

## Appendix G

# Air Quality Calculations

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**Table 1**  
**Summary of Construction Emissions by Alternative**  
**Proposed Modernization and Expansion of Townsend Bombing Range**

Alternative	Emissions (tons)						Emissions (metric tons)
	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
1	4.5	1.6	8.4	0.010	10	1.4	820
2	3.9	1.4	7.3	0.009	8.4	1.2	716
3	8.3	3.0	16	0.018	17	2.6	1,532
4	5.3	1.9	10	0.012	11	1.7	965

**Table 2  
Construction Emissions - Alternative 1  
Proposed Modernization and Expansion of Townsend Bombing Range**

**Non-Road Combustion Emissions<sup>1</sup>**

Construction Activity	Equipment Type	Fuel Type	No of Units	Daily Oper. Per Unit (hrs/day)	Working Days per Unit (days)	Equip. Engine Size (hp)	Load Factor	Emission Factor <sup>2</sup> (g/hp-hr)							Emissions (tons)							GHG Emissions (metric tons)
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
								Clearing <sup>3</sup>	Chain Saw	Gasoline	8	6	82	6.6	0.70	1.353	59.788	289.454	0.008	9.748	9.748	
Backhoe/Loader	Diesel	2	8	82	98	0.21	5.021		1.033	6.128	0.008	0.912	0.912	692.767	0.15	0.031	0.18	0.0002	0.027	0.027	19	
Skid steer Loader	Diesel	2	8	21	168	0.59	5.510		0.978	3.883	0.007	0.667	0.667	623.483	0.20	0.036	0.14	0.0003	0.024	0.024	21	
Dozer	Diesel	4	6	33	299	0.58	2.184		0.184	0.742	0.006	0.148	0.148	536.249	0.33	0.028	0.11	0.0009	0.022	0.022	74	
Dump Truck (12 CY)	Diesel	6	8	82	275	0.21	1.535		0.152	0.444	0.005	0.084	0.084	536.351	0.38	0.038	0.11	0.0013	0.021	0.021	122	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>1.1</b>	<b>1.3</b>	<b>6.4</b>	<b>0.0028</b>	<b>0.29</b>	<b>0.29</b>	<b>248</b>	
Cut, Fill, Excavate, Borrow <sup>4</sup>	Skid steer Loader	Diesel	3	8	46	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.11	0.024	0.12	0.0002	0.018	0.018	12	
	Dump Truck (12 CY)	Diesel	6	8	46	710	0.59	2.807	0.169	1.581	0.006	0.169	0.169	536.047	2.9	0.17	1.6	0.0061	0.17	0.17	496	
	Backhoe/Loader	Diesel	2	8	46	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.084	0.017	0.10	0.0001	0.015	0.015	10	
	Excavator	Diesel	2	8	8	513	0.59	2.565	0.166	1.010	0.006	0.154	0.154	536.307	0.11	0.0071	0.043	0.0003	0.0066	0.0066	21	
	Dozer	Diesel	2	8	8	620	0.59	2.855	0.171	1.599	0.006	0.171	0.171	536.294	0.15	0.0088	0.083	0.0003	0.0088	0.0088	25	
	Small Generator	Diesel	10	8	4	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.0087	0.0012	0.007	0.0000	0.0009	0.0009	1	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>3.3</b>	<b>0.23</b>	<b>2.0</b>	<b>0.0070</b>	<b>0.22</b>	<b>0.22</b>	<b>565</b>	
Grading/Site Prep (grading, drainage, utilities, etc.) <sup>4</sup>	Dozer	Diesel	2	6	6	90	0.59	2.907	0.245	2.709	0.007	0.359	0.359	595.388	0.012	0.0010	0.011	0.00003	0.0015	0.0015	2	
	Skid steer Loader	Diesel	4	4	17	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.026	0.0059	0.029	0.00004	0.0045	0.0045	3	
	Backhoe/Loader	Diesel	2	6	12	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.016	0.0034	0.020	0.00003	0.0030	0.0030	2	
	Small Generator	Diesel	2	4	17	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.004	0.0005	0.0030	0.000005	0.0004	0.0004	0.3	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>0.059</b>	<b>0.011</b>	<b>0.064</b>	<b>0.00010</b>	<b>0.0093</b>	<b>0.0093</b>	<b>8</b>	
<b>TOTAL</b>								-	-	-	-	-	-	-	<b>4.5</b>	<b>1.6</b>	<b>8.4</b>	<b>0.010</b>	<b>0.52</b>	<b>0.52</b>	<b>820</b>	

Notes:

- Estimates of the type of equipment, number of units, daily operation, working days per unit, equipment engine size, and load factor are based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Emission factors from USEPA's NONROAD emission model for CY 2014.
- For Alternative 1, the total disturbed area for the construction period is estimated at 200 acres. It is estimated that 80% (i.e., 160 acres) would be cleared. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 176 acres.
- For Alternative 1, the total disturbed area for the construction period is estimated at 200 acres. It is estimated that 8% (i.e., 16 acres) would be graded. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 17.6 acres.

**Fugitive Dust Emissions<sup>4</sup>**

Area of Disturbance (acres)	Duration of Disturbance (months)	PM <sub>2.5</sub> to PM <sub>10</sub> Ratio <sup>5</sup>	Emission Factor <sup>6</sup> (tons per acre-month)		Emissions (tons)	
			PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
15	5.5	0.1	0.11	0.011	9.1	0.91

Notes:

- Estimates of the area and duration of disturbance based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Ratio from Executive Summary of "Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust - Final Report" (Western Governors' Association Western Regional Air Partnership (WRAP), October 2005).
- PM<sub>10</sub> emission factor from Table 3.2 of "WRAP Fugitive Dust Handbook" (Western Governor's Association, September 2006). PM<sub>2.5</sub> emission factor calculated using PM<sub>2.5</sub> to PM<sub>10</sub> ratio and PM<sub>10</sub> emission factor.

**TOTAL EMISSIONS:**

Emissions (tons)						Emissions (metric tons)
NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
4.5	1.6	8.4	0.010	10	1.4	820

**Table 3  
Construction Emissions - Alternative 2  
Proposed Modernization and Expansion of Townsend Bombing Range**

**Non-Road Combustion Emissions<sup>1</sup>**

Construction Activity	Equipment Type	Fuel Type	No of Units	Daily Oper. Per Unit (hrs/day)	Working Days per Unit (days)	Equip. Engine Size (hp)	Load Factor	Emission Factor <sup>2</sup> (g/hp-hr)							Emissions (tons)							GHG Emissions (metric tons)
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
								Clearing <sup>3</sup>	Chain Saw	Gasoline	8	6	72	6.6	0.70	1.353	59.788	289.454	0.008	9.748	9.748	
Backhoe/Loader	Diesel	2	8	72	98	0.21	5.021		1.033	6.128	0.008	0.912	0.912	692.767	0.13	0.027	0.16	0.0002	0.024	0.024	16	
Skid steer Loader	Diesel	2	8	19	168	0.59	5.510		0.978	3.883	0.007	0.667	0.667	623.483	0.18	0.032	0.13	0.0002	0.022	0.022	19	
Dozer	Diesel	4	6	29	299	0.58	2.184		0.184	0.742	0.006	0.148	0.148	536.249	0.29	0.024	0.10	0.0008	0.020	0.020	65	
Dump Truck (12 CY)	Diesel	6	8	72	275	0.21	1.535		0.152	0.444	0.005	0.084	0.084	536.351	0.34	0.033	0.10	0.0011	0.018	0.018	107	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>1.0</b>	<b>1.2</b>	<b>5.6</b>	<b>0.0025</b>	<b>0.26</b>	<b>0.26</b>	<b>218</b>	
Cut, Fill, Excavate, Borrow <sup>4</sup>	Skid steer Loader	Diesel	3	8	40	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.09	0.021	0.10	0.0001	0.016	0.016	10	
	Dump Truck (12 CY)	Diesel	6	8	40	710	0.59	2.807	0.169	1.581	0.006	0.169	0.169	536.047	2.5	0.15	1.4	0.0053	0.15	0.15	431	
	Backhoe/Loader	Diesel	2	8	40	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.073	0.015	0.09	0.0001	0.013	0.013	9	
	Excavator	Diesel	2	8	7	513	0.59	2.565	0.166	1.010	0.006	0.154	0.154	536.307	0.10	0.0062	0.038	0.0002	0.0058	0.0058	18	
	Dozer	Diesel	2	8	7	620	0.59	2.855	0.171	1.599	0.006	0.171	0.171	536.294	0.13	0.0077	0.072	0.0003	0.0077	0.0077	22	
	Small Generator	Diesel	10	8	4	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.0087	0.0012	0.007	0.0000	0.0009	0.0009	1	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>2.9</b>	<b>0.20</b>	<b>1.7</b>	<b>0.0061</b>	<b>0.19</b>	<b>0.19</b>	<b>491</b>	
Grading/Site Prep (grading, drainage, utilities, etc.) <sup>4</sup>	Dozer	Diesel	2	6	5	90	0.59	2.907	0.245	2.709	0.007	0.359	0.359	595.388	0.010	0.0009	0.010	0.00002	0.0013	0.0013	2	
	Skid steer Loader	Diesel	4	4	15	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.023	0.0052	0.026	0.00003	0.0039	0.0039	3	
	Backhoe/Loader	Diesel	2	6	11	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.015	0.0031	0.018	0.00002	0.0027	0.0027	2	
	Small Generator	Diesel	2	4	15	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.003	0.0005	0.0026	0.000004	0.0003	0.0003	0.3	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>0.052</b>	<b>0.010</b>	<b>0.056</b>	<b>0.00009</b>	<b>0.0083</b>	<b>0.0083</b>	<b>7</b>	
<b>TOTAL</b>								-	-	-	-	-	-	-	<b>3.9</b>	<b>1.4</b>	<b>7.3</b>	<b>0.009</b>	<b>0.46</b>	<b>0.46</b>	<b>716</b>	

Notes:

- Estimates of the type of equipment, number of units, daily operation, working days per unit, equipment engine size, and load factor are based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Emission factors from USEPA's NONROAD emission model for CY 2014.
- For Alternative 2, the total disturbed area for the construction period is estimated at 174 acres. It is estimated that 80% (i.e., 139 acres) would be cleared. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 176 acres.
- For Alternative 2, the total disturbed area for the construction period is estimated at 174 acres. It is estimated that 8% (i.e., 14 acres) would be graded. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 17.6 acres.

**Fugitive Dust Emissions<sup>4</sup>**

Area of Disturbance (acres)	Duration of Disturbance (months)	PM <sub>2.5</sub> to PM <sub>10</sub> Ratio <sup>5</sup>	Emission Factor <sup>6</sup> (tons per acre-month)		Emissions (tons)	
			PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
15	4.8	0.1	0.11	0.011	7.9	0.79

Notes:

- Estimates of the area and duration of disturbance based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Ratio from Executive Summary of "Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust - Final Report" (Western Governors' Association Western Regional Air Partnership (WRAP), October 2005).
- PM<sub>10</sub> emission factor from Table 3.2 of "WRAP Fugitive Dust Handbook" (Western Governor's Association, September 2006). PM<sub>2.5</sub> emission factor calculated using PM<sub>2.5</sub> to PM<sub>10</sub> ratio and PM<sub>10</sub> emission factor.

**TOTAL EMISSIONS:**

Emissions (tons)						Emissions (metric tons)
NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
3.9	1.4	7.3	0.009	8.4	1.2	716

**Table 4  
Construction Emissions - Alternative 3  
Proposed Modernization and Expansion of Townsend Bombing Range**

**Non-Road Combustion Emissions<sup>1</sup>**

Construction Activity	Equipment Type	Fuel Type	No of Units	Daily Oper. Per Unit (hrs/day)	Working Days per Unit (days)	Equip. Engine Size (hp)	Load Factor	Emission Factor <sup>2</sup> (g/hp-hr)							Emissions (tons)							GHG Emissions (metric tons)
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
								Clearing <sup>3</sup>	Chain Saw	Gasoline	8	6	155	6.6	0.70	1.353	59.788	289.454	0.008	9.748	9.748	
Backhoe/Loader	Diesel	2	8	155	98	0.21	5.021		1.033	6.128	0.008	0.912	0.912	692.767	0.28	0.058	0.34	0.0005	0.051	0.051	35	
Skid steer Loader	Diesel	2	8	40	168	0.59	5.510		0.978	3.883	0.007	0.667	0.667	623.483	0.39	0.068	0.27	0.0005	0.047	0.047	40	
Dozer	Diesel	4	6	62	299	0.58	2.184		0.184	0.742	0.006	0.148	0.148	536.249	0.62	0.052	0.21	0.0017	0.042	0.042	138	
Dump Truck (12 CY)	Diesel	6	8	155	275	0.21	1.535		0.152	0.444	0.005	0.084	0.084	536.351	0.73	0.072	0.21	0.0024	0.040	0.040	230	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>2.1</b>	<b>2.5</b>	<b>12</b>	<b>0.0053</b>	<b>0.55</b>	<b>0.55</b>	<b>467</b>	
Cut, Fill, Excavate, Borrow <sup>4</sup>	Skid steer Loader	Diesel	3	8	86	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.20	0.045	0.22	0.0003	0.034	0.034	22	
	Dump Truck (12 CY)	Diesel	6	8	86	710	0.59	2.807	0.169	1.581	0.006	0.169	0.169	536.047	5.4	0.32	3.0	0.011	0.32	0.32	927	
	Backhoe/Loader	Diesel	2	8	86	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.16	0.032	0.19	0.0002	0.028	0.028	20	
	Excavator	Diesel	2	8	14	513	0.59	2.565	0.166	1.010	0.006	0.154	0.154	536.307	0.19	0.012	0.075	0.0004	0.012	0.012	36	
	Dozer	Diesel	2	8	14	620	0.59	2.855	0.171	1.599	0.006	0.171	0.171	536.294	0.26	0.015	0.14	0.0005	0.015	0.015	44	
	Small Generator	Diesel	10	8	7	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.015	0.0022	0.012	0.0000	0.0016	0.0016	1	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>6.2</b>	<b>0.43</b>	<b>3.7</b>	<b>0.0130</b>	<b>0.41</b>	<b>0.41</b>	<b>1,050</b>	
Grading/Site Prep (grading, drainage, utilities, etc.) <sup>4</sup>	Dozer	Diesel	2	6	11	90	0.59	2.907	0.245	2.709	0.007	0.359	0.359	595.388	0.022	0.0019	0.021	0.00005	0.0028	0.0028	4	
	Skid steer Loader	Diesel	4	4	31	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.048	0.011	0.053	0.00007	0.0081	0.0081	5	
	Backhoe/Loader	Diesel	2	6	23	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.031	0.0065	0.038	0.00005	0.0057	0.0057	4	
	Small Generator	Diesel	2	4	31	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.007	0.0010	0.0055	0.000008	0.0007	0.0007	0.6	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>0.109</b>	<b>0.020</b>	<b>0.118</b>	<b>0.00018</b>	<b>0.017</b>	<b>0.017</b>	<b>14</b>	
<b>TOTAL</b>								-	-	-	-	-	-	-	<b>8.3</b>	<b>3.0</b>	<b>16</b>	<b>0.018</b>	<b>0.98</b>	<b>0.98</b>	<b>1,532</b>	

Notes:

- Estimates of the type of equipment, number of units, daily operation, working days per unit, equipment engine size, and load factor are based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Emission factors from USEPA's NONROAD emission model for CY 2014.
- For Alternative 3, the total disturbed area for the construction period is estimated at 379 acres. It is estimated that 80% (i.e., 303 acres) would be cleared. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 176 acres.
- For Alternative 3, the total disturbed area for the construction period is estimated at 379 acres. It is estimated that 8% (i.e., 30 acres) would be graded. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 17.6 acres.

**Fugitive Dust Emissions<sup>4</sup>**

Area of Disturbance (acres)	Duration of Disturbance (months)	PM <sub>2.5</sub> to PM <sub>10</sub> Ratio <sup>5</sup>	Emission Factor <sup>6</sup> (tons per acre-month)		Emissions (tons)	
			PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
15	10	0.1	0.11	0.011	17	1.7

Notes:

- Estimates of the area and duration of disturbance based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Ratio from Executive Summary of "Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust - Final Report" (Western Governors' Association Western Regional Air Partnership (WRAP), October 2005).
- PM<sub>10</sub> emission factor from Table 3.2 of "WRAP Fugitive Dust Handbook" (Western Governor's Association, September 2006). PM<sub>2.5</sub> emission factor calculated using PM<sub>2.5</sub> to PM<sub>10</sub> ratio and PM<sub>10</sub> emission factor.

**TOTAL EMISSIONS:**

Emissions (tons)						Emissions (metric tons)
NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
8.3	3.0	16	0.018	17	2.6	1,532

**Table 5  
Construction Emissions - Alternative 4  
Proposed Modernization and Expansion of Townsend Bombing Range**

**Non-Road Combustion Emissions<sup>1</sup>**

Construction Activity	Equipment Type	Fuel Type	No of Units	Daily Oper. Per Unit (hrs/day)	Working Days per Unit (days)	Equip. Engine Size (hp)	Load Factor	Emission Factor <sup>2</sup> (g/hp-hr)							Emissions (tons)							GHG Emissions (metric tons)
								NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>	
Clearing <sup>3</sup>	Chain Saw	Gasoline	8	6	98	6.6	0.70	1.353	59.788	289.454	0.008	9.748	9.748	685.997	0.032	1.4	6.9	0.0002	0.23	0.23	15	
	Backhoe/Loader	Diesel	2	8	98	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.18	0.037	0.22	0.0003	0.032	0.032	22	
	Skid steer Loader	Diesel	2	8	25	168	0.59	5.510	0.978	3.883	0.007	0.667	0.667	623.483	0.24	0.043	0.17	0.0003	0.029	0.029	25	
	Dozer	Diesel	4	6	39	299	0.58	2.184	0.184	0.742	0.006	0.148	0.148	536.249	0.39	0.033	0.13	0.0011	0.026	0.026	87	
	Dump Truck (12 CY)	Diesel	6	8	98	275	0.21	1.535	0.152	0.444	0.005	0.084	0.084	536.351	0.46	0.046	0.13	0.0015	0.025	0.025	146	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>1.3</b>	<b>1.6</b>	<b>7.6</b>	<b>0.0034</b>	<b>0.35</b>	<b>0.35</b>	<b>295</b>	
Cut, Fill, Excavate, Borrow <sup>4</sup>	Skid steer Loader	Diesel	3	8	54	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.13	0.028	0.14	0.0002	0.021	0.021	14	
	Dump Truck (12 CY)	Diesel	6	8	54	710	0.59	2.807	0.169	1.581	0.006	0.169	0.169	536.047	3.4	0.20	1.9	0.0072	0.20	0.20	582	
	Backhoe/Loader	Diesel	2	8	54	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.098	0.020	0.12	0.0002	0.018	0.018	12	
	Excavator	Diesel	2	8	9	513	0.59	2.565	0.166	1.010	0.006	0.154	0.154	536.307	0.12	0.0080	0.049	0.0003	0.0074	0.0074	23	
	Dozer	Diesel	2	8	9	620	0.59	2.855	0.171	1.599	0.006	0.171	0.171	536.294	0.17	0.0099	0.093	0.0003	0.0099	0.0099	28	
	Small Generator	Diesel	10	8	5	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.0109	0.0016	0.009	0.0000	0.0012	0.0012	1	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>3.9</b>	<b>0.27</b>	<b>2.3</b>	<b>0.0082</b>	<b>0.26</b>	<b>0.26</b>	<b>661</b>	
Grading/Site Prep (grading, drainage, utilities, etc.) <sup>4</sup>	Dozer	Diesel	2	6	7	90	0.59	2.907	0.245	2.709	0.007	0.359	0.359	595.388	0.014	0.0012	0.013	0.00003	0.0018	0.0018	3	
	Skid steer Loader	Diesel	4	4	20	67	0.23	5.709	1.272	6.308	0.008	0.965	0.965	692.019	0.031	0.0069	0.034	0.00004	0.0052	0.0052	3	
	Backhoe/Loader	Diesel	2	6	15	98	0.21	5.021	1.033	6.128	0.008	0.912	0.912	692.767	0.021	0.0042	0.025	0.00003	0.0037	0.0037	3	
	Small Generator	Diesel	2	4	20	10	0.43	5.754	0.823	4.637	0.007	0.609	0.609	587.780	0.004	0.0006	0.0035	0.000005	0.0005	0.0005	0.4	
<b>Subtotal</b>								-	-	-	-	-	-	-	<b>0.070</b>	<b>0.013</b>	<b>0.076</b>	<b>0.00012</b>	<b>0.0112</b>	<b>0.0112</b>	<b>9</b>	
<b>TOTAL</b>								-	-	-	-	-	-	-	<b>5.3</b>	<b>1.9</b>	<b>10</b>	<b>0.012</b>	<b>0.62</b>	<b>0.62</b>	<b>965</b>	

Notes:

- Estimates of the type of equipment, number of units, daily operation, working days per unit, equipment engine size, and load factor are based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Emission factors from USEPA's NONROAD emission model for CY 2014.
- For Alternative 4, the total disturbed area for the construction period is estimated at 237 acres. It is estimated that 80% (i.e., 190 acres) would be cleared. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 176 acres.
- For Alternative 4, the total disturbed area for the construction period is estimated at 237 acres. It is estimated that 8% (i.e., 19 acres) would be graded. The working days for each unit were adjusted to account for the difference in acreage listed in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008), which was 17.6 acres.

**Fugitive Dust Emissions<sup>4</sup>**

Area of Disturbance (acres)	Duration of Disturbance (months)	PM <sub>2.5</sub> to PM <sub>10</sub> Ratio <sup>5</sup>	Emission Factor <sup>6</sup> (tons per acre-month)		Emissions (tons)	
			PM <sub>10</sub>	PM <sub>2.5</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
15	6.5	0.1	0.11	0.011	10.7	1.1

Notes:

- Estimates of the area and duration of disturbance based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Ratio from Executive Summary of "Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust - Final Report" (Western Governors' Association Western Regional Air Partnership (WRAP), October 2005).
- PM<sub>10</sub> emission factor from Table 3.2 of "WRAP Fugitive Dust Handbook" (Western Governor's Association, September 2006). PM<sub>2.5</sub> emission factor calculated using PM<sub>2.5</sub> to PM<sub>10</sub> ratio and PM<sub>10</sub> emission factor.

**TOTAL EMISSIONS:**

Emissions (tons)						Emissions (metric tons)
NO <sub>x</sub>	VOC	CO	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub>
5.3	1.9	10	0.012	11	1.7	965

**Table 6  
Prescribed Fires - Operational Emissions  
Proposed Modernization and Expansion of Townsend Bombing Range**

Alternative	Acquisition Areas	Area Affected by Each Alternative			Current Annual Baseline Area of Prescribed Burns (acres)	New Total Annual Area of Prescribed Burns <sup>1</sup> (acres)	Vegetation Fraction <sup>2</sup>		Area of Prescribed Burn by Vegetation Type (acre/yr)		Fuel Loading <sup>3</sup> (ton/acre)		Fuel Amount (ton/yr)	
		Area of Classified Softwood Forest Product (acres)	Fraction of Area with Prescribed Burning Each Year	Annual Area of Prescribed Burns (acres)			Long Needle (Pine)	Palmetto /Gallberry	Long Needle (Pine)	Palmetto /Gallberry	Long Needle (Pine)	Palmetto /Gallberry	Long Needle (Pine)	Palmetto /Gallberry
1	1A+1B	8,881	0.25	2,220	1,310	3,530	0.83	0.17	2,930	600	3.48	4.87	10,197	2,923
2	3	17,898	0.25	4,475	1,310	5,785	0.83	0.17	4,801	983	3.48	4.87	16,708	4,789
3	1A+1B+3	26,779	0.25	6,695	1,310	8,005	0.83	0.17	6,644	1,361	3.48	4.87	23,121	6,627
4	1B+3	21,850	0.25	5,463	1,310	6,773	0.83	0.17	5,621	1,151	3.48	4.87	19,562	5,607
No Action	-	0	0.25	0	1,310	1,310	0.83	0.17	1,087	223	3.48	4.87	3,784	1,085

Notes:

- Total area includes areas from each alternative added to the baseline area.
- Estimates of vegetation fraction based on listing in Appendix C of the "Environmental Assessment U.S Marine Corps and U.S. Navy Operations at for the Townsend Bombing Range, GA" (October 2008).
- Fuel loading based on Table 1 in "NWCG Fireline Handbook Fireline Handbook - Appendix B: Fire Behavior" (National Wildfire Coordinating Group, April 2006).

Emission Factors for Prescribed Burning of Long Needle Conifer (Pine) <sup>4</sup> (g/kg)				Emission Factors for Prescribed Burning of Palmetto/Gallberry <sup>4</sup> (g/kg)			
VOC	CO	PM <sub>10</sub>	PM <sub>2.5</sub>	VOC	CO	PM <sub>10</sub>	PM <sub>2.5</sub>
3.5	200.00	40.0	40.00	0.0	150.00	15.0	15.00

Notes:

- Emission factors from USEPA's AP-42, Section 13.2: "Wildfires And Prescribed Burning".

Alternative	Emissions (tons)			
	VOC	CO	PM <sub>10</sub>	PM <sub>2.5</sub>
1	36	2,478	452	452
2	58	4,060	740	740
3	81	5,618	1,024	1,024
4	68	4,753	867	867
No Action	13	919	168	168