Report on Point and Non-Point Source Analysis for Segment 56 in Reach 7, below Valencia WRP

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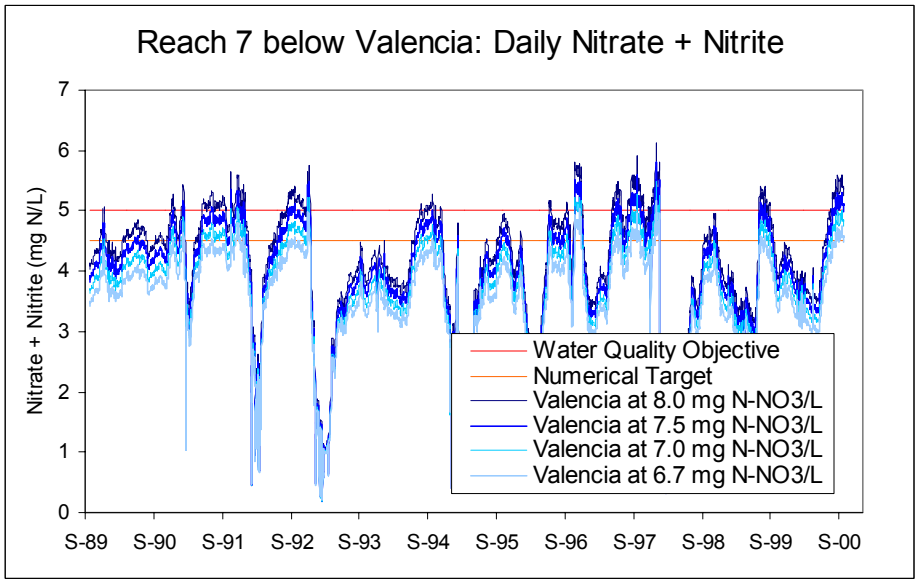
Based on the desired goal of reducing NPS loading from agricultural operations by 20%, we considered a 20% decrease in fertilizer application in all the catchments at or above Segment 56 (area immediately below Valencia), including the upper Reach 7, and all the areas in Reaches 8 and 9. The simulated daily nitrate + nitrite in-stream concentrations, at different levels of Valencia nitrate concentration in the effluent (from 6.7 to 8 mg N-NO3/L) are presented in Figure 1.

Figure 1. Simulated daily nitrate + nitrite in-stream concentrations



The Water Quality Objective (WQO, 5 mg NO2 + NO3 as N/L) and the Numerical Target (NT, 4.5 mg NO2 + NO3 as N/L) are exceeded during short periods typically near the end of the dry season and the first storm events. The statistics are presented in Table 1.

If the WQO and NT are evaluated on a daily basis, NT is exceeded around 5% of

the time in all cases if the Valencia effluent nitrate concentration is above 6.7 mg/L. It should be noted that the WQO can be met on a daily basis around 95% of the time even when the Valencia effluent nitrate concentration is 7.5 mg /L, and that the exceedance of the historical nitrite + nitrate concentration is relatively small in magnitude and duration, even at the higher Valencia loading rate (8 mg/L).

Table 1. Statistics of simulated daily nitrate + nitrite concentrations below Valencia

	Valencia effluent nitrate concentration			
	6.7 mg/L	**7.0 mg/L**	**7.5 mg/L**	**8.0 mg/L**
95 Percentile	4.5	4.8	5.1	5.3
99 Percentile	4.8	5.1	5.3	5.6
99.9 Percentile	5.0	5.3	5.6	5.9

From these simulations, a 20% decrease in agricultural fertilizer application has very little effect on the simulated concentrations in this reach, since the percentage of land use that is occupied by farms is less than 10% for all the catchments in this area, thus the total land application is small. Nitrogen fertilizer applied to the land is mostly being assimilated by the crops and surrounding vegetation, or is relatively slowly leaching down into the subsurface and then migrating towards the river. It is possible that this migration is slow and will not be evident in the river for a number of years. Groundwater concentration data would help to determine the magnitude of this process.

In addition, a significant amount of NPS loading is via atmospheric deposition, which is currently under analysis to evaluate the potential for reducing nitrate concentrations if stormwater BMPs such as bioswales are installed to reduce this loading during storm events. Failing septic systems might also be contributing significantly to loading in some specific areas.

Since it is uncertain whether a very small short term exceedance of the historical nitrate + nitrite concentration would have any significant effect on aquatic organisms, 30-day and 365-day rolling averages were calculated based on these simulation results. These are presented in Figures 2 and 3.

Figure 2. 30-day rolling average nitrate + nitrite in-stream concentrations

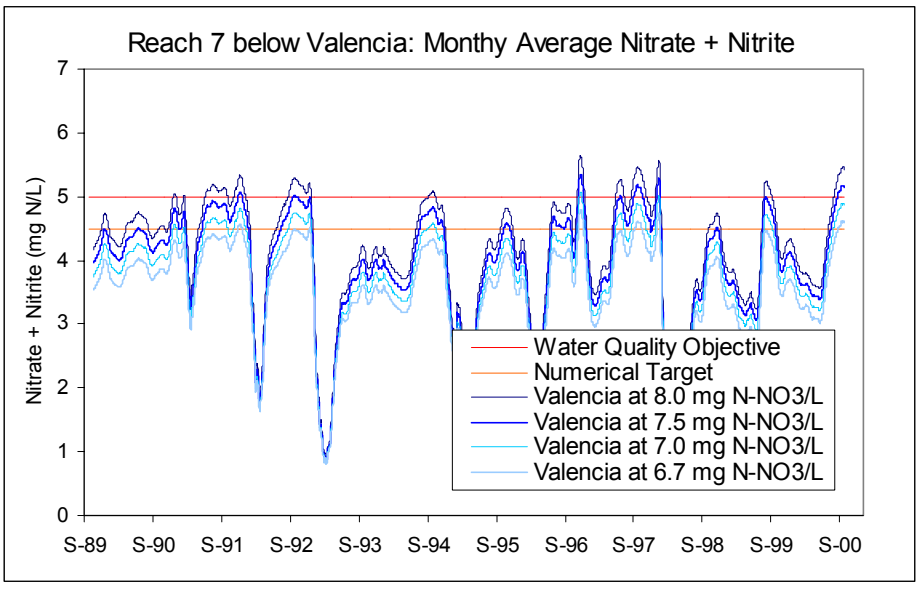


Table 2. Statistics of 30-day rolling average NO_2+ NO_3 concentrations below Valencia

	Valencia effluent nitrate concentration			
	6.7 mg/L	**7.0 mg/L**	**7.5 mg/L**	**8.0 mg/L**
95 Percentile	4.4	4.7	5.0	5.2
99 Percentile	4.6	4.9	5.2	5.5
99.9 Percentile	4.8	5.1	5.3	5.6

Figure 3. 365-day rolling average nitrate + nitrite in-stream concentrations

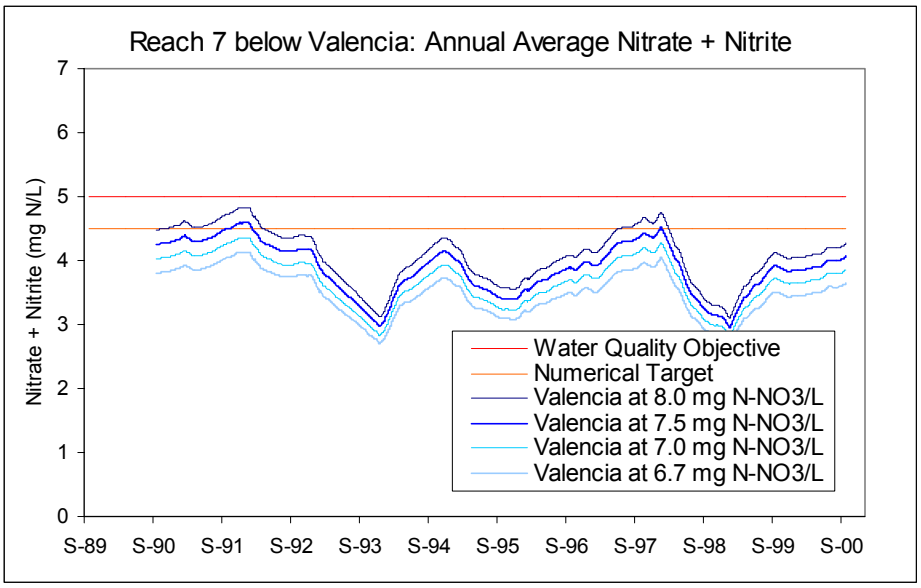


Table 3. Statistics of 365-day rolling average NO_2+ NO_3 conc. below Valencia

	Valencia effluent nitrate concentration			
	6.7 mg/L	**7.0 mg/L**	**7.5 mg/L**	**8.0 mg/L**
95 Percentile	4.0	4.2	4.5	4.7
99 Percentile	4.1	4.4	4.6	4.8
99.9 Percentile	4.1	4.4	4.6	4.8

As expected, with a longer averaging time there is a higher likelihood of compliance with the WQO for all Valencia WWTP loading scenarios.