US Army Corps of Engineers®
New York District

NEW YORK AND NEW JERSEY HARBOR AND TRIBUTARIES COASTAL STORM RISK MANAGEMENT STUDY

Tier 1 EIS

INTEGRATED FEASIBILITY REPORT & TIER 1 ENVIRONMENTAL IMPACT STATEMENT

APPENDIX A6: CLEAN AIR ACT AND GREENHOUSE GAS

Draft Tier 1

September 2022

CENAN-PL-E September 2022

RECORD OF NON-APPLICABILITY (RONA)

Project Name: New York and New Jersey Harbors and Tributaries Study

Reference: Appendix A

Project/Action Point of Contact: Peter Weppler

Begin Date: TBD

End Date: TBD

1. The project described above has been evaluated for Section 176 of the Clean Air Act. Project related emissions associated with the federal action were estimated to evaluate the applicability of General Conformity regulations (40CFR§93 Subpart B).

2. The requirements of this rule do not apply because the total direct and indirect emissions from this project are less than the 50 tons trigger levels for NO_x, and VOCs, and less than 100 tons of $PM_{2.5}$, CO, and SO_2 for each project year (40CFR§93.153(b)(1) & (2)). The highest estimated total annual NO_x emissions for the project are 47.7 tons. Emissions of VOC, $PM_{2.5}$, CO, and SO_2 are also all well below the applicable trigger levels (see attached estimates).

3. The project is presumed to conform with the General Conformity requirements and is exempted from Subpart B under 40CFR§93.153(c)(1).

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Peter Weppler
Chief, Environmental Analyses Branch

Encl. Appendix A: Emissions Analyses

Emissions have been estimated using project planning information developed by the New York District, consisting of anticipated dredging volumes, equipment types and estimates of the horsepower and operating hours of the diesel engines powering the equipment. In addition to this planning information, conservative factors have been used to represent the average level of engine load of operating engines (load factors) and the average emissions of typical engines used to power the equipment (emission factors). The basic emission estimating equation is the following:

E = hrs x LF x EF

Where:

E = Emissions per period of time such as a year or the entire project.
hrs = Number of operating hours in the period of time (e.g., hours per year, hours per project).
LF = Load factor, an estimate of the average percentage of full load an engine is run at in its usual operating mode.
EF = Emission factor, an estimate of the amount of a pollutant (such as NO_x) that an engine emits while performing a defined amount of work.

In these estimates, the emission factors are in units of grams of pollutant per horsepower hour (g/hphr). For each piece of equipment, the number of horsepower hours (hphr) is calculated by multiplying the engine's horsepower by the load factor assigned to the type of equipment and the number of hours that piece of equipment is anticipated to work during the year or during the project. For example, a crane with a 250-horsepower engine would have a load factor of 0.43 (meaning on average the crane's engine operates at 43% of its maximum rated power output). If the crane were anticipated to operate 1,000 hours during the course of the project, the horsepower hours would be calculated by:

250 horsepower x 0.43 x 1,000 hours = 107,500 hphr

The emissions from diesel engines vary with the age of an engine and, most importantly, with when it was built. Newer engines of a given size and function typically emit lower levels of most pollutants than older engines. The emission factors used in these calculations assume that the equipment pre-dates most emission control requirements (known as Tier 0 engines in most cases), to provide a reasonable "upper bound" to the emission estimates. If newer engines are actually used in the work, then emissions will be lower than estimated for the same amount of work. In the example of the crane engine, a NO_x emission factor of 9.5 g/hphr would be used to estimate emissions from this crane on the project by the following equation:

$$\frac{\textbf{107,500 hphr x 9.5 g } NO_x\textbf{/hphr}}{\textbf{453.59 g/lb x 2,000 lbs/ton}} = \textbf{1.1 tons of } NO_x$$

As noted above, information on the equipment types, horsepower, and hours of operation associated with the project have been obtained from the project's plans and represent current best estimates of the equipment and work that will be required. Load factors have been obtained from various sources depending on the type of equipment. Land-side nonroad equipment load factors are from the documentation for EPA's NONROAD emission estimating model, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, EPA420-P-04-005, April 2004."

Emission factors have also been sourced from a variety of documents and other sources depending on engine type and pollutant. Nonroad equipment NOx and other emission factors have been derived from EPA emission standards and documentation. As noted above, the emission factors have been chosen to be moderately conservative so as not to underestimate project emissions. Equipment turnover by the time the project is undertaken will likely result in newer equipment performing the work than assumed in this analysis, meaning the emissions presented in this analysis are likely higher than will actually occur.

The following pages summarize the estimated emissions in sum for the project including the anticipated equipment and engine information developed by the New York District, the load factors and emission factors as discussed above, and the estimated emissions for the project.

USACE - New York District
Harbors and Tributaries Study (HATS)
Emission Estimates
10 August 2022
DRAFT

Emission Summary	NO_x	VOC	$PM_{2.5}$	SO_x	CO	CO_2
			Project Emissions			
			total project tons			
Estimated total emissions	667.5	24.1	33.4	0.36	80.2	41,384
Emissions - tons per year over 14 years	**47.7**	**1.7**	**2.4**	**0.03**	**5.7**	**2,956**

Key Equipment and Operating Assumptions

Equipment/Engine Category	Engine count	hp	LF	Operating hrs/day	Operating days	hp-hrs
Mechanical dredge, main	1	2,000	0.59	16	565	10,670,072
Mechanical dredge, generator	2	500	0.40	16	565	3,616,974
Tugboat - Propulsion	2	1,000	0.69	18	1,130	28,076,758
Tugboat - Auxiliary	1	150	0.40	18	1,130	1,220,729
Hydraulic dredge, main engine	2	4,500	0.66	22	70	9,173,736
Hydraulic dredge, pump engine	2	2,000	0.80	16	70	3,594,240
Hydraulic dredge, generator	2	1,100	0.40	16	70	988,416
Hydraulic dredge, jet pump	1	2,500	0.80	16	70	2,246,400
Booster pump main engine	1	3,500	0.40	22	70	2,162,160
Booster pump aux engine	2	500	0.40	22	70	617,760
Tugboat - Propulsion	2	500	0.69	22	211	3,196,908
Tugboat - Auxiliary	1	100	0.40	22	211	185,328

Emission Factors by Equipment and Engine Type

Equipment/Engine Category	NO_x	VOC	$PM_{2.5}$	SO_x	CO	CO_2
			Emission Factors			
			g/hphr			
Mechanical dredge, main	9.7	0.37	0.51	0.005	1.06	571
Mechanical dredge, generator	7.5	0.20	0.29	0.005	1.27	571
Tugboat - Propulsion	9.7	0.37	0.51	0.005	1.06	571
Tugboat - Auxiliary	7.5	0.20	0.29	0.005	1.27	571
Hydraulic dredge, main engine	9.7	0.37	0.51	0.005	1.06	571
Hydraulic dredge, pump engine	7.5	0.20	0.29	0.005	1.27	571
Hydraulic dredge, generator	7.5	0.20	0.29	0.005	1.27	571
Hydraulic dredge, jet pump	7.5	0.20	0.29	0.005	1.27	571
Booster pump main engine	7.5	0.20	0.29	0.005	1.27	571
Booster pump aux engine	7.5	0.20	0.29	0.005	1.27	571
Tugboat - Propulsion	9.7	0.37	0.51	0.005	1.06	571
Tugboat - Auxiliary	7.5	0.20	0.29	0.005	1.27	571

Emission Estimates by Equipment and Engine Type

Equipment/Engine Category	NO_x	VOC	$PM_{2.5}$	SO_x	CO	CO_2
			Project Emissions			
			total project tons			
Mechanical dredge, main	114.1	4.4	6.0	0.06	12.5	6,716
Mechanical dredge, generator	29.9	0.8	1.2	0.02	5.1	2,277
Tugboat - Propulsion	300.2	11.5	15.8	0.15	32.8	17,672
Tugboat - Auxiliary	10.1	0.3	0.4	0.01	1.7	768
Hydraulic dredge, main engine	98.1	3.7	5.2	0.05	10.7	5,774
Hydraulic dredge, pump engine	29.7	0.8	1.1	0.02	5.0	2,262
Hydraulic dredge, generator	8.2	0.2	0.3	0.01	1.4	622
Hydraulic dredge, jet pump	18.6	0.5	0.7	0.01	3.1	1,414
Booster pump main engine	17.9	0.5	0.7	0.01	3.0	1,361
Booster pump aux engine	5.1	0.1	0.2	0.00	0.9	389
Tugboat - Propulsion	34.2	1.3	1.8	0.02	3.7	2,012
Tugboat - Auxiliary	1.5	0.0	0.1	0.00	0.3	117
Total emissions over 14-year project	**667.5**	**24.1**	**33.4**	**0.36**	**80.2**	**41,384**

Greenhouse gas (GHG) emissions have been estimated using project planning information developed by the New York District, consisting of anticipated equipment types and estimates of the horsepower and operating hours of the diesel engines powering the equipment. In addition to this planning information, conservative factors have been used to represent the average level of engine load of operating engines (load factors) and the average emissions of typical engines used to power the equipment (emission factors). The basic emission estimating equation is the following:

E = hrs x LF x EF

Where:

E = Emissions per period of time such as a year or the entire project.
hrs = Number of operating hours in the period of time (e.g., hours per year, hours per project).
LF = Load factor, an estimate of the average percentage of full load an engine is run at in its usual operating mode.
EF = Emission factor, an estimate of the amount of a pollutant (such as NO_x) that an engine emits while performing a defined amount of work.

In these estimates, the emission factors are in units of grams of pollutant per horsepower hour (g/hphr). For each piece of equipment, the number of horsepower hours (hphr) is calculated by multiplying the engine's horsepower by the load factor assigned to the type of equipment and the number of hours that piece of equipment is anticipated to work during the year or during the project. For example, a crane with a 250-horsepower engine would have a load factor of 0.43 (meaning on average the crane's engine operates at 43% of its maximum rated power output). If the crane were anticipated to operate 1,000 hours during the course of the project, the horsepower hours would be calculated by:

250 horsepower x 0.43 x 1,000 hours = 107,500 hphr

The CO_2 emission factors used in these calculations are based on locally-specific emissions data related to off-road and on-road diesel engines.[1] In the example of the crane engine, a CO_2 emission factor of 571 g/hphr would be used to estimate emissions from this crane on the project by the following equation:

$$\frac{\text{107,500 hphr x 571 g } CO_2\text{/hphr}}{\text{1,000,000 g/metric ton}} = \text{61.4 metric tons (tonnes) of } NO_x$$

As noted above, information on the equipment types, horsepower, and hours of operation associated with the project have been obtained from the project's plans and represent current best estimates of the equipment and work that will be required. Load factors have been obtained from various sources depending on the type of equipment. Land-side

[1] http://www.panynj.gov/about/pdf/PANYNJ-2014%20Multi-Facility-EI-Report-1-Mar-16-scg.pdf

nonroad equipment load factors are from the documentation for EPA's NONROAD emission estimating model, "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, EPA420-P-04-005, April 2004."

The following pages summarize the estimated emissions of CO_2 in sum for the project including the anticipated equipment and engine information developed by the New York District, the load factors and emission factors as discussed above, and the estimated emissions from the project.

USACE - New York District
Harbors and Tributaries Study (HATS)
GHG Emission Estimates
26 August 2022
DRAFT

Key Equipment and Operating Assumptions, GHG emissions

Equipment/Engine Category	Engine count	hp	LF	Operating hrs/day	Operating days	hp-hrs	CO_2 g/hphr	CO_2 tonnes
Mechanical dredge, main	1	2,000	0.59	16	565	10,670,072	571	6,093
Mechanical dredge, generator	2	500	0.40	16	565	3,616,974	571	2,065
Tugboat - Propulsion	2	1,000	0.69	18	1,130	28,076,758	571	16,032
Tugboat - Auxiliary	1	150	0.40	18	1,130	1,220,729	571	697
Hydraulic dredge, main engine	2	4,500	0.66	22	70	9,173,736	571	5,238
Hydraulic dredge, pump engine	2	2,000	0.80	16	70	3,594,240	571	2,052
Hydraulic dredge, generator	2	1,100	0.40	16	70	988,416	571	564
Hydraulic dredge, jet pump	1	2,500	0.80	16	70	2,246,400	571	1,283
Booster pump main engine	1	3,500	0.40	22	70	2,162,160	571	1,235
Booster pump aux engine	2	500	0.40	22	70	617,760	571	353
Tugboat - Propulsion	2	500	0.69	22	211	3,196,908	571	1,825
Tugboat - Auxiliary	1	100	0.40	22	211	185,328	571	106
Total emissions for 14-year project								**37,543**
Average emissions, tonnes per year								**2,682**