10/26/2018

EPA's Calculations for Proposed Great Bay Total Nitrogen General Permit

Provided below are calculations to develop total nitrogen allocations for facilities discharging into the Great Bay Estuary (GBE). These calculations are based upon a loading threshold of 100 kg/ha-yr to the entire Great Bay Estuary.

Under this proposed approach (Scenario A), treatment facilities with greater than 2.0 mgd design flow would have annual mass-based limits based upon 8 mg/l at existing average flows. Facilities with less than 2.0 mgd design flow would be required to hold their existing TN load (also as annual mass-based limits). The permit would also require optimization of nitrogen removal for all facilities under 2.0 mgd design flow.

Non-point source reductions of approximately 43% (normalized to average rainfall) throughout the estuary would be needed to meet the loading threshold. We understand that NHDES plans to require control of non-point sources of nitrogen.

Additionally, the permit would require ambient monitoring to track the recovery of the estuary as nitrogen loads are reduced. Other scenarios for alternate load limits (Scenarios B, C and D) with corresponding non-point source reduction requirements were also considered and are presented below.

Table 1 - Great Bay Total Nitrogen Allocations to Point Sources

									Scenario A						
Town	**Receiving Water**	**Design Flow (mgd)**	**2012-2016 Ave Flow (mgd)**	**2012-2016 Ave TN Conc (mg/l)**	**Actual Load in Effluent (lbs/day)**	**Delivery Factor (%)***	**Actual Load to GBE (lbs/day)**	**% of Total Point Source Load**	**Permit Limit Basis (mg/L)**	**Permit Limit (lbs/day)**	**Delivery Factor (%)***	**Actual Load to GBE (lbs/day)**	**% of Total Point Source Load**	**equiv conc @ design flow**
Rochester	Cocheco River	5.03	2.97	16.9	418.8	75.56	316.4	12%	8	**198**	75.56	149.8	14%	4.7
Portsmouth	Lower Piscataqua	4.8	4.03	30	1009.4	100	1009.4	38%	8	**269**	100	269.2	25%	6.7
Dover	Upper Piscataqua	4.7	2.46	18.2	372.9	100	372.9	14%	8	**164**	100	163.9	15%	4.2
Exeter	Squamscott River	3	1.61	22.6	304.0	100	304.0	11%	8	**108**	100	107.6	10%	4.3
Durham	Oyster River	2.5	0.90	12.8	95.7	100	95.7	4%	8	**60**	100	59.8	5%	2.9
Kittery	Lower Piscataqua	2.5	0.90	19.4	146.1	100	146.1	5%	8	**60**	100	60.2	5%	2.9
Somersworth	Salmon Falls River	2.4	1.44	6.8	81.6	94.94	77.5	3%	8	**82**	94.94	77.5	7%	4.1
Pease ITP	Lower Piscataqua	1.2	0.64	8.7	46.4	100	46.4	2%	hold	**46**	100	46.4	4%	4.6
Berwick	Salmon Falls River	1.1	0.21	16.7	28.9	94.55	27.3	1%	hold	**29**	94.55	27.3	2%	3.1
North Berwick	Great Works River	1	0.20	18.2	30.4	51.56	15.7	1%	hold	**30**	51.56	15.7	1%	3.6
Newmarket	Lamprey River	0.85	0.52	8	170.2	100	170.2	6%	hold	**35**	100	34.8	3%	4.9
South Berwick	Salmon Falls River	0.567	0.28	5.9	13.9	100	13.9	1%	hold	**14**	100	13.9	1%	2.9
Epping	Lamprey River	0.5	0.25	18.2	37.4	58.2	21.8	1%	hold	**37**	58.2	21.8	2%	9.0
Newington	Lower Piscataqua	0.29	0.11	17.6	15.6	100	15.6	1%	hold	**16**	100	15.6	1%	6.5
Rollinsford	Salmon Falls River	0.15	0.08	18.2	11.5	98.96	11.4	0%	hold	**12**	98.96	11.4	1%	9.2
Newfields	Squamscott River	0.117	0.09	21.5	16.0	100	16.0	1%	hold	**16**	100	16.0	1%	16.4
Milton	Salmon Falls River	0.1	0.07	18.2	10.8	65.7	7.1	0%	hold	**11**	65.7	7.1	1%	12.9
Total					2809.6		2667.4	100%		**1186**		1098.0	100%	
		estimated (no data)			**Converting to kg/ha-yr**									
		post-upgrade for Newmarket												
					85.5	**kg/ha-yr**	**81.2**	**kg/ha-yr**		**36.1**	**kg/ha-yr**	**33.4**	**kg/ha-yr**	

Great Bay Estuary (GBE) surface area:
5,439 Hectares (21 sq mi)
GBE surface area includes all surface area of estuary below head-of-tide dams in each tributary to the mouth of Portsmouth Harbor

largest 7 WWTFs make up 87% of 2012-2016 point source load delivered to GBE
smallest 10 WWTFs make up 13% of 2012-2016 point source load delivered to GBE

*All discharges directly to GBE were given delivery factor of 100%.

Table 1 - Great Bay Total Nitrogen Allocations to Point Sources (continued)													
	Scenario B				Scenario C				Scenario D			
Town	Permit Limit Basis @ design flow (mg/L)	Permit Limit (lbs/day)	Delivery Factor (%)	Actual Load to GBE (lbs/day)	Permit Limit Basis @ design flow (mg/L)	Permit Limit (lbs/day)	Delivery Factor (%)	Actual Load to GBE (lbs/day)	Permit Limit Basis @ design flow (mg/L)	Permit Limit (lbs/day)	Delivery Factor (%)	Actual Load to GBE (lbs/day)
Rochester	3	126	75.56	95.1	3	126	75.56	95.1	3	126	75.56	95.1
Portsmouth	3	120	100	120.2	3	120	100	120.2	3	120	100	120.2
Dover	3	118	100	117.7	3	118	100	117.7	3	118	100	117.7
Exeter	3	75	100	75.1	3	75	100	75.1	3	75	100	75.1
Durham	3	63	100	62.6	3	63	100	62.6	3	63	100	62.6
Kittery	3	63	100	62.6	3	63	100	62.6	3	63	100	62.6
Somersworth	3	60	94.94	57.0	3	60	94.94	57.0	3	60	94.94	57.0
Pease ITP	hold	44	100	43.6	5	50	100	50.1	3	30	100	30.0
Berwick	hold	28	94.55	26.4	5	46	94.55	43.4	3	28	94.55	26.0
North Berwick	hold	30	51.56	15.7	5	42	51.56	21.5	3	25	51.56	12.9
Newmarket	hold	33	100	33.4	5	35	100	35.5	3	21	100	21.3
South Berwick	hold	15	100	14.8	5	24	100	23.7	3	14	100	14.2
Epping	hold	30	58.2	17.7	8	33	58.2	19.4	3	13	58.2	7.3
Newington	hold	15	100	14.7	8	19	100	19.4	3	7	100	7.3
Rollinsford	hold	15	98.96	15.0	8	10	98.96	9.9	3	4	98.96	3.7
Newfields	hold	18	100	17.9	8	8	100	7.8	3	3	100	2.9
Milton	hold	15	65.7	10.0	8	7	65.7	4.4	3	3	65.7	1.6
		867		799.3		898		825.3		771		717.6
	Converting to kg/ha-yr				**Converting to kg/ha-yr**				**Converting to kg/ha-yr**			
		26.4	**kg/ha-yr**	**24.3**		**27.3**	**kg/ha-yr**	**25.1**		**23.5**	**kg/ha-yr**	**21.8**

Table 2 - Non-Point Source Nitrogen Reduction Requirements for each Point Source Resuction Scenario

Year	GBE NPS Loading		NPS Load Normalized to average rainfall*		
	tons/yr	kg/ha-yr	kg/ha-yr		
2012	645.2	107.6	119.8		
2013	642	107.1	110.1		
2014	760.8	126.9	129.8		
2015	498.5	83.1	99.4		
2016	451.6	75.3	89.3		
		100.0	109.7	2012-2016 average	
		6.6	7.3	2012-2016 LPR NPS Load**	
		106.6	**117.0**	2012-2016 Total NPS Load	

Loading target: 100 kg/ha-yr

Scenario	Loading Target	WWTF Load	NPS Load Target	NPS % Reduction Required (from 2012-2016 levels)	
	kg/ha-yr	kg/ha-yr	kg/ha-yr	%	%
A	100	33.4	66.6	38%	**43%**
B	100	24.4	75.6	29%	35%
C	100	25.1	74.9	30%	36%
D	100	21.8	78.2	27%	33%
				Based on actual 2012-2016 data	Normalized to 1988-2017 average rainfall*

*Normalized to 1988-2017 average rainfall in Durham, NH (45.2 in/yr) taken from www.ncdc.noaa.gov database

**LPR NPS Load taken from GBNNPSS Report because not accounted for in the SOOE NPS data

Abbreviations:

GBE = Great Bay Estuary

NPS = Non-Point Source

WWTF = Wastewater Treatment Facility

LPR = Lower Piscataqua River

GBNNPSS = Great Bay Nitrogen Non-Point Source Study (2014)

SOOE = State of Our Estuaries (2018 report)