
Appendix C Air Quality Example Calculations

**Supplemental Environmental Impact Statement/
Overseas Impact Statement
Northwest Training and Testing**

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Appendix C Air Quality Example Calculations

This appendix discusses emission factor development, calculations, and assumptions used in the air quality analyses presented in Section 3.2 (Air Quality) of the Northwest Training and Testing (NWTT) Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (Supplemental).

C.1 Surface Operations Emissions

Surface operations are activities associated with vessel movements. Fleet training activities use a variety of marine vessels, including cruisers, destroyers, frigates, carriers, submarines, amphibious vessels, and small boats. Testing activities use a variety of marine vessels, including various testing support vessels, work boats, torpedo recovery vessels, unmanned surface vehicles, and small boats. These vessels use diverse propulsion methods, including marine outboard engines, diesel engines, and gas turbines.

C.1.1 Marine Outboard Engines

Emission factors for small surface craft involved in amphibious training and testing activities were obtained from the Navy and Military Sealift Command Marine Engine Fuel Consumption & Emission Calculator database. Emissions for surface craft using outboard engines were calculated using Navy and Military Sealift Command emission factors, which are provided in terms of Vessel Emission Total per hour and multiplied by the hours of operation.

$$\text{Emissions} = \text{HR/YR} \times \text{EF}$$

Where:

Emissions = surface craft emissions (*pounds [lb.]/yr*)

HR/YR = hours per year per vessel per activity (*hr/yr*)

EF = emission factor for specific vessel (*lb./hr*)

To obtain the total criteria pollutant emissions for the Proposed Action, emissions were calculated for each training or testing activity, type of surface vessel, and criteria pollutant. These individual estimates of emissions, in units of tons per year, were then summed by criteria pollutant to obtain the aggregate emissions for surface vessel emissions activities.

C.1.2 Ship Marine Engines

Large vessel emissions were calculated in a similar fashion using emission factors from the Naval Sea Systems Command Navy and Military Sealift Command Marine Engine Fuel Consumption and Emission Calculator for the propulsion system and the supplemental ship service generator(s).

Ship engine emission factors were multiplied by the engine horsepower and annual hours of operation to calculate the pounds of pollutant emissions per year. This value was then converted to a tons-per-year value for comparison with the Study Area total summed emissions on an individual pollutant basis.

C.2 Air Operations Emissions

Fleet training and Naval Air Systems Command testing use various aircraft, including the E/A-18G, P-8, EP-3, and SH-60B. Aircraft operations of concern are those that occur from ground level up to 3,000 feet (ft.) above ground level (AGL). The 3,000 ft. AGL altitude was assumed to be the ceiling of the mixing zone (known as the atmospheric mixing height) above which any pollutant generated would not contribute to increased pollutant concentrations at ground level. Pollutants emitted by aircraft above 3,000 ft. AGL are excluded from the analysis of compliance with National Ambient Air Quality Standards. The pollutant emission rate is a function of the aircraft engine's fuel flow rate and efficiency. Emissions for one complete training activity for a particular aircraft are calculated by knowing the specific engine pollutant emission factors for each mode of operation.

For this Supplemental, emission factors for most military engines were obtained from the Navy's Aircraft Environmental Support Office memoranda. For those aircraft for which engine data were unavailable from Aircraft Environmental Support Office, emission factors from Air Emissions Guide for Air Force Mobile Source, July 2016, were used. Using these data, as well as number of sorties, pollutant emissions for each aircraft were calculated by applying the equation below.

$$\text{Emissions} = N \times FF \times EF \times ENG \times CF$$

Where:

Emissions = annual aircraft emissions (pounds [lb.]/yr.)

N = Hours of operation of aircraft operations per year for each type of aircraft per activity (hr./yr.)

FF = fuel flow at a specified power setting (gal./hr./engine)

EF = pollutant emission factor by engine type and power setting (lb./1,000 gal. of fuel used)

ENG = number of engines per aircraft

CF = conversion factor (0.001)

C.3 Ordnance and Munitions Emissions

Available emissions factors (AP-42, *Compilation of Air Pollutant Emission Factors*) were used. If an AP-42 factor was not available, other references, including Chemical Products of Underwater Explosions, 1980, were used to estimate the emissions. These factors were then multiplied by the net weight of the explosive and the number of items that were used per year. This calculation provides estimates of annual emissions.

$$\text{Emissions} = EXP/YR \times EF \times \text{Net Wt}$$

Where:

Emissions = annual ordnance emissions

EXP/YR = number of explosives, propellants, and pyrotechnics items used per year

EF = air pollutant emissions factor per item

Net Wt = net weight of explosive, propellant, or pyrotechnics per ordnance item

C.4 Emissions Estimates Spreadsheets

Tables C-1 through C-7 provide example emissions summaries for aircraft, vessels, and ordnance for the Baseline and Alternatives 1 and 2.

C.5 Example Record of Non-Applicability

This appendix provides an example of the documentation that will be prepared for each affected Air Quality Control Region potentially impacted by the Proposed Action. The example document includes a Record of Non-Applicability memorandum, a standard form to show Clean Air Act conformity, and sample conformity analyses.

MEMORANDUM FOR THE RECORD

From: _____

Subj: Conformity Analysis for Northwest Training and Testing (NWTT) Environmental Impact Statement/Overseas Environmental Impact Statement – Operations in State of Washington Waters

Ref: (a) 40 CFR, Part 93, Subpart B: Determining Conformity of General Federal Actions to State or Federal Implementation Plans

Encl: (1) Record of Non-Applicability for Northwest Training and Testing in State of Washington Waters

1. Enclosure (1) is a Record of Non-Applicability for those activities associated with Pacific Fleet training and testing activities that are expected to occur annually in State of Washington waters. The Proposed Action would have no new emissions of criteria air pollutants in air quality non-attainment or maintenance areas.

2. If there are any questions or if additional information is needed, please call _____ at _____.

Name

Title

Figure C-1: Sample Record of Non-Applicability Form for Northwest Washington Air Quality Control Region

NAVY RECORD OF NON-APPLICABILITY FOR CLEAN AIR ACT CONFORMITY

The Proposed Action falls under the Record of Non-Applicability (RONA) category and is documented with this RONA.

Proposed Action: Northwest Training and Testing

Action Proponents: Commander, Pacific Fleet
Naval Sea Systems Command
Naval Air Systems Command

Proposed Action Name: Northwest Training and Testing (NWTT) Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement (SEIS/OEIS)

Proposed Action and Emissions Summary:

The Proposed Action consists of training and testing activities in the waters of the States of Alaska and Washington, as well as in federal and international waters. The action involves operation of military aircraft, vessels, and small boats in order to achieve requisite training and testing requirements. Small boats and vessels would be operational in locations within the Northwest Washington Air Quality Control Region. These nearshore activities generate emissions primarily through fossil fuel combustion from engine operation. The region managed by Olympic Region Clean Air Agency, Thurston County is an air quality maintenance area for PM₁₀. As a conservative estimate it was assumed that all of the activities occurring within the Olympic-Northwest Washington Air Quality Control Region would take place in the maintenance areas for PM₁₀. The Proposed Action would result in no increases in emissions of criteria air pollutants in air quality non-attainment or maintenance areas. Accordingly, the Proposed Action is exempt from the provisions of 40 CFR, Part 93, Subpart B.

The table below provides a summary of the evaluation.

Emissions from all sources – with 3 NM, tons	Baseline	ALT 1	ALT 2
PM ₁₀	3.0	4.2	10.1
Net Increase (Decrease)	N/A	1.2	7.1
<i>De Minimis</i> Threshold	100	100	100
<i>Exceedance?</i>	N/A	No	No

The U.S. Navy concludes that *de minimis* thresholds for PM₁₀ would not be exceeded as a result of implementation of the Proposed Action. Formal Conformity Determination procedures are not required, resulting in this RONA. The emissions data supporting the conclusion are attached to this RONA.

Affected Air Basins: Northwest Washington Air Quality Control Region

Date RONA prepared: _____

RONA prepared by: Naval Facilities Engineering Command, Northwest

Attainment Area Status and Emissions Evaluation Conclusion:

To the best of my knowledge and belief, the information contained within this General Conformity Applicability Analysis is correct and accurate. By signing this statement, I am in agreement with the finding that the total of all reasonably foreseeable direct and indirect emissions that will result from this action is below the *de minimis* threshold set forth in 40 CFR 93.153. Accordingly, it is my determination that this action conforms to the applicable State Implementation Plan (SIP).

RONA Approval:

Signature: _____

Name/Rank: _____ Date: _____

Position: _____ Commanding Officer: _____ Activity: _____

Enclosure 1

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Table C-1: Total Baseline Emissions (2015 NWTT ALT1) – Updated August 2020

		Criteria Pollutants, Tons					
		CO	NOx	VOC	SOx	PM10	PM2.5
Training	Aircraft	9.7	67.4	0.8	12.2	1.4	1.4
	Vessels	130.8	265.0	10.2	104.9	14.0	14.0
	Ordnance	3.4	0.2	0.0	0.0	2.0	1.6
	Total	143.9	332.6	11.0	117.1	17.4	17.4
Testing	Aircraft	2.4	10.1	0.2	2.0	0.9	0.9
	Vessels	28.3	52.2	3.0	11.8	1.6	1.6
	Ordnance	0.0	0.0	0.0	0.0	0.0	0.0
	Total	30.7	62.3	3.2	13.8	2.5	2.5
Total	Aircraft	12.1	77.5	1.0	14.2	2.3	2.3
	Vessels	159.1	317.2	13.2	116.7	15.6	15.6
	Ordnance	3.4	0.2	0.0	0.0	2.0	1.6
	Total	174.6	394.9	14.2	130.9	19.9	19.5

Table C-2: Estimated Annual Criteria Air Pollutant Emissions in the Northwest Training and Testing Study Area Under Alternative 1

		Criteria Pollutants, Tons					
		CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Training	Aircraft	12.6	78.5	1.2	14.4	5.4	5.4
	Vessels	108.7	269.7	7.3	111.9	11.5	11.5
	Ordnance	2.5	0.1	0.0	0.0	1.3	1.1
	Total	123.8	348.3	8.5	126.3	18.2	18.0
Testing	Aircraft	3.4	12.9	0.3	2.6	1.4	1.4
	Vessels	50.6	271.1	7.1	106.6	6.9	6.9
	Ordnance	0.0	0.0	0.0	0.0	0.0	0.0
	Total	54.0	284.0	7.4	109.2	8.3	8.3
Total	Aircraft	15.9	91.4	1.5	16.9	6.8	6.8
	Vessels	159.3	540.8	14.4	218.5	18.5	18.5
	Ordnance	2.5	0.1	0.0	0.0	1.3	1.1
	Total	177.7	632.3	15.9	235.5	26.6	26.4
Baseline		174.6	394.9	14.2	130.9	19.9	19.5
Delta		3.1	237.4	1.7	104.6	6.6	6.8
% Delta		2%	60%	12%	80%	33%	35%

Table C-3: Estimated Annual Criteria Air Pollutant Emissions in the Northwest Training and Testing Study Area Under Alternative 2

		Criteria Pollutants, Tons					
		CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Training	Aircraft	13.5	79.8	1.4	14.8	6.8	6.8
	Vessels	124.7	310.1	8.4	127.8	16.4	16.4
	Ordnance	3.2	0.2	0.0	0.0	1.7	1.7
	Total	141.4	390.1	9.8	142.6	24.9	24.9
Testing	Aircraft	3.5	13.2	0.3	2.6	1.5	1.5
	Vessels	54.1	294.9	7.4	115.0	13.0	13.0
	Ordnance	0.0	0.0	0.0	0.0	0.0	0.0
	Total	57.5	308.1	9.7	117.6	14.4	14.4
Total	Aircraft	17.0	93.1	1.7	17.4	8.3	8.3
	Vessels	178.7	605.0	15.8	242.8	29.4	29.4
	Ordnance	3.2	0.2	0.0	0.0	1.7	1.7
	Total	198.9	698.3	19.5	260.3	39.4	39.4
Baseline		174.6	394.9	14.2	130.9	19.9	19.5
Delta		24.3	303.4	5.3	129.4	19.4	19.8
% Delta		14%	77%	37%	99%	97%	101%

Table C-4: Estimated Net Change in Annual Air Pollutant Emissions from Training and Testing Activities in the Olympic Northwest Washington Intrastate (Within 3 NM) Under Alternative 1

	Criteria Pollutants, Tons					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Emissions from all sources	32.0	237.7	2.9	76.5	4.2	4.2
Baseline	27.6	69.7	2.3	15.6	3.0	2.9
Net Increase (Decrease)	4.4	168.0	0.6	60.9	1.2	1.3
<i>De Minimis</i> Threshold	N/A	N/A	N/A	N/A	100.0	100.0

Table C-5: Estimated Net Change in Annual Air Pollutant Emissions from Training and Testing Activities in the Puget Sound Intrastate (Within 3 NM) Under Alternative 1

	Criteria Pollutants, Tons					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Emissions from all sources	10.8	47.8	1.2	15.1	6.1	6.1
Baseline	18.2	41.4	1.7	9.0	7.2	7.2
Net Increase (Decrease)	-7.5	6.4	-0.5	6.1	-1.1	-1.1
<i>De Minimis</i> Threshold	N/A	N/A	N/A	N/A	100.0	100.0

Table C-6: Estimated Net Change in Annual Air Pollutant Emissions from Training and Testing Activities in the Olympic Northwest Washington Intrastate (Within 3 NM) Under Alternative 2

	Criteria Pollutants, Tons					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Emissions from all sources	36.0	254.5	3.2	81.5	10.1	10.1
Baseline	27.6	69.7	2.3	15.6	3.0	3.0
Net Increase (Decrease)	8.4	184.8	0.9	65.9	7.1	7.1
<i>De Minimis</i> Threshold	N/A	N/A	N/A	N/A	100.0	100.0

Table C-7: Estimated Net Change in Annual Air Pollutant Emissions from Training and Testing Activities in the Puget Sound Intrastate (Within 3 NM) Under Alternative 2

	Criteria Pollutants, Tons					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Emissions from all sources	13.4	56.5	1.4	17.9	10.1	10.1
Baseline	18.2	41.4	1.7	9.0	7.2	7.2
Net Increase (Decrease)	-4.8	15.1	-0.3	8.9	2.9	2.9
<i>De Minimis</i> Threshold	N/A	N/A	N/A	N/A	100.0	100.0

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