VILLANOVA URBAN STORMWATER PARTNERSHIP

Constructed Stormwater Wetlands: Design and Function

Bridget M. Wadzuk
Robert G. Traver

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History of Villanova Constructed Stormwater Wetlands: 1999 CSW 1.0

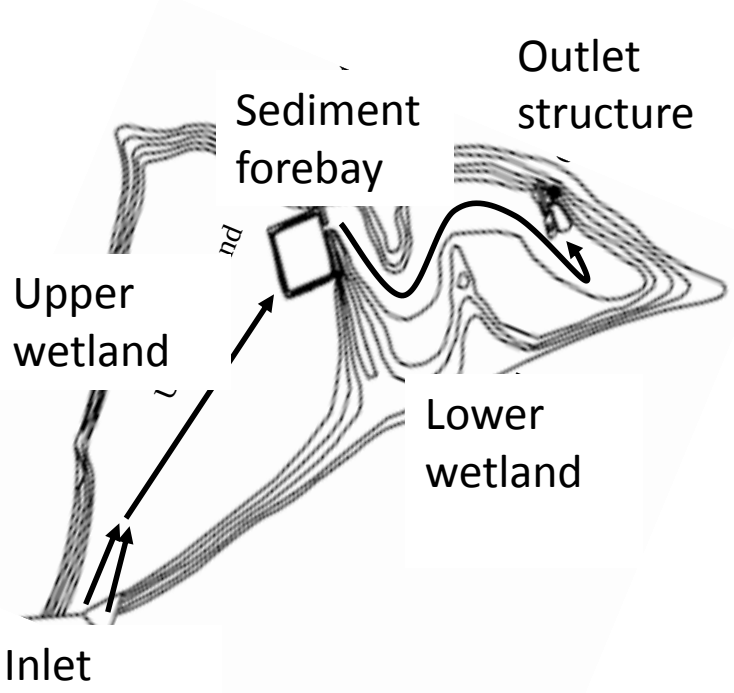
- Converted detention basin
- Utilized lower portion only due to campus development
- Water quality and quantity data collected off and on over 10 year period

History of Villanova Constructed Stormwater Wetlands: 2010 CSW 2.0

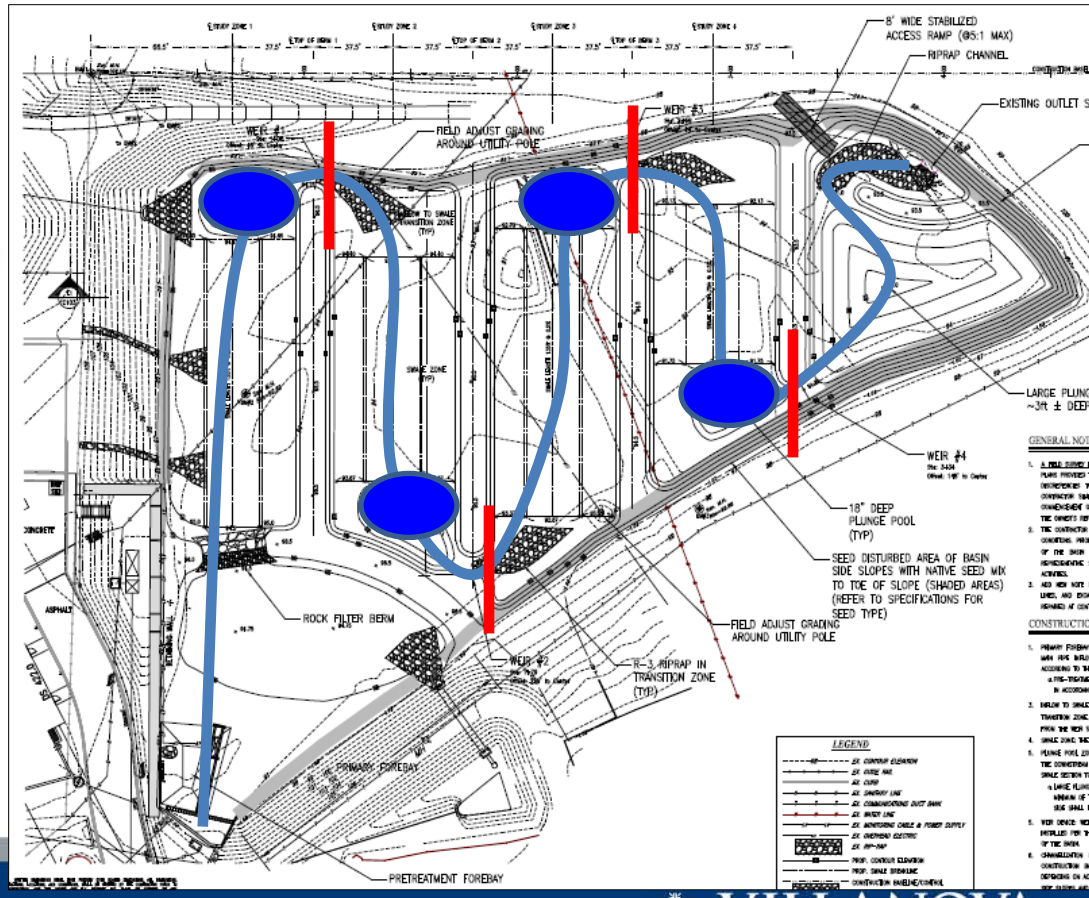
- Redesigned using total area
- Designed with **treatment zones**
- Water quality and quantity have been and will continue to be monitored
- Other research initiatives underway

Villanova CSW Details

- CSW 1.0

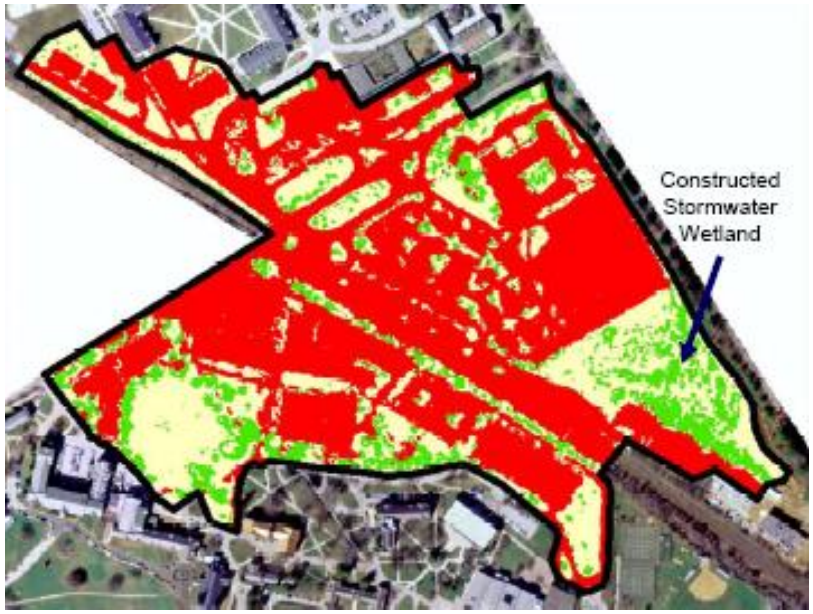


- CSW 2.0



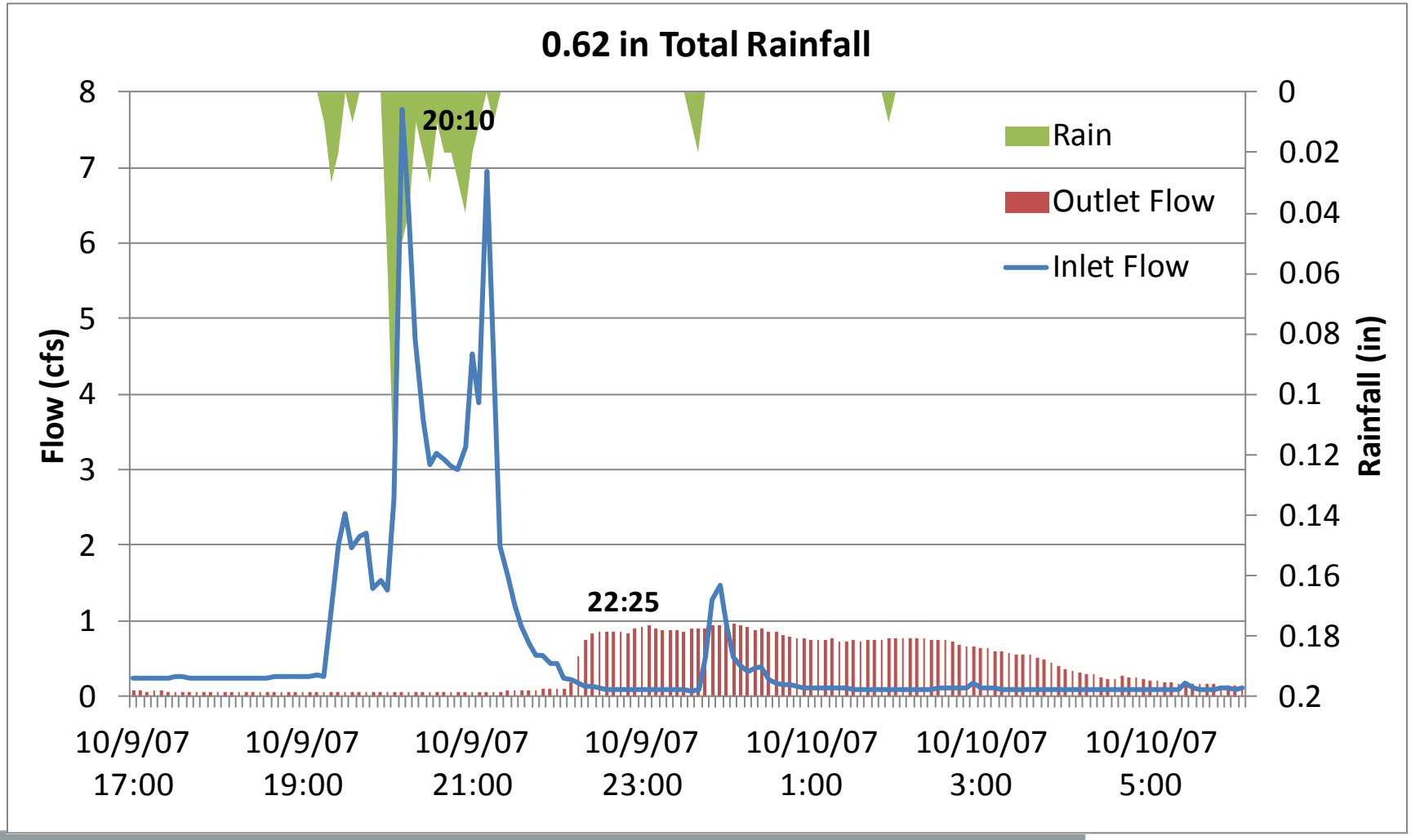
Villanova CSW Details

- Watershed
  - 19 ha watershed
    - 57% impervious
    - 12% pervious
    - 31% semi-pervious
  - Headwaters of Mill Creek, a tributary to the Schuylkill River
- CSW area = 0.4 ha

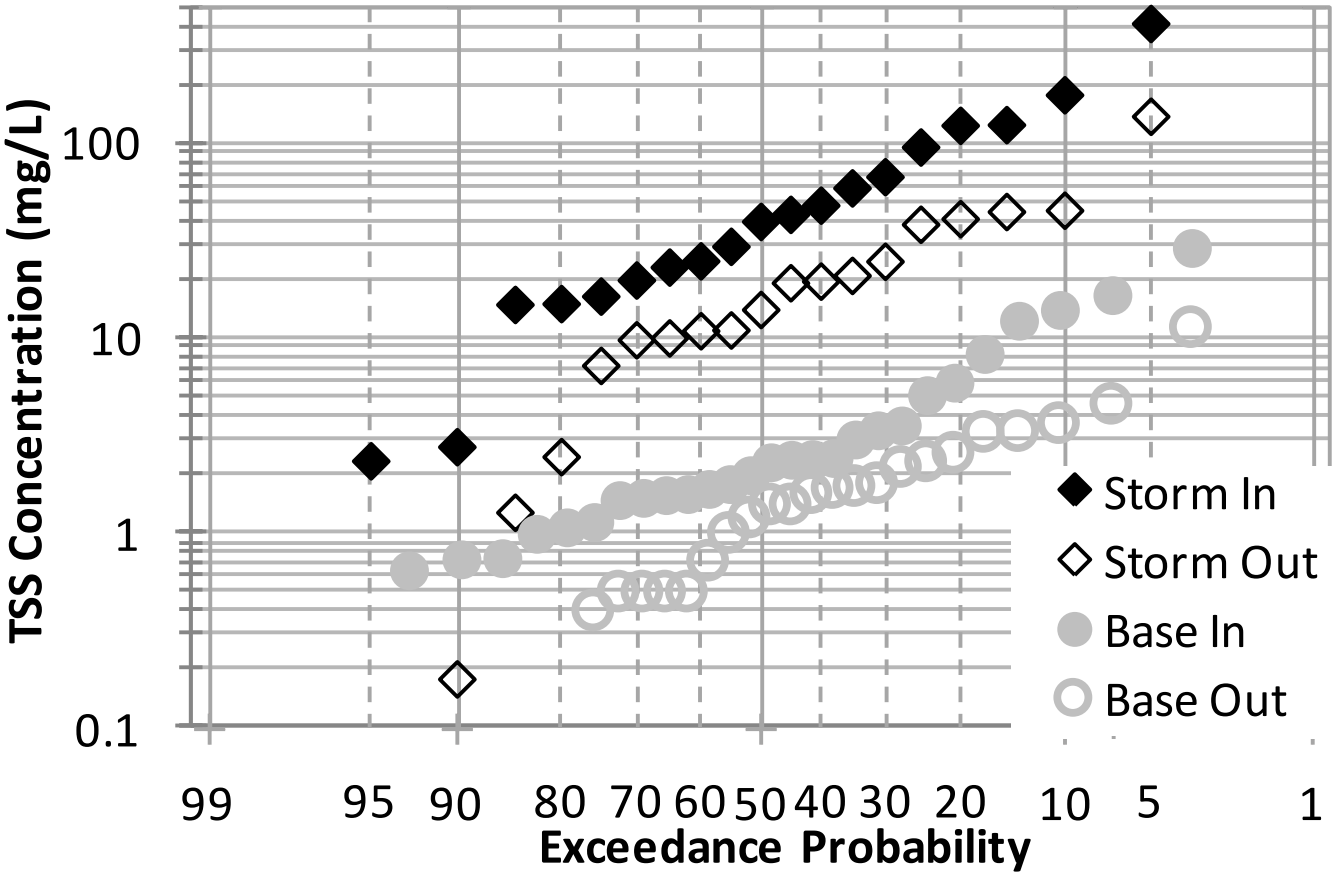


Impervious – red
Semipervious – yellow
Pervious – green

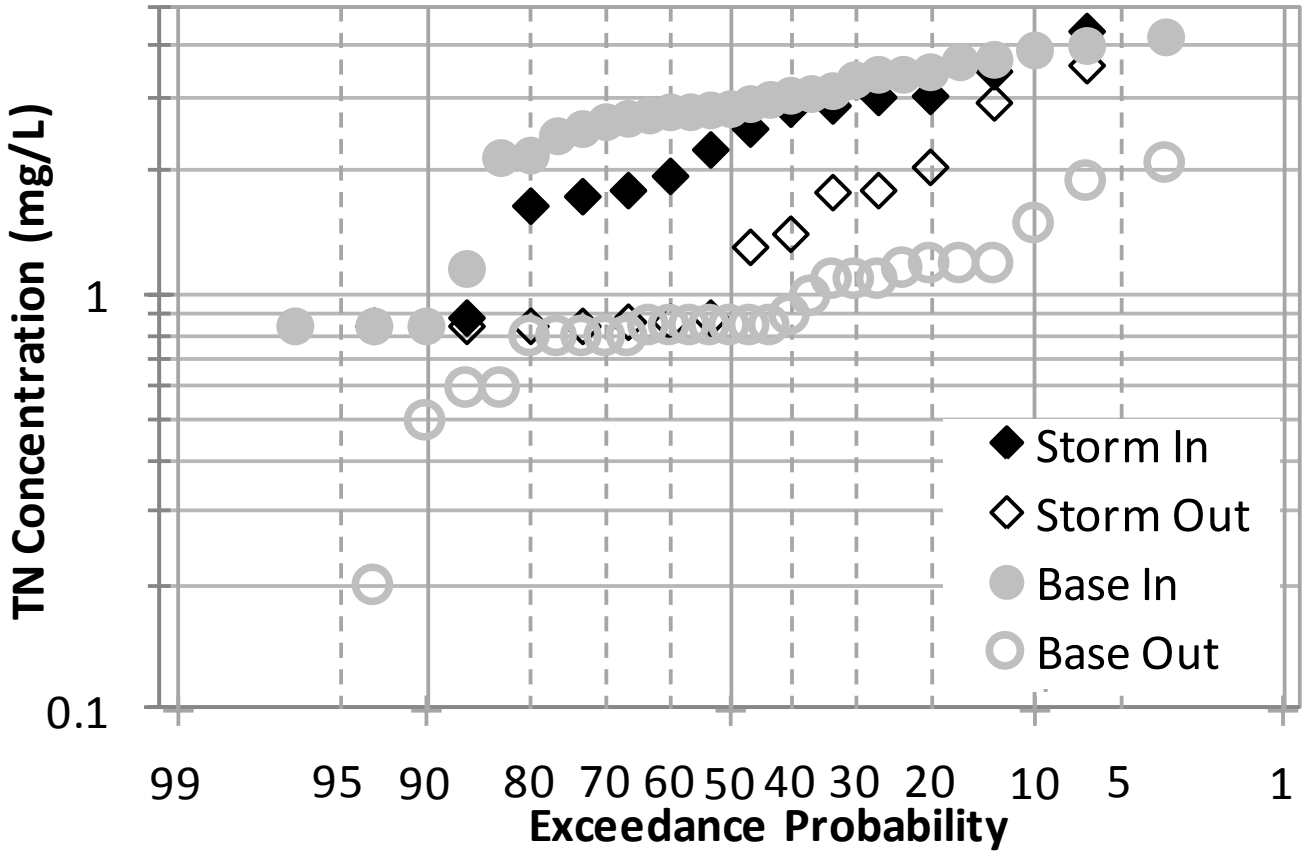
CSW 1.0 Flow Rate



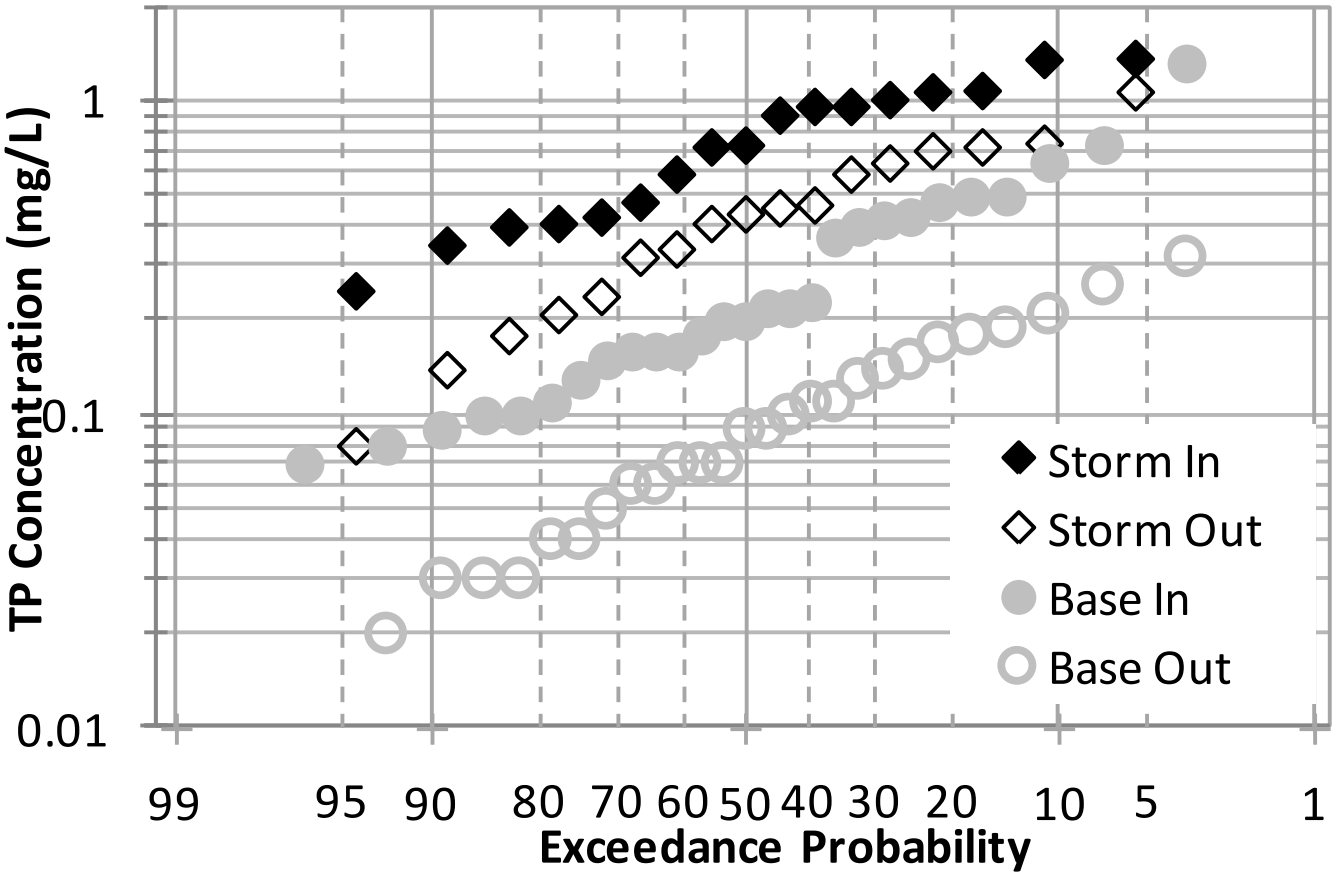
CSW 1.0 Water Quality - TSS



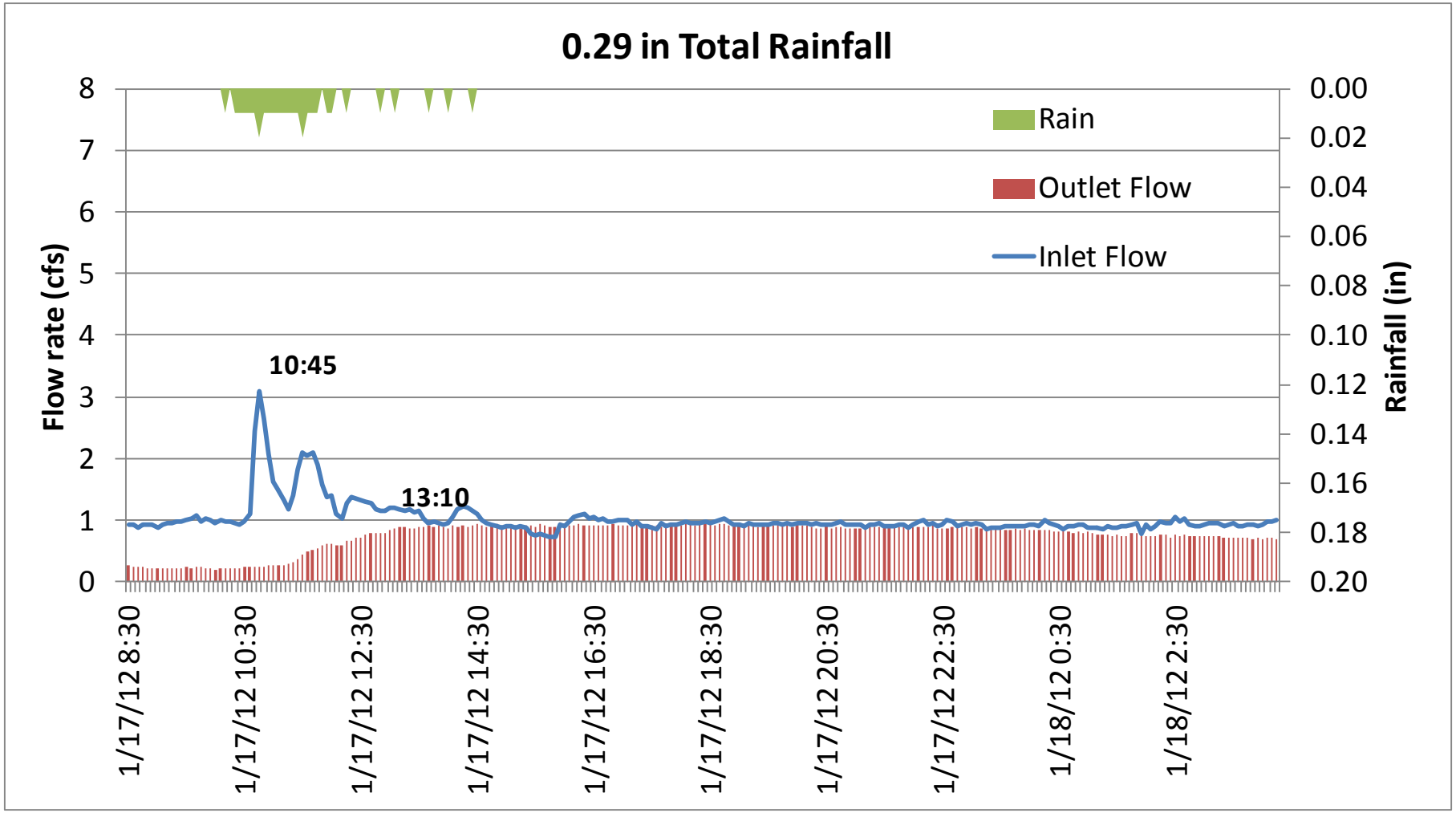
CSW 1.0 Water Quality - TN



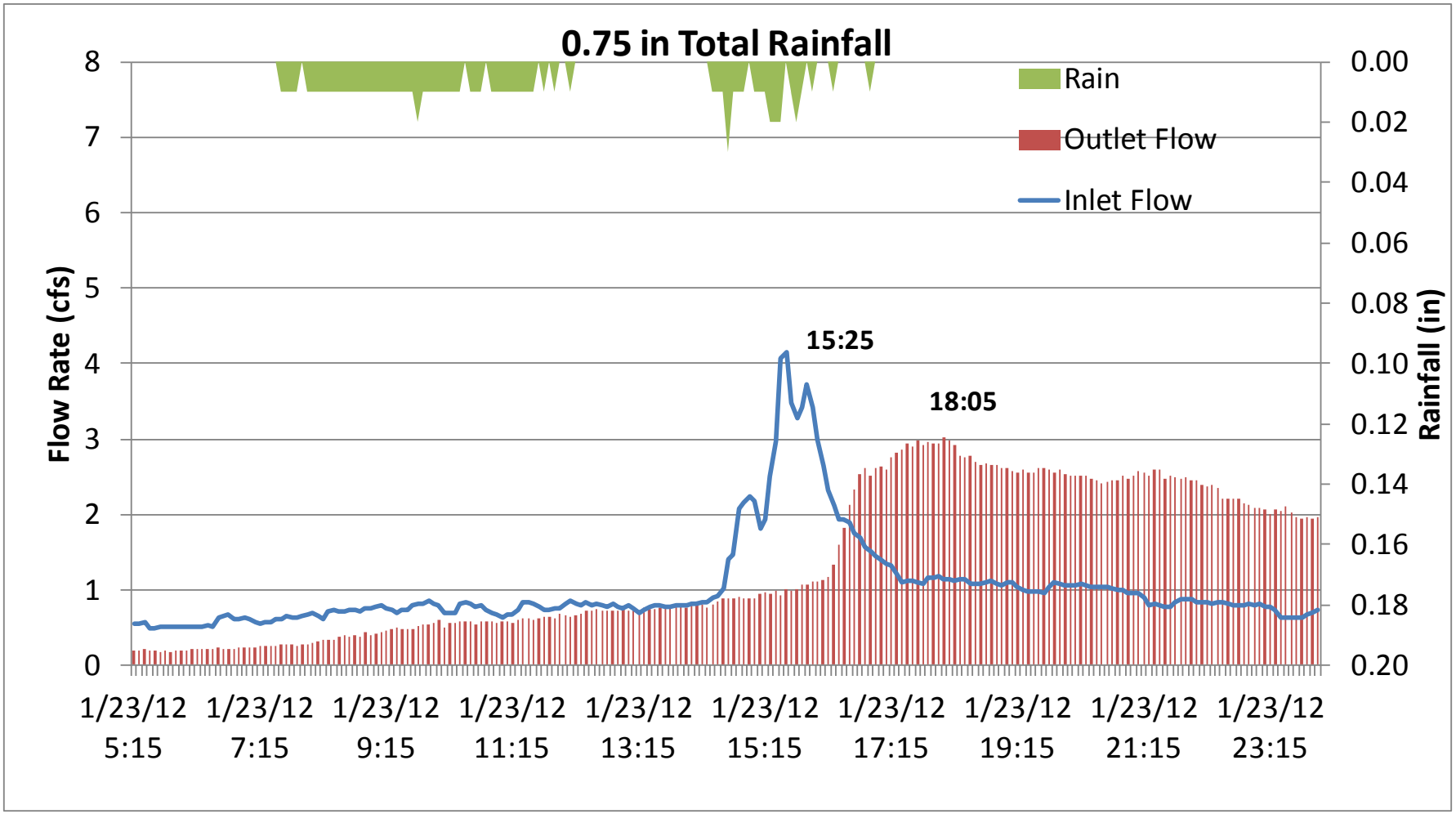
CSW 1.0 Water Quality - TP



CSW 2.0 Flow Rate

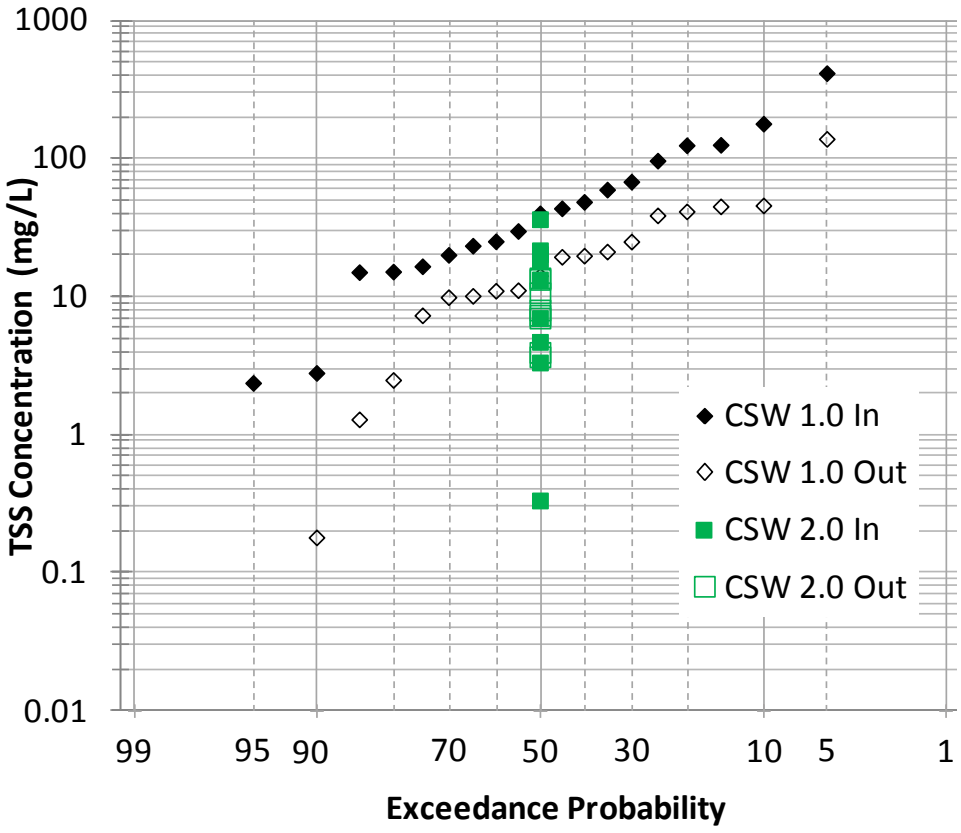


CSW 2.0 Flow Rate

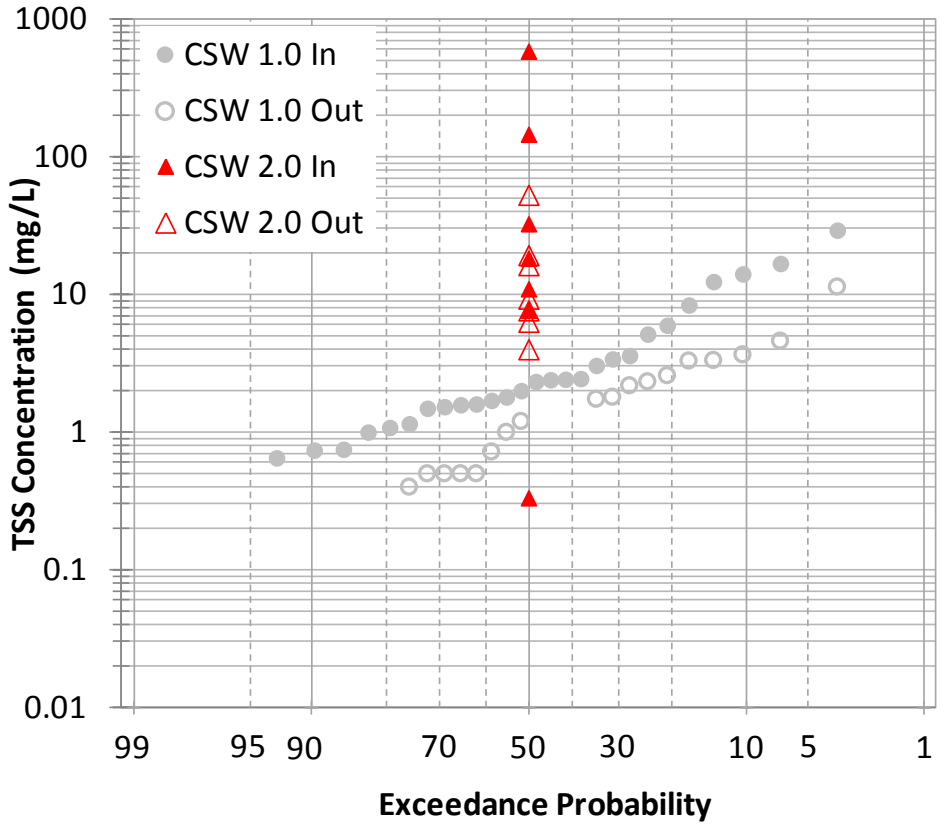


CSW 2.0 Water Quality - TSS

Storm Conditions

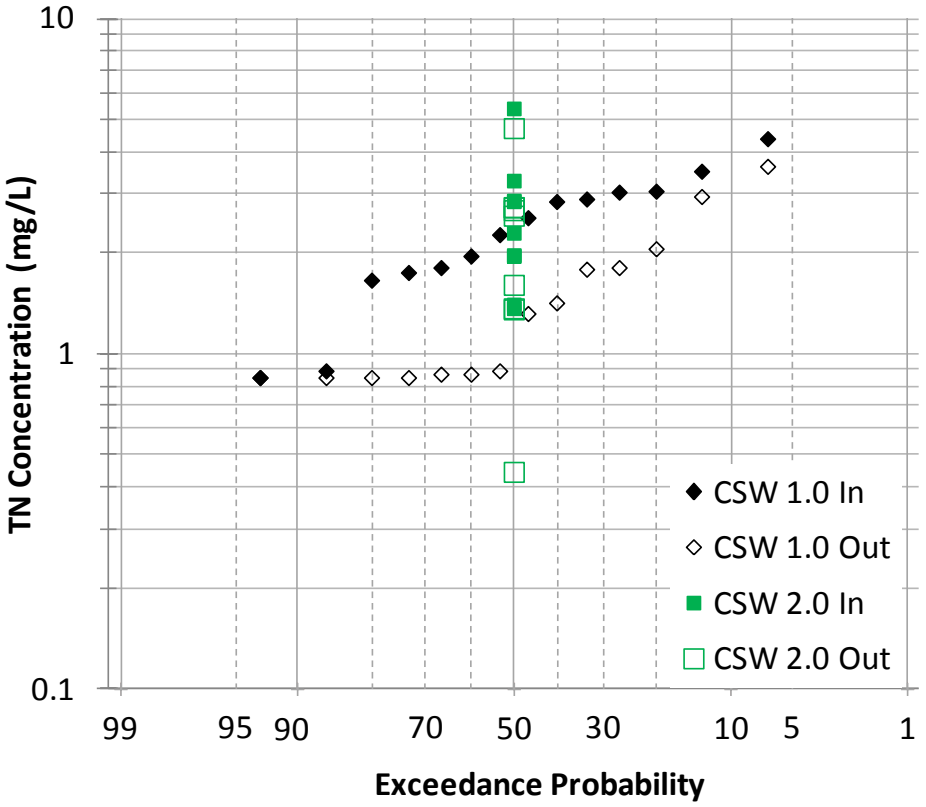


Baseflow Conditions

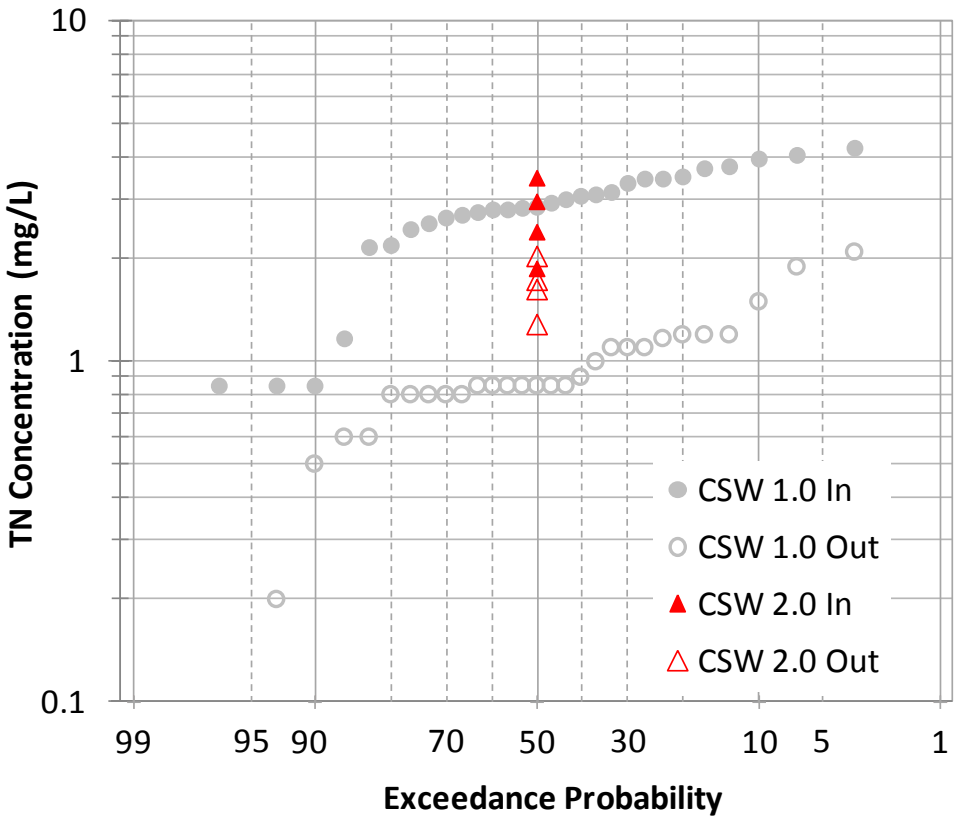


CSW 2.0 Water Quality - TN

Storm Conditions

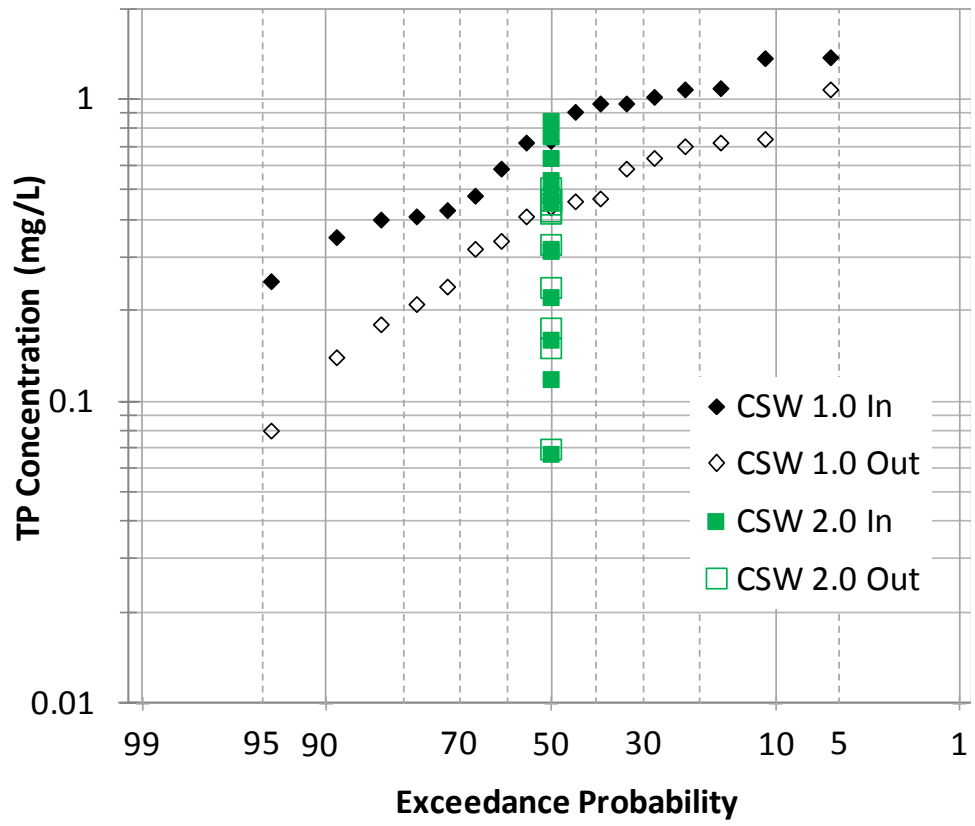


Baseflow Conditions

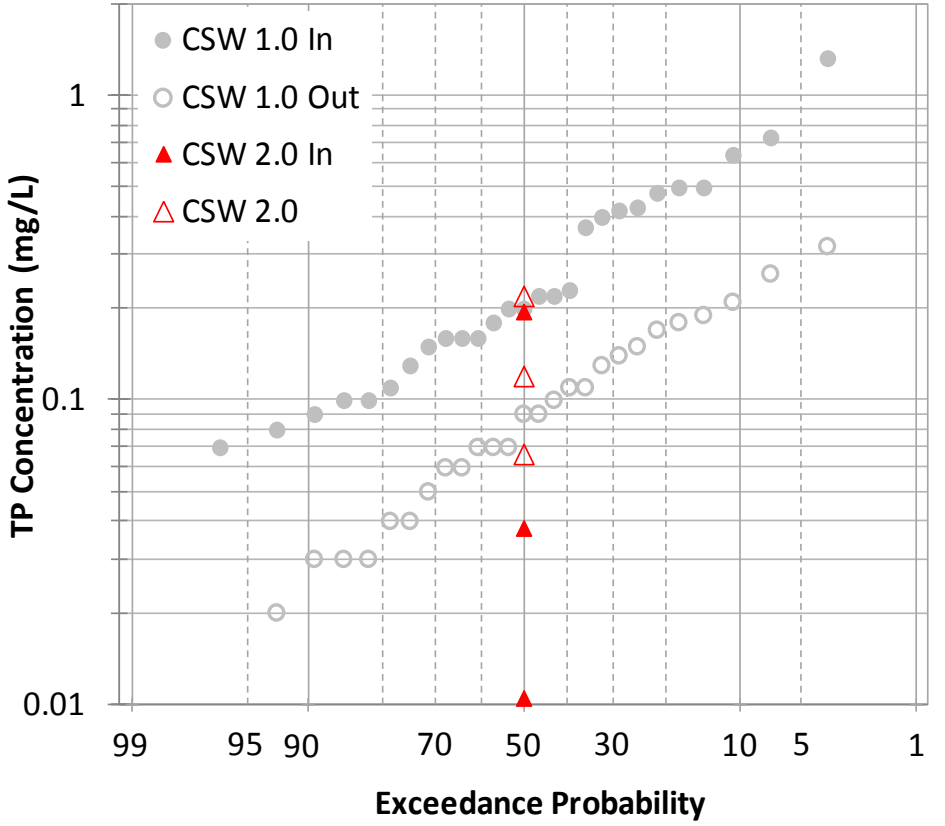


CSW 2.0 Water Quality - TP

Storm Conditions

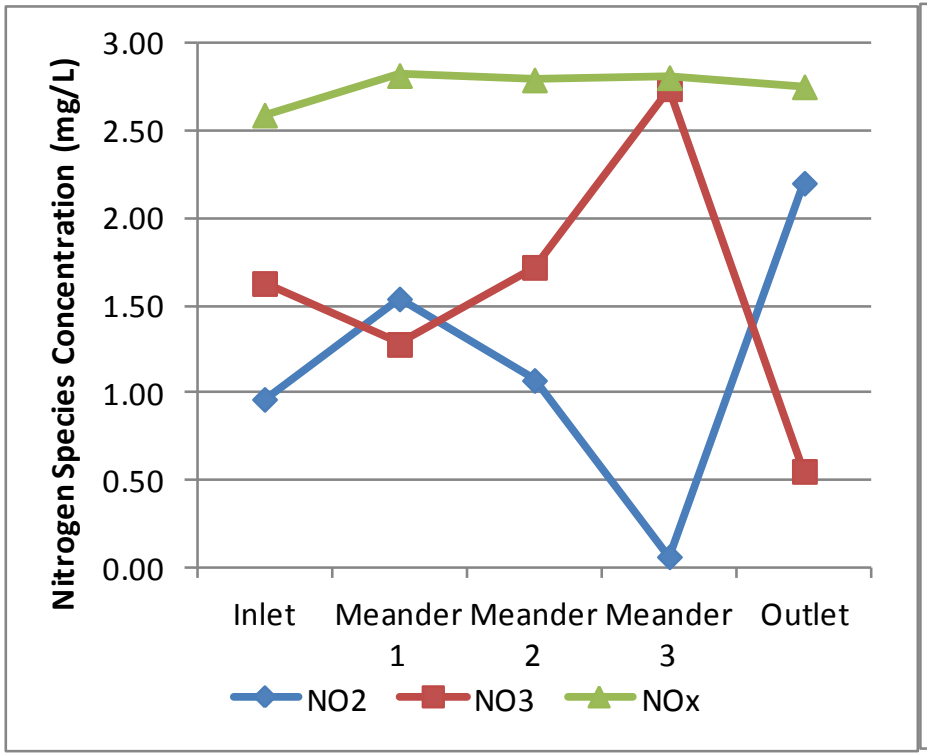


Baseflow Conditions

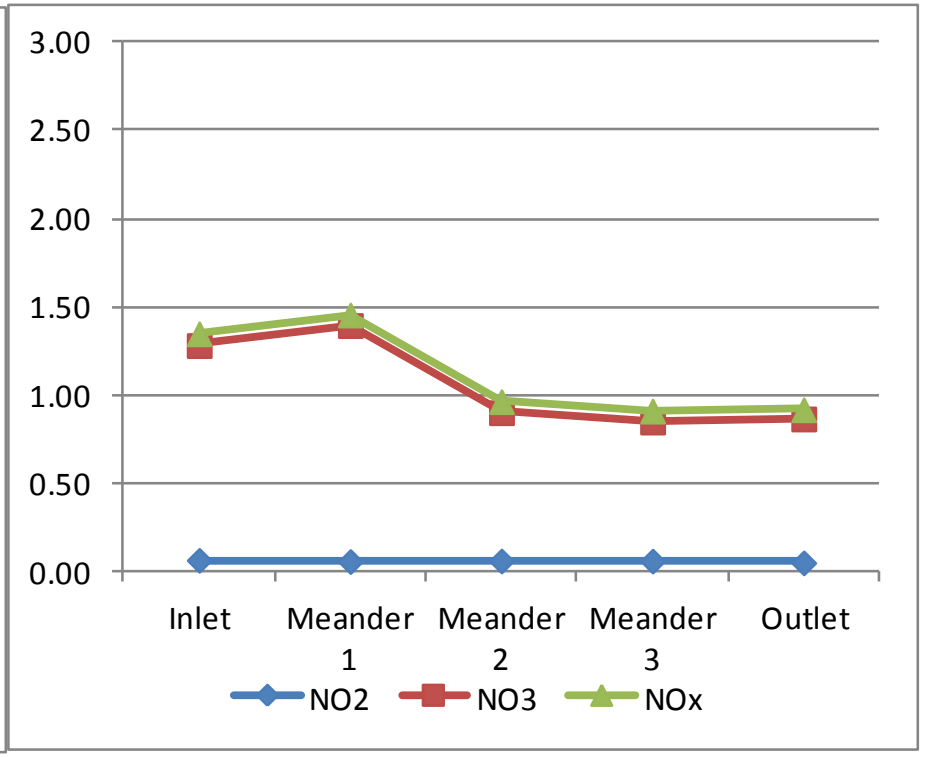


CSW 2.0 - Nitrogen Cycling?

12/12/2011
Avg Daily Temp – 2.6 ^{0}C



3/28/2012
Avg Daily Temp – 12.9 ^{0}C



Where Are We Now?

- Vegetation still being established
- Hydraulics of CSW 2.0 – similar to CSW 1.0
- TSS of CSW 2.0
  - Similar to better than CSW 1.0 for **storms**
  - A bit worse than CSW 1.0 for **baseflow**

  *** Baseflow influent conditions are higher for CSW 2.0
- TN of CSW 2.0
  - A bit worse than CSW 1.0 for **storms**
  - A bit worse than CSW 1.0 for **baseflow**

  *** All influent conditions are higher for CSW 2.0
- TP of CSW 2.0
  - Similar to better than CSW 1.0 for **storms**
  - Similar to better than CSW 1.0 for **baseflow**

Where Are We Going?

- Continue to monitor as site becomes more established
- Investigate concept of treatment zones
  - Amendments for soluble reactive phosphorus
  - Dissolved Oxygen measurements to understand potential for nitrification/denitrification

Acknowledgements

VUSP Strategic Partner

Baker

Partners:

Down To Earth Design

Philadelphia Water Department

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Members:

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MOMENEE AND ASSOCIATES, INC.
Bryn Mawr Office: 924 County Line Road, Bryn Mawr, PA 19010
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Thank you
Questions?

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