Relationship of Load Reduction Calculated by PAT To Other Return Frequencies

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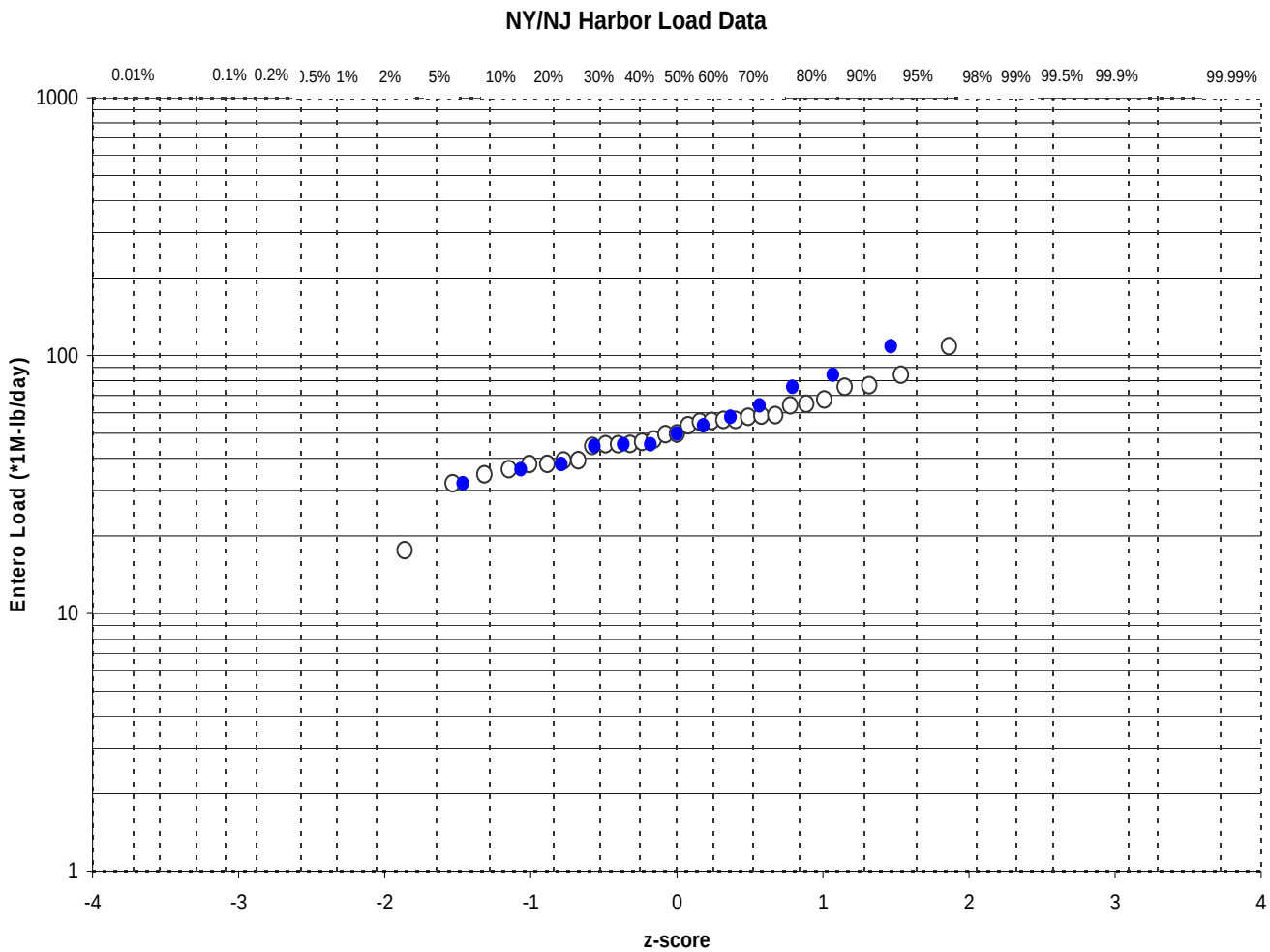
Re-Evaluation of Recurrence Interval Concentrations

- **NYSDEC Concern That PAT Model Too Conservative**
  - Uses 2003 as the Base
- **Re-evaluated Long –Term RAINMAN Loadings**
  - Compare 31- year record with 13-year record
- **Computed Harbor Loadings for Each Day**
  - Temperature Corrected Loadings
  - Computed 30-day Loadings
  - Determined Max 30-day Loadings for Summer Period
- **Compared 31-year an 13-year Probability Distributions**

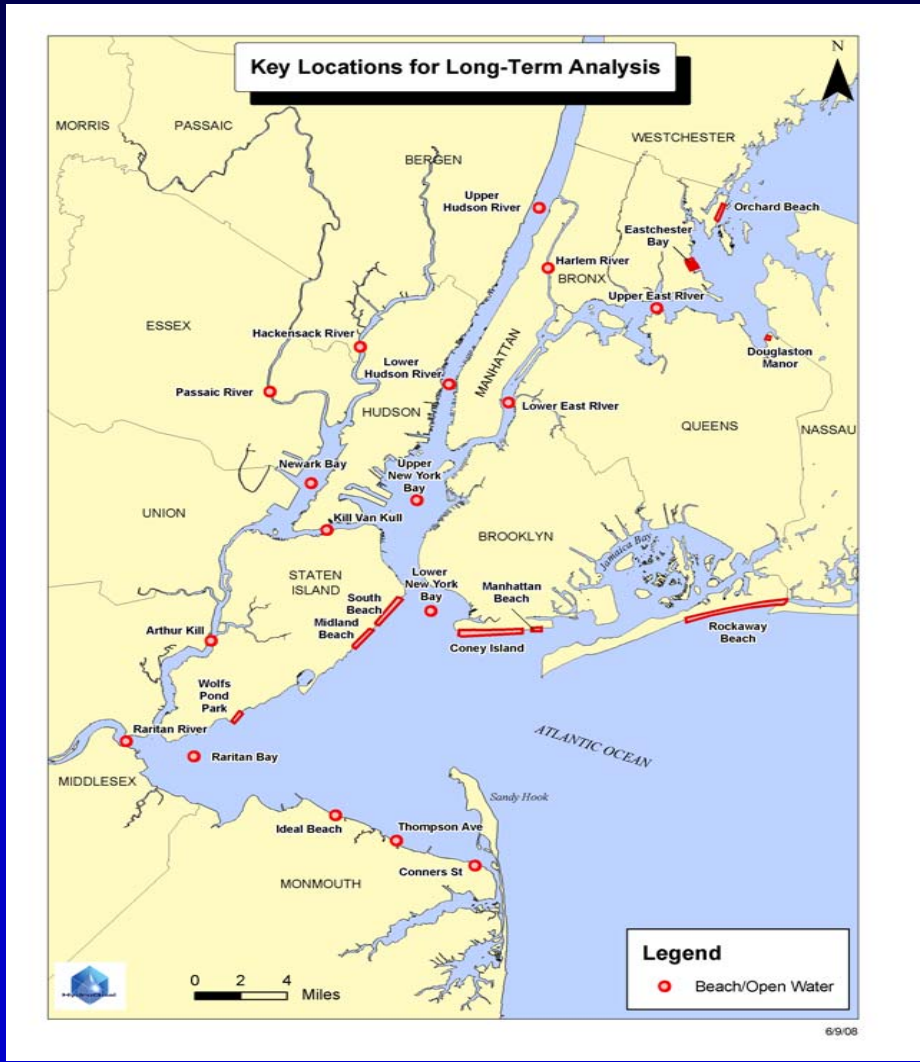

NY/NJ Harbor Load Data
0.01%
0.1%
0.2%
).5%
1%
2%
5%
10%
20%
30%
40%
50%
60%
70%
80%
90%
95%
98%
99%
99.5%
99.9%
99.99%
1000
100
10
1
Entero Load (*1M-lb/day)
-4
-3
-2
-1
0
1
2
3
4
z-score

Recurrence Interval Adjustments

- **Observations**
  - Distributions are Similar
  - However, the tails for the 31-year distribution are “stretched”
  - 2003 has a probability of 93.75 (16 year return interval)

- **Recommendation**
  - Adjust the Z-Scores of the 13-year simulation to match the Z-scores of the 31 year analysis
  - Re-calculate the Max 30-day Geometric Concentrations for various Recurrence Intervals

Selected Key Locations



Enterococci Max 30-day GM Open Waters

	Recurrence Interval (Years)					
Location	**2**	**3**	**4**	**5**	**10**	**PAT Model**
Harlem River	32	37	42	48	72	110
Upper Hudson River	9	10	13	15	19	25
Lower Hudson River	17	18	24	28	34	48
Upper East River	27	36	39	42	67	103
Lower East River	30	38	43	47	69	98
Upper New York Bay	18	21	26	30	39	53
Lower New York Bay	12	16	19	22	30	40
Arthur Kill	93	104	112	125	194	236
Kill Van Kull	41	45	53	62	99	142
Raritan Bay	23	23	27	32	55	66
Raritan River	62	68	82	95	132	164
Newark Bay	81	92	114	138	212	306
Hackensack River	81	92	116	138	189	222
Passaic River	464	490	570	623	630	730

Return Period Relation

- **TMDL Is A Mass Loading Rate**
  - **Allowable Load To Meet Standard**
  - **Therefore the TMDL is Independent of Year**
- **Mass Loading Rate Calculated By PAT Is The TMDL**
- **However, Percent Reduction Must Be Adjusted To The Desired Return Frequency**

Example: Management Zone X For 5 Year Return Period

- **Mass Loading Rate (10 Yr) = 150**
- **Alternative (From PAT) = 60% of Total (40% Reduction)**
  Therefore, TMDL = 90
- **Mass Loading Rate (5Yr) = 100**
- **Percent Reduction (5Yr)**
  Equals (100-90)/100 = 10% Reduction
- **Or**
  Percent Reduction (5YR)
  = 1 – [(10Yr Load/5Yr Load) * PAT % of Total]
  Therefore Only Needs Table Of 10yr/5Yr (Load Reduction Factor) For Each Area

Calculating Load Reduction Factors

- **Basic Formula**

  Percent Reduction (RP)

  = 1 – [(PAT Load/RP Load) * PAT % of Total]

- **Loads Vary Between Locations**
- **Responses Vary Between Locations (Hydrodynamics)**
- **Therefore, Instead of Using Load Ratios – Use Ratios of Final Concentrations Which is the Load Response**
- **The Reduction Factors are Simply the Ratio of the PAT Response to the RP Response**

Approximate Reduction Factors

Translator	Harbor	Passaic
PAT/10yr	1.4	1.16
PAT/5yr	2.0	1.17
PAT/4yr	2.3	1.28
PAT/3yr	2.7	1.49
PAT/2yr	3.2	1.57

Example Conversions of PAT Removals To Other Return Intervals

New Return Interval	Percent Removal @ PAT 15% of Total (85 % Removal)	Percent Removal @ PAT 40% of Total (60 % Removal)
5 YR	70	20
4 YR	65	8
3 YR	60	- 8
2 YR	52	- 28