

APPENDIX E

Air Quality and Greenhouse Gas Calculations

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Description:

This spreadsheet calculates annual CAP and GHG emissions generated by Lind Shell mining activities.

Scenarios:

- S1. Baseline. Conditions prior to 2014 – mining with original equipment (Self powered tug/dredge SOUTH BAY, small shell hopper barge).
- S2. Interim Phase 1. New shell dredge in operation. Equipment converted to electric with exception of wash pump. 2014-2016.
- S3. Interim Phase 2. New shell dredge in operation. Equipment converted to electric with exception of wash pump. Using larger hopper barges. 2017-to date.
- S4. Final Conditions: New shell dredge in operation. Equipment converted to electric – using one Tier 4 generator on barge. Using larger hopper barges. mid-2018 – going forward.

Annual activities and engine specs are provided by Lind Shell. For detailed activity/engine data used for each scenario, please check 'Scenario Setting' tab.

Assumptions:

- 1. Data in 'Scenario Setting' tab are provided by Lind Shell.
- 2. Assume throttle percentage equals to engine load factor.
- 3. Harbor Craft engine emission rates are obtained from ARB 2011 Commercial Harbor Craft Inventory Model. Offroad (portable engine) emission rates are obtained from ARB 2017 Portable Engine Emission Inventory Model.
- 4. Offroad CO₂ and SO_x emission rates are derived from emissions and activity data from ARB OFFROAD ORION Web Database. Offroad ROG and CH₄ emission rates are derived using conversion factors from Offroad2007. Offroad N₂O emissions are assumed zero.
- 5. Harbor Craft GHG emission factors are obtained from Port of Long Beach Emissions Inventory 2013. Source: <http://polb.com/civica/filebank/blobdload.asp?BlobID=12253>.
- 6. PM_{2.5} is assumed be 92% of PM₁₀.
- 7. Fuel correction factors are applied to give credit for using California diesel.

Sum of Annual Hp-hr		Model Yr	HP								
Scenario	Fuel Type	1972	1978	2001	2002	2006	2011	2011	2013	2013	2017
		100	80	80	255	95	67	250	350	660	550
Baseline	Diesel	192,150	51,240	139,788	826,328						
Interim 1	Diesel					-	60,883	91,800	137,088	973,289	
Interim 2	Diesel					-	39,758	60,225	89,936	634,894	
Final	Diesel					-	39,758			634,894	158,994

Annual Horsepower-hours per Scenario

Scenario	C'ville	Petaluma	Grand Total
Baseline	918,265	291,241	1,209,506
Interim 1	935,723	327,336	1,263,060
Interim 2	627,158	197,655	824,812
Final	633,874	199,771	833,645 <---- difference between I2 and final is due to load %

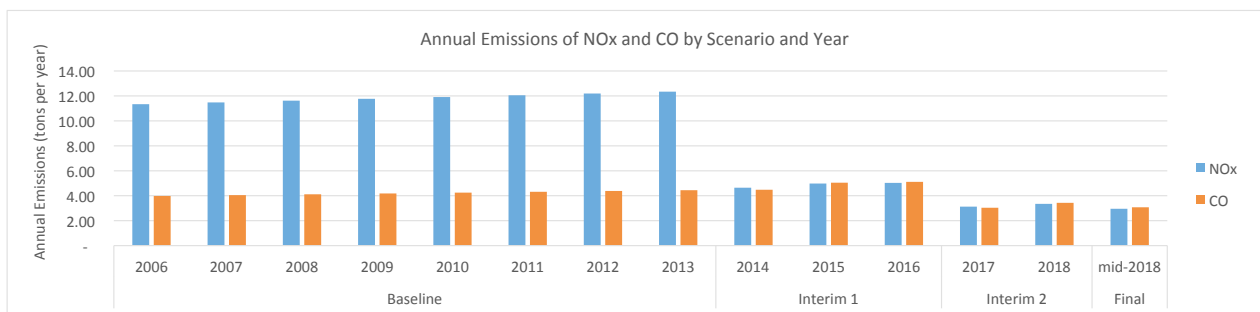
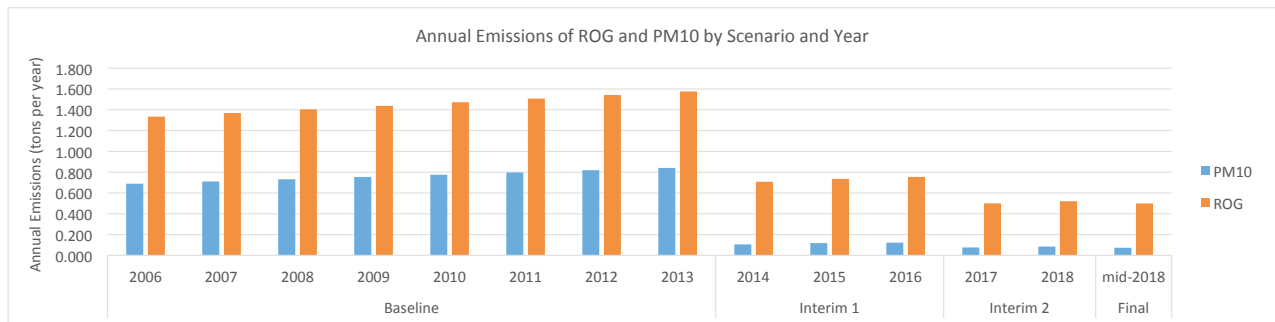
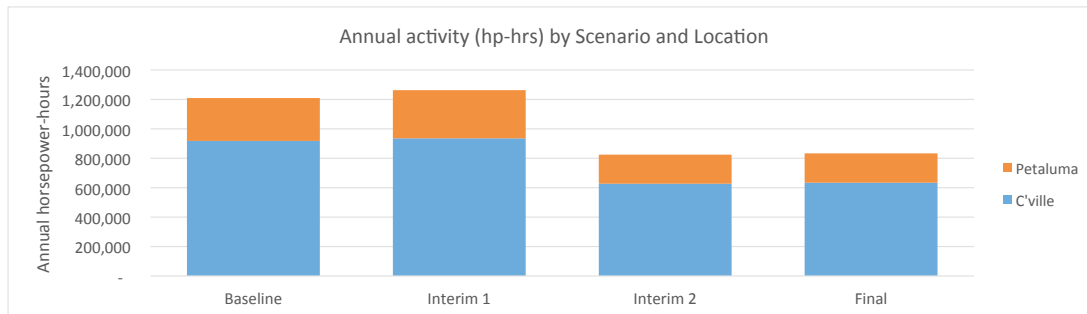
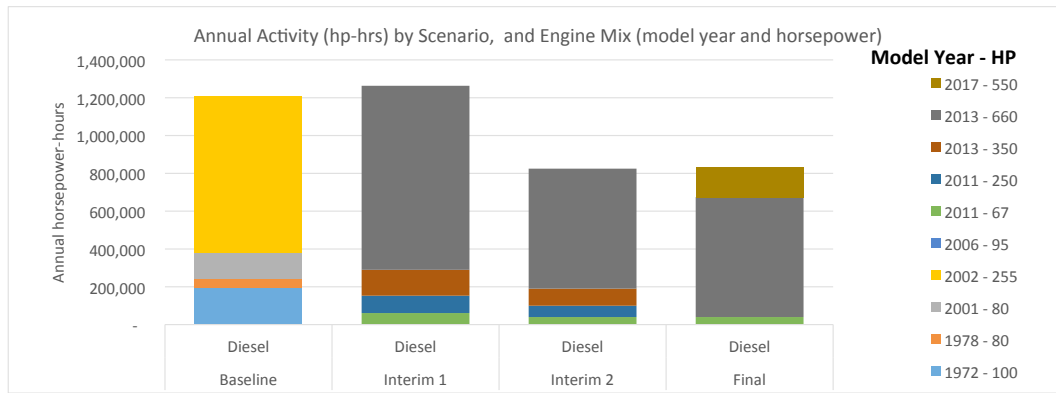
Annual Emissions ROG and PM10 in tpy

Scenario	CY	PM10	ROG	% difference (previous version)		
				PM10	ROG	
Baseline	2006	0.689	1.335	-1%	-1%	-1%
Baseline	2007	0.711	1.369	-1%	-1%	-1%
Baseline	2008	0.732	1.404	-1%	-1%	-1%
Baseline	2009	0.754	1.438	-1%	-1%	-1%
Baseline	2010	0.776	1.473	-1%	-1%	-1%
Baseline	2011	0.797	1.507	-1%	-1%	-1%
Baseline	2012	0.819	1.542	-1%	-1%	-1%
Baseline	2013	0.841	1.576	-1%	-1%	-1%
Interim 1	2014	0.105	0.708	10%	-7%	
Interim 1	2015	0.118	0.736	6%	-6%	
Interim 1	2016	0.122	0.754	7%	-6%	
Interim 2	2017	0.076	0.500	49%	26%	
Interim 2	2018	0.085	0.520	45%	27%	
Final	mid-2018	0.073	0.499	15%	0%	

Annual Emissions NOx and CO in tpy

Scenario	CY	NOx	CO	% difference (previous version)		
				NOx	CO	
Baseline	2006	11.34	3.98	-1%	-1%	-1%
Baseline	2007	11.48	4.05	-1%	-1%	-1%
Baseline	2008	11.62	4.12	-1%	-1%	-1%
Baseline	2009	11.77	4.18	-1%	-1%	-1%
Baseline	2010	11.91	4.25	-1%	-1%	-1%
Baseline	2011	12.05	4.31	-1%	-1%	-1%
Baseline	2012	12.20	4.38	-1%	-1%	-1%
Baseline	2013	12.34	4.45	-1%	-1%	-1%
Interim 1	2014	4.64	4.48	-3%	-4%	
Interim 1	2015	4.98	5.05	0%	2%	
Interim 1	2016	5.03	5.11	0%	2%	
Interim 2	2017	3.12	3.03	30%	29%	
Interim 2	2018	3.35	3.43	34%	37%	
Final	mid-2018	2.95	3.07	2%	3%	

Values	Scenario	CY	Equipment Type		Grand Total	
			Harbor Craft Engines	Dredging/Off-road Eq		
Sum of ROG	Baseline	2006	0.604	0.730	1.335	
	Baseline	2007	0.616	0.753	1.369	
	Baseline	2008	0.628	0.776	1.404	
	Baseline	2009	0.639	0.799	1.438	
	Baseline	2010	0.651	0.822	1.473	
	Baseline	2011	0.663	0.845	1.507	
	Baseline	2012	0.674	0.868	1.542	
	Baseline	2013	0.686	0.890	1.576	
	Interim 1	2014	0.670	0.038	0.708	
	Interim 1	2015	0.684	0.052	0.736	
	Interim 1	2016	0.698	0.056	0.754	
	Interim 2	2017	0.464	0.036	0.500	
	Interim 2	2018	0.473	0.047	0.520	
	Final	2018	0.473	0.026	0.499	
	Sum of CO	Baseline	2006	1.881	2.103	3.984
		Baseline	2007	1.902	2.148	4.050
		Baseline	2008	1.924	2.192	4.116
		Baseline	2009	1.945	2.237	4.182
Baseline		2010	1.966	2.281	4.248	
Baseline		2011	1.988	2.326	4.313	
Baseline		2012	2.009	2.370	4.379	
Baseline		2013	2.030	2.415	4.445	
Interim 1		2014	4.049	0.427	4.477	
Interim 1		2015	4.097	0.950	5.047	
Interim 1		2016	4.145	0.965	5.109	
Interim 2		2017	2.735	0.299	3.034	
Interim 2		2018	2.766	0.664	3.430	
Final		2018	2.766	0.304	3.070	
Sum of NOx		Baseline	2006	6.440	4.895	11.335
		Baseline	2007	6.502	4.977	11.479
		Baseline	2008	6.564	5.058	11.622
		Baseline	2009	6.626	5.139	11.765
	Baseline	2010	6.688	5.221	11.909	
	Baseline	2011	6.750	5.302	12.052	
	Baseline	2012	6.812	5.384	12.195	
	Baseline	2013	6.874	5.465	12.339	
	Interim 1	2014	4.107	0.537	4.644	
	Interim 1	2015	4.148	0.831	4.979	
	Interim 1	2016	4.189	0.838	5.026	
	Interim 2	2017	2.759	0.365	3.124	
	Interim 2	2018	2.785	0.563	3.348	
	Final	2018	2.785	0.168	2.953	
	Sum of PM10	Baseline	2006	0.263	0.426	0.689
		Baseline	2007	0.271	0.440	0.711
		Baseline	2008	0.278	0.454	0.732
		Baseline	2009	0.286	0.468	0.754
Baseline		2010	0.293	0.483	0.776	
Baseline		2011	0.301	0.497	0.797	
Baseline		2012	0.308	0.511	0.819	
Baseline		2013	0.315	0.525	0.841	
Interim 1		2014	0.080	0.025	0.105	
Interim 1		2015	0.082	0.036	0.118	
Interim 1		2016	0.085	0.037	0.122	
Interim 2		2017	0.057	0.019	0.076	
Interim 2		2018	0.058	0.026	0.085	
Final		2018	0.058	0.015	0.073	



Scenario	CY	Avg. Annual Tonnage	Annual Engine Usage (Hp-hrs)	Annual Emissions (tpy)						
				THC	ROG	CO	NOx	PM10	PM2.5	SOx
Baseline	2006	1,209,506	1,209,506	1.32	1.33	3.98	11.34	0.69	0.63	0.01
Baseline	2007	1,209,506	1,209,506	1.36	1.37	4.05	11.48	0.71	0.65	0.01
Baseline	2008	1,209,506	1,209,506	1.39	1.40	4.12	11.62	0.73	0.67	0.01
Baseline	2009	1,209,506	1,209,506	1.42	1.44	4.18	11.77	0.75	0.69	0.01
Baseline	2010	1,209,506	1,209,506	1.46	1.47	4.25	11.91	0.78	0.71	0.01
Baseline	2011	1,209,506	1,209,506	1.49	1.51	4.31	12.05	0.80	0.73	0.01
Baseline	2012	1,209,506	1,209,506	1.53	1.54	4.38	12.20	0.82	0.75	0.01
Baseline	2013	1,209,506	1,209,506	1.56	1.58	4.45	12.34	0.84	0.77	0.01
Interim 1	2014	1,263,060	1,263,060	0.70	0.71	4.48	4.64	0.11	0.10	0.01
Interim 1	2015	1,263,060	1,263,060	0.73	0.74	5.05	4.98	0.12	0.11	0.01
Interim 1	2016	1,263,060	1,263,060	0.75	0.75	5.11	5.03	0.12	0.11	0.01
Interim 2	2017	824,812	824,812	0.50	0.50	3.03	3.12	0.08	0.07	0.00
Interim 2	2018	824,812	824,812	0.51	0.52	3.43	3.35	0.08	0.08	0.00
Final	mid-2018	833,645	833,645	0.49	0.50	3.07	2.95	0.07	0.07	0.00

Scenario	CY	Avg. Annual Tonnage	Annual Engine Usage (Hp-hrs)	Annual Metric Tons			
				CO2	CH4	N2O	CO2e
Baseline	2006	1,209,506	1,209,506	464	0.06	0.01	469
Baseline	2007	1,209,506	1,209,506	464	0.06	0.01	469
Baseline	2008	1,209,506	1,209,506	464	0.06	0.01	469
Baseline	2009	1,209,506	1,209,506	464	0.06	0.01	469
Baseline	2010	1,209,506	1,209,506	464	0.06	0.01	469
Baseline	2011	1,209,506	1,209,506	464	0.06	0.01	469
Baseline	2012	1,209,506	1,209,506	461	0.06	0.01	465
Baseline	2013	1,209,506	1,209,506	461	0.06	0.01	465
Interim 1	2014	1,263,060	1,263,060	518	0.02	0.01	522
Interim 1	2015	1,263,060	1,263,060	518	0.02	0.01	522
Interim 1	2016	1,263,060	1,263,060	516	0.02	0.01	520
Interim 2	2017	824,812	824,812	337	0.01	0.01	340
Interim 2	2018	824,812	824,812	337	0.01	0.01	340
Final	mid-2018	833,645	833,645	339	0.01	0.01	341

GWP Factors

CO2	CH4	N2O
1	28	265

0.907185 metric ton/US ton

Scenario	CY	Engine #	Description	Equipment Type	Equipment Fuel Type	Annual Emissions (tpy)										In metric tons	
						THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	CO2e	
Baseline	2006		1 Main Tug	HC	Tugboat Diesel	0.299	0.302	0.940	3.220	0.132	0.121	0.002	221.431		0.008	0.006	202
Baseline	2006		2 Main Tug	HC	Tugboat Diesel	0.299	0.302	0.940	3.220	0.132	0.121	0.002	221.431		0.008	0.006	202
Baseline	2007		1 Main Tug	HC	Tugboat Diesel	0.305	0.308	0.951	3.251	0.135	0.125	0.002	221.431		0.008	0.006	202
Baseline	2007		2 Main Tug	HC	Tugboat Diesel	0.305	0.308	0.951	3.251	0.135	0.125	0.002	221.431		0.008	0.006	202
Baseline	2008		1 Main Tug	HC	Tugboat Diesel	0.311	0.314	0.962	3.282	0.139	0.128	0.002	221.431		0.008	0.006	202
Baseline	2008		2 Main Tug	HC	Tugboat Diesel	0.311	0.314	0.962	3.282	0.139	0.128	0.002	221.431		0.008	0.006	202
Baseline	2009		1 Main Tug	HC	Tugboat Diesel	0.316	0.320	0.972	3.313	0.143	0.131	0.002	221.431		0.008	0.006	202
Baseline	2009		2 Main Tug	HC	Tugboat Diesel	0.316	0.320	0.972	3.313	0.143	0.131	0.002	221.431		0.008	0.006	202
Baseline	2010		1 Main Tug	HC	Tugboat Diesel	0.322	0.325	0.983	3.344	0.147	0.135	0.002	221.431		0.008	0.006	202
Baseline	2010		2 Main Tug	HC	Tugboat Diesel	0.322	0.325	0.983	3.344	0.147	0.135	0.002	221.431		0.008	0.006	202
Baseline	2011		1 Main Tug	HC	Tugboat Diesel	0.328	0.331	0.994	3.375	0.150	0.138	0.002	221.431		0.008	0.006	202
Baseline	2011		2 Main Tug	HC	Tugboat Diesel	0.328	0.331	0.994	3.375	0.150	0.138	0.002	221.431		0.008	0.006	202
Baseline	2012		1 Main Tug	HC	Tugboat Diesel	0.334	0.337	1.005	3.406	0.154	0.142	0.002	221.431		0.008	0.006	202
Baseline	2012		2 Main Tug	HC	Tugboat Diesel	0.334	0.337	1.005	3.406	0.154	0.142	0.002	221.431		0.008	0.006	202
Baseline	2013		1 Main Tug	HC	Tugboat Diesel	0.340	0.343	1.015	3.437	0.158	0.145	0.002	221.431		0.008	0.006	202
Baseline	2013		2 Main Tug	HC	Tugboat Diesel	0.340	0.343	1.015	3.437	0.158	0.145	0.002	221.431		0.008	0.006	202
Baseline	2006		3 Generator	Offroad	Portable Eq Diesel	0.194	0.196	0.598	0.935	0.056	0.052	0.002	25.223		0.012	0.000	23
Baseline	2006		4 Dredge Pump	Offroad	Portable Eq Diesel	0.141	0.142	0.399	1.050	0.099	0.091	0.001	11.557		0.009	0.000	11
Baseline	2006		5 Dredge Pump	Offroad	Portable Eq Diesel	0.141	0.142	0.399	1.050	0.099	0.091	0.001	11.557		0.009	0.000	11
Baseline	2006		6 Wash Pump	Offroad	Portable Eq Diesel	0.141	0.142	0.399	1.050	0.099	0.091	0.001	11.557		0.009	0.000	11
Baseline	2006		7 Wash Pump	Offroad	Portable Eq Diesel	0.108	0.107	0.307	0.810	0.073	0.067	0.001	9.245		0.007	0.000	9
Baseline	2007		3 Generator	Offroad	Portable Eq Diesel	0.206	0.208	0.623	0.970	0.061	0.056	0.000	25.223		0.013	0.000	23
Baseline	2007		4 Dredge Pump	Offroad	Portable Eq Diesel	0.144	0.145	0.405	1.062	0.101	0.093	0.000	11.557		0.009	0.000	11
Baseline	2007		5 Dredge Pump	Offroad	Portable Eq Diesel	0.144	0.145	0.405	1.062	0.101	0.093	0.000	11.557		0.009	0.000	11
Baseline	2007		6 Wash Pump	Offroad	Portable Eq Diesel	0.144	0.145	0.405	1.062	0.101	0.093	0.000	11.557		0.009	0.000	11
Baseline	2007		7 Wash Pump	Offroad	Portable Eq Diesel	0.108	0.109	0.311	0.820	0.075	0.069	0.000	9.245		0.007	0.000	9
Baseline	2008		3 Generator	Offroad	Portable Eq Diesel	0.218	0.221	0.648	1.005	0.066	0.061	0.000	25.223		0.014	0.000	23
Baseline	2008		4 Dredge Pump	Offroad	Portable Eq Diesel	0.146	0.148	0.410	1.074	0.104	0.095	0.000	11.557		0.009	0.000	11
Baseline	2008		5 Dredge Pump	Offroad	Portable Eq Diesel	0.146	0.148	0.410	1.074	0.104	0.095	0.000	11.557		0.009	0.000	11
Baseline	2008		6 Wash Pump	Offroad	Portable Eq Diesel	0.146	0.148	0.410	1.074	0.104	0.095	0.000	11.557		0.009	0.000	11
Baseline	2008		7 Wash Pump	Offroad	Portable Eq Diesel	0.111	0.112	0.315	0.830	0.077	0.071	0.000	9.245		0.007	0.000	9
Baseline	2009		3 Generator	Offroad	Portable Eq Diesel	0.231	0.233	0.672	1.040	0.071	0.065	0.000	25.223		0.015	0.000	23
Baseline	2009		4 Dredge Pump	Offroad	Portable Eq Diesel	0.149	0.151	0.415	1.087	0.106	0.098	0.000	11.557		0.009	0.000	11
Baseline	2009		5 Dredge Pump	Offroad	Portable Eq Diesel	0.149	0.151	0.415	1.087	0.106	0.098	0.000	11.557		0.009	0.000	11
Baseline	2009		6 Wash Pump	Offroad	Portable Eq Diesel	0.149	0.151	0.415	1.087	0.106	0.098	0.000	11.557		0.009	0.000	11
Baseline	2009		7 Wash Pump	Offroad	Portable Eq Diesel	0.113	0.114	0.319	0.839	0.079	0.073	0.000	9.245		0.007	0.000	9
Baseline	2010		3 Generator	Offroad	Portable Eq Diesel	0.243	0.246	0.697	1.075	0.075	0.069	0.000	25.223		0.015	0.000	23
Baseline	2010		4 Dredge Pump	Offroad	Portable Eq Diesel	0.152	0.153	0.420	1.099	0.109	0.100	0.000	11.557		0.010	0.000	11
Baseline	2010		5 Dredge Pump	Offroad	Portable Eq Diesel	0.152	0.153	0.420	1.099	0.109	0.100	0.000	11.557		0.010	0.000	11
Baseline	2010		6 Wash Pump	Offroad	Portable Eq Diesel	0.152	0.153	0.420	1.099	0.109	0.100	0.000	11.557		0.010	0.000	11
Baseline	2010		7 Wash Pump	Offroad	Portable Eq Diesel	0.115	0.116	0.324	0.849	0.081	0.074	0.000	9.245		0.007	0.000	9
Baseline	2011		3 Generator	Offroad	Portable Eq Diesel	0.255	0.258	0.722	1.110	0.080	0.074	0.000	25.223		0.016	0.000	23
Baseline	2011		4 Dredge Pump	Offroad	Portable Eq Diesel	0.155	0.156	0.425	1.111	0.111	0.102	0.000	11.557		0.010	0.000	11
Baseline	2011		5 Dredge Pump	Offroad	Portable Eq Diesel	0.155	0.156	0.425	1.111	0.111	0.102	0.000	11.557		0.010	0.000	11
Baseline	2011		6 Wash Pump	Offroad	Portable Eq Diesel	0.155	0.156	0.425	1.111	0.111	0.102	0.000	11.557		0.010	0.000	11
Baseline	2011		7 Wash Pump	Offroad	Portable Eq Diesel	0.117	0.118	0.328	0.859	0.083	0.076	0.000	9.245		0.007	0.000	9
Baseline	2012		3 Generator	Offroad	Portable Eq Diesel	0.268	0.270	0.747	1.145	0.085	0.078	0.000	23.633		0.017	0.000	22
Baseline	2012		4 Dredge Pump	Offroad	Portable Eq Diesel	0.157	0.159	0.430	1.123	0.114	0.105	0.000	10.828		0.010	0.000	10
Baseline	2012		5 Dredge Pump	Offroad	Portable Eq Diesel	0.157	0.159	0.430	1.123	0.114	0.105	0.000	10.828		0.010	0.000	10
Baseline	2012		6 Wash Pump	Offroad	Portable Eq Diesel	0.157	0.159	0.430	1.123	0.114	0.105	0.000	10.828		0.010	0.000	10
Baseline	2012		7 Wash Pump	Offroad	Portable Eq Diesel	0.119	0.120	0.332	0.869	0.085	0.078	0.000	8.763		0.007	0.000	8
Baseline	2013		3 Generator	Offroad	Portable Eq Diesel	0.280	0.283	0.772	1.180	0.090	0.083	0.000	23.771		0.018	0.000	22
Baseline	2013		4 Dredge Pump	Offroad	Portable Eq Diesel	0.160	0.162	0.436	1.136	0.116	0.107	0.000	10.892		0.010	0.000	10
Baseline	2013		5 Dredge Pump	Offroad	Portable Eq Diesel	0.160	0.162	0.436	1.136	0.116	0.107	0.000	10.892		0.010	0.000	10
Baseline	2013		6 Wash Pump	Offroad	Portable Eq Diesel	0.160	0.162	0.436	1.136	0.116	0.107	0.000	10.892		0.010	0.000	10
Baseline	2013		7 Wash Pump	Offroad	Portable Eq Diesel	0.121	0.123	0.336	0.879	0.087	0.080	0.000	8.713		0.008	0.000	8
Interim 1	2014		1 Main Tug	HC	Tugboat Diesel	0.332	0.335	2.025	2.054	0.040	0.037	0.003	260.812		0.009	0.007	238
Interim 1	2014		2 Main Tug	HC	Tugboat Diesel	0.332	0.335	2.025	2.054	0.040	0.037	0.003	260.812		0.009	0.007	238
Interim 1	2015		1 Main Tug	HC	Tugboat Diesel	0.339	0.342	2.049	2.074	0.041	0.038	0.003	260.812		0.009	0.007	238
Interim 1	2015		2 Main Tug	HC	Tugboat Diesel	0.339	0.342	2.049	2.074	0.041	0.038	0.003	260.812		0.009	0.007	238
Interim 1	2016		1 Main Tug	HC	Tugboat Diesel	0.345	0.349	2.072	2.094	0.042	0.039	0.003	260.812		0.009	0.007	238
Interim 1	2016		2 Main Tug	HC	Tugboat Diesel	0.345	0.349	2.072	2.094	0.042	0.039	0.003	260.812		0.009	0.007	238
Interim 1	2014		3 Generator	Offroad	Portable Eq Diesel	0.014	0.014	0.211	0.188	0.013	0.012	0.000	10.425		0.001	0.000	9
Interim 1	2014		4 Generator	Offroad	Portable Eq Diesel	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0
Interim 1	2014		5 Wash Pump	Offroad	Portable Eq Diesel	0.009	0.009	0.087	0.141	0.005	0.005	0.000	15.719		0.001	0.000	14
Interim 1	2014		6 Generator	Offroad	Portable Eq Diesel	0.014	0.014	0.130	0.209	0.007	0.006	0.000	23.474		0.001	0.000	21
Interim 1	2015		3 Generator	Offroad	Portable Eq Diesel	0.016	0.016	0.216	0.191	0.014	0.013	0.000	10.330		0.001	0.000	9
Interim 1	2015		4 Generator	Offroad	Portable Eq Diesel	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0
Interim 1	2015		5 Wash Pump	Offroad	Portable Eq Diesel	0.014	0.014	0.292	0.271	0.017	0.015	0.000	15.576		0.001	0.000	14
Interim 1	2015		6 Generator	Offroad	Portable Eq Diesel	0.022	0.022	0.441	0.369	0.005	0.005	0.000	23.260		0.001	0.000	21
Interim 1	2016		3 Generator	Offroad	Portable Eq Diesel	0.018	0.018	0.222	0.193	0.015	0.014	0.000	9.934		0.001	0.000	9
Interim 1	2016		4 Generator	Offroad	Portable Eq Diesel	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0
Interim 1	2016		5 Wash Pump	Offroad	Portable Eq Diesel	0.015	0.015	0.296	0.273	0.017	0.016	0.000	14.979		0.001	0.000	14
Interim 1	2016		6 Generator	Offroad	Portable Eq Diesel	0.023	0.024	0.446	0.371	0.005	0.005	0.000	22.368		0.001	0.000	20
Interim 2	2017		1 Main Tug	HC	Tugboat Diesel	0.230	0.232	1.367	1.379	0.028	0.026	0.002	170.132		0.006	0.004	156
Interim 2	2017		2 Main Tug	HC	Tugboat Diesel	0.234	0.237	1.383	1.393	0.029	0.027	0.002	170.13				

Episodes and Hours

Scenario	Start Year	End Year	Location	Annual Tonnage	# of Episodes	Travel Time - Empty		Travel Time - Full		Dredge Time		Total Annual Hours	Total HP-Hrs	TRUE
						Per Episode	Annual - Empty	Per Episode	Annual - Full	Per Episode	Annual - Dredge			
Baseline	2006	2013	Petaluma	8,743	17	8	136	9	153	10.5	178.5	468	291,241	
Baseline	2006	2013	C'ville	22,481	44	11	484	12	528	10.5	462	1,474	918,265	
Interim 1	2014	2016	Petaluma	8,743	10	8	80	9	90	14.4	144	314	327,336	
Interim 1	2014	2016	C'ville	22,481	24	11	264	12	288	14.4	345.6	898	935,723	
Interim 2	2017	2018	Petaluma	8,743	6	8	48	9	54	14.6	87.6	190	197,655	
Interim 2	2017	2018	C'ville	22,481	16	11	176	12	192	14.6	233.6	602	627,158	
Final	2018	-	Petaluma	8,743	6	8	48	9	54	14.6	87.6	190	199,771	
Final	2018	-	C'ville	22,481	16	11	176	12	192	14.6	233.6	602	633,874	

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Engine Specs and Annual Activities

Lc	Scenario	Engine #	Description	Make	Model	Equipment Type	Equipment Category	Model Yr	Family	HP	Travelling			Dredging			Total		Fuel Type	Annual Tonnage per Scenario
											LF	Travelling Hours	Travelling HP-Hr	LF	Dredging Hours	Dredging HP-Hr	Annual Hours	Annual Hp-hr		
B	Baseline	1	Main Tug	Cummins	6CTA8.3M	HC	Tugboat	2002	YCEXM08.3AB# 255		0.95	1301	315,167	0.6	640.5	97,997	1,942	413,164	Diesel	31,224
B	Baseline	2	Main Tug	Cummins	6CTA8.3M	HC	Tugboat	2002	YCEXM08.3AB# 255		0.95	1301	315,167	0.6	640.5	97,997	1,942	413,164	Diesel	
B	Baseline	3	Generator	Kubota	V3300-T	Offroad	Portable Equip	2001	XKBXL03.3BAD 80		0.9	1301	93,672	0.9	640.5	46,116	1,942	139,788	Diesel	
B	Baseline	4	Dredge Pump	Detroit	671	Offroad	Portable Equip	1972	0	100		1	640.5	64,050	641	64,050	641	64,050	Diesel	
B	Baseline	5	Dredge Pump	Detroit	671	Offroad	Portable Equip	1972	0	100		1	640.5	64,050	641	64,050	641	64,050	Diesel	
B	Baseline	6	Wash Pump	Detroit	671	Offroad	Portable Equip	1972	0	100		1	640.5	64,050	641	64,050	641	64,050	Diesel	
B	Baseline	7	Wash Pump	Detroit	471	Offroad	Portable Equip	1978	0	80		1	640.5	51,240	641	51,240	641	51,240	Diesel	
In	Interim 1	1	Main Tug	Cummins	QSK 10-M	HC	Tugboat	2013	ECEXN19.OAAA# 660		0.75	722	357,390	0.4	489.6	129,254	1,212	486,644	Diesel	31,224
In	Interim 1	2	Main Tug	Cummins	QSK 10-M	HC	Tugboat	2013	ECEXN19.OAAA# 660		0.75	722	357,390	0.4	489.6	129,254	1,212	486,644	Diesel	
In	Interim 1	3	Generator	John Deere	4045DFM70	Offroad	Portable Equip	2011	XKBXL03.3BAD 67		0.75	722	36,281	0.75	489.6	24,602	1,212	60,883	Diesel	
In	Interim 1	4	Generator	John Deere	4045TFM75	Offroad	Portable Equip	2006	0	95		0	0	0	0	0	0	0	Diesel	
In	Interim 1	5	Wash Pump	Cummins	QSC Tier 3	Offroad	Portable Equip	2011	0	250		0.75	489.6	91,800	490	91,800	490	91,800	Diesel	
In	Interim 1	6	Generator	John Deere	Tier 3	Offroad	Portable Equip	2013	0	350		0.8	489.6	137,088	490	137,088	490	137,088	Diesel	
In	Interim 2	1	Main Tug	Cummins	QSK 10-M	HC	Tugboat	2013	ECEXN19.OAAA# 660		0.75	470	232,650	0.4	321.2	84,797	791	317,447	Diesel	31,224
In	Interim 2	2	Main Tug	Cummins	QSK 10-M	HC	Tugboat	2013	ECEXN19.OAAA# 660		0.75	470	232,650	0.4	321.2	84,797	791	317,447	Diesel	
In	Interim 2	3	Generator	John Deere	4045DFM70	Offroad	Portable Equip	2011	XKBXL03.3BAD 67		0.75	470	23,618	0.75	321.2	16,140	791	39,758	Diesel	
In	Interim 2	4	Generator	John Deere	4045TFM75	Offroad	Portable Equip	2006	0	95		0	0	0	0	0	0	0	Diesel	
In	Interim 2	5	Wash Pump	Cummins	QSC Tier 3	Offroad	Portable Equip	2011	0	250		0.75	321.2	60,225	321	60,225	321	60,225	Diesel	
In	Interim 2	6	Generator	John Deere	Tier 3	Offroad	Portable Equip	2013	0	350		0.8	321.2	89,936	321	89,936	321	89,936	Diesel	
Fi	Final	1	Main Tug	Cummins	QSK 10-M	HC	Tugboat	2013	ECEXN19.OAAA# 660		0.75	470	232,650	0.4	321.2	84,797	791	317,447	Diesel	31,224
Fi	Final	2	Main Tug	Cummins	QSK 10-M	HC	Tugboat	2013	ECEXN19.OAAA# 660		0.75	470	232,650	0.4	321.2	84,797	791	317,447	Diesel	
Fi	Final	3	Generator	John Deere	4045DFM70	Offroad	Portable Equip	2011	XKBXL03.3BAD 67		0.75	470	23,618	0.75	321.2	16,140	791	39,758	Diesel	
Fi	Final	4	Generator	John Deere	4045TFM75	Offroad	Portable Equip	2006	0	95		0	0	0	0	0	0	0	Diesel	
Fi	Final	5	Generator	John Deere	Tier 4	Offroad	Portable Equip	2017	0	550		0.9	321.2	158,994	321	158,994	321	158,994	Diesel	

Scenario	Baseline
Starting Year	2006
End Year	2013

Summary		Annual Emissions (tpy)									
CY	Annual Hp-hr	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2006	1,209,506	1.32	1.33	3.98	11.34	0.69	0.63	0.01	512.00	0.06	0.01
2007	1,209,506	1.36	1.37	4.05	11.48	0.71	0.65	0.01	512.00	0.06	0.01
2008	1,209,506	1.39	1.40	4.12	11.62	0.73	0.67	0.01	512.00	0.06	0.01
2009	1,209,506	1.42	1.44	4.18	11.77	0.75	0.69	0.01	512.00	0.06	0.01
2010	1,209,506	1.46	1.47	4.25	11.91	0.78	0.71	0.01	512.00	0.07	0.01
2011	1,209,506	1.49	1.51	4.31	12.05	0.80	0.73	0.01	512.00	0.07	0.01
2012	1,209,506	1.53	1.54	4.38	12.20	0.82	0.75	0.01	507.64	0.07	0.01
2013	1,209,506	1.56	1.58	4.45	12.34	0.84	0.77	0.01	508.02	0.07	0.01

TRUE

Harbor Crafts

CY	Engine #	Description	Equipment		Engine Specs				Cumulative		Annual Hp-
			Type	Category	Fuel Type	Model Yr	Age	Hours	HP	HP Bin	hr
			HC	Tugboat	Diesel	2002	4	-	255	500	413,164
2006	1	Main Tug	HC	Tugboat	Diesel	2002	4	-	255	500	413,164
2006	2	Main Tug	HC	Tugboat	Diesel	2002	4	-	255	500	413,164
2007	1	Main Tug	HC	Tugboat	Diesel	2002	5	-	255	500	413,164
2007	2	Main Tug	HC	Tugboat	Diesel	2002	5	-	255	500	413,164
2008	1	Main Tug	HC	Tugboat	Diesel	2002	6	-	255	500	413,164
2008	2	Main Tug	HC	Tugboat	Diesel	2002	6	-	255	500	413,164
2009	1	Main Tug	HC	Tugboat	Diesel	2002	7	-	255	500	413,164
2009	2	Main Tug	HC	Tugboat	Diesel	2002	7	-	255	500	413,164
2010	1	Main Tug	HC	Tugboat	Diesel	2002	8	-	255	500	413,164
2010	2	Main Tug	HC	Tugboat	Diesel	2002	8	-	255	500	413,164
2011	1	Main Tug	HC	Tugboat	Diesel	2002	9	-	255	500	413,164
2011	2	Main Tug	HC	Tugboat	Diesel	2002	9	-	255	500	413,164
2012	1	Main Tug	HC	Tugboat	Diesel	2002	10	-	255	500	413,164
2012	2	Main Tug	HC	Tugboat	Diesel	2002	10	-	255	500	413,164
2013	1	Main Tug	HC	Tugboat	Diesel	2002	11	-	255	500	413,164
2013	2	Main Tug	HC	Tugboat	Diesel	2002	11	-	255	500	413,164

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Equipment		Fuel Type	Model Yr	Age	Cumulative		Annual Hp-	
			Type	Category				Hours	HP	HP Bin	hr
2006	3	Generator	Offroad	Portable Equipr	Diesel	2001	5	8,896	80	100	139,788
2006	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	34	11,706	100	100	64,050
2006	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	34	11,706	100	100	64,050
2006	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	34	11,706	100	100	64,050
2006	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	28	9,753	80	100	51,240
2007	3	Generator	Offroad	Portable Equipr	Diesel	2001	6	10,838	80	100	139,788
2007	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	35	12,347	100	100	64,050
2007	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	35	12,347	100	100	64,050
2007	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	35	12,347	100	100	64,050
2007	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	29	10,394	80	100	51,240
2008	3	Generator	Offroad	Portable Equipr	Diesel	2001	7	12,779	80	100	139,788
2008	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	36	12,987	100	100	64,050
2008	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	36	12,987	100	100	64,050
2008	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	36	12,987	100	100	64,050
2008	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	30	11,034	80	100	51,240
2009	3	Generator	Offroad	Portable Equipr	Diesel	2001	8	14,721	80	100	139,788
2009	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	37	13,628	100	100	64,050
2009	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	37	13,628	100	100	64,050
2009	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	37	13,628	100	100	64,050
2009	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	31	11,675	80	100	51,240
2010	3	Generator	Offroad	Portable Equipr	Diesel	2001	9	16,662	80	100	139,788
2010	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	38	14,268	100	100	64,050
2010	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	38	14,268	100	100	64,050
2010	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	38	14,268	100	100	64,050
2010	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	32	12,315	80	100	51,240
2011	3	Generator	Offroad	Portable Equipr	Diesel	2001	10	18,604	80	100	139,788
2011	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	39	14,909	100	100	64,050
2011	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	39	14,909	100	100	64,050
2011	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	39	14,909	100	100	64,050
2011	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	33	12,956	80	100	51,240
2012	3	Generator	Offroad	Portable Equipr	Diesel	2001	11	20,545	80	100	139,788
2012	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	40	15,549	100	100	64,050
2012	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	40	15,549	100	100	64,050
2012	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	40	15,549	100	100	64,050
2012	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	34	13,596	80	100	51,240
2013	3	Generator	Offroad	Portable Equipr	Diesel	2001	12	22,487	80	100	139,788
2013	4	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	41	16,190	100	100	64,050
2013	5	Dredge Pump	Offroad	Portable Equipr	Diesel	1972	41	16,190	100	100	64,050
2013	6	Wash Pump	Offroad	Portable Equipr	Diesel	1972	41	16,190	100	100	64,050
2013	7	Wash Pump	Offroad	Portable Equipr	Diesel	1978	35	14,237	80	100	51,240

Harbor Crafts

CY	Engine #	Description	Final EFs (g/hp-hr)											Annual Emissions (tpy)								
			THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2006	1	Main Tug	0.66	0.66	2.06	7.07	0.29	0.27	0.01	486.20	0.02	0.01	0.30	0.30	0.94	3.22	0.13	0.12	0.00	221.43	0.01	0.01
2006	2	Main Tug	0.66	0.66	2.06	7.07	0.29	0.27	0.01	486.20	0.02	0.01	0.30	0.30	0.94	3.22	0.13	0.12	0.00	221.43	0.01	0.01
2007	1	Main Tug	0.67	0.68	2.09	7.14	0.30	0.27	0.01	486.20	0.02	0.01	0.30	0.31	0.95	3.25	0.14	0.12	0.00	221.43	0.01	0.01
2007	2	Main Tug	0.67	0.68	2.09	7.14	0.30	0.27	0.01	486.20	0.02	0.01	0.30	0.31	0.95	3.25	0.14	0.12	0.00	221.43	0.01	0.01
2008	1	Main Tug	0.68	0.69	2.11	7.21	0.31	0.28	0.01	486.20	0.02	0.01	0.31	0.31	0.96	3.28	0.14	0.13	0.00	221.43	0.01	0.01
2008	2	Main Tug	0.68	0.69	2.11	7.21	0.31	0.28	0.01	486.20	0.02	0.01	0.31	0.31	0.96	3.28	0.14	0.13	0.00	221.43	0.01	0.01
2009	1	Main Tug	0.69	0.70	2.14	7.27	0.31	0.29	0.01	486.20	0.02	0.01	0.32	0.32	0.97	3.31	0.14	0.13	0.00	221.43	0.01	0.01
2009	2	Main Tug	0.69	0.70	2.14	7.27	0.31	0.29	0.01	486.20	0.02	0.01	0.32	0.32	0.97	3.31	0.14	0.13	0.00	221.43	0.01	0.01
2010	1	Main Tug	0.71	0.71	2.16	7.34	0.32	0.30	0.01	486.20	0.02	0.01	0.32	0.33	0.98	3.34	0.15	0.13	0.00	221.43	0.01	0.01
2010	2	Main Tug	0.71	0.71	2.16	7.34	0.32	0.30	0.01	486.20	0.02	0.01	0.32	0.33	0.98	3.34	0.15	0.13	0.00	221.43	0.01	0.01
2011	1	Main Tug	0.72	0.73	2.18	7.41	0.33	0.30	0.01	486.20	0.02	0.01	0.33	0.33	0.99	3.37	0.15	0.14	0.00	221.43	0.01	0.01
2011	2	Main Tug	0.72	0.73	2.18	7.41	0.33	0.30	0.01	486.20	0.02	0.01	0.33	0.33	0.99	3.37	0.15	0.14	0.00	221.43	0.01	0.01
2012	1	Main Tug	0.73	0.74	2.21	7.48	0.34	0.31	0.01	486.20	0.02	0.01	0.33	0.34	1.00	3.41	0.15	0.14	0.00	221.43	0.01	0.01
2012	2	Main Tug	0.73	0.74	2.21	7.48	0.34	0.31	0.01	486.20	0.02	0.01	0.33	0.34	1.00	3.41	0.15	0.14	0.00	221.43	0.01	0.01
2013	1	Main Tug	0.75	0.75	2.23	7.55	0.35	0.32	0.01	486.20	0.02	0.01	0.34	0.34	1.02	3.44	0.16	0.15	0.00	221.43	0.01	0.01
2013	2	Main Tug	0.75	0.75	2.23	7.55	0.35	0.32	0.01	486.20	0.02	0.01	0.34	0.34	1.02	3.44	0.16	0.15	0.00	221.43	0.01	0.01

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Final EFs (g/hp-hr)											Annual Emissions (tpy)								
			THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2006	3	Generator	1.26	1.27	3.88	6.07	0.36	0.34	0.01	163.69	0.08	0.00	0.19	0.20	0.60	0.94	0.06	0.05	0.00	25.22	0.01	0.00
2006	4	Dredge Pump	2.00	2.02	5.66	14.87	1.40	1.29	0.01	163.69	0.13	0.00	0.14	0.14	0.40	1.05	0.10	0.09	0.00	11.56	0.01	0.00
2006	5	Dredge Pump	2.00	2.02	5.66	14.87	1.40	1.29	0.01	163.69	0.13	0.00	0.14	0.14	0.40	1.05	0.10	0.09	0.00	11.56	0.01	0.00
2006	6	Wash Pump	2.00	2.02	5.66	14.87	1.40	1.29	0.01	163.69	0.13	0.00	0.14	0.14	0.40	1.05	0.10	0.09	0.00	11.56	0.01	0.00
2006	7	Wash Pump	1.88	1.90	5.43	14.34	1.29	1.19	0.01	163.69	0.12	0.00	0.11	0.11	0.31	0.81	0.07	0.07	0.00	9.25	0.01	0.00
2007	3	Generator	1.34	1.35	4.04	6.30	0.40	0.36	0.00	163.69	0.08	0.00	0.21	0.21	0.62	0.97	0.06	0.06	0.00	25.22	0.01	0.00
2007	4	Dredge Pump	2.04	2.06	5.73	15.04	1.43	1.32	0.00	163.69	0.13	0.00	0.14	0.15	0.40	1.06	0.10	0.09	0.00	11.56	0.01	0.00
2007	5	Dredge Pump	2.04	2.06	5.73	15.04	1.43	1.32	0.00	163.69	0.13	0.00	0.14	0.15	0.40	1.06	0.10	0.09	0.00	11.56	0.01	0.00
2007	6	Wash Pump	2.04	2.06	5.73	15.04	1.43	1.32	0.00	163.69	0.13	0.00	0.14	0.15	0.40	1.06	0.10	0.09	0.00	11.56	0.01	0.00
2007	7	Wash Pump	1.92	1.94	5.51	14.52	1.33	1.22	0.00	163.69	0.12	0.00	0.11	0.11	0.31	0.82	0.07	0.07	0.00	9.25	0.01	0.00
2008	3	Generator	1.42	1.43	4.20	6.52	0.43	0.39	0.00	163.69	0.09	0.00	0.22	0.22	0.65	1.01	0.07	0.06	0.00	25.22	0.01	0.00
2008	4	Dredge Pump	2.07	2.10	5.80	15.22	1.47	1.35	0.00	163.69	0.13	0.00	0.15	0.15	0.41	1.07	0.10	0.10	0.00	11.56	0.01	0.00
2008	5	Dredge Pump	2.07	2.10	5.80	15.22	1.47	1.35	0.00	163.69	0.13	0.00	0.15	0.15	0.41	1.07	0.10	0.10	0.00	11.56	0.01	0.00
2008	6	Wash Pump	2.07	2.10	5.80	15.22	1.47	1.35	0.00	163.69	0.13	0.00	0.15	0.15	0.41	1.07	0.10	0.10	0.00	11.56	0.01	0.00
2008	7	Wash Pump	1.96	1.98	5.58	14.69	1.36	1.25	0.00	163.69	0.12	0.00	0.11	0.11	0.32	0.83	0.08	0.07	0.00	9.25	0.01	0.00
2009	3	Generator	1.50	1.51	4.36	6.75	0.46	0.42	0.00	163.69	0.09	0.00	0.23	0.23	0.67	1.04	0.07	0.06	0.00	25.22	0.01	0.00
2009	4	Dredge Pump	2.11	2.13	5.88	15.39	1.51	1.38	0.00	163.69	0.13	0.00	0.15	0.15	0.41	1.09	0.11	0.10	0.00	11.56	0.01	0.00
2009	5	Dredge Pump	2.11	2.13	5.88	15.39	1.51	1.38	0.00	163.69	0.13	0.00	0.15	0.15	0.41	1.09	0.11	0.10	0.00	11.56	0.01	0.00
2009	6	Wash Pump	2.11	2.13	5.88	15.39	1.51	1.38	0.00	163.69	0.13	0.00	0.15	0.15	0.41	1.09	0.11	0.10	0.00	11.56	0.01	0.00
2009	7	Wash Pump	2.00	2.02	5.65	14.86	1.40	1.29	0.00	163.69	0.13	0.00	0.11	0.11	0.32	0.84	0.08	0.07	0.00	9.25	0.01	0.00
2010	3	Generator	1.58	1.59	4.53	6.98	0.49	0.45	0.00	163.69	0.10	0.00	0.24	0.25	0.70	1.07	0.08	0.07	0.00	25.22	0.02	0.00
2010	4	Dredge Pump	2.15	2.17	5.95	15.57	1.54	1.42	0.00	163.69	0.14	0.00	0.15	0.15	0.42	1.10	0.11	0.10	0.00	11.56	0.01	0.00
2010	5	Dredge Pump	2.15	2.17	5.95	15.57	1.54	1.42	0.00	163.69	0.14	0.00	0.15	0.15	0.42	1.10	0.11	0.10	0.00	11.56	0.01	0.00
2010	6	Wash Pump	2.15	2.17	5.95	15.57	1.54	1.42	0.00	163.69	0.14	0.00	0.15	0.15	0.42	1.10	0.11	0.10	0.00	11.56	0.01	0.00
2010	7	Wash Pump	2.03	2.05	5.73	15.04	1.43	1.32	0.00	163.69	0.13	0.00	0.11	0.12	0.32	0.85	0.08	0.07	0.00	9.25	0.01	0.00
2011	3	Generator	1.66	1.67	4.69	7.20	0.52	0.48	0.00	163.69	0.10	0.00	0.26	0.26	0.72	1.11	0.08	0.07	0.00	25.22	0.02	0.00
2011	4	Dredge Pump	2.19	2.21	6.02	15.74	1.58	1.45	0.00	163.69	0.14	0.00	0.15	0.16	0.43	1.11	0.11	0.10	0.00	11.56	0.01	0.00
2011	5	Dredge Pump	2.19	2.21	6.02	15.74	1.58	1.45	0.00	163.69	0.14	0.00	0.15	0.16	0.43	1.11	0.11	0.10	0.00	11.56	0.01	0.00
2011	6	Wash Pump	2.19	2.21	6.02	15.74	1.58	1.45	0.00	163.69	0.14	0.00	0.15	0.16	0.43	1.11	0.11	0.10	0.00	11.56	0.01	0.00
2011	7	Wash Pump	2.07	2.09	5.80	15.21	1.47	1.35	0.00	163.69	0.13	0.00	0.12	0.12	0.33	0.86	0.08	0.08	0.00	9.25	0.01	0.00
2012	3	Generator	1.74	1.76	4.85	7.43	0.55	0.51	0.00	153.37	0.11	0.00	0.27	0.27	0.75	1.14	0.09	0.08	0.00	23.63	0.02	0.00
2012	4	Dredge Pump	2.23	2.25	6.10	15.91	1.61	1.48	0.00	153.37	0.14	0.00	0.16	0.16	0.43	1.12	0.11	0.10	0.00	10.83	0.01	0.00
2012	5	Dredge Pump	2.23	2.25	6.10	15.91	1.61	1.48	0.00	153.37	0.14	0.00	0.16	0.16	0.43	1.12	0.11	0.10	0.00	10.83	0.01	0.00
2012	6	Wash Pump	2.23	2.25	6.10	15.91	1.61	1.48	0.00	153.37	0.14	0.00	0.16	0.16	0.43	1.12	0.11	0.10	0.00	10.83	0.01	0.00
2012	7	Wash Pump	2.11	2.13	5.87	15.38	1.50	1.38	0.00	153.37	0.13	0.00	0.12	0.12	0.33	0.87	0.08	0.08	0.00	8.66	0.01	0.00
2013	3	Generator	1.82	1.84	5.01	7.65	0.58	0.54	0.00	154.27	0.11	0.00	0.28	0.28	0.77	1.18	0.09	0.08	0.00	23.77	0.02	0.00
2013	4	Dredge Pump	2.27	2.29	6.17	16.09	1.65	1.51	0.00	154.27	0.14	0.00	0.16	0.16	0.44	1.14	0.12	0.11	0.00	10.89	0.01	0.00
2013	5	Dredge Pump	2.27	2.29	6.17	16.09	1.65	1.51	0.00	154.27	0.14	0.00	0.16	0.16	0.44	1.14	0.12	0.11	0.00	10.89	0.01	0.00
2013	6	Wash Pump	2.27	2.29	6.17	16.09	1.65	1.51	0.00	154.27	0.14	0.00	0.16	0.16	0.44	1.14	0.12	0.11	0.00	10.89	0.01	0.00
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Scenario	Interim 1
Starting Year	2014
End Year	2016

Summary		Annual Emissions (tpy)									
CY	Annual Hp-hr	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2014	1,263,060	0.70	0.71	4.48	4.64	0.11	0.10	0.01	571.24	0.02	0.01
2015	1,263,060	0.73	0.74	5.05	4.98	0.12	0.11	0.01	570.79	0.02	0.01
2016	1,263,060	0.75	0.75	5.11	5.03	0.12	0.11	0.01	568.91	0.02	0.01

TRUE

Harbor Crafts

CY	Engine #	Description	Engine Specs					Cumulative			Annual Hp-hr
			Equipment Type	Equipment Category	Fuel Type	Model Yr	Age	Hours	HP	HP Bin	
2014	1	Main Tug	HC	Tugboat	Diesel	2013	1	-	660	750	486,644
2014	2	Main Tug	HC	Tugboat	Diesel	2013	1	-	660	750	486,644
2015	1	Main Tug	HC	Tugboat	Diesel	2013	2	-	660	750	486,644
2015	2	Main Tug	HC	Tugboat	Diesel	2013	2	-	660	750	486,644
2016	1	Main Tug	HC	Tugboat	Diesel	2013	3	-	660	750	486,644
2016	2	Main Tug	HC	Tugboat	Diesel	2013	3	-	660	750	486,644

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Engine Specs					Cumulative			Annual Hp-hr
			Equipment Type	Equipment Category	Fuel Type	Model Yr	Age	Hours	HP	HP Bin	
2014	3	Generator	Offroad	Portable Equiprr	Diesel	2011	3	5,384	67	75	60,883
2014	4	Generator	Offroad	Portable Equiprr	Diesel	2006	8	11,128	95	100	0
2014	5	Wash Pump	Offroad	Portable Equiprr	Diesel	2011	3	1,466	250	300	91,800
2014	6	Generator	Offroad	Portable Equiprr	Diesel	2013	1	1,881	350	600	137,088
2015	3	Generator	Offroad	Portable Equiprr	Diesel	2011	4	6,596	67	75	60,883
2015	4	Generator	Offroad	Portable Equiprr	Diesel	2006	9	11,128	67	75	0
2015	5	Wash Pump	Offroad	Portable Equiprr	Diesel	2011	4	1,956	67	75	91,800
2015	6	Generator	Offroad	Portable Equiprr	Diesel	2013	2	2,370	67	75	137,088
2016	3	Generator	Offroad	Portable Equiprr	Diesel	2011	5	7,808	67	75	60,883
2016	4	Generator	Offroad	Portable Equiprr	Diesel	2006	10	11,128	67	75	0
2016	5	Wash Pump	Offroad	Portable Equiprr	Diesel	2011	5	2,445	67	75	91,800
2016	6	Generator	Offroad	Portable Equiprr	Diesel	2013	3	2,860	67	75	137,088

Harbor Crafts

CY	Engine #	Description	Zero Hour EFs (g/hp-hr)					Deterioration Rate				
			THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM
2014	1	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67
2014	2	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67
2015	1	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67
2015	2	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67
2016	1	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67
2016	2	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67

OFFROAD Engines**Engine Specs**

CY	Engine #	Description	Zero Hour EFs (g/hp-hr)					Deterioration Factor (g/hp-hr ²)				
			THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM
2014	3	Generator	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001
2014	4	Generator	-	-	-	-	-	-	-	-	-	-
2014	5	Wash Pump	0.07	0.07	0.92	1.52	0.06	0.00002	0.00002	0.00002	0.00002	0.00000
2014	6	Generator	0.07	0.07	0.92	1.50	0.05	0.00002	0.00002	0.00002	0.00002	0.00000
2015	3	Generator	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001
2015	4	Generator	-	-	-	-	-	-	-	-	-	-
2015	5	Wash Pump	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001
2015	6	Generator	0.10	0.10	3.05	2.63	0.03	0.00003	0.00003	0.00008	0.00003	0.00000
2016	3	Generator	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001
2016	4	Generator	-	-	-	-	-	-	-	-	-	-
2016	5	Wash Pump	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001
2016	6	Generator	0.10	0.10	3.05	2.63	0.03	0.00003	0.00003	0.00008	0.00003	0.00000

Harbor Crafts

CY	Engine #	Description	Final EFs (g/hp-hr)										Annual Emissions (tpy)									
			THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2014	1	Main Tug	0.62	0.62	3.77	3.83	0.07	0.07	0.01	486.20	0.02	0.01	0.33	0.34	2.02	2.05	0.04	0.04	0.00	260.81	0.01	0.01
2014	2	Main Tug	0.62	0.62	3.77	3.83	0.07	0.07	0.01	486.20	0.02	0.01	0.33	0.34	2.02	2.05	0.04	0.04	0.00	260.81	0.01	0.01
2015	1	Main Tug	0.63	0.64	3.82	3.87	0.08	0.07	0.01	486.20	0.02	0.01	0.34	0.34	2.05	2.07	0.04	0.04	0.00	260.81	0.01	0.01
2015	2	Main Tug	0.63	0.64	3.82	3.87	0.08	0.07	0.01	486.20	0.02	0.01	0.34	0.34	2.05	2.07	0.04	0.04	0.00	260.81	0.01	0.01
2016	1	Main Tug	0.64	0.65	3.86	3.90	0.08	0.07	0.01	486.20	0.02	0.01	0.35	0.35	2.07	2.09	0.04	0.04	0.00	260.81	0.01	0.01
2016	2	Main Tug	0.64	0.65	3.86	3.90	0.08	0.07	0.01	486.20	0.02	0.01	0.35	0.35	2.07	2.09	0.04	0.04	0.00	260.81	0.01	0.01

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Final EFs (g/hp-hr)										Annual Emissions (tpy)									
			THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2014	3	Generator	0.21	0.21	3.14	2.80	0.20	0.18	0.00	155.34	0.01	0.00	0.01	0.01	0.21	0.19	0.01	0.01	0.00	10.43	0.00	0.00
2014	4	Generator	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2014	5	Wash Pump	0.09	0.09	0.86	1.39	0.05	0.05	0.00	155.34	0.01	0.00	0.01	0.01	0.09	0.14	0.01	0.00	0.00	15.72	0.00	0.00
2014	6	Generator	0.09	0.09	0.86	1.38	0.04	0.04	0.00	155.34	0.01	0.00	0.01	0.01	0.13	0.21	0.01	0.01	0.00	23.47	0.00	0.00
2015	3	Generator	0.24	0.24	3.23	2.84	0.21	0.20	0.00	153.92	0.01	0.00	0.02	0.02	0.22	0.19	0.01	0.01	0.00	10.33	0.00	0.00
2015	4	Generator	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2015	5	Wash Pump	0.13	0.14	2.89	2.68	0.16	0.15	0.00	153.92	0.01	0.00	0.01	0.01	0.29	0.27	0.02	0.02	0.00	15.58	0.00	0.00
2015	6	Generator	0.14	0.14	2.92	2.44	0.03	0.03	0.00	153.92	0.01	0.00	0.02	0.02	0.44	0.37	0.01	0.00	0.00	23.26	0.00	0.00
2016	3	Generator	0.27	0.27	3.31	2.88	0.23	0.21	0.00	148.02	0.02	0.00	0.02	0.02	0.22	0.19	0.02	0.01	0.00	9.93	0.00	0.00
2016	4	Generator	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2016	5	Wash Pump	0.15	0.15	2.92	2.70	0.17	0.16	0.00	148.02	0.01	0.00	0.01	0.01	0.30	0.27	0.02	0.02	0.00	14.98	0.00	0.00
2016	6	Generator	0.15	0.16	2.95	2.46	0.03	0.03	0.00	148.02	0.01	0.00	0.02	0.02	0.45	0.37	0.01	0.00	0.00	22.37	0.00	0.00

Scenario	Interim 2
Starting Year	2017
End Year	2018

Summary		Annual Emissions (tpy)									
CY	Annual Hp-hr	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2017	824,812	0.50	0.50	3.03	3.12	0.08	0.07	0.00	371.59	0.01	0.01
2018	824,812	0.51	0.52	3.43	3.35	0.08	0.08	0.00	371.93	0.01	0.01

TRUE

Harbor Crafts

CY	Engine #	Description	Engine Specs				Age	Cumulative			Annual Hp-hr
			Equipment Type	Equipment Category	Fuel Type	Model Yr		Hours	HP	HP Bin	
2017	1	Main Tug	HC	Tugboat	Diesel	2013	4	-	660	750	317,447
2017	2	Main Tug	HC	Tugboat	Diesel	2013	4	-	660	750	317,447
2018	1	Main Tug	HC	Tugboat	Diesel	2013	5	-	660	750	317,447
2018	2	Main Tug	HC	Tugboat	Diesel	2013	5	-	660	750	317,447

OFFROAD Engines

CY	Engine #	Description	Engine Specs				Age	Cumulative			Annual Hp-hr
			Equipment Type	Equipment Category	Fuel Type	Model Yr		Hours	HP	HP Bin	
2017	3	Generator	Offroad	Portable Equiprr	Diesel	2011	6	9,137	67	75	39,758
2017	4	Generator	Offroad	Portable Equiprr	Diesel	2006	11	12,000	95	100	0
2017	5	Wash Pump	Offroad	Portable Equiprr	Diesel	2011	6	2,274	250	300	60,225
2017	6	Generator	Offroad	Portable Equiprr	Diesel	2013	4	5,885	350	600	89,936
2018	3	Generator	Offroad	Portable Equiprr	Diesel	2011	7	9,928	67	75	39,758
2018	4	Generator	Offroad	Portable Equiprr	Diesel	2006	12	12,000	67	75	0
2018	5	Wash Pump	Offroad	Portable Equiprr	Diesel	2011	7	2,595	67	75	60,225
2018	6	Generator	Offroad	Portable Equiprr	Diesel	2013	5	6,206	67	75	89,936

TRUE

Harbor Crafts

CY	Engine #	Description	Zero Hour EFs (g/hp-hr)					Deterioration Rate					Final EFs (g/hp-hr)									
			THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2017	1	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67	0.66	0.66	3.91	3.94	0.08	0.07	0.01	486.20	0.02	0.01
2017	2	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67	0.66	0.66	3.91	3.94	0.08	0.07	0.01	486.20	0.02	0.01
2018	1	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67	0.67	0.68	3.95	3.98	0.08	0.08	0.01	486.20	0.02	0.01
2018	2	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67	0.67	0.68	3.95	3.98	0.08	0.08	0.01	486.20	0.02	0.01

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Zero Hour EFs (g/hp-hr)					Deterioration Factor (g/hp-hr^2)					Final EFs (g/hp-hr)									
			THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2017	3	Generator	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001	0.30	0.30	3.41	2.93	0.24	0.22	0.00	149.64	0.02	0.00
2017	4	Generator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	5	Wash Pump	0.07	0.07	0.92	1.52	0.06	0.00002	0.00002	0.00002	0.00002	0.00000	0.10	0.10	0.88	1.40	0.05	0.05	0.00	149.64	0.01	0.00
2017	6	Generator	0.07	0.07	0.92	1.50	0.05	0.00002	0.00002	0.00002	0.00002	0.00000	0.16	0.16	0.92	1.45	0.05	0.05	0.00	149.64	0.01	0.00
2018	3	Generator	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001	0.31	0.32	3.47	2.95	0.25	0.23	0.00	151.27	0.02	0.00
2018	4	Generator	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2018	5	Wash Pump	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001	0.15	0.15	2.93	2.70	0.17	0.16	0.00	151.27	0.01	0.00
2018	6	Generator	0.10	0.10	3.05	2.63	0.03	0.00003	0.00003	0.00008	0.00003	0.00000	0.23	0.23	3.20	2.56	0.04	0.04	0.00	151.27	0.01	0.00

Harbor Crafts

Annual Emissions (tpy)

CY	Engine #	Description	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2017	1	Main Tug	0.23	0.23	1.37	1.38	0.03	0.03	0.00	170.13	0.01	0.00
2017	2	Main Tug	0.23	0.23	1.37	1.38	0.03	0.03	0.00	170.13	0.01	0.00
2018	1	Main Tug	0.23	0.24	1.38	1.39	0.03	0.03	0.00	170.13	0.01	0.00
2018	2	Main Tug	0.23	0.24	1.38	1.39	0.03	0.03	0.00	170.13	0.01	0.00

OFFROAD Engines

Engine Specs

Annual Emissions (tpy)

CY	Engine #	Description	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2017	3	Generator	0.01	0.01	0.15	0.13	0.01	0.01	0.00	6.56	0.00	0.00
2017	4	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2017	5	Wash Pump	0.01	0.01	0.06	0.09	0.00	0.00	0.00	9.93	0.00	0.00
2017	6	Generator	0.02	0.02	0.09	0.14	0.00	0.00	0.00	14.83	0.00	0.00
2018	3	Generator	0.01	0.01	0.15	0.13	0.01	0.01	0.00	6.63	0.00	0.00
2018	4	Generator	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	5	Wash Pump	0.01	0.01	0.19	0.18	0.01	0.01	0.00	10.04	0.00	0.00
2018	6	Generator	0.02	0.02	0.32	0.25	0.00	0.00	0.00	15.00	0.00	0.00

Scenario	Final
Starting Year	2018
End Year	-

Summary		Annual Emissions (tpy)									
CY	Annual Hp-hr	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2018	833,645	0.494	0.499	3.070	2.953	0.073	0.067	0.004	373.405	0.013	0.009

TRUE

Harbor Crafts

CY	Engine #	Description	Engine Specs					Age	Cumulative Hours	HP	HP Bin	Annual Hp-hr
			Equipment Type	Equipment Category	Fuel Type	Model Yr						
2018	1	Main Tug	HC	Tugboat	Diesel	2013	5	-	660	750	317,447	
2018	2	Main Tug	HC	Tugboat	Diesel	2013	5	-	660	750	317,447	

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Engine Specs					Age	Cumulative Hours	HP	HP Bin	Annual Hp-hr
			Equipment Type	Equipment Category	Fuel Type	Model Yr						
2018	3	Generator	Offroad	Portable Equiprr	Diesel	2011	7	10,528	67	75	39,758	
2018	4	Generator	Offroad	Portable Equiprr	Diesel	2006	12	12,000	95	100	0	
2018	5	Generator	Offroad	Portable Equiprr	Diesel	2017	1	1,712	550	600	158,994	

TRUE

Harbor Crafts

CY	Engine #	Description	Zero Hour EFs (g/hp-hr)					Deterioration Rate				
			THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM
2018	1	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67
2018	2	Main Tug	0.67	0.68	3.73	3.99	0.08	0.44	0.44	0.25	0.21	0.67

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Zero Hour EFs (g/hp-hr)					Deterioration Factor (g/hp-hr^2)				
			THC	ROG	CO	NOx	PM	THC	ROG	CO	NOx	PM
2018	3	Generator	0.10	0.10	3.05	2.90	0.16	0.00003	0.00003	0.00008	0.00004	0.00001
2018	4	Generator	-	-	-	-	-	-	-	-	-	-
2018	5	Generator	0.05	0.05	0.92	0.23	0.02	0.00001	0.00001	0.00002	0.00000	0.00000

Harbor Crafts

CY	Engine #	Description	Final EFs (g/hp-hr)										Annual Emissions (tpy)									
			THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2018	1	Main Tug	0.67	0.68	3.95	3.98	0.08	0.08	0.01	486.20	0.02	0.01	0.23	0.24	1.38	1.39	0.03	0.03	0.00	170.13	0.01	0.00
2018	2	Main Tug	0.67	0.68	3.95	3.98	0.08	0.08	0.01	486.20	0.02	0.01	0.23	0.24	1.38	1.39	0.03	0.03	0.00	170.13	0.01	0.00

OFFROAD Engines

Engine Specs

CY	Engine #	Description	Final EFs (g/hp-hr)										Annual Emissions (tpy)									
			THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O	THC	ROG	CO	NOx	PM10	PM2.5	SOx	CO2	CH4	N2O
2018	3	Generator	0.33	0.33	3.51	2.97	0.25	0.23	0.00	151.27	0.02	0.00	0.01	0.01	0.15	0.13	0.01	0.01	0.00	6.63	0.00	0.00
2018	4	Generator	-	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	5	Generator	0.06	0.06	0.86	0.21	0.02	0.02	0.00	151.27	0.00	0.00	0.01	0.01	0.15	0.04	0.00	0.00	0.00	26.51	0.00	0.00