

TEXTOX MENU #4 - LAKE OR RESERVOIR

The water quality-based effluent limitations developed below are calculated using:

Table 1, 2014 Texas Surface Water Quality Standards (30 TAC 307) for Freshwater Aquatic Life

Table 2, 2014 Texas Surface Water Quality Standards for Human Health

"Procedures to Implement the Texas Surface Water Quality Standards," TCEQ, June 2010

PERMIT INFORMATION

Permittee Name:	Freeport LNG Preatreatment Facility
TPDES Permit No:	TX0134056
Outfall No:	Internal Outfall 101
Prepared by:	Maria Okpala
Date:	03/6/2018

DISCHARGE INFORMATION

Receiving Waterbody:	South Horseshoe
Segment No.:	2501
TSS (mg/L):	12
pH (Standard Units):	7
Hardness (mg/L as CaCO ₃):	4613
Chloride (mg/L):	15500
Effluent Flow for Aquatic Life (MGD):	0.000296
% Effluent for Chronic Aquatic Life (Mixing Zone):	0.015
% Effluent for Acute Aquatic Life (ZID):	0.6
Effluent Flow for Human Health (MGD):	0.000296
% Effluent for Human Health:	0.08
Public Water Supply Use?	no

CALCULATE DISSOLVED FRACTION (AND ENTER WATER EFFECT RATIO IF APPLICABLE):

CALCULATE DISSOLVED FRACTION (AND ENTER WATER EFFECT RATIO IF APPLICABLE):								
Lake/Reservoir Metal	Intercept	(b)	Slope	(m)	Partition Coefficient (Kp)	Dissolved Fraction (Cd/Ct)	Water Effect Ratio (WER)	
Aluminum		N/A		N/A	N/A	1.00	Assumed	1.00
Arsenic		5.68		-0.73	78018.52	0.52		1.00
Cadmium		6.55		-0.92	360705.91	0.19		1.00
Chromium (Total)		6.34		-0.27	1118461.56	0.07		1.00
Chromium (+3)		6.34		-0.27	1118461.56	0.07		1.00
Chromium (+6)		N/A		N/A	N/A	1.00	Assumed	1.00
Copper		6.45		-0.90	301118.11	0.22		1.00
Lead		6.31		-0.53	547058.71	0.13		1.00
Mercury		N/A		N/A	N/A	1.00	Assumed	1.00
Nickel		6.34		-0.76	330995.62	0.20		1.00
Selenium		N/A		N/A	N/A	1.00	Assumed	1.00

Silver	6.38	-1.03	185542.46	0.31	1.00	Assumed
Zinc	6.52	-0.68	611162.58	0.12	1.00	Assumed

AQUATIC LIFE

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

<i>Parameter</i>	<i>FW Acute Criterion (ug/L)</i>	<i>FW Chronic Criterion (ug/L)</i>	<i>WLAa</i>	<i>WLAc</i>	<i>LTAa</i>	<i>LTAc</i>	<i>Daily Avg. (ug/L)</i>	<i>Daily Max. (ug/L)</i>
Aldrin	3.0	N/A	500.00	N/A	160.00	N/A	235.20	497.60
Aluminum	991	N/A	165166.67	N/A	52853.33	N/A	77694.40	164373.87
Arsenic	340	150	109719.26	1936222.20	35110.16	1181095.54	51611.94	109192.61
Cadmium	350.2520264	3.463519077	311051.29	123035.07	99536.41	75051.39	110325.55	233409.83
Carbaryl	2.0	N/A	333.33	N/A	106.67	N/A	156.80	331.73
Chlordane	2.4	0.004	400.00	26.67	128.00	16.27	23.91	50.59
Chlorpyrifos	0.083	0.041	13.83	273.33	4.43	166.73	6.51	13.77
Chromium (+3)	13137.02583	1708.857157	31576021.17	164295664.77	10104326.77	100220355.51	14853360.36	31424456.27
Chromium (+6)	15.7	10.6	2616.67	70666.67	837.33	43106.67	1230.88	2604.11
Copper	524.9873999	250.1301764	403664.33	7693032.63	129172.59	4692749.90	189883.70	401726.74
Cyanide (free)	45.8	10.7	7633.33	71333.33	2442.67	43513.33	3590.72	7596.69
4,4'-DDT	1.1	0.001	183.33	6.67	58.67	4.07	5.98	12.65
Demeton	N/A	0.1	N/A	666.67	N/A	406.67	597.80	1264.73
Diazinon	0.17	0.17	28.33	1133.33	9.07	691.33	13.33	28.20
Dicofol	59.3	19.8	9883.33	132000.00	3162.67	80520.00	4649.12	9835.89
Dieldrin	0.24	0.002	40.00	13.33	12.80	8.13	11.96	25.29
Diuron	210	70	35000.00	466666.67	11200.00	284666.67	16464.00	34832.00
Endosulfan I (alpha)	0.22	0.056	36.67	373.33	11.73	227.73	17.25	36.49
Endosulfan II (beta)	0.22	0.056	36.67	373.33	11.73	227.73	17.25	36.49
Endosulfan sulfate	0.22	0.056	36.67	373.33	11.73	227.73	17.25	36.49
Endrin	0.086	0.002	14.33	13.33	4.59	8.13	6.74	14.26
Guthion	N/A	0.01	N/A	66.67	N/A	40.67	59.78	126.47
Heptachlor	0.52	0.004	86.67	26.67	27.73	16.27	23.91	50.59
Hexachlorocyclohexane (Lindane)	1.126	0.08	187.67	533.33	60.05	325.33	88.28	186.77
Lead	2494.585197	97.21040378	3145133.33	4902453.23	1006442.67	2990496.47	1479470.72	3130036.69
Malathion	N/A	0.01	N/A	66.67	N/A	40.67	59.78	126.47
Mercury	2.4	1.3	400.00	8666.67	128.00	5286.67	188.16	398.08
Methoxychlor	N/A	0.03	N/A	200.00	N/A	122.00	179.34	379.42
Mirex	N/A	0.001	N/A	6.67	N/A	4.07	5.98	12.65
Nickel	11972.76892	1329.804991	9921329.74	44078137.31	3174825.52	26887663.76	4666993.51	9873707.36
Nonylphenol	28	6.6	4666.67	44000.00	1493.33	26840.00	2195.20	4644.27
Parathion (ethyl)	0.065	0.013	10.83	86.67	3.47	52.87	5.10	10.78
Pentachlorophenol	8.723	6.693	1453.89	44617.22	465.24	27216.51	683.91	1446.91
Phenanthrene	30	30	5000.00	200000.00	1600.00	122000.00	2352.00	4976.00

Polychlorinated Biphenyls (PCBs)	2.0	0.014	333.33	93.33	106.67	56.93	83.69	177.06
Selenium	20	5	3333.33	33333.33	1066.67	20333.33	1568.00	3317.33
Silver	0.8	N/A	4790.20	N/A	1532.87	N/A	2253.31	4767.21
Toxaphene	0.78	0.0002	130.00	1.33	41.60	0.81	1.20	2.53
Tributyltin (TBT)	0.13	0.024	21.67	160.00	6.93	97.60	10.19	21.56
2,4,5 Trichlorophenol	136	64	22666.67	426666.67	7253.33	260266.67	10662.40	22557.87
Zinc	3011.260712	3035.892701	4182616.49	168673204.95	1338437.28	102890655.02	1967502.80	4162539.93

HUMAN HEALTH

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

<i>Parameter</i>	<i>Water and Fish Criterion (ug/L)</i>	<i>Fish Only Criterion (ug/L)</i>	<i>WLAh</i>	<i>LTAh</i>	<i>Daily Avg. (ug/L)</i>	<i>Daily Max. (ug/L)</i>
Acrylonitrile	0.80	3.8	4750.00	4417.50	6493.73	13738.43
Aldrin	0.00094	0.0010	1.2500	1.1625	1.7089	3.6154
Anthracene	5,569	N/A	N/A	N/A	N/A	N/A
Antimony	6	1,071	1338750.00	1245037.50	1830205.13	3872066.63
Arsenic	10	N/A	N/A	N/A	N/A	N/A
Barium	2,000	N/A	N/A	N/A	N/A	N/A
Benzene	5	513	641250.00	596362.50	876652.88	1854687.38
Benzidine	0.00086	0.0020	2.5000	2.3250	3.4178	7.2308
Benzo(a)anthracene	0.68	3.28	4100.00	3813.00	5605.11	11858.43
Benzo(a)pyrene	0.068	0.33	412.50	383.63	563.93	1193.07
Bis(chloromethyl)ether	0.0024	0.44	550.00	511.50	751.91	1590.77
Bis(2-chloroethyl)ether	0.57	10.06	12575.00	11694.75	17191.28	36370.67
Bis(2-ethylhexyl)phthalate	6	41	51250.00	47662.50	70063.88	148230.38
Bromodichloromethane (Dichlorobromomethane)	10.2	322	402500.00	374325.00	550257.75	1164150.75
Bromoform	69.1	2,175	2718750.00	2528437.50	3716803.13	7863440.63
Cadmium	5	N/A	N/A	N/A	N/A	N/A
Carbon Tetrachloride	4.3	30.5	38125.00	35456.25	52120.69	110268.94
Chlordane	0.0080	0.0081	10.125	9.416	13.842	29.285
Chlorobenzene	100	5,201	6501250.00	6046162.50	8887858.88	18803565.38
Chlorodibromomethane (Dibromochloromethane)	7.6	239	298750.00	277837.50	408421.13	864074.63
Chloroform	70	7,143	8928750.00	8303737.50	12206494.13	25824623.63
Chromium (+6)	62	502	627500.00	583575.00	857855.25	1814918
Chrysene	68.13	327	408750.00	380137.50	558802.13	1182227.63
Cresols (Methylphenols)	1,041	9,301	11626250.00	10812412.50	15894246.38	33626602.88
Cyanide (free)	200	N/A	N/A	N/A	N/A	N/A
4,4'-DDD	0.0059	0.0059	7.375	6.859	10.082	21.331
4,4'-DDE	0.0040	0.0040	5.000	4.650	6.836	14.462
4,4'-DDT	0.0040	0.0040	5.000	4.650	6.836	14.462
2,4'-D	70	N/A	N/A	N/A	N/A	N/A

Danitol	262	473	591250.00	549862.50	808297.88	1710072.38
1,2-Dibromoethane	0.17	4.24	5300.00	4929.00	7245.63	15329.19
m-Dichlorobenzene (1,3-Dichlorobenzene)	473	1,445	1806250.00	1679812.50	2469324.38	5224216.88
o-Dichlorobenzene (1,2-Dichlorobenzene)	600	4,336	5420000.00	5040600.00	7409682.00	15676266.00
p-Dichlorobenzene (1,4-Dichlorobenzene)	75	N/A	N/A	N/A	N/A	N/A
3,3'-Dichlorobenzidine	0.32	0.44	550.00	511.50	751.91	1590.77
1,2-Dichloroethane	5	553	691250.00	642862.50	945007.88	1999302.38
1,1-Dichloroethylene	7	23,916	29895000.00	27802350.00	40869454.50	86465308.50
Dichloromethane (Methylene Chloride)	5	22,222	27777500.00	25833075.00	37974620.25	80340863.25
1,2-Dichloropropane	5	226	282500.00	262725.00	386205.75	817074.75
1,3-Dichloropropene (1,3- Dichloropropylene)	3.4	211	263750.00	245287.50	360572.63	762844.13
Dicofol	0.30	0.30	375.00	348.75	512.66	1084.61
Dieldrin	0.001	0.001	1.2500	1.1625	1.7089	3.6154
2,4-Dimethylphenol	257	571	713750.00	663787.50	975767.63	2064379.13
Di-n-Butyl Phthalate	1,318	3,010	3762500.00	3499125.00	5143713.75	10882278.75
Dioxins/Furans (TCDD Equivalents)	7.80E-08	7.97E-08	9.96E-05	9.27E-05	1.36E-04	2.88E-04
Endrin	0.20	0.20	250.00	232.50	341.78	723.08
Ethylbenzene	700	7,143	8928750.00	8303737.50	12206494.13	25824623.63
Fluoride	4,000	N/A	N/A	N/A	N/A	N/A
Heptachlor	0.0015	0.0015	1.8750	1.7438	2.5633	5.4231
Heptachlor Epoxide	0.00074	0.00075	0.9375	0.8719	1.2817	2.7115
Hexachlorobenzene	0.0044	0.0045	5.6250	5.2313	7.6899	16.2692
Hexachlorobutadiene	6.5	274	342500.00	318525.00	468231.75	990612.75
Hexachlorocyclohexane (alpha)	0.050	0.093	116.25	108.11	158.93	336.23
Hexachlorocyclohexane (beta)	0.17	0.33	412.50	383.63	563.93	1193.07
Hexachlorocyclohexane (gamma) (Lindane)	0.2	6.2	7750.00	7207.50	10595.03	22415.33
Hexachlorocyclopentadiene	50	N/A	N/A	N/A	N/A	N/A
Hexachloroethane	4.97	11.51	14387.50	13380.38	19669.15	41612.97
Hexachlorophene	2.05	2.90	3625.00	3371.25	4955.74	10484.59
Lead	1.15	3.83	36216.02	33680.90	49510.93	104747.60
Mercury	0.0122	0.0122	15.250	14.183	20.848	44.108
Methoxychlor	1.59	1.61	2012.50	1871.63	2751.29	5820.75
Methyl Ethyl Ketone	13,865	992,000	1240000000	1153200000	1695204000	3586452000
Nickel	332	1,140	7085025.18	6589073.42	9685937.93	20492018.33
Nitrate-Nitrogen (as Total Nitrogen)	10,000	N/A	N/A	N/A	N/A	N/A
Nitrobenzene	45	1,853	2316250.00	2154112.50	3166545.38	6699289.88
N-Nitrosodiethylamine	0.0037	2.1	2625.000	2441.250	3588.638	7592.288
N-Nitroso-di-n-Butylamine	0.119	4.2	5250.00	4882.50	7177.28	15184.58
Pentachlorobenzene	1.0	1.0	1250.00	1162.50	1708.88	3615.38
Pentachlorophenol	0.80	9.1	11375.00	10578.75	15550.76	32899.91
Polychlorinated Biphenyls (PCBs)	6.4E-04	6.4E-04	8.00E-01	7.44E-01	1.09E+00	2.31E+00
Pyridine	23	947	1183750.00	1100887.50	1618304.63	3423760.13

Selenium	50	N/A	N/A	N/A	N/A	N/A
1,2,4,5-Tetrachlorobenzene	0.65	0.71	887.50	825.38	1213.30	2566.92
1,1,2,2-Tetrachloroethane	1.7	40	50000.00	46500.00	68355.00	144615.00
Tetrachloroethylene	5	525	656250.00	610312.50	897159.38	1898071.88
Thallium	0.12	0.23	287.50	267.38	393.04	831.54
Toluene	1,000	N/A	N/A	N/A	N/A	N/A
Toxaphene	0.0053	0.0053	6.625	6.161	9.057	19.161
2,4,5-TP (Silvex)	19	21	26250.00	24412.50	35886.38	75922.88
1,1,1-Trichloroethane	200	956,663	1195828750	1112120738	1634817484	3458695494
1,1,2-Trichloroethane	5	295	368750.00	342937.50	504118.13	1066535.63
Trichloroethylene	5	82	102500.00	95325.00	140127.75	296460.75
2,4,5-Trichlorophenol	1,194	2,435	3043750.00	2830687.50	4161110.63	8803438.13
TTHM (Sum of Total Trihalomethanes)	80	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride	0.25	24	30000.00	27900.00	41013.00	86769.00

CALCULATE 70% AND 85% OF DAILY AVERAGE EFFLUENT LIMITATIONS:

Aquatic Life

Parameter	70%	85%
Aldrin	164.640	199.920
Aluminum	54386.080	66040.240
Arsenic	36128.357	43870.148
Cadmium	77227.883	93776.715
Carbaryl	109.760	133.280
Chlordane	16.738	20.325
Chlorpyrifos	4.555	5.531
Chromium (+3)	10397352.25	12625356.31
Chromium (+6)	861.616	1046.248
Copper	132918.590	161401.145
Cyanide (free)	2513.504	3052.112
4,4'-DDT	4.185	5.081
Demeton	418.460	508.130
Diazinon	9.330	11.329
Dicofol	3254.384	3951.752
Dieldrin	8.369	10.163
Diuron	11524.800	13994.400
Endosulfan (alpha)	12.074	14.661
Endosulfan (beta)	12.074	14.661
Endosulfan sulfate	12.074	14.661
Endrin	4.720	5.731
Guthion	41.846	50.813
Heptachlor	16.738	20.325

Hexachlorocyclohexane (Lindane)	61.795	75.037
Lead	1035629.504	1257550.113
Malathion	41.846	50.813
Mercury	131.712	159.936
Methoxychlor	125.538	152.439
Mirex	4.185	5.081
Nickel	3266895.458	3966944.485
Nonylphenol	1536.640	1865.920
Parathion (ethyl)	3.567	4.332
Pentachlorophenol	478.736	581.322
Phenanthrene	1646.400	1999.200
Polychlorinated Biphenyls (PCBs)	58.584	71.138
Selenium	1097.600	1332.800
Silver	1577.318	1915.315
Toxaphene	0.8369	1.0163
Tributyltin (TBT)	7.134	8.663
2,4,5 Trichlorophenol	7463.680	9063.040
Zinc	1377251.958	1672377.378

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450

Human Health

<i>Parameter</i>	<i>70%</i>	<i>85%</i>
Acrylonitrile	4545.608	5519.666
Aldrin	1.196	1.453
Anthracene	N/A	N/A
Antimony	1281143.588	1555674.356
Arsenic	N/A	N/A
Barium	N/A	N/A
Benzene	613657.013	745154.944
Benzidine	2.392	2.905
Benzo(a)anthracene	3923.577	4764.344
Benzo(a)pyrene	394.750	479.339
Bis(chloromethyl)ether	526.334	639.119
Bis(2-chloroethyl)ether	12033.898	14612.590
Bis(2-ethylhexyl)phthalate	49044.713	59554.294
Bromodichloromethane (Dichlorobromomethane)	385180.425	467719.088
Bromoform	2601762.188	3159282.656
Cadmium	N/A	N/A
Carbon Tetrachloride	36484.481	44302.584
Chlordane	9.689	11.766
Chlorobenzene	6221501.213	7554680.044
Chlorodibromomethane (Dibromochloromethane)	285894.788	347157.956
Chloroform	8544545.888	10375520.006

Chromium (+6)	600498.68	729176.96
Chrysene	391161.488	474981.806
Cresols (Methylphenols)	11125972	13510109
Cyanide (free)	N/A	N/A
4,4'-DDD	7.058	8.570
4,4'-DDE	4.785	5.810
4,4'-DDT	4.785	5.810
2,4'-D	N/A	N/A
Danitol	565808.513	687053.194
1,2-Dibromoethane	5071.941	6158.786
m-Dichlorobenzene (1,3-Dichlorobenzene)	1728527.063	2098925.719
o-Dichlorobenzene (1,2-Dichlorobenzene)	5186777.400	6298229.700
p-Dichlorobenzene (1,4-Dichlorobenzene)	N/A	N/A
3,3'-Dichlorobenzidine	526.334	639.119
1,2-Dichloroethane	661505.513	803256.694
1,1-Dichloroethylene	28608618.150	34739036.325
Dichloromethane (Methylene Chloride)	26582234.175	32278427.213
1,2-Dichloropropane	270344.025	328274.888
1,3-Dichloropropene (1,3- Dichloropropylene)	252400.838	306486.731
Dicofol	358.864	435.763
Dieldrin	1.196	1.453
2,4-Dimethylphenol	683037.338	829402.481
Di-n-Butyl Phthalate	3600599.625	4372156.688
Dioxins/Furans (TCDD Equivalents)	9.53E-05	1.16E-04
Endrin	239.243	290.509
Ethylbenzene	8544545.888	10375520.006
Fluoride	N/A	N/A
Heptachlor	1.794	2.179
Heptachlor Epoxide	0.897	1.089
Hexachlorobenzene	5.383	6.536
Hexachlorobutadiene	327762.225	397996.988
Hexachlorocyclohexane (alpha)	111.248	135.087
Hexachlorocyclohexane (beta)	394.750	479.339
Hexachlorocyclohexane (gamma) (Lindane)	7416.518	9005.771
Hexachlorocyclopentadiene	N/A	N/A
Hexachloroethane	13768.406	16718.779
Hexachlorophene	3469.016	4212.377
Lead	34657.648	42084.286
Mercury	14.594	17.721
Methoxychlor	1925.902	2338.595
Methyl Ethyl Ketone	1186642800	1440923400
Nickel	6780156.548	8233047.237

Nitrate-Nitrogen (as Total Nitrogen)	N/A	N/A
Nitrobenzene	2216581.763	2691563.569
N-Nitrosodiethylamine	2512.046	3050.342
N-Nitroso-di-n-Butylamine	5024.093	6100.684
Pentachlorobenzene	1196.213	1452.544
Pentachlorophenol	10885.534	13218.148
Polychlorinated Biphenyls (PCBs)	0.7656	0.9296
Pyridine	1132813	1375559
Selenium	N/A	N/A
1,2,4,5-Tetrachlorobenzene	849.311	1031.306
1,1,2,2-Tetrachloroethane	47848.500	58101.750
Tetrachloroethylene	628011.563	762585.469
Thallium	275.129	334.085
Toluene	N/A	N/A
Toxaphene	6.340	7.698
2,4,5-TP (Silvex)	25120.463	30503.419
1,1,1-Trichloroethane	1144372239	1389594862
1,1,2-Trichloroethane	352882.688	428500.406
Trichloroethylene	98089.425	119108.588
2,4,5-Trichlorophenol	2912777.438	3536944.031
TTHM (Sum of Total Trihalomethanes)	N/A	N/A
Vinyl Chloride	28709.100	34861.050