
Appendix D: Air Quality Emissions Calculations

Supplemental Environmental Impact Statement/ Overseas Environmental Impact Statement Mariana Islands Training and Testing

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APPENDIX D Air Quality Emissions Calculations and Record of Non-Applicability

This appendix discusses emission factor development, calculations, and assumptions used in the air quality analyses presented in the Air Quality section of Chapter 3 (Section 3.2). Section D-5 of this Appendix contains the Record of Applicability (RONA) for the Preferred Alternative.

D.1 SURFACE ACTIVITIES EMISSIONS

Surface activities are 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 a variety of propulsion methods, including marine outboard engines, diesel engines, and gas turbines.

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 (MSC) Marine Engine Fuel Consumption & Emission Calculator database. Emissions for surface craft using outboard engines were calculated using Navy and MSC emission factors which are provided in terms of emissions per hour, and multiplied by the hours of operation.

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

Where:

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

HR/YR = hours per year

EF = emission factor for specific engine type (lb./hour [hr.])

ENG = number of engines

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.

Diesel Engines:

Emission factors for small surface craft involved in amphibious training and testing activities were obtained from the Navy and MSC Marine Engine Fuel Consumption & Emission Calculator database. Diesel was assumed to be the primary fuel to ensure a conservative estimate. Calculation methods similar to those described for Marine Outboard Engines were used to obtain emissions estimates for diesel engines.

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

Where:

Emissions = surface craft emissions (lb.)

HR/YR = hours per year

EF = emission factor for specific engine type (lb./hr.)

ENG = number of engines

Diesel engine emission factors were multiplied by the annual hours of operation to calculate the pollutant emissions per year.

D.2 AIR ACTIVITIES EMISSIONS

Fleet training and Naval Air Systems Command testing consists of the activities of various aircraft, including the F/A-18, P-8, SH-60B, MH-53, MH-60S, and Lear jet. Research Development Testing & Evaluation air activities consist of various aircraft, including the 1UH-1N, SH-60B, MH-53, MH-60S, and Cessna-172. Aircraft activities of concern are those that occur from ground level up to 3,000 feet (ft.) above ground level (AGL). The 3,000 ft. AGL ceiling was assumed to be the atmospheric mixing height above which any pollutant generated would not contribute to increased pollutant concentrations at ground level (known as the mixing zone). All criteria pollutant emissions from aircraft generated above 3,000 ft. AGL are excluded from 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 Environmental Impact Statement (SEIS)/Overseas EIS (OEIS), emission factors for most military engines were obtained from Navy's Aircraft Environmental Support Office memoranda and previous Navy Environmental Impact Statement (EIS)/OEIS documentation (primarily citing the Federal Aviation Administration's Emissions and Dispersion Modeling System model). For those aircraft for which engine data were unavailable, an applicable surrogate was used. Pollutant emissions for each aircraft/organization were calculated by applying the equation below.

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

Where:

Emissions = aircraft emissions (lb.)

TIM = time-in-mode at a specified power setting (hr./operation).

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

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

ENG = number of engines on aircraft

CF = conversion factor (0.001)

D.3 ORDNANCE AND MUNITIONS EMISSIONS

Available emissions factors (AP-42, *Compilation of Air Pollutant Emission Factors*) were used. 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.

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

Where:

Emissions = ordnance emissions (lb.)

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

EF = emissions factor (lb./item)

Net Wt = net weight of explosive (lb.)

D.4 EMISSIONS ESTIMATES SPREADSHEETS

The following spreadsheets show the emissions calculations for ships, aircraft, and ordnance involved in training and testing activities. These spreadsheets were developed for each range complex and testing area. The spreadsheets show the calculations developed for each alternative analyzed in this SEIS/OEIS.

Table D-1: Summary of Emissions Released Within 3 Nautical Miles of the Coast

Source	Emissions by Air Pollutant (TPY)					
	CO	NO _x	VOC	SO _x	PM ₁₀	PM _{2.5}
Baseline Emissions	404	461	118	237	97	88
Alternative 1 Emissions	467	528	166	254	119	107
Alternative 2 Emissions	473	549	168	313	131	119

¹Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.

Notes: NM = nautical miles, CO = carbon monoxide, NO_x = nitrogen oxides, PM_{2.5} = particulate matter ≤ 2.5 microns in diameter, PM₁₀ = particulate matter ≤ 10 microns in diameter, SO_x = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

Table D-2: Vessel Emissions Factors

Vessel Mode	Emissions Factors (lb/hr) Propulsion Engines + Generators				
	CO	NOx	HC	SOx	PM10
CG-3	61.51	79.58	4.32	77.63	2.79
DDG-3	60.16	114.52	4.01	88.53	3.64
FFG-3	32.94	47.16	3	34.92	2.31
TRB-3	6.47	56.22	1.55	7.40	1.18
AOE-2	109.76	311.31	10.6	119.99	10.41
USCG	5.74	57.91	0.88	11.55	0.21
LHA-1	7.38	43.53	5.53	130.97	26.29
LHD-2	8.08	47.83	5.77	135.50	28.58
LPD-2	3.48	21.00	2.58	60.82	12.85
LCAC	18.32	114.53	3.49	54.61	5.14
LCU	5.06	15.7	1.27	2.91	0.75
AAV-2	0.76	6.22	0.82	1.25	0.26
AAAV					
PC-2	37.36	74.17	6.02	23.42	2.6
MK V-2	3.86	29.49	0.99	4.73	0.40
RIB-4	0.34	9.14	0.06	1.44	0.15
CRRC-5		0.15	12.90		
AE-2	2.61	15.84	1.94	45.83	9.67
BW-3	111.75	1.60	45.89	0.31	0.08
SSN	0	0.00	0.00	0	0
SSGN	0	0.00	0.00	0	0
T-AGO(LFA)	6.67	39.37	5.00	119.43	23.77
CG-PARTNER	107.79	47.10	9.90	21	2.6
DDG-PARTNER	103.99	49.90	9.00	17.9	2.5
SS-PARTNER	2.94	17.32	2.20	52.11	10.46
LCS	727.98	171.04	2.82	67.28	6.94
LSD	21.25	334.51	10.84	35.04	2.71

Table D-3: Aircraft Emissions Factors

Aircraft	Emission Indices, lb/1,000 lb fuel					Emissions Factors (lb/hr)				
	CO	NOx	VOC	SOx	PM	CO	NOx	VOC	SOx	PM
AH-1W	11.21	5.44	0.57	0.40	4.20	9.10	4.42	0.46	0.32	3.41
AV-8B	7.70	8.60	0.54	0.40	3.80	46.20	51.60	3.24	2.40	22.80
C-130 F/R/T	2.07	8.16	0.47	0.40	3.97	9.32	36.72	2.12	1.80	17.87
CH-46	17.04	4.12	2.64	0.40	1.78	20.45	4.94	3.17	0.48	2.14
CH-53	2.13	8.08	0.15	0.40	2.21	9.51	36.07	0.67	1.79	9.87
E-2 / E-2C	2.54	10.04	0.36	0.40	0.94	5.59	22.09	0.79	0.88	2.07
EA-18G	0.72	14.75	0.12	0.40	6.56	7.44	152.49	1.24	4.14	67.82
EA-6B	7.99	5.71	1.09	0.40	12.12	51.06	36.49	6.97	2.56	77.45
EP-3	2.51	7.73	0.58	0.40	3.97	10.57	32.56	2.44	1.68	16.72
F-15	3.62	46.72	0.65	0.40	8.15	22.43	289.48	4.03	2.48	50.50
FA-18A/C	2.44	6.74	0.44	0.40	6.36	16.19	44.73	2.92	2.65	42.20
FA-18E/F	0.72	14.75	0.12	0.40	6.56	7.44	152.49	1.24	4.14	67.82
HH-60	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
Learjet	22.38	5.90	4.26	0.40	1.27	23.81	6.28	4.53	0.43	1.35
MH-60R/S	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
P-3C	2.51	7.73	0.58	0.40	3.97	12.05	37.10	2.78	1.92	19.06
P-8 MMA	1.24	9.26	0.28	0.40	0.56	4.05	30.21	0.91	1.31	1.83
S-3	14.10	4.07	1.86	0.40	3.62	32.29	9.32	4.26	0.92	8.29
S-3B	14.10	4.07	1.86	0.40	3.62	32.29	9.32	4.26	0.92	8.29
SH-60	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
SH-60B	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
SH-60B/F	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
SH-60F	6.25	6.40	0.55	0.40	4.20	7.50	7.68	0.66	0.48	5.04
UH-1N	3.34	4.72	0.17	0.40	4.20	1.80	2.55	0.09	0.22	2.27
A-10	4	8.83	0.4	0.4	2.67	12.104	26.71958	1.2104	1.2104	8.07942
B-1B	0.84	13.12	0.11	0.4	0.14	5.5776	87.1168	0.7304	2.656	0.9296
E-2	0.65	10.45	0.16	0.4	3.97	2.8847	46.3771	0.71008	1.7752	17.61886
E-3	2.07	8.45	0.31	0.4	0.26	67.65588	276.1798	10.13204	13.0736	8.49784
KC-135	1.34	13.5	0.03	0.4	0.13	30.66992	308.988	0.68664	9.1552	2.97544
MQ-4C						2.1	38.84	0.66	3.54	0.61
MV-22	19.74	3.94	3.43	0.40	1.78	22.1088	4.4128	3.8416	0.448	1.9936

Table D-4: Ordnance Emissions Factors

Ordnance Type	Ordnance	Emission Factor (lb per lb)							Emission Factor (lb/item)						
		CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead	CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead
BOMB	CBU MK20 ROCKEYE								0.00						
	GBU32I JDAM		0.1482						57.06						
	LGTR								0.00						
	MK76	0.085							0.26						
	BDU 48	0.085							0.26						
	MK82 HE	0.3184							61						
	GBU12 - Paveway II	0.3184							61						
	MK82 INERT	0.085							0.26						
	BDU 45	0.085							0.26						
	MK83 HE	0.1482							62						
	GBU 16	0.1482							66						
	MK84	0.1482							140						
	MK83 INERT	0.085							0.26						
OTHER ORD	Type														
	EER/IEER AN/SQQ-110	1.2	0.0044	0.011				0.00004		0.02					
	BLASTING CAP MK11								1.80E-03	3.10E-04	4.50E-05	4.60E-04	2.90E-04		1.30E-04
	Detonator														
	FIRING DEVICE														
	FUSE														
	GRENADE SIMULATOR								4.10E-03	0.0004	5.60E-03	0.12		4.70E-04	1.40E-06
	Grenades	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.00					
	Haversacks	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.42					
	K143 Antipersonnel Mine	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.03					
	M1A2 BANGALORE Torp	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.21					
	M7 BANDOLEER MK57 (Claymore mine)		0.15108												

Table D-4: Ordnance Emissions Factors (continued)

Ordnance Type	Ordnance	Emission Factor (lb per lb)							Emission Factor (lb/item)						
		CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead	CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead
	M112 DEMO CHARGE								7.90E-01	2.60E-02	7.90E-03	2.60E-02	1.90E-02		1.70E-04
	M700 BLASTING FUSE		0.149						0.0008	0.0003	0.0002	0.00009	0.00009	0.000002	0
Flare, Aircraft Parachute															
		0.039	0.021	0.054	0.1	0.092	0.00018		5.91E-05	0.000152	0.000282	0.000259	5.07E-07		
	Chaff	0.039	0.021	0.054	0.1	0.092	0.00018		5.91E-05	0.000152	0.000282	0.000259	5.07E-07		
	MK36 M0 DEMO CHARGE														
	MK75 CHARGE														
	MK84 [86] EOD Shaped Charge														
	MK120 NONELEC DET (ft)														
	MK123 NONELEC DET (ft)														
	MK138 DEMO CHG ASSEMBLY	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04							
	MK140 FLEXIBLE CHARGE														
	PBXN-109 TEST Det Cord														
	SIGNAL MK 18(G950) SMOKE														
	C4 1.25 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04	0.02625	0.007875	0.02625	0.01875	0.00015		
	C4 5 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04	0.105	0.0315	0.105	0.075	0.0006		
	C4 15 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04	0.315	0.0945	0.315	0.225	0.0018		
	C4 40 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04	0.84	0.252	0.84	0.6	0.0048	0.0056	
	C4 100 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04	2.1	0.63	2.1	1.5	0.012	0.014	

Table D-4: Ordnance Emissions Factors (continued)

Ordnance Type	Ordnance	Emission Factor (lb per lb)							Emission Factor (lb/item)						
		CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead	CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead
	C4 300 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.021	0.0063	0.021	0.015	0.00012	0.00014
	C4 500 LB	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.021	0.0063	0.021	0.015	0.00012	0.00014
	TNT Blocks 0.5 lbd		0.398												
	DEMO SHEET														
	DETONATING CORD														
	DEMO CHARGE														
	SIMULATED ARTILLERY	6.30E-01	0.021	6.30E-03	2.10E-02	1.50E-02	1.20E-04	1.40E-04		0.002888	0.000866	0.002888	0.002063	1.65E-05	
PROJECTILE (LARGE)	155MM HE	6.51	2.35E+01	1.43E+00	0.496	0.2418		2.26E-03							
	155MM ILL								6.00	8.63	0.087	3.44	0.13	0.0027	0.029
	5"/54 Inert	2.60E-04	3.50E-04	3.60E-05	2.60E-05	2.30E-05		6.70E-04		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	5"/54 BLP	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06							
	5"/54 HCVT+32 (EOD)	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		0.16	0	0.0096	0.00744	0	0.000048
	5"/54 HECVT	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		0.1280	0.1600	0.0096	0.0074		
	5"/54 HEPD	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		0.16	0	0.0096	0.00744	0	0.000048
	5"/54 HEVT	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
	5"/54 ILL	1.50E-02	1.40E-02	3.60E-04	9.20E-04	7.60E-04		1.30E-06		1.12E-01	2.88E-03	7.36E-03	6.08E-03	0.00E+00	1.04E-05
	5"/54 VTNF	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
	5"/62	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
	5"/62 HE-MFF	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
	5"/62 HECVT	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
	5"/62 HEET	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
	5"/62 KEET	1.60E-02	2.00E-02		1.20E-03	9.30E-04		6.00E-06		1.60E-01	0.00E+00	9.60E-03	7.44E-03	0.00E+00	4.80E-05
60mm	60MM								0.4	0.06	0.005	0.062	0.03		0.0004
	60MM WP								0.13	0.154	0.0124	0.221	0.494	0.00014	0.001
	76MM BLP	1.44E-02	1.80E-02		1.08E-03	8.37E-04		5.40E-06							
	81MM HE								1.48	0.14	0.016	0.173	0.096		0.0007
	81MM ILL								1.48	0.14	0.016	0.173	0.096		0.0007
	GAU-17 30mm														
PROJECTILE (SMALL)	20MM	0.19	0.38	0.0049	0.0075	0.0053		0.00026	0.016	0.033	0.00043	0.00066	0.00046		0.000023

Table D-4: Ordnance Emissions Factors (continued)

Ordnance Type	Ordnance	Emission Factor (lb per lb)							Emission Factor (lb/item)						
		CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead	CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead
	25MM								0.11	0.019	0.00067	0.0027	0.0017		0.000055
	30MM EFV Main Gun	0.14	0.028	0.0063	0.13	0.08		0.00037		7.28E-03	1.64E-03	3.38E-02	2.08E-02	0.00E+00	9.62E-05
	40MM	5.70E-01	6.00E-02	1.30E-02	1.10E-01	5.60E-02		6.20E-04	4.90E-02	4.00E-03	1.30E-03	9.50E-03	5.10E-03	0.00E+00	8.00E-05
	40MM HE	5.70E-01	6.00E-02	1.30E-02	1.10E-01	5.60E-02		6.20E-04	4.90E-02	4.00E-03	1.30E-03	9.50E-03	5.10E-03	0.00E+00	8.00E-05
	40MM ILL	7.20E-02	2.40E-02	6.50E-03	1.40E-01	1.20E-01	0.00019	7.90E-04	0.015	0.005	0.0014	0.029	0.025	0.00004	1.60E-04
	40MM PRACTICE	2.60E-01	2.50E-01	9.50E-03	1.40E-02	1.10E-02		1.10E-03	2.70E-03	2.60E-03	9.70E-05	1.40E-04	1.20E-04	0.00E+00	1.10E-05
	.45 CAL	2.80E-01	3.40E-01	1.00E-02	4.70E-02	4.00E-02		1.60E-02	2.20E-04	2.60E-04	8.10E-06	3.70E-05	3.10E-05		1.20E-05
	.56	2.40E-01	4.40E-01	1.30E-02	9.20E-03	7.60E-03		3.20E-03	8.70E-04	1.60E-03	8.50E-05	3.90E-05	2.80E-05		5.10E-06
	5.56 BLANK	2.60E-01	3.20E-01	2.30E-02	7.80E-03	6.80E-03	0.00011	1.10E-03	2.30E-04	2.80E-04	2.00E-05	6.90E-06	6.00E-06	9.80E-09	9.70E-07
	.50CAL	1.50E-01	3.30E-01	3.60E-02	9.60E-03	5.60E-03		4.00E-04	5.10E-03	1.10E-02	1.20E-03	3.10E-04	1.90E-04		1.30E-05
	.50CAL	1.50E-01	3.30E-01	3.60E-02	9.60E-03	5.60E-03		4.00E-04	5.10E-03	1.10E-02	1.20E-03	3.10E-04	1.90E-04		1.30E-05
	.50CAL BLANK	3.10E-01	2.70E-01	4.10E-03	1.40E-02	1.30E-02		1.70E-03	5.10E-03	1.10E-02	1.20E-03	3.10E-04	1.90E-04		1.30E-05
	7.62	3.50E-01	2.50E-01	1.60E-02	6.10E-03	5.60E-03	0.00013	9.70E-04	1.20E-03	2.30E-03	9.70E-05	5.10E-05	3.80E-05		4.90E-06
	7.62	3.50E-01	2.50E-01	1.60E-02	6.10E-03	5.60E-03	0.00013	9.70E-04	1.20E-03	2.30E-03	9.70E-05	5.10E-05	3.80E-05		4.90E-06
	9MM								2.00E-04	3.10E-04	1.50E-05	2.40E-05	2.00E-05	8.20E-08	6.80E-06
	.300 WIN MAG								1.90E-03	3.00E-03	1.50E-05	9.40E-05	7.30E-05		1.80E-05
	.223 Rifle Rounds								7.50E-05	8.00E-05	5.00E-06	3.40E-06	2.60E-06		1.90E-06
	.22 Magnum								7.50E-05	8.00E-05	5.00E-06	3.40E-06	2.60E-06		1.90E-06
	.22 Long Rifle								7.50E-05	8.00E-05	5.00E-06	3.40E-06	2.60E-06		1.90E-06
	12 Gauge Shotgun	5.10E-03	1.10E-02	1.20E-03	3.10E-04	1.90E-04		1.30E-05							
MINE SHAPE	M18A1	1.6	2.00E-02	1.80E-02	4.90E-02	2.60E-02		5.70E-05							
	MK76														
MISSILE	AGM-114B														
	AGM-65 Maverick														
	AGM-84	0.4		0.06	0.1025	0.1025			140	30.62356	35.574	61.795	61.795		
	AIM-120														
	AIM-7														
	AIM-9														
	BGM-71E TOW-A														
	GBU-9														

Table D-4: Ordnance Emissions Factors (continued)

Ordnance Type	Ordnance	Emission Factor (lb per lb)							Emission Factor (lb/item)						
		CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead	CO ₂	CO	NO _x	PM ₁₀	PM _{2.5}	SO ₂	Lead
	AGM-88 HARM														
	NSM														
	JSOW														
	Japanese Missile Tests														
	Tactical Tomahawk														
	Seasparrow Missile														
	SLAM ER														
	SM2 or equivalent														
ROCKET	2.75" RKT	4.50E-01	5.60E-02	7.10E-03	6.10E-02	3.80E-02		1.20E-03							
	2.75" RKT HE	3.00E-01	1.70E-01	2.40E-03	1.00E-01	5.30E-02		2.60E-04	5.5	0.93	0.0056	0.4	0.29		0.07
	2.75" RKT I	4.50E-01	5.60E-02	7.10E-03	6.10E-02	3.80E-02		1.20E-03							
PYROTECHNICS	MK58 Marine Location Marker	1	1.30E-02	1.20E-02	3.20E-02	1.70E-02	6.10E-05	3.80E-05							
	Smoke Grenade AN-M8								3.30E-02	4.60E-02	1.00E-03	6.80E-01	1.10E-01	1.20E-04	4.70E-04

Table D-5: Vessel Emissions – No Action Alternative

Table D-5: Vessel Emissions – No Action Alternative (continued)

Table D-5: Vessel Emissions – No Action Alternative (continued)

Table D-5: Vessel Emissions – No Action Alternative (continued)

Table D-6: Aircraft Emissions – No Action Alternative

Table D-6: Aircraft Emissions – No Action Alternative (continued)

Table D-6: Aircraft Emissions – No Action Alternative (continued)

Type Training	Training Ops #	OPERATIONAL INFORMATION - AIRCRAFT												EMISSIONS/YEAR (lb) BY JURISDICTION												EMISSIONS/YEAR (lb) BY JURISDICTION												Training Platform	Annual Fuel Use (total)			GHG Emissions (lb)					
		Aircraft	Time	Altitude	Distribution (%)	Distribution (hr)	State (0-3 nm offshore)						Waters of U S (3-12 nm)						Int Waters (> 12 nm)						Total Emissions				Engines (#)	Fuel Flow (lb/hr)	Pounds	Gallons	CO ₂	N ₂ O	CH ₄	CO _{2-e}											
Distribution	A/C Sorties (#)	Type	Ave Time on Range (hr)	Total Time on Range (hr)	Time < 3,000 ft (%)	Time < 3,000 ft (hr)	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	Total Time 0-3 nm from shore	Total Time 3-12 nm from shore	Total Time >12 nm from shore	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	Engines (#)	Fuel Flow (lb/hr)	Pounds	Gallons	CO ₂	N ₂ O	CH ₄	CO _{2-e}			
SURFACE WARFARE																																															
Gunnery Exercise, A-S (Small Caliber) - Ship	242	0.25	60.5 FA-18E/F	2.0	121.0	10%	12.1	0%	0%	100%	0.00	0.00	12.10	0	0	0	0	0	0	0	0	0	0	0	90	1845	15	50	821	739	90	1845	15	50	821	739	2	10,338	125098	183956	3873001	126	109	3,914,248			
		0.75	181.5 SH-60B	2.0	363.0	100%	363.0	0%	0%	100%	0.00	0.00	363.00	0	0	0	0	0	0	0	0	0	0	0	2723	2788	240	174	1830	1647	2723	2788	240	174	1830	1647	2	1200	435600	64059	1348694	44	38	1,363,058			
Gunnery Exercise, A-S (Medium Caliber) - Ship	295	0.25	73.75 FA-18E/F	2.0	147.5	10%	14.8	0%	0%	100%	0.00	0.00	14.75	0	0	0	0	0	0	0	0	0	0	0	110	2249	18	61	1000	900	110	2249	18	61	1000	900	2	10,338	1524855	224243	4721220	153	133	4,771,501			
		0.75	221.25 SH-60B	2.0	442.5	100%	442.5	0%	0%	100%	0.00	0.00	442.50	0	0	0	0	0	0	0	0	0	0	0	3319	3398	292	212	2230	2007	3319	3398	292	212	2230	2007	2	1200	531000	78088	1644070	53	46	1,661,579			
Missile Exercise (A-S) - Rocket	3	0.33	0.99 FA-18E/F	2.0	2.0	10%	0.2	0%	0%	100%	0.00	0.00	0.20	0	0	0	0	0	0	0	0	0	0	0	1	30	0	1	13	12	1	30	0	1	13	12	2	10,338	20469.24	3010	63376	2	2	64,051			
		0.66	1.98 SH-60B	2.0	4.0	100%	4.0	0%	0%	100%	0.00	0.00	3.96	0	0	0	0	0	0	0	0	0	0	0	30	30	3	2	20	18	30	30	3	2	20	18	2	1200	4752	699	14713	0	0	14,870			
Missile Exercise (A-S)	20	0.5	10 FA-18E/F	2.0	20.0	10%	2.0	0%	0%	100%	0.00	0.00	2.00	0	0	0	0	0	0	0	0	0	0	0	15	305	2	8	136	122	15	305	2	8	136	122	2	10,338	206760	30406	640165	21	18	646,983			
		0.5	10 SH-60B	2.0	20.0	100%	20.0	0%	0%	100%	0.00	0.00	20.00	0	0	0	0	0	0	0	0	0	0	0	150	154	13	10	101	91	150	154	13	10	101	91	2	1200	24000	3529	74308	2	2	75,100			
Laser Targeting	600	0.5	300 FA-18E/F	1.0	300.0	10%	30.0	0%	0%	100%	0.00	0.00	30.00	0	0	0	0	0	0	0	0	0	0	0	223	4575	37	124	2035	1831	223	4575	37	124	2035	1831	2	10,338	3101400	456088	9602482	312	271	9,704,748			
		0.5	300 SH-60B	1.0	300.0	100%	300.0	0%	0%	100%	0.00	0.00	300.00	0	0	0	0	0	0	0	0	0	0	0	2250	2304	198	144	1512	1361	2250	2304	198	144	1512	1361	2	1200	360000	52941	1114624	36	32	1,126,494			
Bombing Exercise (A-S)	37	0.5	19 FA-18E/F	1.0	18.5	10%	1.9	0%	0%	100%	0.00	0.00	1.85	0	0	0	0	0	0	0	0	0	0	0	14	282	2	8	125	113	14	282	2	8	125	113	2	10,338	191253	28125	592153	19	17	598,459			
		0.5	19 P-3	1.0	18.5	10%	1.9	0%	0%	100%	0.00	0.00	1.85	0	0	0	0	0	0	0	0	0	0	0	22	69	5	4	35	32	22	69	5	4	35	32	4	4,800	88800	13059	274940	9	8	277,869			
Torpedo Exercise (Submarine to Surface)	5																																														
Missile Exercise (S)	12																																														
Sinking Exercise (SINKEX)	2	2	4 FA-18E/F	8.0	32.0	10%	3.2	0%	0%	100%	0.00	0.00	32.0	0	0	0	0	0	0	0	0	0	0	0	24	488	4	13	217	195	24	488	4	13	217	195	2	10,338	330816	48649	1024265	33	29	1,035,173			
		1	2 P-3	8																																											

Table D-6: Aircraft Emissions – No Action Alternative (continued)

Type Training	Training Ops #	OPERATIONAL INFORMATION - AIRCRAFT												EMISSIONS/YEAR (lb) BY JURISDICTION												EMISSIONS/YEAR (lb) BY JURISDICTION												Training Platform	Annual Fuel Use (total)			GHG Emissions (lb)			
		Aircraft		Time		Altitude		Distribution (%)		Distribution (hr)		State (0-3 nm offshore)						Waters of U S (3-12 nm)						Int Waters (> 12 nm)						Total Emissions															
		Distribution	A/C Sorties (#)	Type	Ave Time on Range (hr)	Total Time on Range (hr)	Time < 3,000 ft (%)	Time > 3,000 ft (hr)	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	Total Time 0-3 nm from shore	Total Time 3-12 nm from shore	Total Time >12 nm from shore	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	Engines (#)	Fuel Flow (lb/hr)	Pounds	Gallons	CO ₂	N ₂ O	CH ₄	CO _{2-e}					
MAJOR TRAINING EXERCISES																																													
Joint Expeditionary Exercise	1	48	48	FA-18E/F	8.0	384.0	10%	38.4	0%	100%	0%	0.00	38.40	0.00	0	0	0	0	286	5855	48	159	2604	2344	0	0	0	0	0	0	286	5855	48	159	2604	2344	2	10,338	3969792	583793	12291177	399	347	12,422,078	
		4	4	EA-6B	8.0	32.0	10%	3.2	0%	100%	0%	0.00	3.20	0.00	0	0	0	0	148	165	10	8	73	66	0	0	0	0	0	0	148	165	10	8	73	66	1	6,000	192000	28235	594466	19	17	600,797	
		4	4	E-2	8.0	32.0	10%	3.2	0%	100%	0%	0.00	3.20	0.00	0	0	0	0	18	71	3	3	7	6	0	0	0	0	0	0	18	71	3	3	7	6	1	1,100	35200	5176	108985	4	3	110,146	
		3	3	P-3	8.0	24.0	10%	2.4	0%	100%	0%	0.00	2.40	0.00	0	0	0	0	29	89	7	5	46	41	0	0	0	0	0	0	29	89	7	5	46	41	4	4,800	115200	16941	356680	12	10	360,478	
		6	6	AV-8B	8.0	48.0	10%	4.8	0%	100%	0%	0.00	4.80	0.00	0	0	0	0	222	248	16	12	109	98	0	0	0	0	0	0	222	248	16	12	109	98	1	6,000	288000	4253	891699	29	25	901,195	
		2	2	C-130	8.0	16.0	10%	1.6	0%	100%	0%	0.00	1.60	0.00	0	0	0	0	15	59	3	3	29	26	0	0	0	0	0	0	15	59	3	3	29	26	4	4,500	72000	10588	222925	7	6	225,299	
		4	4	A-10	8.0	32.0	10%	3.2	0%	100%	0%	0.00	3.20	0.00	0	0	0	0	39	86	4	4	26	23	0	0	0	0	0	0	39	86	4	4	26	23	2	6,052	193664	2840	595618	19	17	606,004	
		1	1	E-3	8.0	8.0	10%	0.8	0%	100%	0%	0.00	0.80	0.00	0	0	0	0	54	221	8	10	7	6	0	0	0	0	0	0	54	221	8	10	7	6	4	####	1045888	153807	328254	105	92	3,272,741	
		1	1	KC-135	8.0	8.0	10%	0.8	0%	100%	0%	0.00	0.80	0.00	0	0	0	0	0	25	247	1	7	2	2	0	0	0	0	0	0	25	247	1	7	2	2	4	9,1552	732416	107708	2267689	74	64	2,291,840
		15	15	SH-60B	8.0	120.0	100%	120.0	0%	100%	0%	0.00	120.00	0.00	0	0	0	0	900	922	79	58	605	544	0	0	0	0	0	0	900	922	79	58	605	544	2	1200	144000	21176	445849	14	13	450,598	
		4	4	CH-53	8.0	32.0	100%	3.2	0%	100%	0%	0.00	32.00	0.00	0	0	0	0	304	1154	21	57	316	284	0	0	0	0	0	0	304	1154	21	57	316	284	3	4,464	142848	2107	442283	14	12	446,993	
		12	12	CH-46	8.0	96.0	100%	96.0	0%	100%	0%	0.00	96.00	0.00	0	0	0	0	0	2454	593	380	58	256	231	0	0	0	0	0	0	2454	593	380	58	256	231	2	1200	144000	21176	445849	14	13	450,598
		4	4	AH-1	8.0	32.0	100%	3.2	0%	100%	0%	0.00	32.00	0.00	0	0	0	0	0	291	141	15	10	109	98	0	0	0	0	0	0	291	141	15	10	109	98	2	812	25984	3821	80451	3	2	81,308
		2	2	UH-1	8.0	16.0	100%	1.6	0%	100%	0%	0.00	16.00	0.00	0	0	0	0	0	29	41	1	3	36	33	0	0	0	0	0	0	29	41	1	3	36	33	2	540	8640	1271	26751	1	1	27,036
		10	10	MV-22	8.0	80.0	100%	80.0	0%	100%	0%	0.00	80.00	0.00	0	0	0	0	1769	353	307	36	159	144	0	0	0	0	0	0	1769	353	307	36	159	144	2	2240	179200	26353	554835	18	16	560,744	
Joint Multi-Strike Group Exercise	1	144	144	FA-18E/F	8.0																																								

Table D-6: Aircraft Emissions – No Action Alternative (continued)

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Table D-7: Emissions from Ordnance – No Action Alternative

MEM Category	Location	Training MEM #/yr	Testing MEM #/yr	Emissions (lb/year) Training						Emissions (lb/year) Testing					
				CO	NOx	VOC	SOx	PM10	PM2.5	CO	NOx	VOC	SOx	PM10	PM2.5
BOMBS															
Bombs (H-E)	MITT	6,454	0	394,551.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bombs (N-E)	MITT	3,038	0	774.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PROJECTILES															
Small Caliber	MITT	138,640	0	318.9	13.4	0.0	0.0	7.1	5.3	0.0	0.0	0.0	0.0	0.0	0.0
Medium Caliber (H-E)	MITT	25,500	2040	102.0	33.2	0.0	0.0	242.3	130.1	8.2	2.7	0.0	0.0	19.4	10.4
Medium Caliber (N-E)	MITT	179,650	2040	467.1	17.4	0.0	0.0	25.2	21.6	5.3	0.2	0.0	0.0	0.3	0.2
Large Caliber (H-E)	MITT	2,500	3290	320.0	400.0	0.0	0.0	24.0	18.6	421.1	526.4	0.0	0.0	31.6	24.5
Large Caliber (N-E)	MITT	7,038	2310	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Missiles (H-E)	MITT	210	12	6,430.9	7,470.5	0.0	0.0	12,977.0	12,977.0	367.5	426.9	0.0	0.0	741.5	741.5
Missiles (N-E)	MITT	0	12	0.0	0.0	0.0	0.0	0.0	0.0	367.5	426.9	0.0	0.0	741.5	741.5
Rockets (H-E)	MITT	2,114	8	1,966.0	11.8	0.0	0.0	845.6	613.1	7.4	0.0	0.0	0.0	3.2	2.3
Rockets (N-E)	MITT	0	8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COUNTERMEASURES															
Chaff	MITT	25,840	0	1.5	3.9	0.0	0.0	7.3	6.7	0.0	0.0	0.0	0.0	0.0	0.0
Flares	MITT	25,600	0	1.5	3.9	0.0	0.0	7.2	6.6	0.0	0.0	0.0	0.0	0.0	0.0
TARGETS															
Airborne targets	MITT	12	0												
Surface targets	MITT	200	0												
Expendable sub-surface targets	MITT	87	0												
TOTAL EMISSIONS (lbs per year)				404,934	7,954	0	0	14,136	13,779	1,177	1,383	0	0	1,538	1,521
TOTAL EMISSIONS (tons per year)				202.5	4.0	0.0	0.0	7.1	6.9	0.6	0.7	0.0	0.0	0.8	0.8

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Table D-8: Vessel Emissions – Alternative 1

Table D-8: Vessel Emissions – Alternative 1 (continued)

Type Training	Training Ops (#)	OPERATIONAL INFORMATION - VESSELS										EMISSIONS/YEAR (lb) BY JURISDICTION										EMISSIONS/YEAR (lb) BY JURISDICTION										GHG Emissions (lb)									
		Ship / Vessel / Boat				Range Time (hr)		Distribution (hr)		State (0-3 nm offshore)					Waters of U S (3-12 nm)					Int Waters (> 12 nm)					Total Emissions					Fuel Flow (GPH)	Annual Fuel Consumption (gal)	CO ₂	N ₂ O	CH ₄	CO _{2-e}						
		Number	Ship Type	Type	Participation	Per Ship	Time at Each Power level %	Total	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5						
SURFACE WARFARE																																									
Gunnery Exercise, A-S (Small Caliber) - Ship	321																																								
Gunnery Exercise, A-S (Medium Caliber) - Ship	120																																								
Missile Exercise (A-S) - Rocket	110																																								
Missile Exercise (A-S)	10																																								
Laser Targeting	600																																								
Bombing Exercise (A-S)	37																																								
Torpedo Exercise (Submarine to Surface)	0																																								
Missile Exercise (S-S)	19	38	FFG	Guided Missile Frigate	2.00	2.0	100%	76.0	0.0	0.0	76.0	0	0	0	0	0	0	0	0	0	0	0	2,503	3,584	228	2,654	176	158	2,503	3,584	228	2,654	176	158	79	6,004	126,408	4	4	127,754	
Gunner Exercise (Surface-to-Surface) Ship – Large-caliber	140	30.8	CG	Cruiser	0.22	2.5	100%	77.00	0.0	21.6	55.4	0	0	0	0	0	0	1,326	1,716	93	1,674	60	54	3,410	4,412	240	4,304	155	139	4,736	6,128	333	5,978	215	193	184	14,168	298,293	10	8	301,470
		63	DDG		0.45	2.5	100%	157.5	0.0	44.1	113.4	0	0	0	0	0	0	2,653	5,050	177	3,904	161	144	6,822	12,987	455	10,039	413	371	9,475	18,037	632	13,943	573	516	187	29,453	620,093	20	18	626,697
		21	FFG	Guided Missile Frigate	0.15	2.5	100%	52.5	0.0	14.7	37.8	0	0	0	0	0	0	484	693	44	513	34	31	1,245	1,783	113	1,320	87	79	1,729	2,476	158	1,833	121	109	79	4,148	87,321	3	2	88,251
		16.8	USCG	US Coast Guard	0.12	2.5	100%	42.0	0.0	11.8	30.2	0	0	0	0	0	0	68	681	10	136	2	2	174	1,751	27	349	6	6	241	2,432	37	485	9	8	66	2,772	58,362	2	2	58,963
Gunner Exercise (Surface-to-Surface) Ship – Medium-caliber	100	22	CG	Cruiser	0.22	2.5	100%	55.00	0.0	15.4	39.6	0	0	0	0	0	0	947	1,226	67	1,196	43	39	2,436	3,151	171	3,074	110	99	3,383	4,377	238	4,270	153	138	184	10,120	213,066	7	6	215,336
		45	DDG		0.45	2.5	100%	112.5	0.0	31.5	81.0	0	0	0	0	0	0	1,895	3,607	126	2,789	115	103	4,873	9,276	325	7,171	295	265	6,768	12,884	451	9,960	410	369	187	21,038	442,924	14	13	447,641
		15	FFG	Guided Missile Frigate	0.15	2.5	100%	37.5	0.0	10.5	27.0	0	0	0	0	0	0	346	495	32	367	24	22	889	1,273	81	943	62	56	1,235	1,769	113	1,310	87	78	79	2,963	62,372	2	2	63,037
		1	LPD	Amphibious Transport Dock - Wasp	0.01	2.5	100%	2.5	0.0	0.7	1.8	0	0	0	0	0	0	2	43	9	8	6	38	5	109	23	21	9	53	6	152	32	29	373	933	19,633	1	1	19,842		
		12	USCG	US Coast Guard	0.12	2.5	100%	30.0	0.0	8.4	21.6	0	0	0	0	0	0	48	486	7	97	2	2	124	1,251	19	249	5	4	172	1,737	26	347	6	6	66	1,980	41,687	1	1	42,131
Sinking Exercise (SINKEX)	21	105	FFG	Guided Missile Frigate	5.00	16.0	100%	1680.0	0.0	0.0	1680.0	0	0	0	0	0	0	0	0	0	0	0	55,339	79,229	5,040	58,666	3,881	3,493	55,339	79,229	5,040	58,666	3,881	3,493	79	132,720	2,794,287	91	79	2,824,046	
Gunnery Exercise (S-S) Boat – Medium-caliber	20	100	FFG	Guided Missile Frigate	5.00	3.0	100%	300.0	0.0	0.0	300.0	0	0	0	0	0	0	0	0	0	0	0	9,882	14,148	900	10,476	693	624	9,882	14,148	900	10,476	693	624	79	23,700	498,980	16	14	504,294	
Gunnery Exercise (S-S) Small-caliber	43	86	CRRC	Combat Rubber Raiding Craft	2	3.0	100%	258.0	0.0	0.0	258.0	0	0	0	0	0	0	0	0	0	0	0	0	38	3,329	0	0	0	0	0	38	3,329	0	0							

Table D-8: Vessel Emissions – Alternative 1 (continued)

Table D-8: Vessel Emissions – Alternative 1 (continued)

Type Training	Training Ops (#)	OPERATIONAL INFORMATION - VESSELS										EMISSIONS/YEAR (lb) BY JURISDICTION										EMISSIONS/YEAR (lb) BY JURISDICTION										GHG Emissions (lb)					
		Ship / Vessel / Boat	Type	Participation	Per Ship	Time at Each Power Level (%)	Total	Distribution (hr)	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	Total Emissions	Fuel Flow (GPH)	Annual Fuel Consumption (gal)	CO ₂	N ₂ O	CH ₄	CO _{2-e}	
NAVAL SPECIAL WARFARE																																					
Personnel I&E	365	1825 RHIB Rigid Hulled Inflatable Boat	5	8.0	100%	14600.0	14600.0	0.0	0.0	4964.0	133444.0	876.0	21024.0	2190.0	1,971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48	700,800	14,754,643	479	417	14,911,780	
		2190 CRRC Combat Rubber Raiding Craft	6	8.0	100%	17520.0	17520.0	0.0	0.0	0	2,603	226,033	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	52,560	1,106,598	36	31	1,118,384		
Parachute Insertion	64																																				
Embassy Reinforcement	0	0 LCAC Landing Craft Air Cushioned	1	24.0	100%	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	611	0	0	0	0	0		
Underwater Demolition Qualifications	0	0 CRRC Combat Rubber Raiding Craft	1	8.0	100%	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0		
Intelligence, Surveillance, Reconnaissance	44																																				
Urban Warfare Training	0	0.0 LHA Amphib. Assault Ship - Tarawa	1	40.0	100%	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	373	0	0	0	0	0		
		0.0 LPD Amphibious Transport Dock - Wasp	2	40.0	100%	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	373	0	0	0	0	0		
OTHER																																					
Direct Action (Tactical Air Control Party)	30																																				
Intelligence, Surveillance, Reconnaissance	44																																				
Surface Ship Sonar Maintenance	44	44 FFG Guided Missile Frigate	1	4.0	100%	176.0	176.0	0.0	0.0	5,797	8,300	528	6,146	407	366	0	0	0	0	0	0	0	0	0	0	0	0	0	0	79	13,904	292,735	9	8	295,852		
Submarine Sonar Maintenance	32																																				
Small Boat Attack	18	18 CRRC Combat Rubber Raiding Craft	1	4.0	100%	72.0	0.0	72.0	0.0	0	0	0	0	0	0	11	929	0	0	0	0	0	0	0	0	0	0	0	3	216	4,548	0	0	4,596			
Sub Navigation / Sub Nav Under Ice	8																																				
Precision Anchoring	18	18 FFG Guided Missile Frigate	1	4.0	100%	72.0	72.0	0.0	0.0	2,372	3,396	216	2,514	166	150	0	0	0	0	0	0	0	0	0	0	0	0	0	79	5,688	119,755	4	3	121,031			
Unmanned Aerial Vehicle Operation	950																																				
Search and Rescue At Sea	45																																				
Underwater Survey	32	96 RHIB Rigid Hulled Inflatable Boat	3	8.0	100%	768.0	768.0	0.0	0.0	261.1	7019.5	46.1	1105.9	115.2	104	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48	36,864	776,135	25	22	784,400			
		96 CRRC Combat Rubber Raiding Craft	3	8.0	100%	768.0	768.0	0.0	0.0	0	114	9,908	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	2,304	48,508	2	1	49,025				
Unmanned Underwater Vehicle Training	64																																				
TOTAL TRAINING (lbs per year)						40,826	5,806	8,665	84,793	750,012	268,652	485,068	86,270	77,643	93,825	208,182	36,967	167,900	19,696	17,727	286,234	488,009	32,434	359,677	24,147	21,732	464,852	1,446,204	338,053	1,012,646	130,113	117,102	9,852,767	207,440,146	6,729	5,862	209,649,382
TOTAL TRAINING (tons per year)						42	375	134	243	43	39	47	104	18	84	10	9	143	244	16	180	12	11	232	723	169	506	65	59		103,720	3	3	104,825			

Table D-8: Vessel Emissions – Alternative 1 (continued)

Type Training	Training Ops (#)	OPERATIONAL INFORMATION - VESSELS										EMISSIONS/YEAR (lb) BY JURISDICTION										EMISSIONS/YEAR (lb) BY JURISDICTION										GHG Emissions (lb)											
		Ship / Vessel / Boat					Range Time (hr)			Distribution (hr)		State (0-3 nm offshore)					Waters of U S (3-12 nm)					Int Waters (> 12 nm)					Total Emissions					Fuel Flow (GPH)	Annual Fuel Consumption (gal)	CO ₂	N ₂ O	CH ₄	CO _{2-e}						
		Number	Ship Type	Type	Participation	Per Ship	Time at Each	Power Level (%)	Total	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	CO	NO _x	HC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	HC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	HC	SO _x	PM ₁₀	PM _{2.5}	CO	NO _x	HC	SO _x	PM ₁₀	PM _{2.5}							
LIFECYCLE ACTIVITIES TESTING																																											
Littoral Combat Ship (LCS) Mission Package Testing-ASW	2	2	LCS		1	60.0	100%	120.0	0.0	120.0	0.0	0	0	0	0	0	3,953	5,659	360	4,190	277	249	0	0	0	0	0	0	3,953	5,659	360	4,190	277	249	79	152,280	3,206,103	104	91	3,240,248			
Ship Signature Testing	40	40	FFG	Guided Missile Frigate	1	4.0	100%	160.0	52.8	52.8	54.4	1,739	2,490	158	1,844	122	110	1,739	2,490	158	1,844	122	110	1,792	2,566	163	1,900	126	113	5,270	7,546	480	5,587	370	333	79	203,040	4,274,804	139	121	4,320,331		
ANTI-SUBMARINE WARFARE TESTING																																											
Anti-submarine Warfare Tracking Test - MPA	26																																										
Torpedo (Explosive) Testing	2	6.0	DDG		3	4.0	100%	24.0	0.0	0.0	24.0	0	0	0	0	0	0	0	0	0	0	0	1,444	2,748	96	2,125	87	79	1,444	2,748	96	2,125	87	79	187	4,488	94,490	3	3	95,497			
Torpedo (Non-explosive Testing)	6																																										
Countermeasure / Acoustic Systems Testing	2	4.0	DDG		2	2.0	100%	8.0	4.0	4.0	0.0	241	458	16	354	15	13	241	458	16	354	15	13	0	0	0	0	0	0	481	916	32	708	29	26	187	1,496	31,497	1	1	31,832		
At-Sea Sonar Testing	27	108.0	SSN	Nuclear Carrier (No emissions)	4	2.0	100%	216.0	0.0	0.0	216.0	0	0	0	0	0	0	0	0	0	0	0	3,322	4,297	233	4,192	151	136	3,322	4,297	233	4,192	151	136	184	9,936	209,193	7	6	211,420			
	27.0	CG			1	2.0	100%	54.0	0.0	0.0	54.0	0	0	0	0	0	0	0	0	0	0	0	12,995	24,736	866	19,122	786	708	12,995	24,736	866	19,122	786	708	187	40,392	850,413	28	24	859,470			
	108.0	DDG			4	2.0	100%	216.0	0.0	0.0	216.0	0	0	0	0	0	0	0	0	0	0	0																					
SHIPBOARD PROTECTION SYSTEMS AND SWIMMER DEFENSE TESTING																																											
Pierside Integrated Swimmer Defense	0	0	FFG	Guided Missile Frigate	1	8.0	100%	0.0	0.0	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
MINE WARFARE TESTING																																											
Mine Detection and Classification Testing	4	4	FFG	Guided Missile Frigate	1	4	100%	16.0	5.3	5.3	5.4	174	249	16	184	12	11	174	249	16	184	12	11	179	257	16	190	13	11	527	755	48	559	37	33	79	1,264	26,612	1	1	26,896		
UNMANNED VEHICLE TESTING																																											
Unmanned Vehicle Development and Payload Testing	0																																										
OFFICE OF NAVAL RESEARCH																																											
North Pacific Acoustic Lab Philippine Sea 2018-19 Experiment (Deep Water)	1																																										
TOTAL TESTING (lbs per year)												62	182	570	2,154	3,197	190	2,382	149	134	6,107	8,856	550	6,573	426	383	19,731	34,604	1,375	27,529	1,162	1,046	27,991	46,658	2,116	36,484	1,737	1,563	412,896	8,693,112	282	246	8,785,651
TOTAL TESTING (tons per year)												1	2	0	1	0	0	3	4	0	3	0	0	10	17	1	14	1	1	14	23	1	18	1	1	4,347	0	0	0	4,351			

Table D-9: Aircraft Emissions – Alternative 1

Table D-9: Aircraft Emissions – Alternative 1 (continued)

Type Training	Training Ops (#)	OPERATIONAL INFORMATION - AIRCRAFT												EMISSIONS/YEAR (lb) BY JURISDICTION										EMISSIONS/YEAR (lb) BY JURISDICTION										Training Platform	Annual Fuel Use (total)			GHG Emissions (lb)						
		Aircraft			Time		Altitude		Distribution (%)		Distribution (hr)		State (0-3 nm offshore)					Waters of U S (3-12 nm)					Int Waters (> 12 nm)					Total Emissions					Engines (#)	Fuel Flow (lb/hr)	Pounds	Gallons	CO ₂	N ₂ O	CH ₄	CO _{2-e}				
		Distribution	A/C Sorties (#)	Type	Ave Time on Range (hr)	Total Time on Range (hr)	Time < 3,000 ft (%)	Time < 3,000 ft (hr)	0-3 nm from shore	>12 nm from shore	Total Time 0-3 nm from shore	Total Time 3-12 nm from shore	Total Time > 12 nm from shore	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5													
AMPHIBIOUS WARFARE																																												
Fire Support Exercise - Land-Based target	10																																											
Amphibious Rehearsal, No Landing – Marine Air Ground Task Force	12	4	48.0	CH-53	18.0	864.0	100%	864.0	100%	0%	0%	864.00	0.00	0.00	8215	31164	579	1543	8524	7671	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3, 4,464	3856896	567191	11941631	387	337	12,068,809
		10	120.0	MV-22	18.0	2160.0	100%	2160.0	100%	0%	0%	2160.00	0.00	0.00	47755	9532	8298	968	4306	3876	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 2240	4838400	711529	14980540	486	423	15,140,083	
		2	24.0	UH-1	18.0	432.0	100%	432.0	100%	0%	0%	432.00	0.00	0.00	779	1101	40	93	980	882	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 540	233280	34306	722276	23	20	729,968	
		4	48.0	AH-1	18.0	864.0	100%	864.0	100%	0%	0%	864.00	0.00	0.00	7865	3817	400	281	2947	2652	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 812	701568	103172	2172178	70	61	2,195,312
		4	48.0	AV-8	18.0	864.0	0%	0.0	100%	0%	0%	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6,000	5184000	762353	1605079	521	454	16,221,517				
Amphibious Assault : Marine Air Ground Task Force	12	4	48.0	CH-53	18.0	864.0	100%	864.0	100%	0%	0%	864.00	0.00	0.00	8215	31164	579	1543	8524	7671	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3, 4,464	3856896	567191	11941631	387	337	12,068,809
		10	120.0	MV-22	18.0	2160.0	100%	2160.0	100%	0%	0%	2160.00	0.00	0.00	47755	9532	8298	968	4306	3876	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 2240	4838400	711529	14980540	486	423	15,140,083	
		2	24.0	UH-1	18.0	432.0	100%	432.0	100%	0%	0%	432.00	0.00	0.00	779	1101	40	93	980	882	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 540	233280	34306	722276	23	20	729,968	
		4	48.0	AH-1	18.0	864.0	100%	864.0	100%	0%	0%	864.00	0.00	0.00	7865	3817	400	281	2947	2652	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 812	701568	103172	2172178	70	61	2,195,312
		4	48.0	AV-8	18.0	864.0	0%	0.0	100%	0%	0%	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6,000	5184000	762353	1605079	521	454	16,221,517				
Amphibious Raid - Special Purpose Marine Air Ground Task Force	6	4	24.0	H-53	12.0	288.0	100%	288.0	100%	0%	0%	288.00	0.00	0.00	2738	10388	193	514	2841	2557	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3, 4,464	1285632	189064	3980544	129	112	4,022,936
		10	60.0	MV-22	12.0	720.0	100%	720.0	100%	0%	0%	720.00	0.00	0.00	15918	3177	2766	323	1435	1292	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 2240	1612800	237176	4993513	162	141	5,046,694	
		2	12.0	UH-1	12.0	144.0	100%	144.0	100%	0%	0%	144.00	0.00	0.00	260	367	13	31	327	294	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 540	77760	11435	240759	8	7	243,323	
		4	24.0	AH-1	12.0	288.0	100%	288.0	100%	0%	0%	288.00	0.00	0.00	2622	1272	133	94	982	884	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2, 812	233856	34391	724059	23	20	731,771
		4	24.0	AV-8	12.0	288.0	0%	0.0	100%	0%	0%	0.00	0.00	0.00	0	0	0	0	0</td																									

Table D-9: Aircraft Emissions – Alternative 1 (continued)

Table D-9: Aircraft Emissions – Alternative 1 (continued)

Type Training	Training Ops (#)	OPERATIONAL INFORMATION - AIRCRAFT												EMISSIONS/YEAR (lb) BY JURISDICTION												EMISSIONS/YEAR (lb) BY JURISDICTION												Training Platform	Annual Fuel Use (total)				GHG Emissions (lb)			
		Aircraft			Time		Altitude		Distribution (%)		Distribution (hr)		State (0-3 nm offshore)						Waters of U.S. (3-12 nm)						Int Waters (> 12 nm)						Total Emissions						Engines (#)	Fuel Flow (lb/hr)	Pounds	Gallons	CO ₂	N ₂ O	CH ₄	CO _{2-e}		
		Distribution	A/C Sorties (#)	Type	Ave Time on Range (hr)	Total Time on Range (hr)	Time < 3,000 ft (%)	Time < 3,000 ft (hr)	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	Total Time 0-3 nm from shore	Total Time 3-12 nm from shore	Total Time >12 nm from shore	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5	CO	NOx	HC	SOx	PM	PM2.5								
MAJOR TRAINING EVENTS																																														
Joint Expeditionary Exercise	1	48	48	FA-18E/I	8.0	384.0	10%	38.4	0%	100%	0%	0.00	0.00	38.40	0.00	0	0	0	0	286	5855	48	159	2604	2344	0	0	0	0	0	0	286	5855	48	159	2604	2344	2	10,338	3969792	583793	12291177	399	347	12,422,078	
	4	4	EA-6B	8.0	32.0	10%	3.2	0%	100%	0%	0.00	0.00	3.20	0.00	0	0	0	0	0	148	165	10	8	73	66	0	0	0	0	0	0	0	148	165	10	8	73	66	1	6,000	192000	28235	594466	19	17	600,797
	4	4	E-2	8.0	32.0	10%	3.2	0%	100%	0%	0.00	0.00	3.20	0.00	0	0	0	0	0	18	71	3	6	0	0	0	0	0	0	0	18	71	3	3	7	6	1	1,100	35200	5176	108985	4	3	110,146		
	3	3	P-3	8.0	24.0	10%	2.4	0%	100%	0%	0.00	0.00	2.40	0.00	0	0	0	0	0	29	89	7	5	46	41	0	0	0	0	0	0	0	29	89	7	5	46	41	4	4,800	115200	16941	356680	12	10	360,478
	6	6	AV-8B	8.0	48.0	10%	4.8	0%	100%	0%	0.00	0.00	4.80	0.00	0	0	0	0	0	222	248	16	12	109	98	0	0	0	0	0	0	0	222	248	16	12	109	98	1	6,000	288000	42353	891699	29	25	901,195
	2	2	C-130	8.0	16.0	10%	1.6	0%	100%	0%	0.00	0.00	1.60	0.00	0	0	0	0	0	15	59	3	3	29	26	0	0	0	0	0	0	0	15	59	3	3	29	26	4	4,500	72000	10588	22295	7	6	225,299
	4	4	A-10	8.0	32.0	10%	3.2	0%	100%	0%	0.00	0.00	3.20	0.00	0	0	0	0	0	39	86	4	4	26	23	0	0	0	0	0	0	0	39	86	4	4	26	23	2	6,052	193664	28480	599618	19	17	606,004
	1	1	F-3	8.0	8.0	10%	0.8	0%	100%	0%	0.00	0.00	0.80	0.00	0	0	0	0	0	54	221	8	10	7	6	0	0	0	0	0	0	0	54	221	8	10	7	6	4	130,736	1045888	153807	3238254	105	92	3,272,741
	1	1	KC-135	8.0	8.0	10%	0.8	0%	100%	0%	0.00	0.00	0.80	0.00	0	0	0	0	0	25	247	1	7	2	2	0	0	0	0	0	0	0	25	247	1	7	2	2	4	91,552	732416	107708	2267689	74	64	2,291,840
	15	15	SH-60B	8.0	120.0	100%	120.0	0%	100%	0%	0.00	0.00	120.00	0.00	0	0	0	0	0	900	922	79	58	605	544	0	0	0	0	0	0	0	900	922	79	58	605	544	2	1200	144000	21176	445849	14	13	450,598
	4	4	CH-53	8.0	32.0	100%	32.0	0%	100%	0%	0.00	0.00	32.00	0.00	0	0	0	0	0	304	1154	21	57	316	284	0	0	0	0	0	0	0	304	1154	21	57	316	284	3	4,464	142848	2107	442283	14	12	446,993
	12	12	CH-46	8.0	96.0	100%	96.0	0%	100%	0%	0.00	0.00	96.00	0.00	0	0	0	0	0	2454	593	380	58	256	231	0	0	0	0	0	0	0	2454	593	380	58	256	231	2	1200	144000	21176	445849	14	13	450,598
	4	4	AH-1	8.0	32.0	100%	32.0	0%	100%	0%	0.00	0.00	32.00	0.00	0	0	0	0	0	291	141	15	10	109	98	0	0	0	0	0	0	0	291	141	15	10	109	98	2	812	25984	3821	80451	3	2	81,308
	2	2	UH-1	8.0	16.0	100%	16.0	0%	100%	0%	0.00	0.00	16.00	0.00	0	0	0	0	0	29	41	1	3	36	33	0	0	0	0	0	0	0	29	41	1	3	36	33	2	540	8640	1271	26751	1	1	27,036
	10	10	MV																																											

Table D-9: Aircraft Emissions – Alternative 1 (continued)

Table D-10: Emissions from Ordnance – Alternative 1

MEM Category	Location	Training	Testing	Emissions (lb/year)					Emissions (lb/year)						
		MEM #/yr	MEM #/yr	CO	NOx	VOC	SOx	PM10	PM2.5	CO	NOx	VOC	SOx	PM10	PM2.5
BOMBS															
Bombs (H-E)	MITT	6,454	0	394,551.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bombs (N-E)	MITT	2,820	0	719.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PROJECTILES															
Small Caliber	MITT	307,105	0	706.3	29.8	0.0	0.0	15.7	11.7	0.0	0.0	0.0	0.0	0.0	0.0
Medium Caliber (H-E)	MITT	22,780	4082	91.1	29.6	0.0	0.0	216.4	116.2	16.3	5.3	0.0	0.0	38.8	20.8
Medium Caliber (N-E)	MITT	218,855	0	569.0	21.2	0.0	0.0	30.6	26.3	0.0	0.0	0.0	0.0	0.0	0.0
Large Caliber (H-E)	MITT	5,102	240	653.1	816.3	0.0	0.0	49.0	38.0	30.7	38.4	0.0	0.0	2.3	1.8
Large Caliber (N-E)	MITT	16,370	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Missiles (H-E)	MITT	240	20	7,349.7	8,537.8	0.0	0.0	14,830.8	14,830.8	612.5	711.5	0.0	0.0	1,235.9	1,235.9
Missiles (N-E)	MITT	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockets (H-E)	MITT	4,100	16	3,813.0	23.0	0.0	0.0	1,640.0	1,189.0	14.9	0.1	0.0	0.0	6.4	4.6
Rockets (N-E)	MITT	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COUNTERMEASURES															
Chaff	MITT	17,844	0	1.1	2.7	0.0	0.0	5.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0
Flares	MITT	17,600	0	1.0	2.7	0.0	0.0	5.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0
TARGETS															
Airborne targets	MITT	16	0												
Surface targets	MITT	240	0												
Expendable sub-surface targets	MITT	261	0												
TOTAL EMISSIONS (lbs per year)				408,454	9,463	0	0	16,792	16,221	674	755	0	0	1,283	1,263
TOTAL EMISSIONS (tons per year)				204.2	4.7	0.0	0.0	8.4	8.1	0.3	0.4	0.0	0.0	0.6	0.6

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Table D-11: Vessel Emissions – Alternative 2

Table D-11: Vessel Emissions – Alternative 2 (continued)

Type Training	Training Ops (#)	OPERATIONAL INFORMATION - VESSELS										EMISSIONS/YEAR (lb) BY JURISDICTION										EMISSIONS/YEAR (lb) BY JURISDICTION										GHG Emissions (lb)										
		Number	Ship Type	Type	Participation	Per Ship	Range Time (hr)	Distribution (hr)	0-3 nm from shore	3-12 nm from shore	>12 nm from shore	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	Fuel Flow (GPH)	Annual Fuel Consumption (gal)	CO ₂	N ₂ O	CH ₄	CO _{2-e}							
												CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5	CO	NO _x	HC	SO _x	PM ₁₀	PM2.5													
SURFACE WARFARE																																										
Gunnery Exercise, A-S (Small Caliber) - Ship	220																																									
Gunnery Exercise, A-S (Medium Caliber) - Ship	295																																									
Missile Exercise (A-S) - Rocket	10																																									
Missile Exercise (A-S)	20																																									
Laser Targeting	60																																									
Bombing Exercise (A-S)	37																																									
Torpedo Exercise (Submarine to Surface)	0																																									
Missile Exercise (S-S)	12	24	FFG	Guided Mi	2.00	2.0	100%	48.0	0.0	0.0	48.0	0	0	0	0	0	0	0	0	0	0	0	0	1,581	2,264	144	1,676	111	100	1,581	2,264	144	1,676	111	100	79	3,792	79,837	3	2	80,687	
Gunner Exercise (Surface-to-Surface) Ship – Large-caliber	140	30.8	CG	Cruiser	0.22	2.5	100%	77.00	0.0	21.6	55.4	0	0	0	0	0	0	1,326	1,716	93	1,674	60	54	3,410	4,412	240	4,304	155	139	4,736	6,128	333	5,978	215	193	184	14,168	298,293	10	8	301,470	
		63	DDG		0.45	2.5	100%	157.5	0.0	44.1	113.4	0	0	0	0	0	0	2,653	5,050	177	3,904	161	144	6,822	12,987	455	10,039	413	371	9,475	18,037	632	13,943	573	516	187	29,453	620,093	20	18	626,697	
		21	FFG	Guided Mi	0.15	2.5	100%	52.5	0.0	14.7	37.8	0	0	0	0	0	0	484	693	44	513	34	31	1,245	1,783	113	1,320	87	79	1,729	2,476	158	1,833	121	109	79	4,148	87,321	3	2	88,251	
		16.8	USCG	US Coast	0.12	2.5	100%	42.0	0.0	11.8	30.2	0	0	0	0	0	0	68	681	10	136	2	2	174	1,751	27	349	6	6	241	2,432	37	485	9	8	66	2,772	58,362	2	2	58,983	
Gunner Exercise (Surface-to-Surface) Ship – Medium-caliber	100	22	CG	Cruiser	0.22	2.5	100%	55.00	0.0	15.4	39.6	0	0	0	0	0	0	947	1,226	67	1,196	43	39	2,436	3,151	171	3,074	110	99	3,383	4,377	238	4,270	153	138	184	10,120	213,066	7	6	215,336	
		45	DDG		0.45	2.5	100%	112.5	0.0	31.5	81.0	0	0	0	0	0	0	1,895	3,607	126	2,789	115	103	4,873	9,276	325	7,171	295	265	6,768	12,884	451	9,960	410	369	187	21,038	442,924	14	13	447,641	
		15	FFG	Guided Mi	0.15	2.5	100%	37.5	0.0	10.5	27.0	0	0	0	0	0	0	346	495	32	367	24	22	889	1,273	81	943	62	56	1,235	1,769	113	1,310	87	78	79	2,963	62,372	2	2	63,037	
		1	LPD	Amphibio	0.01	2.5	100%	2.5	0.0	0.7	1.8	0	0	0	0	0	0	2	15	2	43	9	8	6	38	5	109	23	21	9	53	6	152	32	29	373	933	19,633	1	1	19,842	
		12	USCG	US Coast	0.12	2.5	100%	30.0	0.0	8.4	21.6	0	0	0	0	0	0	48	486	7	97	2	2	124	1,251	19	249	5	4	172	1,737	26	347	6	6	66	1,980	41,687	1	1	42,131	
Sinking Exercise (SINKEX)	2	10	FFG	Guided Mi	5.00	16.0	100%	160.0	0.0	0.0	160.0	0	0	0	0	0	0	0	0	0	0	0	0	5,270	7,546	480	5,587	370	333	5,270	7,546	480	5,587	370	333	79	12,640	266,123	9	8	268,957	
Gunnery Exercise (S-S) Boat – Medium-caliber	10	50	FFG	Guided Mi	5.00	3.0	100%	150.0	0.0	0.0	150.0	0	0	0	0	0	0	0	0	0	0	0	0	4,941	7,074	450	5,238	347	312	4,941	7,074	450	5,238	347	312	79	11,850	249,490	8	7	252,147	
Gunnery Exercise (S-S) Small-caliber	40	80	CRRC	Combat R	2	3.0	100%	240.0	0.0	0.0	240.0	0	0	0	0	0	0	0	0	0	0	0	0	0	36	3,096	0	0	0	0	0	36	3,096	0	0	0	3	720	15,159	0	0	15,320
Maritime Security Operations (MSO)	8	8	FFG	Guided Mi	1	8.0	100%	64.0	0.0	0.0	64.0	0	0																													

Table D-11: Vessel Emissions – Alternative 2 (continued)

Table D-11: Vessel Emissions – Alternative 2 (continued)

Table D-12: Aircraft Emissions – Alternative 2

Table D-12: Aircraft Emissions – Alternative 2 (continued)

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Table D-13: Emissions from Ordnance – Alternative 2

MEM Category	Location	Training	Testing	Emissions (lb/year)						Emissions (lb/year)					
		MEM	MEM	Training					Testing						
#/yr	#/yr	CO	NOx	VOC	SOx	PM10	PM2.5	CO	NOx	VOC	SOx	PM10	PM2.5		
BOMBS															
Bombs (H-E)	MITT	6,454	0	394,551.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bombs (N-E)	MITT	2,820	0	719.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PROJECTILES															
Small Caliber	MITT	310,155	0	713.4	30.1	0.0	0.0	15.8	11.8	0.0	0.0	0.0	0.0	0.0	0.0
Medium Caliber (H-E)	MITT	23,020	4082	92.1	29.9	0.0	0.0	218.7	117.4	16.3	5.3	0.0	0.0	38.8	20.8
Medium Caliber (N-E)	MITT	309,275	0	804.1	30.0	0.0	0.0	43.3	37.1	0.0	0.0	0.0	0.0	0.0	0.0
Large Caliber (H-E)	MITT	6,757	240	864.9	1,081.1	0.0	0.0	64.9	50.3	30.7	38.4	0.0	0.0	2.3	1.8
Large Caliber (N-E)	MITT	24,540	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Missiles (H-E)	MITT	258	20	7,900.9	9,178.1	0.0	0.0	15,943.1	15,943.1	612.5	711.5	0.0	0.0	1,235.9	1,235.9
Missiles (N-E)	MITT	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rockets (H-E)	MITT	4,100	16	3,813.0	23.0	0.0	0.0	1,640.0	1,189.0	14.9	0.1	0.0	0.0	6.4	4.6
Rockets (N-E)	MITT	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
COUNTERMEASURES															
Chaff	MITT	18,204	0	1.1	2.8	0.0	0.0	5.1	4.7	0.0	0.0	0.0	0.0	0.0	0.0
Flares	MITT	17,600	0	1.0	2.7	0.0	0.0	5.0	4.6	0.0	0.0	0.0	0.0	0.0	0.0
TARGETS															
Airborne targets	MITT	16	0												
Surface targets	MITT	240	0												
Expendable sub-surface targets	MITT	261	0												
TOTAL EMISSIONS (lbs per year)				409,461	10,378	0	0	17,936	17,358	674	755	0	0	1,283	1,263
TOTAL EMISSIONS (tons per year)				204.7	5.2	0.0	0.0	9.0	8.7	0.3	0.4	0.0	0.0	0.6	0.6

D.5 RECORD OF NON-APPLICABILITY

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RECORD OF NON-APPLICABILITY

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

PROPOSED ACTION

Action Proponent: Commander, U.S. Pacific Fleet

Location: Mariana Islands Training and Testing Study Area

Proposed Action: Mariana Islands Training and Testing (MITT) Military Readiness Activities

Proposed Action and Emissions Summary:

The Proposed Action is to conduct military readiness activities within the MITT Study Area. The Proposed Action involves operation of military aircraft, vessels, and small boats.

Federal actions may be exempt from conformity determinations if their emissions do not exceed designated *de minimis* levels for the criteria pollutants of nonattainment or maintenance in the areas of the federal action (40 CFR part 93.153[b]). A portion of the Study Area is located within the Guam Piti-Cabrus area, which has been designated nonattainment for sulfur dioxide (SO_2), unclassifiable for particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers, and unclassifiable/attainment for carbon monoxide, ozone, nitrogen dioxide, lead, and particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers. As a result, the action alternatives emissions were evaluated to assess compliance with the General Conformity Rule *de minimis* thresholds. The estimated annual emissions for SO_2 for Alternative 1 and Alternative 2 compared to the baseline are shown in Table 1. The detailed calculations for emissions are shown in Table D-1 through D-13 of Appendix D of the MITT Final Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement.

Table 1: Estimated Emissions from Training and Testing Activities Between 0 and 3 Nautical Miles from Shore, Alternative 1 & 2

Criteria Pollutant	Annual SO_2 Emissions (tons per year)
Baseline Emissions	237
Alternative 1 Emissions	254
Alternative 2 Emissions	313
Net Change from Alternative 1	17
Net Change from Alternative 2	76
<i>De minimis</i> thresholds	100
Alternative 1 Exceeds Threshold?	No
Alternative 2 Exceeds Threshold?	No

Notes: Individual values may not add exactly to total values due to rounding. SO_2 = sulfur dioxide

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PROPOSED ACTION EXEMPTION(S)

The Proposed Action is exempt from the General Conformity Rule Requirements because the projected SO₂ emissions as shown in Table 1 are below the *de minimis* thresholds.

ATTAINMENT AREA STATUS AND EMISSIONS EVALUATION CONCLUSION

Since the Proposed Action's projected emissions as reflected in Table 1 do not exceed the *de minimis* thresholds, the Navy concludes that formal Conformity Determination procedures are not required, resulting in this RONA.

Affected Air Basin: Piti-Cabras, Guam

Date RONA Prepared: March 6, 2020

Rona Prepared by: Naval Facilities Engineering Command

RONA Approval

MCNAIR.DANIEL.AN Digital signature:
MCNAIR.DANIEL.ANTHONY.116612589
THONY.1166125894 Date: 2020.05.11 08:56:09 -10'00'

Date: 11 May 2020

D. A. McNAIR
Director, Environmental Readiness
By direction of the Commander
U.S. Pacific Fleet

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Appendix D Air Quality Emissions Calculations

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Appendix D Air Quality Emissions Calculations and Record of Non-Applicability