

## **APPENDIX 7**

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Emissions Data from Boat Manufacturers

<b>Emission Factors for Four-Stroke Outboard Engines</b>															
Model #	MY <sup>1</sup>	HP <sup>2</sup>	EPA <sup>3</sup> Family	FEL <sup>4</sup>	CA Star Rating	HC <sup>5</sup> (Mode 1), g/hr	HC (Mode 2), g/hr	HC (Mode 3), g/hr	HC (Mode 4), g/hr	HC (Mode 5), g/hr	NO <sub>x</sub> <sup>6</sup> (Mode 1), g/hr	NO <sub>x</sub> (Mode 2), g/hr	NO <sub>x</sub> (Mode 3), g/hr	NO <sub>x</sub> (Mode 4), g/hr	NO <sub>x</sub> (Mode 5), g/hr
<b>Four-Stroke Outboards</b>															
1-A254131	2008	25	6M9XM.49	17.85	3	136.35	111.36	62.77	29.79	15.69	65.60	28.74	10.55	3.70	0.39
1-A404121	2005	40	5M9XM.74	15.30	3	183.18	102.76	58.45	35.32	13.12	181.12	74.53	46.10	10.37	0.46
1-A404121	2005	40	5M9XM.74	15.30	3	182.15	104.97	59.69	37.05	13.12	168.77	68.36	43.63	10.13	0.46
1-A403022	2002	30	2M9XM.99	15.30	3	121.95	80.36	53.10	31.68	13.66	128.58	1.32	28.71	8.15	0.46
1-A504522	2002	50	2M9XM.99	14.80	3	187.81	127.35	78.67	38.90	17.37	352.48	84.36	51.97	16.67	0.58
1-A504522	2002	50	2M9XM.99	14.80	3	204.53	120.18	84.38	48.47	17.56	311.30	112.46	37.56	9.26	0.58
1-F904231	2005	75	5M9XM.99	14.30	3	393.62	215.83	130.44	69.83	28.85	121.56	66.98	37.05	8.80	0.87
1-115F13	2001	115	1M9XM.01	16.60	3	455.63	242.18	159.77	69.59	32.40	278.11	348.69	107.69	19.88	0.89
1-225F230	2004	225	4M9XM.03	15.25	3	1,452.94	606.32	328.79	158.38	61.65	451.51	233.20	87.99	44.46	1.74
<b>Supercharged Four-Stroke Outboards</b>															
1-760V932	2006	175	6M9XM.01	16.32	3	1,940.46	733.22	369.18	161.00	38.49	193.60	225.78	205.30	49.70	1.35
1-760V132	2006	175	6M9XM.02	16.32	3	1,845.92	737.08	361.98	158.84	35.12	202.60	227.65	210.70	49.70	1.35
1-250F831	2006	250	5M9XM.02	16.11	3	2,051.73	904.12	738.37	209.93	37.63	591.72	432.77	264.99	66.38	0.96
1-250F831	2005	150	5M9XM.02	16.11	3	2,038.87	953.74	725.50	203.76	38.59	598.15	448.55	277.85	75.64	0.96
1-275V241	2005	250	5M9XM.02	16.11	3	1,685.12	1,088.81	704.92	200.67	39.56	398.77	372.12	208.39	57.11	0.96
Notes: Mode 1 = Wide Open Throttle; Mode 2 = 80% rpm, 71.6% Torque; Mode 3 = 60% rpm, 46.8% Torque; Mode 4 = 40% rpm, 25.3% Torque; Mode 5 = Idle															
<sup>1</sup> model year															
<sup>2</sup> horsepower															
<sup>3</sup> Environmental Protection Agency															
<sup>4</sup> family emission level (weighted average of HC + NO <sub>x</sub> over 5 mode cycle) in grams per headwater-hour															
<sup>5</sup> hydrocarbons															
<sup>6</sup> oxides of nitrogen															
Source: Mercury Marine, from Russ Robinson (July 2005).															

**Outboard Engines**

4-stroke

HP	HC (grams/hour)		Nox (grams/hour)	
	Mode 4	Mode 5	Mode 4	Mode 5
8	15	12	1	0
15	14	10	10	0
25	32	18	5	1
40	29	15	18	1
60	48	22	19	1
75	52	27	42	1
90	76	31	49	1
115	73	33	53	1
150	126	29	86	1
250	261	41	47	1

HC diff	HC %	Nox diff	Nox %
3	20	1	100
4	28.57143	10	100
14	43.75	4	80
14	48.27586	17	94.44444
26	54.16667	18	94.73684
25	48.07692	41	97.61905
45	59.21053	48	97.95918
40	54.79452	52	98.11321
97	76.98413	85	98.83721
220	84.29119	46	97.87234

Direct Injected 2-stroke				
HP	Mode 4	Mode 5	Mode 4	Mode 5
115	106	53	43	5
135	222	75	45	10
150	248	79	57	8
225	361	112	51	6

53	50	38	88.37209
147	66.21622	35	77.77778
169	68.14516	49	85.96491
249	68.97507	45	88.23529

**Sterndrive/Inboard Engines**

Engine	HP	HC (grams/hour)		Nox (grams/hour)	
		Mode 4	Mode 5	Mode 4	Mode 5
3.0L	135	76	102	13	1
4.3L	190	85	156	44	2
5.0L	220	153	155	44	2
5.7L	250	139	111	20	1
4.3L MPI	220	93	61	63	1
5.0L MPI	260	121	101	63	2
350 MPI	300	145	59	81	2
6.2L MPI	320	77	246	72	2
8.1L	375	115	224	105	3
8.1L HO	425	166	276	69	3

-26	-19.25926	12	92.30769
-71	-37.36842	42	95.45455
-2	-0.909091	42	95.45455
28	11.2	19	95
32	14.54545	62	98.4127
20	7.692308	61	96.8254
86	28.66667	79	97.53086
-169	-52.8125	70	97.22222
-109	-29.06667	102	97.14286
-110	-25.88235	66	95.65217

**Appendix 7C**  
**5.7-Liter Stern Drive Engine Exhaust Emissions (raw data, unweighted)**

RPM	HC (g/hr <sup>1</sup> )	CO (g/hr)	NO <sub>x</sub> (g/hr)	Fuel (g/hr)	Power (kilowatt)
1900	75.07	1,431.39	89.90	9,643.33	21.69
630 (idle)	56.64	1,058.68	2.39	2,340.00	0.02

<sup>1</sup> grams per hour  
Source: National Marine Manufacturers Association, from Russ Robinson (February 2006)