

# **Assessment of Tile Drainage System Impacts to Lake Champlain and Phosphorus Loads in Tile Drainage in the Jewett Brook Watershed of St. Albans Bay**

Date: December 21, 2017

Presented by: Dave Braun

Conference/Venue: Tile Drain Advisory Group Meeting

# This is a study in three parts:

## Task 1: Tile Drainage Literature Review (Completed)

- Written by Don Meals and Julie Moore
- 252 publications were reviewed
- Used as a basis for VTANR's required tile drain report to the Vermont legislature, January 2017

## Task 2: Monitoring of Tile Drainage Systems (In Progress)

- Participation by 6 farmers
- Monitoring of 12 tile drains (April 2018 – April 2019)
- Characterization of tile drainage systems
- Continuous flow measurement and composite sample collection
- Analysis for total and dissolved P and total N

## Task 3: P Load Estimation of Tile Drainage Systems (2019)

- Analysis of associations between water quality and agronomic data
- Evaluation of Jewett Brook P load
- Assessment of tile drain P load significance

# Study Field and Tile Drainage System Characterization

Characterization Report (March 1, 2017) describes:

- Construction of tile drainage systems
- Surface inlets to tile drains
- Crop production in study fields
- Field soil types
- Soil Test P in study fields
- Manure and fertilizer applications

	Site	Area (A)	Crop	Soil Survey Data % of field, type, slope class, hydrologic group	Soil Test P	Fertilizer Application	Manure Application	Cover Crop
Farmer1	JBT01	25	2016: Silage corn 2017: Soybean	82%: Kingsbury clay, 0 to 3%, D 10%: Massena stony loam, 0 to 3%, C/D 8%: Kingsbury clay, 3 to 8%, D	7.2	2016: starter at plant 2017: starter at plant	2016: None 2017: None	2016: None 2017: Unknown
Farmer1	JBT02	4.7	2016: Silage corn 2017: Soybean	69%: Kingsbury clay, 3 to 8%, D 31%: Kingsbury clay, 0 to 3%, D	9.3	2016: starter at plant 2017: starter at plant	2016: None 2017: None	2016: None 2017: Unknown
Farmer1	JBT04	5.7	2016: Silage corn 2017: Soybean	100%: Kingsbury clay, 0 to 3%, D	4.5	2016: starter at plant 2017: starter at plant	2016: None 2017: None	2016: None 2017: Unknown

# Tile Drainage System Construction



- All 12 systems selected are standard, perforated, corrugated drain pipe.
- Most were installed within the last decade.
- The outfalls range in diameter from 4–12 inches.
- 9 of the 12 tile drains discharge to ditches. The 3 remaining (JBT01, JBT02, and JBT04) discharge directly to Jewett Brook.
- The tile drains range from 3–5 feet below ground, with most in the 3–4 feet range.
- All study fields have patterned drainage except JBT16, which has a dendritic (branching) system.
- Drain spacing is in the typical range of 25–40 feet, with the exception of JBT18 and JBT19, which have 80-foot spacing.



# Standpipe Inlet to JBT14 Tile Drain





# Monitoring Manhole Construction





# Monitoring Manhole Construction





# JBT11 Monitoring Station



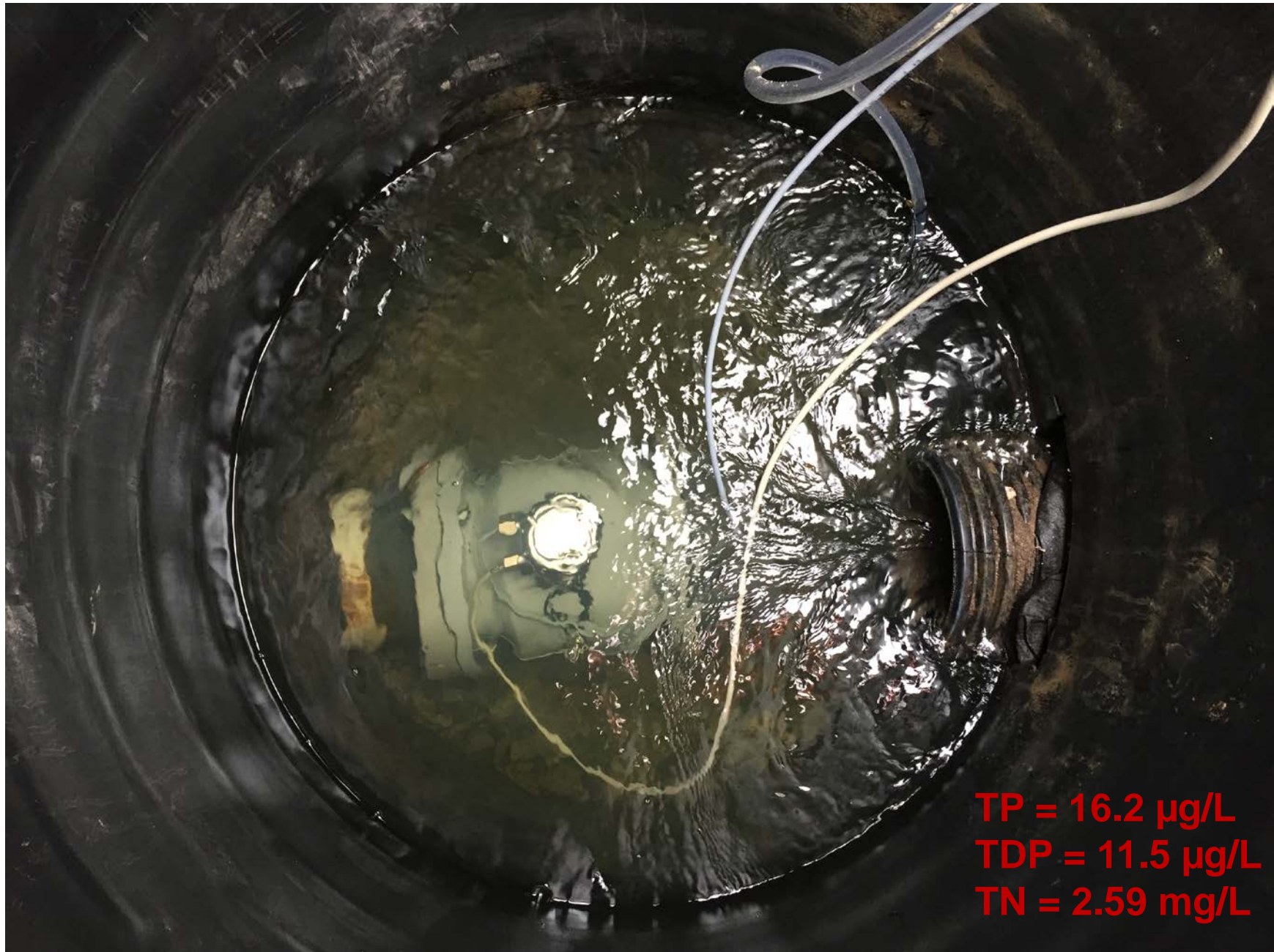


# Typical Instrument Shelter (JBT11)





# Waterflux 3000 Flowmeter at JBT11, April 20, 2017





# Flow Proportional Sampling at JBT06

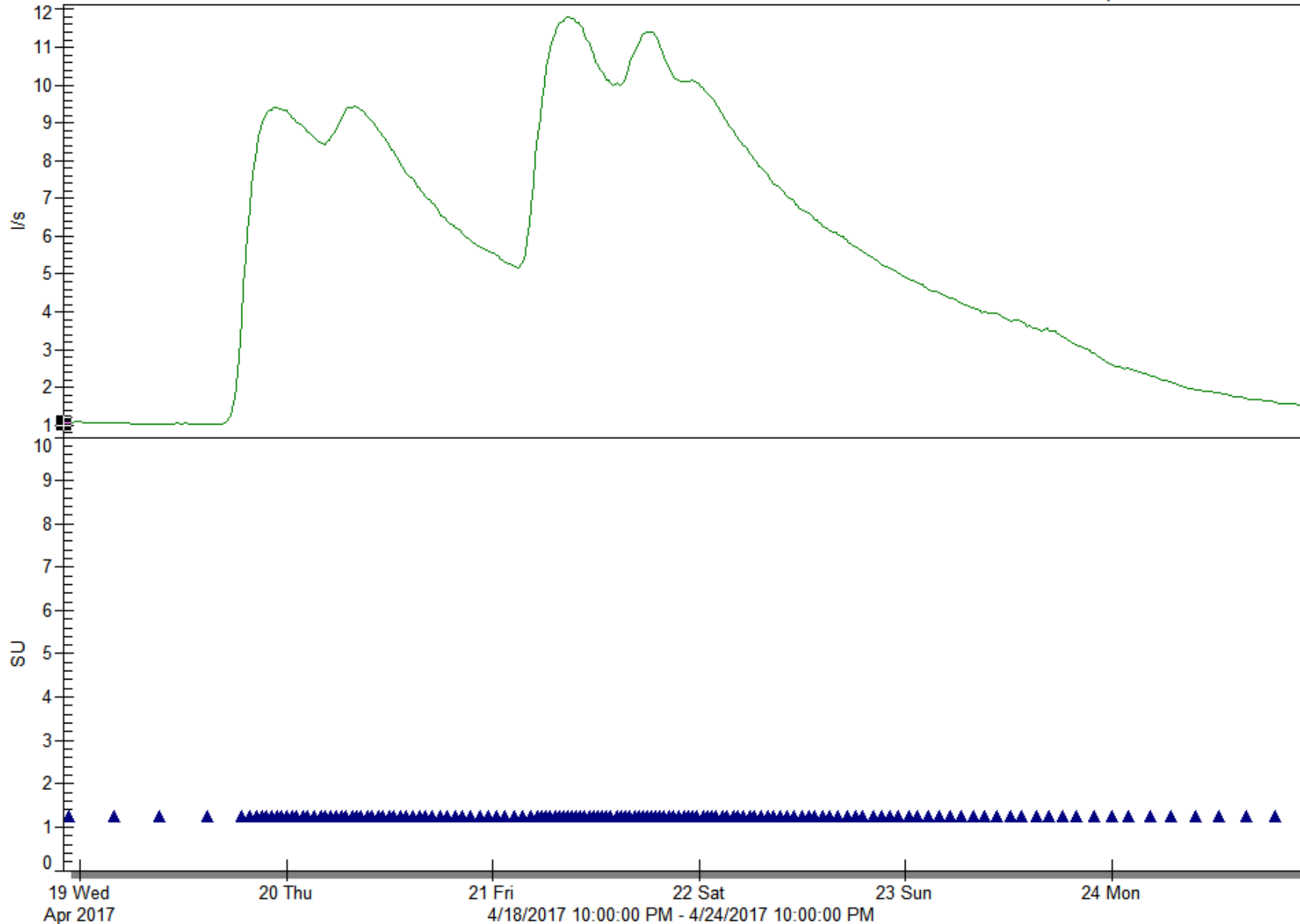
4/18/2017 22:00, 1.062

Flowlink



JBT06.2110 US.Flow Rate

JBT06.2105 Interface Module.Sampler

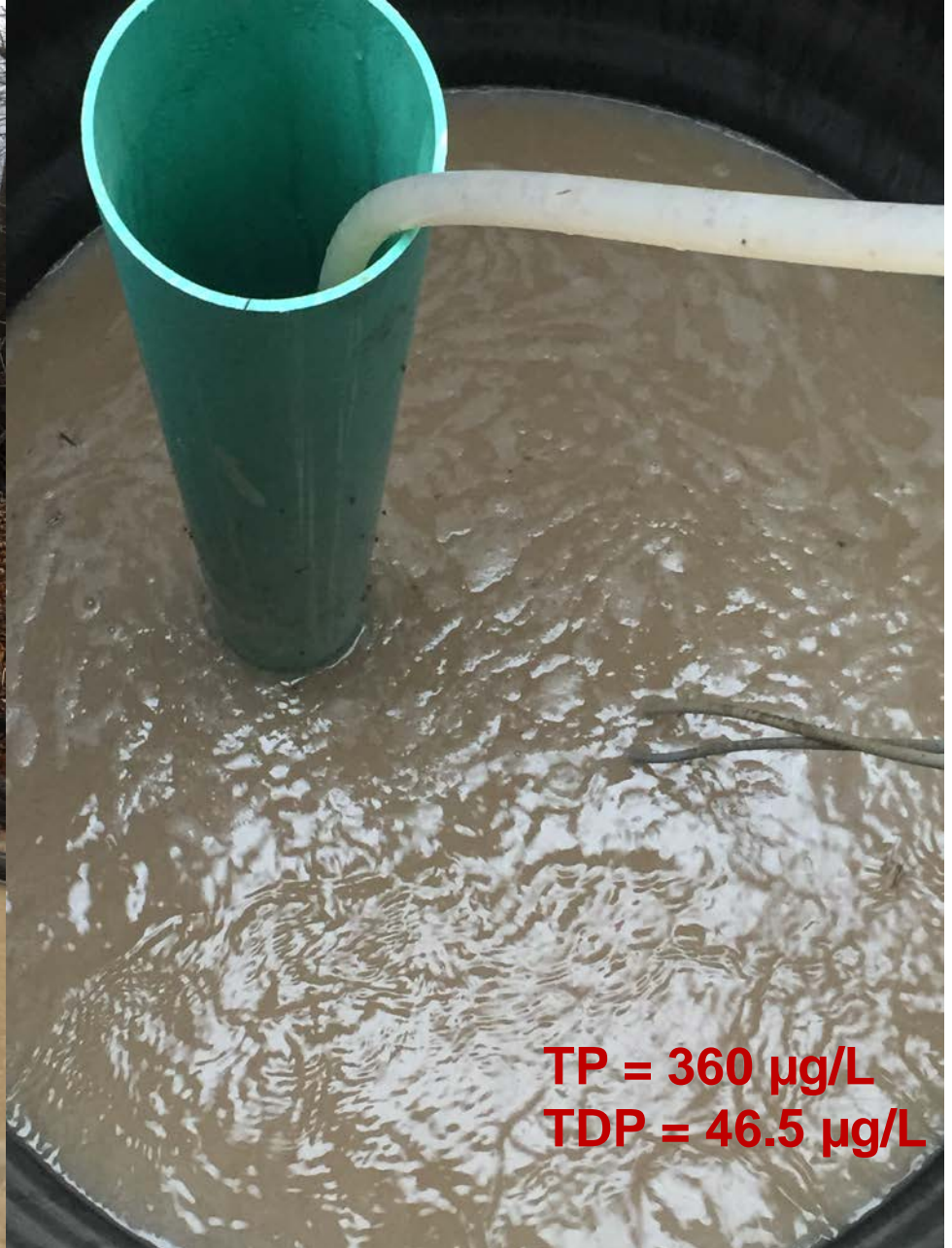




# Tile drain muddying already turbid Jewett Brook

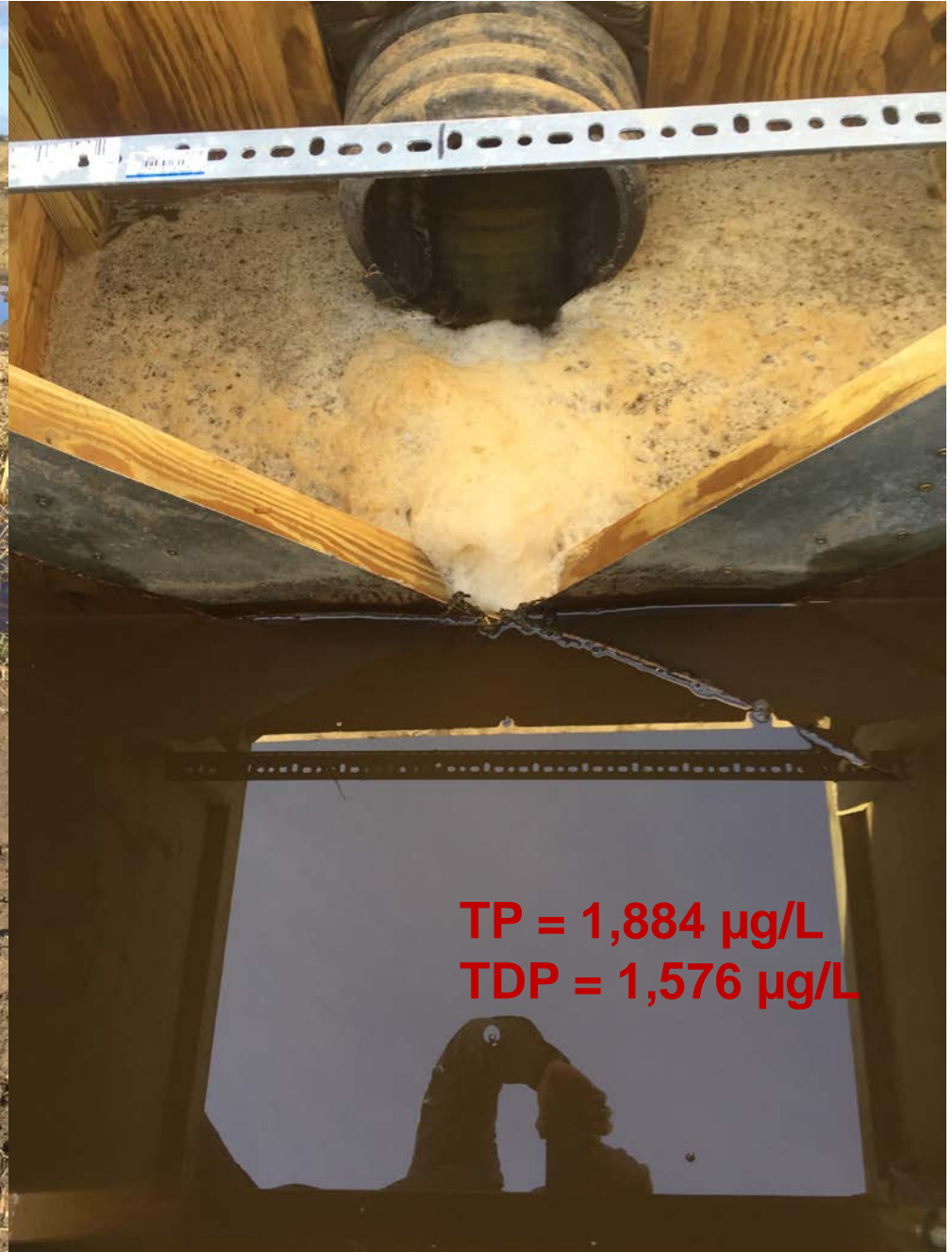


# JBT01 flowing muddy, November 3, 2017



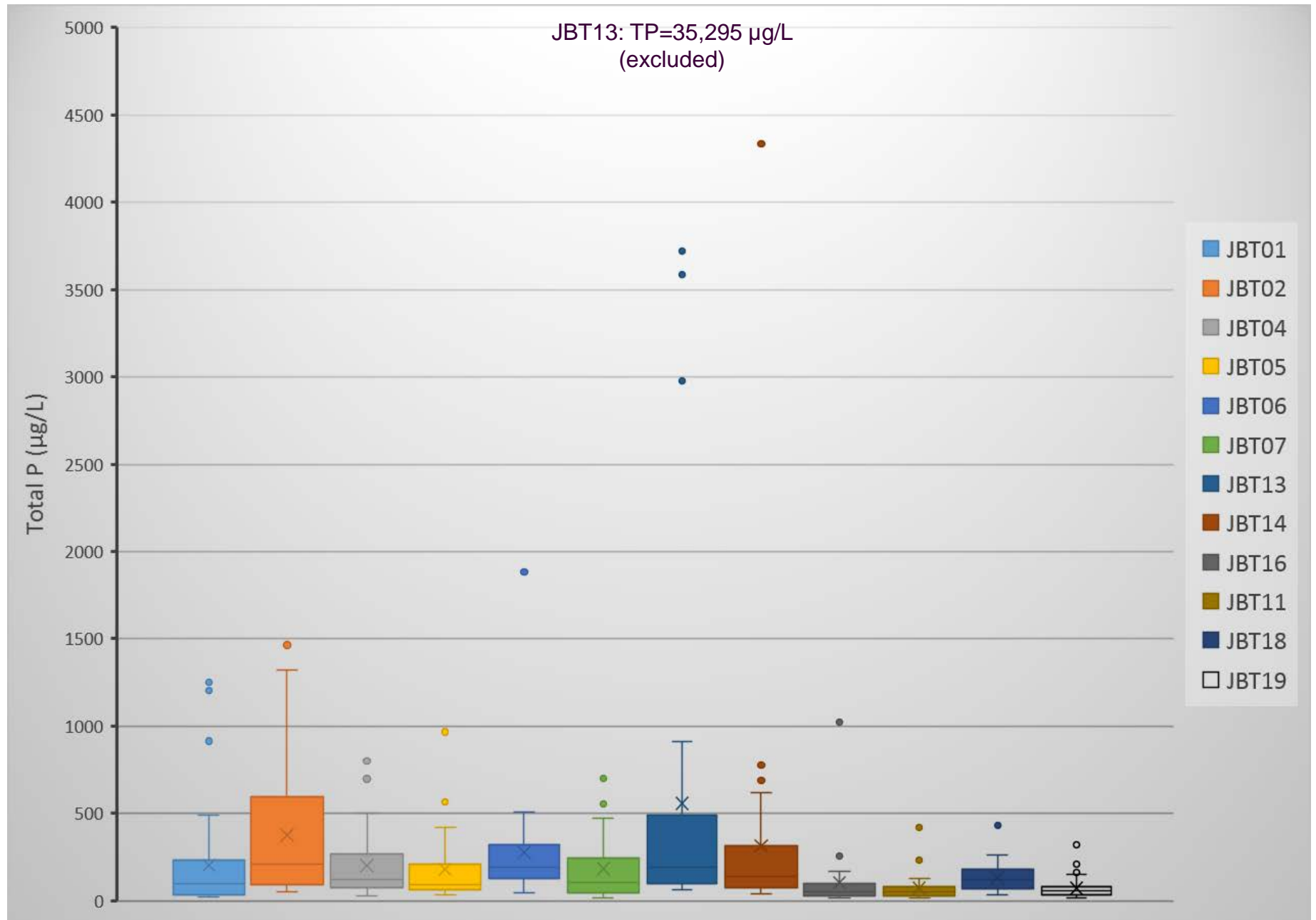


# JBT06 field on October 27, 2017 after manure injection



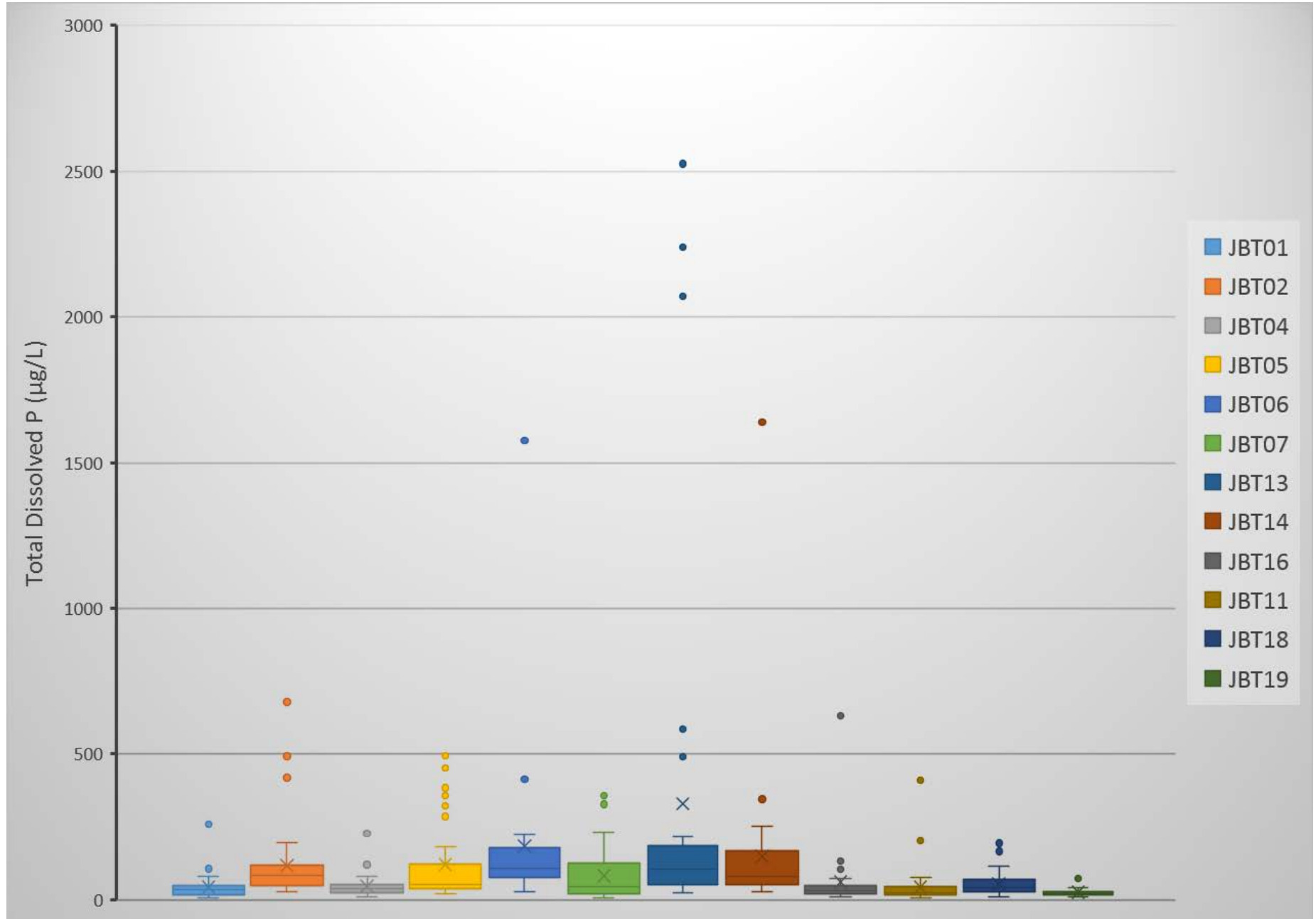
TP = 1,884  $\mu\text{g/L}$   
TDP = 1,576  $\mu\text{g/L}$

# Distributions of Total P EMCs (April – Nov., 2017)

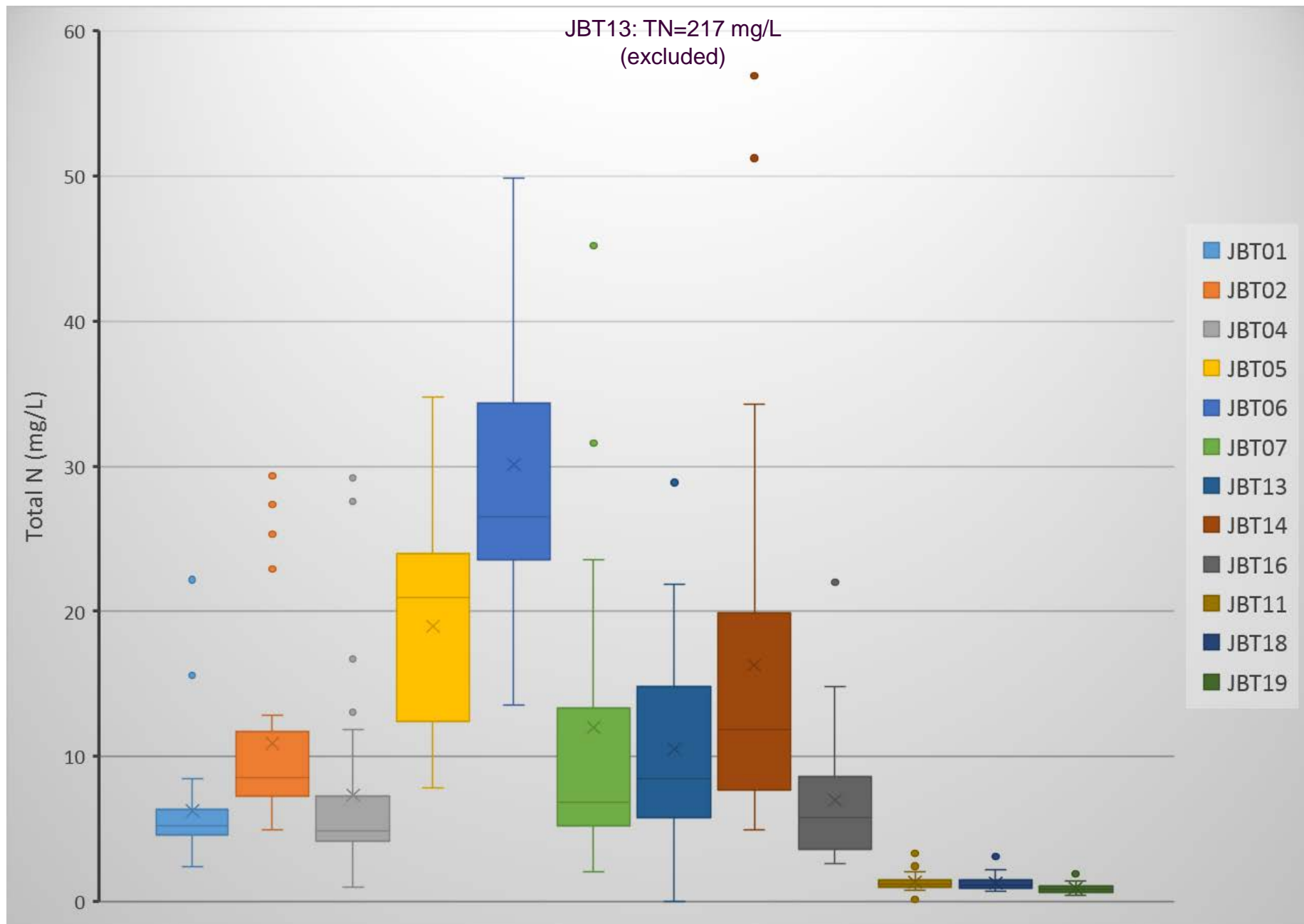




# Distributions of Total Dissolved P EMCs (April – Nov., 2017)



# Distributions of Total N EMCs (April – Nov., 2017)







**Thank you.**

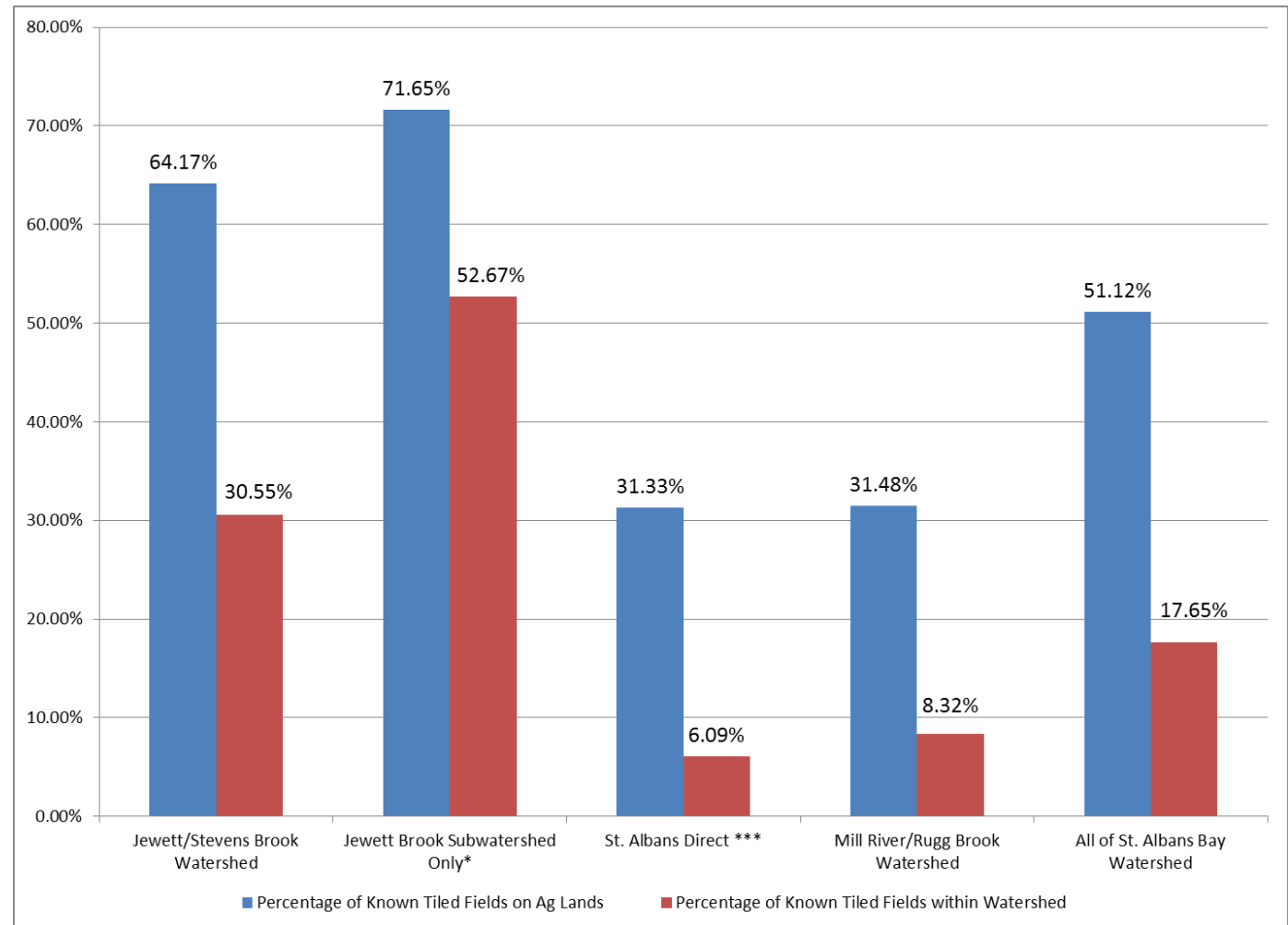
Dave Braun

dbraun@[stone-env.com](mailto:dbraun@stone-env.com)

(802)272-8819



## Identifiable Tiled Agricultural Fields from AAFM's 2015 Cropland Inventory





# Runoff and Erosion on Tiled Field (JBT14)





# Monitoring Manhole Construction



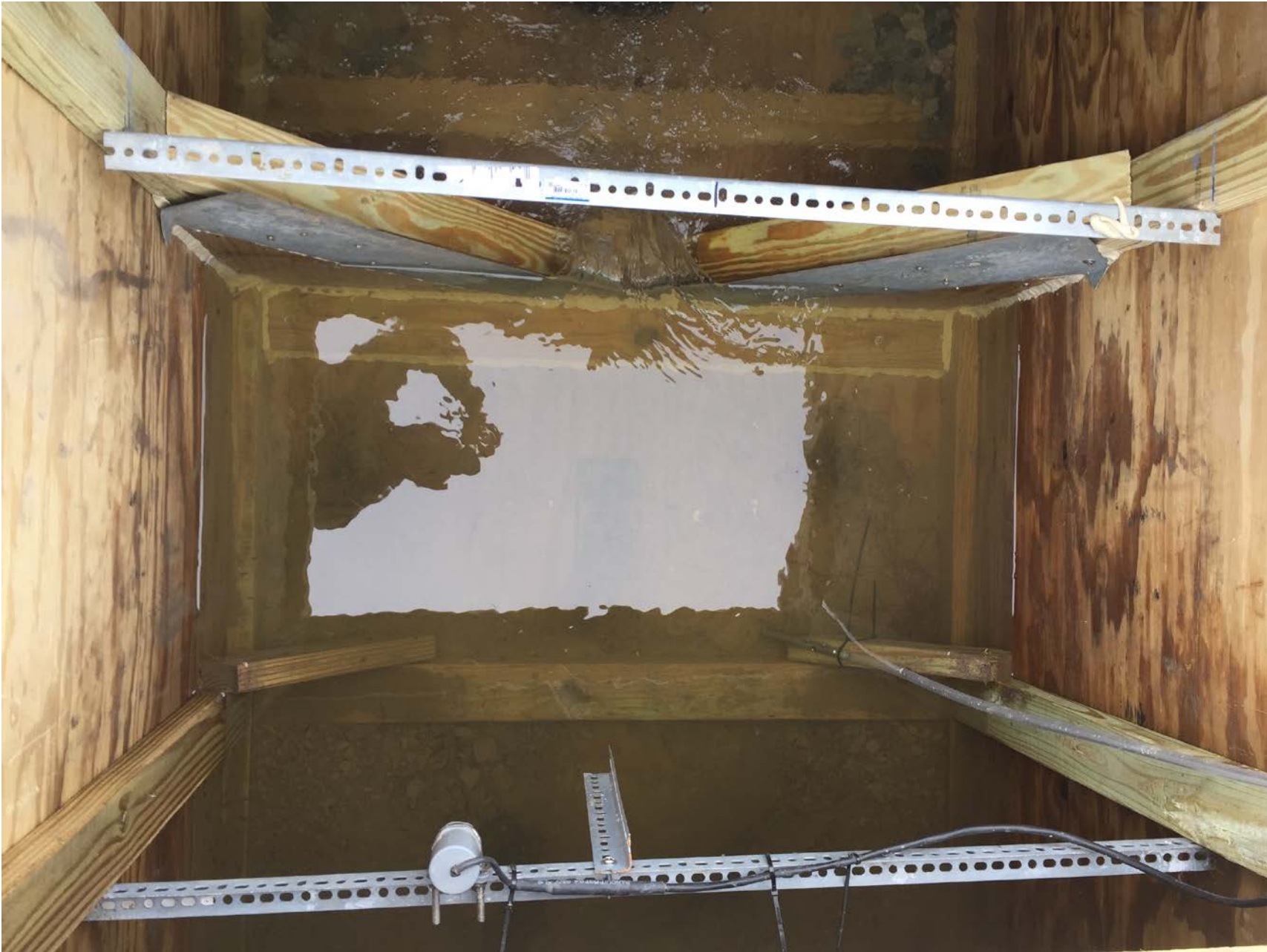


# Weir Box Constructed at Station JBT06





## 90-degree V Weir and Level Sensor at JBT06



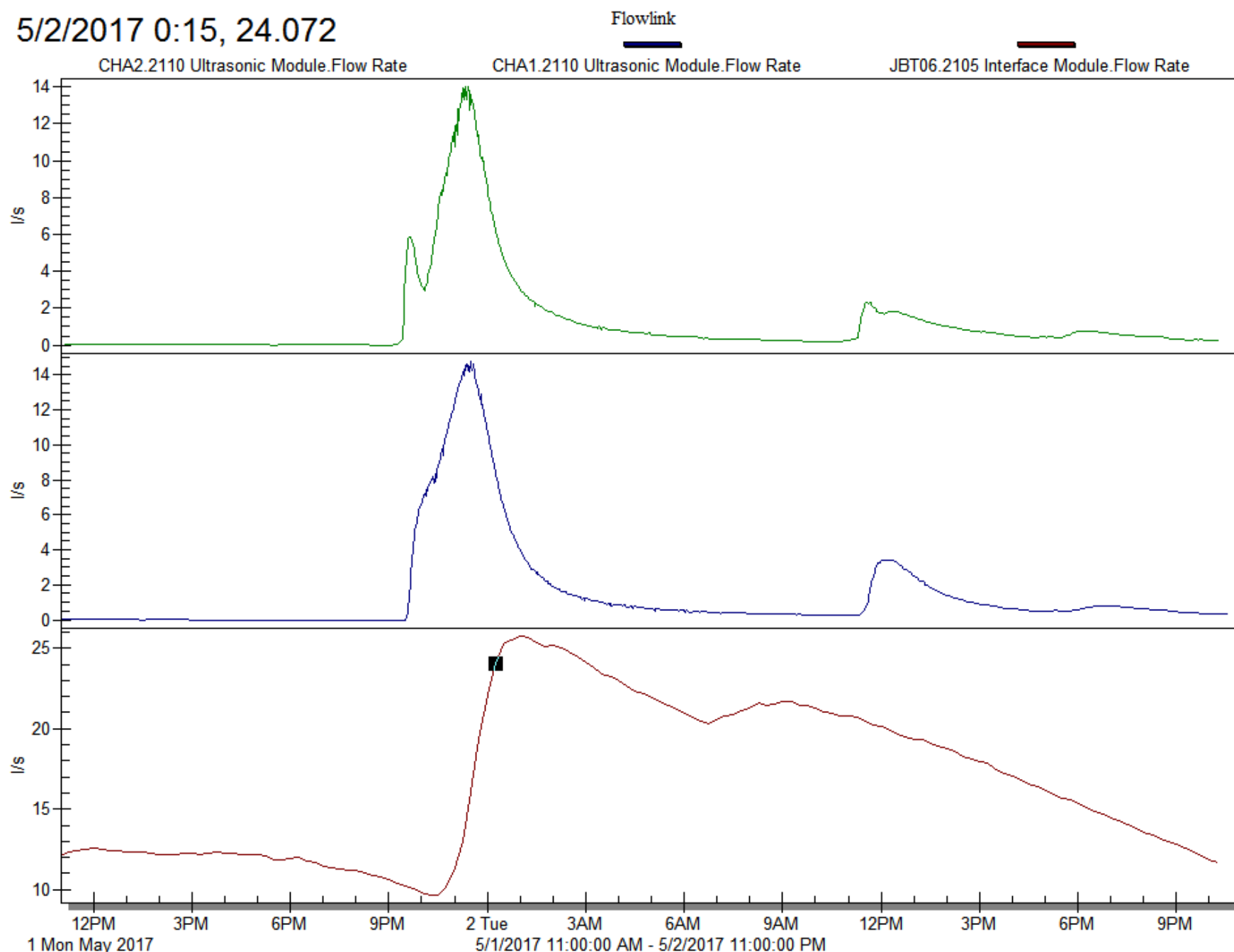


# Station JBT01



# Comparing Flow at JBT06 with CHA1 and CHA2

5/2/2017 0:15, 24.072





# Monitoring Start Dates

Station	Start flow monitoring	Start autosampling	Current condition
JBT01	3/23/17	4/5/17	OK
JBT02	3/23/17	4/5/17	OK
JBT04	4/3/17	4/5/17	OK
JBT05	4/20/17	4/20/17	1) Waterflux flowmeter bad; ISCO 2150 AV flowmeter temporarily substituted 2) Replacement modem requires activation
JBT06	4/5/17	4/5/17	OK
JBT07	3/30/17	4/5/17	OK
JBT11	4/5/17	4/5/17	Modem problem (power)
JBT13	4/3/17	4/11/17	OK
JBT14	4/5/17	4/5/17	Modem problem (clock)
JBT16	3/30/17	4/5/17	OK
JBT18	4/22/17	4/22/17	OK
JBT19	4/22/17	4/22/17	OK

# TP, TDP, and TN in Weekly Composite Samples April 11, 2017 Collection Date (first round)

Station	TP (ug/L)	TDP (ug/L)	TN (mg/L)
JBT01	491	258	4.8
JBT02	976	678	7.2
JBT04	798	120	4.9
JBT05	NS	NS	NS
JBT06	195	131	33
JBT07	708	159	7.5
JBT11	40	58	3.3
JBT13	NS	NS	NS
JBT14	248	66	7.4
JBT16	105	73	5.8
JBT18	NS	NS	NS
JBT19	NS	NS	NS