehicles.

**E. Increased On-Post VOC Emissions From Military Vehicle/Aircraft Diesel Usage (YTC)**

Vehicle Miles	Mileage/Flight Hours	Estimated Annual Gas Usage <sup>1</sup>	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
Vehicles	514,000	64,250	3.1	0.10
Aircraft	0	0	3.1	0
Annual Increase in VOCs, tons			0.10	tons VOC

<sup>1</sup> Assumes a mileage of 5 miles/gallon for vehicles.

**AIR EMISSIONS ASSOCIATED WITH A MEDIUM CAB**

**Table E-17 Total Estimated Construction Emissions, By Year (tons per year)**

Year	VOCs	NO <sub>x</sub>	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
2010	5.24	21.39	25.18	0.02	59.26	13.21
2011	5.03	19.90	23.67	0.02	59.18	13.14
2012	4.87	18.50	22.34	0.02	59.32	13.11
2013	4.70	17.11	20.98	0.02	59.24	13.03
2014	4.54	15.73	19.76	0.02	59.15	12.95
2015	4.38	14.34	18.60	0.02	59.08	12.89

Note: Estimates assume construction sites are mitigated by watering exposed surfaces two times daily.

**Table E-18 On-Post Air Emissions, Continuous Operation After Initial Construction**

Item	Number of New Homes	Annual VOC (tons)	Annual NO <sub>x</sub> (tons)	Annual CO (tons)	Annual SO <sub>2</sub> (tons)	Annual PM <sub>10</sub> (tons)	Annual PM <sub>2.5</sub> (tons)
New Residential Units	260						
Natural Gas		0.43	5.88	4.54	0	0.01	0.01
Landscape		0.37	0.05	3.28	0	0	0
Consumer Products		4.64	0	0	0	0	0
Architectural Coatings		4.50	0	0	0	0	0
<b>Total (tons/year)</b>		<b>9.94</b>	<b>5.93</b>	<b>7.82</b>	<b>0</b>	<b>0.01</b>	<b>0.01</b>

### AIR EMISSIONS ASSOCIATED WITH A MEDIUM CAB (continued)

**Table E-19 Annual Air Emissions Associated with Vehicle Training by a Medium CAB on Fort Lewis**

***New emissions associated with CAB vehicles***

Vehicle	Number of Vehicles <sup>1</sup>	Annual Miles Traveled /Vehicle <sup>1</sup>	Total Miles Traveled Annually	Annual CO Emissions (tons)	Annual NMHC + NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons)	Annual PM <sub>2.5</sub> Emissions (tons)
HMWWV – 1/2/3 roads	341	330	112,530				
HMWWV – 4/5 roads	341	30	10,230				
HMWWV – off-road	341	20	6,820				
HMWWV - total	341	380	129,580	2.77	3.66	14.31	1.78
Medium-Weight Trucks – 1/2/3 roads	362	330	119,460				
Medium-Weight Trucks – 4/5	362	30	10,860				
Medium-Weight Trucks – off-road	362	20	7,240				
Medium-Weight Trucks - total	362	380	137,560	4.59	8.66	15.28	3.76
<b>Total Emissions (tons)</b>				<b>7.36</b>	<b>12.32</b>	<b>29.59</b>	<b>3.75</b>

<sup>1</sup> Based on information from Fort Lewis/YTC Public Works. A full list of assumptions used to determine annual miles is provided in Appendix B.

**Table E-20 Annual Air Emissions Associated with Vehicle Training by a Medium CAB at Yakima Training Center**

***New emissions associated with CAB vehicles***

Vehicle	Number of Vehicles <sup>1</sup>	Annual Miles Traveled /Vehicle <sup>1</sup>	Total Miles Traveled Annually	Annual CO Emissions (tons)	Annual NMHC + NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons)	Annual PM <sub>2.5</sub> Emissions (tons)
HMWWV – 1/2/3 roads	341	65	22,165				
HMWWV – 4/5 roads	341	30	10,230				
HMWWV – off-road	341	25	8,525				
HMWWV - total	341	120	40,920	0.88	1.15	34.51	3.54
Medium-Weight Trucks – 1/2/3 roads	362	65	23,530				
Medium-Weight Trucks – 4/5	362	30	10,860				
Medium-Weight Trucks – off-road	362	25	9,050				
Medium-Weight Trucks - total	362	120	43,440	1.45	2.74	36.66	3.78
<b>Total Emissions (tons)</b>				<b>2.33</b>	<b>3.89</b>	<b>71.17</b>	<b>7.32</b>

<sup>1</sup> Based on information from Fort Lewis/YTC Public Works. A full list of assumptions used to determine annual miles is provided in Appendix B.

**AIR EMISSIONS ASSOCIATED WITH A MEDIUM CAB (continued)****Table E-21 Annual Air Emissions Associated with CAB Helicopter Training at Fort Lewis**

Vehicle	Number of Helicopters	Annual Training Hours	Landing and Takeoff Cycles (LTO) <sup>1</sup>	Annual CO Emissions (tons)	Annual NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons) <sup>3</sup>	Annual VOC Emissions (tons)
Chinook <sup>2</sup> (MH-47)	12	2,844	5,700	67.426	3.595	1.394	28.288
Blackhawk (UH-60L)	50	11,850	23,750	61.738	7.893	1.978	72.63
Kiowa (OH-58D)	30	7,110	14,250	19.771	0.772	0.390	4.519
Apache (AH-64D)	24	5,688	11,400	14.631	1.381	0.949	27.717
Total Emissions (tons)	216			<b>163.566</b>	<b>13.641</b>	<b>4.711</b>	<b>133.154</b>

<sup>1</sup> 18.6 minutes/LTO for Idle, Takeoff, Climb Out, and Approach; Remainder calculated as flight time.

<sup>2</sup> EDMS Model does not include MH-47 with T55-GA-714A Engine, used T64-GE-100 Engine.

<sup>3</sup> EDMS Model does not include PM<sub>10</sub> emission factors, used Aircraft Engine and Auxiliary Power Unit Emissions Testing: Volume 3, Particulate Matter Results.

**Table E-22 Annual Air Emissions Associated with CAB Helicopter Training at Yakima Training center**

Vehicle	Number of Helicopters	Annual Training Hours	Landing and Takeoff Cycles (LTO) <sup>1</sup>	Annual CO Emissions (tons)	Annual NO <sub>x</sub> Emissions (tons)	Annual PM <sub>10</sub> Emissions (tons) <sup>3</sup>	Annual VOC Emissions (tons)
Chinook <sup>2</sup> (MH-47)	12	156	300	3.549	0.189	0.077	1.489
Blackhawk (UH-60L)	50	650	1,250	3.249	0.415	0.109	3.823
Kiowa (OH-58D)	30	390	750	0.949	0.034	0.021	0.238
Apache (AH-64D)	24	312	600	0.770	0.073	0.052	1.459
Total Emissions (tons)				<b>8.517</b>	<b>0.711</b>	<b>0.259</b>	<b>7.009</b>

<sup>1</sup> 18.6 minutes/LTO for Idle, Takeoff, Climb Out, and Approach; Remainder calculated as flight time.

<sup>2</sup> EDMS Model does not include MH-47 with T55-GA-714A Engine, used T64-GE-100 Engine.

<sup>3</sup> EDMS Model does not include PM<sub>10</sub> emission factors, used Aircraft Engine and Auxiliary Power Unit Emissions Testing: Volume 3, Particulate Matter Results.

**AIR EMISSIONS ASSOCIATED WITH A MEDIUM CAB (continued)**

**Table E-23 Annual Air Emissions Associated with Generator Usage on Fort Lewis (tons per year)**

<b>Pollutant</b>	<b>Emissions</b>
NO <sub>x</sub>	31.13
CO	6.71
SO <sub>x</sub>	2.06
PM <sub>2.5</sub>	2.21
PM <sub>10</sub>	2.21
VOCs	2.48

**Table E-24 Annual Air Emissions Associated with Generator Usage on Yakima Training Center (tons per year)**

<b>Pollutant</b>	<b>Emissions</b>
NO <sub>x</sub>	23.08
CO	5.13
SO <sub>x</sub>	1.57
PM <sub>2.5</sub>	1.69
PM <sub>10</sub>	1.69
VOCs	1.89

**Table E-25 Annual Air Emissions Associated with Commuting by New Soldiers Located On Post**

<b>Estimated Daily Commute Distance</b>	<b>Number of Vehicles</b>	<b>Daily Commute Miles</b>	<b>Total Miles per Year</b>	<b>MOBIL 6 Factor for NO<sub>x</sub> (g/VMT)<sup>1</sup></b>	<b>MOBIL 6 Factor for CO (g/VMT)</b>	<b>MOBIL 6 Factor for VOC (g/VMT)</b>	<b>Factor<sup>3</sup> for PM<sub>10</sub> (g/VMT)</b>	<b>Annual NO<sub>x</sub> (tons)</b>	<b>Annual CO (tons)</b>	<b>Annual VOC (tons)</b>	<b>Annual PM<sub>10</sub> (tons)</b>
On Post <sup>2</sup>	260	6	486,720	1.5	4.0	1.8	0.3	0.80	2.15	0.97	0.16
Off Post <sup>3</sup>	2,540	24	15,849,600	1.5	4.0	1.8	0.3	26.21	69.88	31.45	5.24

<sup>1</sup> VMT = Vehicle mile traveled.

<sup>2</sup> Assume that daily commute is 6 miles, and that soldiers drive on post six days per week.

<sup>3</sup> Assume that daily commute is 24 miles, and that soldiers drive from off post to on post five days per week.

**AIR EMISSIONS ASSOCIATED WITH A MEDIUM CAB (continued)**

**Table E-26 Increased VOC Emissions From On-Post Gas Stations, Wastewater Treatment, and Military Vehicle/Aircraft Diesel Fuel Usage**

**A. Increased Population Contributing to Sewer Usage and On-Post Gas Station Usage (Fort Lewis)**

Category	Current	Proposed Project Additional	Proposed New Total	Percent Change Due to Proposal
Soldiers Living in On-Post Family Housing <sup>1</sup>	<u>4,000</u>	<u>260</u>	<u>4,260</u>	6.5
Soldiers Living in Barracks	<u>11,670</u>	<u>0</u>	<u>11,670</u>	0
Soldiers Commuting from Off-Post	<u>13,830</u>	<u>2,540</u>	<u>16,370</u>	18.4
Dependents Living On-Post	<u>10,000</u>	<u>650</u>	<u>10,650</u>	6.5
Civilian Workers Commuting from Off-Post	11,630	0	11,630	0
<b>Total Population Contributing to Sewer System Loading</b>	<b>25,670</b>	<b>910</b>	<b>26,580</b>	<b>3.5</b>
<i>Total Population Contributing to On-Post Gas Station Usage</i>	<i><u>39,500</u></i>	<i><u>3,450</u></i>	<i><u>42,950</u></i>	<i><u>8.7</u></i>

**Bold items contribute to on-post sewer loading. Underlined items contribute to on-post gas station usage**

**B. Increased On-Post Emissions from Wastewater Treatment Plant (Fort Lewis)**

Reported 2007 VOC Emissions from Treatment Plant, tons	0.08	baseline tons VOC
Percent Increase In Population Contributing to Wastewater Loadings	3.54	population increase
Calculated Increase in VOC Emissions, tons	0.003	increase tons VOC

**C. Increased VOC Emissions From On-Post Gas Station Usage (Fort Lewis)**

Station	VOC Control Method	2008 Throughput (gallons)	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
All gas stations on Fort Lewis	Stage II	3,550,145	3.1	
		2008 VOCs, tons	55.0	tons VOC
		Percent Increase from Proposed Project	8.73	increase in population and gas station usage
		Increased VOC Emissions from on-post Gas Stations Due to Proposed Project	4.80	tons VOC

**D. Increased On-Post VOC Emissions From Military Vehicle/Aircraft Diesel Usage (Fort Lewis)**

Vehicle Miles	Mileage/Flight Hours	Estimated Annual Gas Usage <sup>1</sup>	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
Vehicles	3,093,200	618,640	3.1	0.96
Aircraft	27,492	1,761,324	3.1	2.73
		Annual Increase in VOCs, tons	3.69	tons VOC

<sup>1</sup> Assumes a mileage of 5 miles/gallon for vehicles.. Gas usage for aircraft was calculated using the EDMS model for aircraft.

**E. Increased On-Post VOC Emissions From Military Vehicle/Aircraft Diesel Usage (YTC)**

Vehicle Miles	Mileage/Flight Hours	Estimated Annual Gas Usage <sup>1</sup>	VOC Emission Factor (lbs/Kgal)	VOC emissions (tons)
Vehicles	1,588,470	317,694	3.1	0.49
Aircraft	1,508	97,112	3.1	0.15
		Annual Increase in VOCs, tons	0.64	tons VOC

<sup>1</sup> Assumes a mileage of 5 miles/gallon for vehicles. Gas usage for aircraft was calculated using the EDMS model for aircraft.