Monitoring the Effectiveness of a New Rain Garden Filtering Medium for Pollutant Removal and Urban Hydromodification Mitigation

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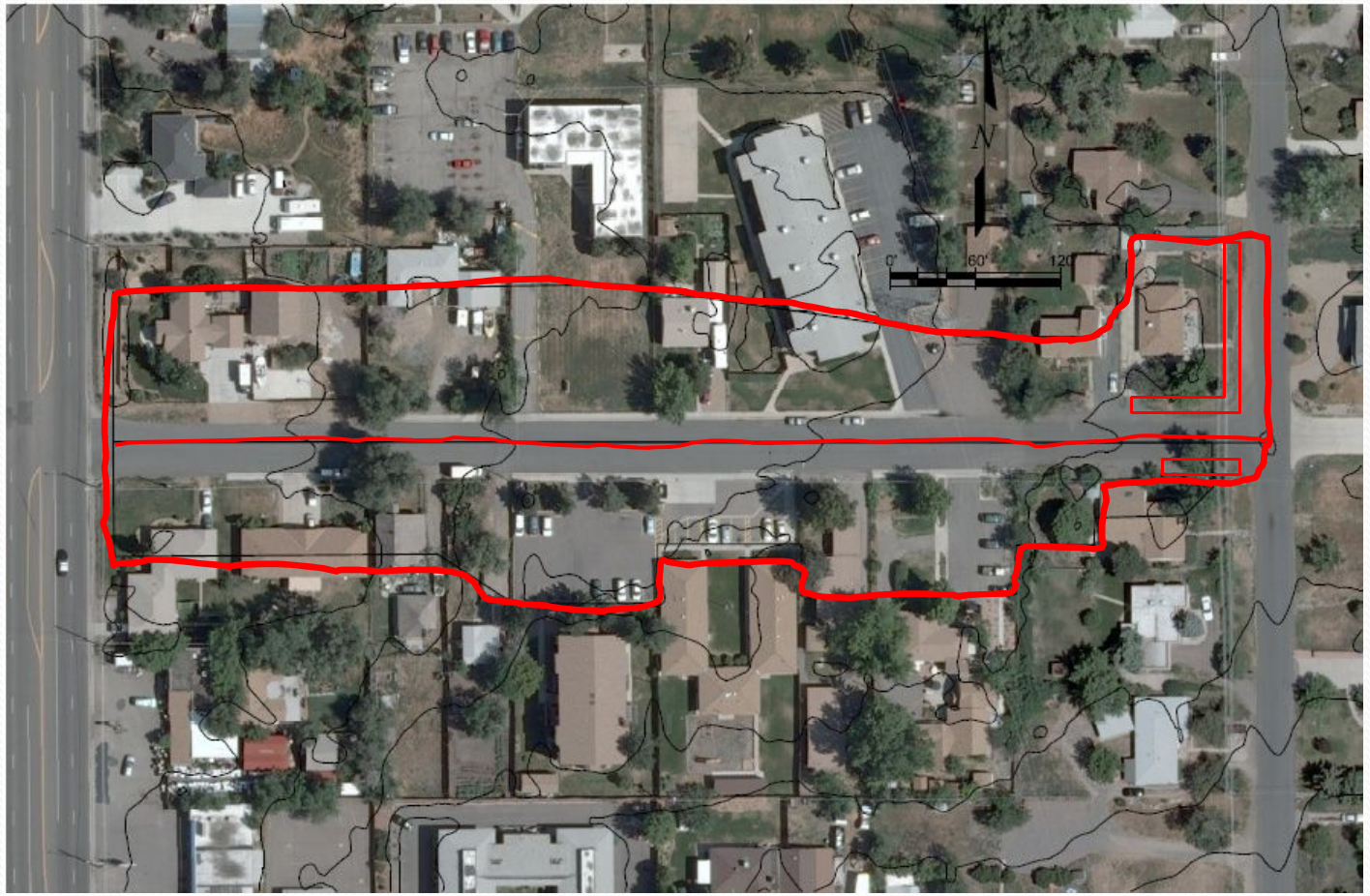
Introduction

- Not a traditional bioretention (rain garden)
  - Traditionally, peat was used to provide nutrients and carbon source for plant health
    - Expensive
    - Large carbon cost
  - Replaced peat with compost and shredded paper
    - Relatively inexpensive
    - Paper captures/stores nutrients from compost and retains moisture
- Monitored throughout the 2011 rain season:
  - For pollutant reduction
  - To measure the effective mitigation of the hydromodification effects of urbanization.

Project Location

- West 21st Avenue and Iris Street in Lakewood, CO

Watershed map



Site Description

- Total watershed area: 83,300 ft^2
  - 38,901 ft^2 impervious area tributary to rain garden
  - Impervious percentage = 47%
- Impervious areas include:
  - asphalt street,
  - gravel driveways,
  - sidewalks, and
  - rooftops
- Some imperviousness is disconnected.

Previous Existing Condition

Before vegetation growth

After initial growth


During Rain

Data Collection

- Inlet
  - ISCO 6712 sampler
    - Stored in job box
    - Collects flow data throughout the runoff event
    - Powered by 12 volt battery charged by solar panels
  - ISCO 720 pressure transducer
    - Measures depth behind composite v-notch weir
  - ISCO 674 tipping rain gauge
    - Measures rainfall to 0.04”

Equipment (Inlet)

Equipment (Inlet)

Equipment (Inlet)

Equipment

Data Collection (cont'd)

- Outlet
  - ISCO 6712 sampler
    - Stored in a vault
    - Collects flow data when rainfall is indicated in conjunction with pressure increase equivalent to 0.01' hydrostatic head
    - Powered by 12 volt battery charged by solar panels
  - (2011) ISCO 720 pressure transducer
    - Measures pressure behind 0.7" dia orifice
      - Designed to drain WQCV in 12 hrs
  - (2012) ISCO 730 bubbler
    - Measures depth behind v-notch weir
  - ISCO 674 tipping rain gauge
    - Measures rainfall to 0.04"

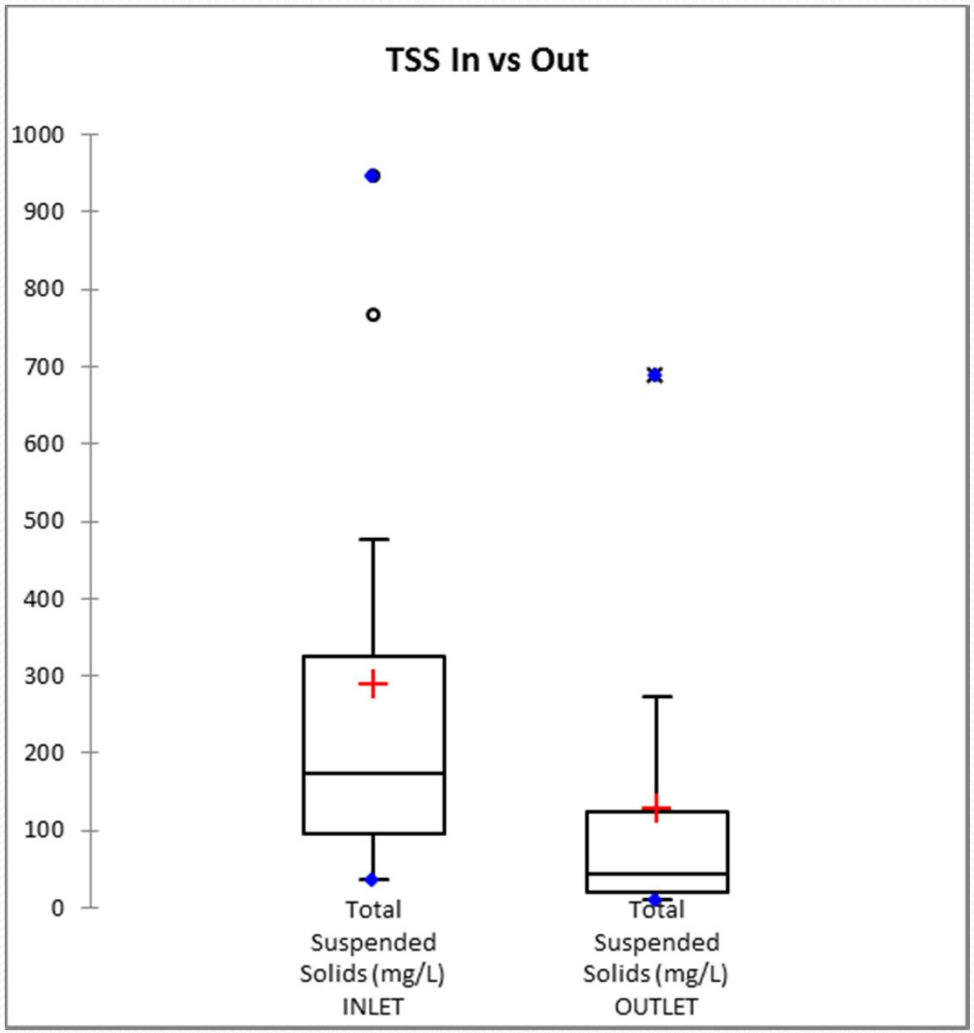
Equipment (Outlet)

Equipment (Outlet)

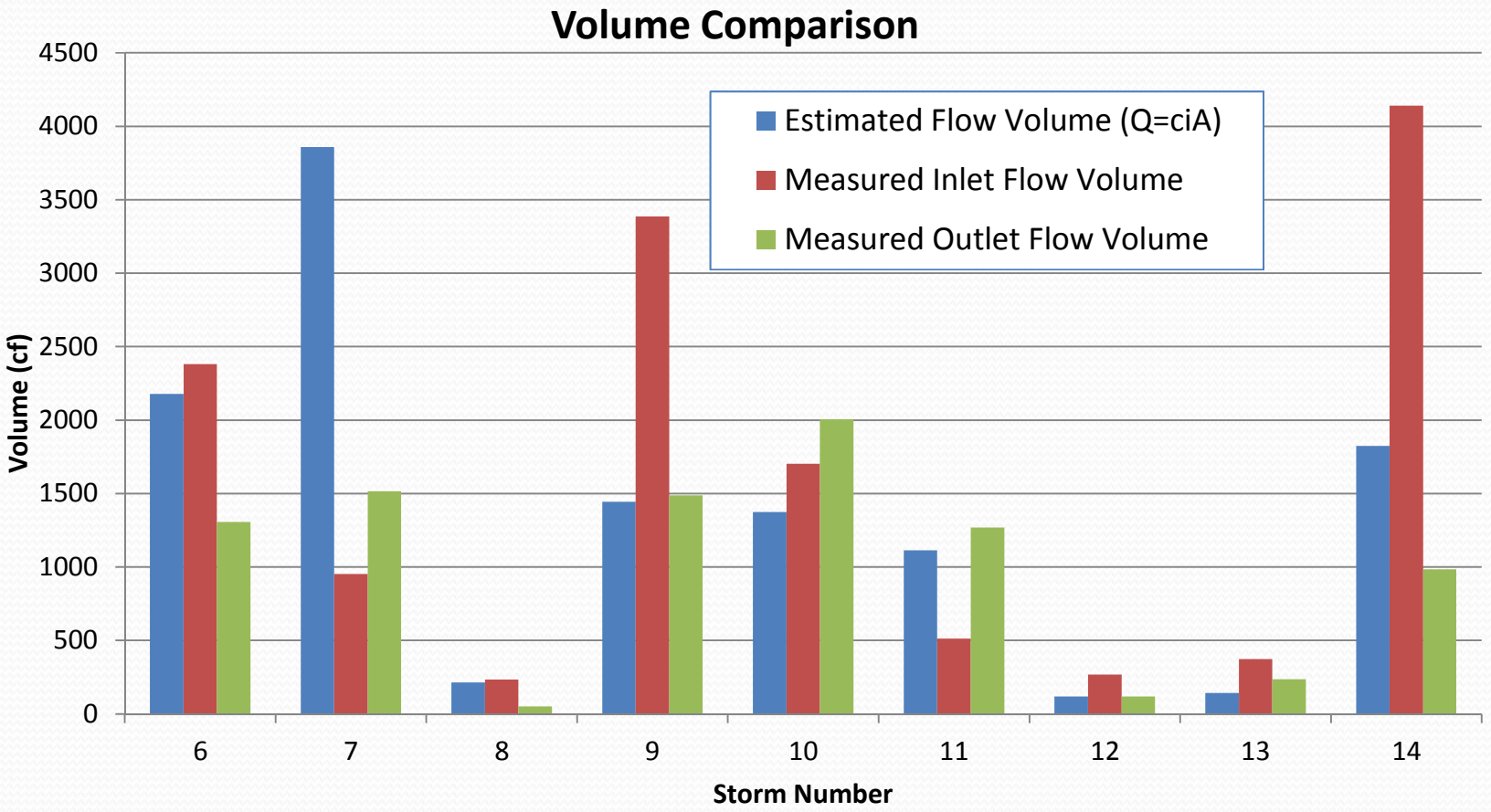
Analysis (Quality)

Of 38 constituents analyzed, TSS showed the most promising downward trend – some had upward trends, possibly due to "dirty sand" in the filter

Statistic	Total Suspended Solids (mg/L) INLET	Total Suspended Solids (mg/L) OUTLET
No. of observations	12	12
Minimum	36	10
Maximum	947	688
Range	911	678
1st Quartile	96	21
Median	174	45
3rd Quartile	325	124
Mean	290	128
Standard deviation (n)	280	189



Analysis (Quantity)



Analysis Summary

- Flow measurements proved to be very problematic
  - Inflow weir did not have enough elevation to collect meaningful PT data.
  - Outflow PT signal was very noisy.

- Solution:
  - Inflow – estimate flow based on rainfall and Rational method?
  - Outflow – design a new outlet box with V-notch weir and replace transducer with bubbler.

New outflow set up

Conclusion

The 21st and Iris rain garden has been set up for the 2012 rain season and more results are to follow at www.udfcd.org.