Passaic Trading Formula

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RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

Cornell University

Formula for trading

- NJDEP guidance
  - The trading program should attain the same or better result as 0.4 mg/l long term avg. (LTA) TP from each discharger on an annual basis *.
    - System is more sensitive to *concentration* of discharge than the *load*
    - →Trades must function to offset deviations of LTA from 0.4 mg/l
    - →Best way to do this: base the trading allocation on discharger actual flow, rather than permitted flow
      - Trading allocation is < TMDL allocation
    - * Modified for Lower Passaic dischargers (seasonal limits)

Formula for trading (cont.)

- Recommended formula

  Allocation =

  (0.4 mg/l LTA * Anticipated Actual Discharger Flow)

  - Anticipated Actual Discharger Flow based on average of 2005-2007 actual flow from facility.

  Balance = Allocation – Load Discharged

  - Actual load sold + Equalized load purchased

Formula for trading (cont.)

[(0.4 mg/l LTA * Anticipated *Actual flow*) – Load Discharged]

- Actual load sold + Equalized load purchased

- What if allocation is based on permitted flow?
  - Seller can take credit for more pounds than it has really removed; risk to stream

- Load discharged is function of actual LTA and flow from facility

Formula for trading (cont.)

BALANCE = Allocation – Load Discharged

- Actual load sold + Equalized load purchased

- Actual load sold
  - Load below allocation that seller has removed from effluent and sold
- Equalized load purchased =

  (Actual load sold * Trading ratio$_{\text{seller to buyer}}$)
  - Uses trading ratio to account for attenuation of TP between buyer and seller; all diversion conditions accounted for
  - Trading ratio of 0.5 means that 0.5 kg discharged from seller has same effect at target location as 1 kg discharged from buyer
  - Trading ratio table developed to guide all dischargers

Trading ratio table

- Grouped by management area and then point source zone
  - Three management areas
    - Upper Passaic, Pompton, Lower Passaic
  - Nine point source zones
    - Dead River Zone
    - Upper Passaic Zone 1
    - Upper Passaic Zone 2
    - Whippany Zone
    - Rockaway Zone
    - Pompton Headwaters Zone
    - Two Bridges Zone
    - Lower Passaic Zone 1
    - Lower Passaic Zone 2

Upper Passaic MA

Pompton MA

Lower Passaic MA

Example of trading ratio table

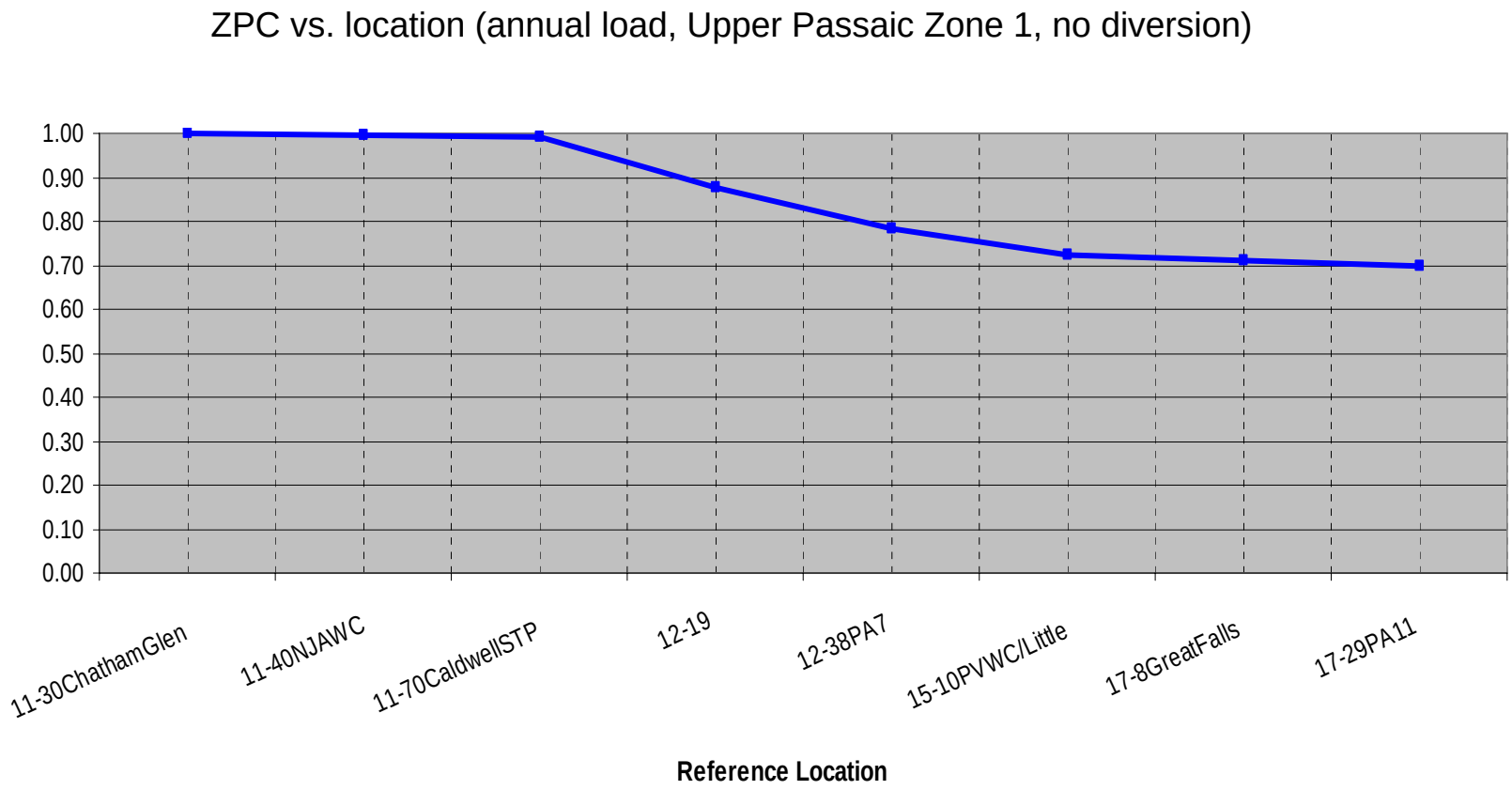
(Based on **No Diversion**, **Diversion**, **Extreme Diversion** Scenarios)

Seller \ Buyer	Dead River Zone (UP MA)	Upper Passaic Zone 2 (UP MA)	Lower Passaic Zone 1 (LP MA)
Upper Passaic Zone 1 (UP MA)	**0.90**	**0.78**	**0.57**
Whippany Zone (UP MA)	**0.82**	**0.77**	**0.52**
Pompton Headwater Zone (Pompton MA)	**0.49**	**0.43**	**0.29**
Lower Passaic Zone 2 (LP MA)			**0.87**

Derivation of trading ratios

- Omni Environmental performed attenuation analysis using calibrated TMDL model
- Considered “no diversion”, “diversion”, and “extreme diversion” scenarios
- Calculated attenuation of TP load from each zone as load moves downstream
- Result: “Zonal persistence coefficient” or *ZPC* for each zone
- *ZPC* is percent of discharged load that reaches target location

Example – Persistence coefficient analysis



Derivation of trading ratios (cont.)

- Trading ratio = (Seller $_{ZPC}$ / Buyer $_{ZPC}$), relative to common critical location.
  - Some ratios have 2 common critical locations; choose the critical location which yields the lower ratio.
- Calculate trading ratio for each diversion scenario,and select lowest ratio; max protection for WQ
  - Ratios further reduced by 10% as margin of safety
  - Experimented with “average” ratios, and “minimum” ratios in trade scenario simulations
    - Unsatisfactory results

Derivation of trading ratios: Example inter-MA trade, Pompton selling to Upper Passaic

- Seller: Two Bridges SA (Two Bridges Zone)
  - ZPC at Dundee Lake = 0.93, no diversion
  - ZPC at Dundee Lake = 0.47, diversion
  - ZPC at Dundee Lake = 0.25, extreme diversion
  - ZPC at Wanaque South = 1.00, extreme diversion
- Buyer: Warren Twp SA – Stage 5 (Dead Zone)
  - ZPC at Dundee Lake = 0.77, no diversion
  - ZPC at Dundee Lake = 0.62, diversion
  - ZPC at Dundee Lake = 0.37, extreme diversion
  - ZPC at Wanaque South = 0.13, extreme diversion
- Trading ratio = (Seller ZPC/Buyer ZPC)
  - No diversion, trading ratio = 1.21 = (0.93/0.77)
  - Diversion, trading ratio = 0.76 = (0.47/0.62)
  - Extreme diversion, trading ratio = 0.68 = min (0.25/0.37 , 1.0/0.13)
  - **Select 0.90*0.68 as trading ratio = <u>0.61</u>**

Table 5-7: FINAL trading ratio matrix, based on 90% of inter-point source zone ratios in table 4-5 (sellers in rows, buyers in columns)

		Upper Passaic Management Area					Pompton Management Area		Lower Passaic Management Area	
	Buyer / Seller	Dead Zone	Upper Passaic Zone 1	Upper Passaic Zone 2	Whippany zone	Rockaway Zone	Pompton Headwater Zone	Two Bridges Zone	Lower Passaic Zone 1	Lower Passaic Zone 2
Upper Passaic Management Area	Dead Zone	1.00	0.85	0.78	0.87	1.00	0.00	0.00	0.54	0.40
	Upper Passaic Zone 1	0.90	1.00	0.78	0.90	1.03	0.00	0.00	0.57	0.42
	Upper Passaic Zone 2	0.92	0.90	1.00	0.96	1.09	0.00	0.00	0.61	0.45
	Whippany zone	0.82	0.80	0.77	1.00	1.03	0.00	0.00	0.52	0.39
	Rockaway Zone	0.65	0.63	0.60	0.69	1.00	0.00	0.00	0.42	0.31
Pompton Management Area	Pompton Headwater Zone	0.49	0.46	0.43	0.50	0.62	1.00	0.72	0.29	0.21
	Two Bridges Zone	0.61	0.58	0.54	0.63	0.76	0.83	1.00	0.36	0.27
Lower Passaic Management Area	Lower Passaic Zone 1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.66
	Lower Passaic Zone 2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	1.00