In-stream AMD treatment for Large Watershed Restoration

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BACKGROUND

- WVDEP/OSR currently treats bond forfeiture sites at source under NPDES permits:
  - For small discharges this is extremely expensive
  - Almost no environmental benefit

- WVDEP/OSR Seeks to demonstrate the effectiveness of in stream dosing to:
  - Recover more stream miles
  - Improve efficiency of SRF expenditures

IN STREAM DOSING

- Advantages
  - Many more stream miles recovered per dollar invested
  - Lower capX, opX
  - Alternative NPDES permitting
  - Easier to attract investors
- Disadvantages
  - Sludge deposition in streams
  - Length of sacrifice zone
  - Unknown downstream benefits for steep stream channels with high metal loadings-Fickey Run

PROJECT WV 342 OBJECTIVES

- Document stream mile recovery in worst case scenarios: Martin Ck and Left Fork, Little Sandy Ck
- Optimize doser configuration and dosing rates
- Avoid $1MM solutions to $100k problems

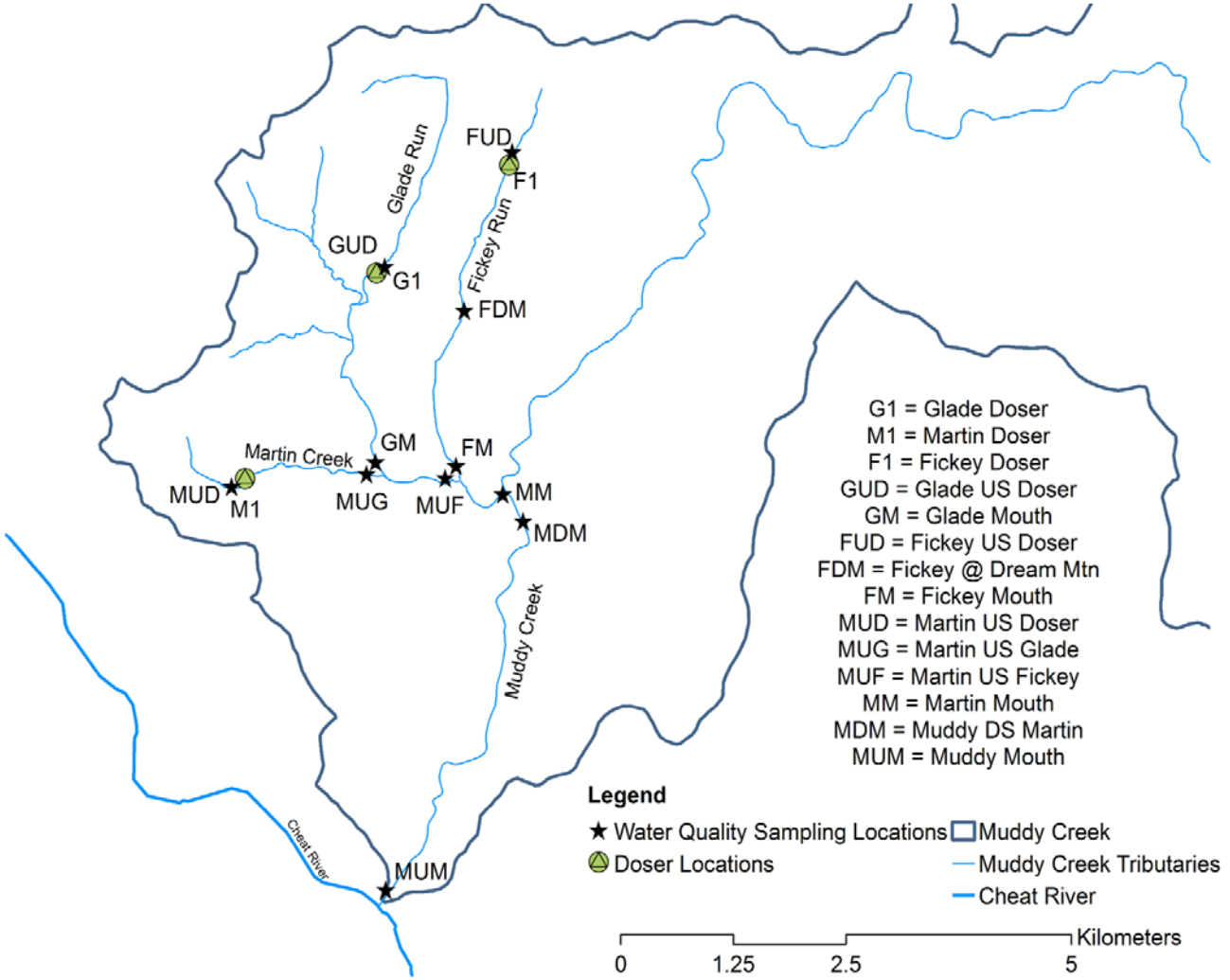
In-stream restoration targets for the three treated streams

	Restoration targets		
	pH	Fe t	Al d
		mg/L	mg/L
Martin Creek	3.2 to 9.0	10	15
Maple Run	2.5 to 9.0	14	33
Little Sandy	3.3 to 9.0	2	12

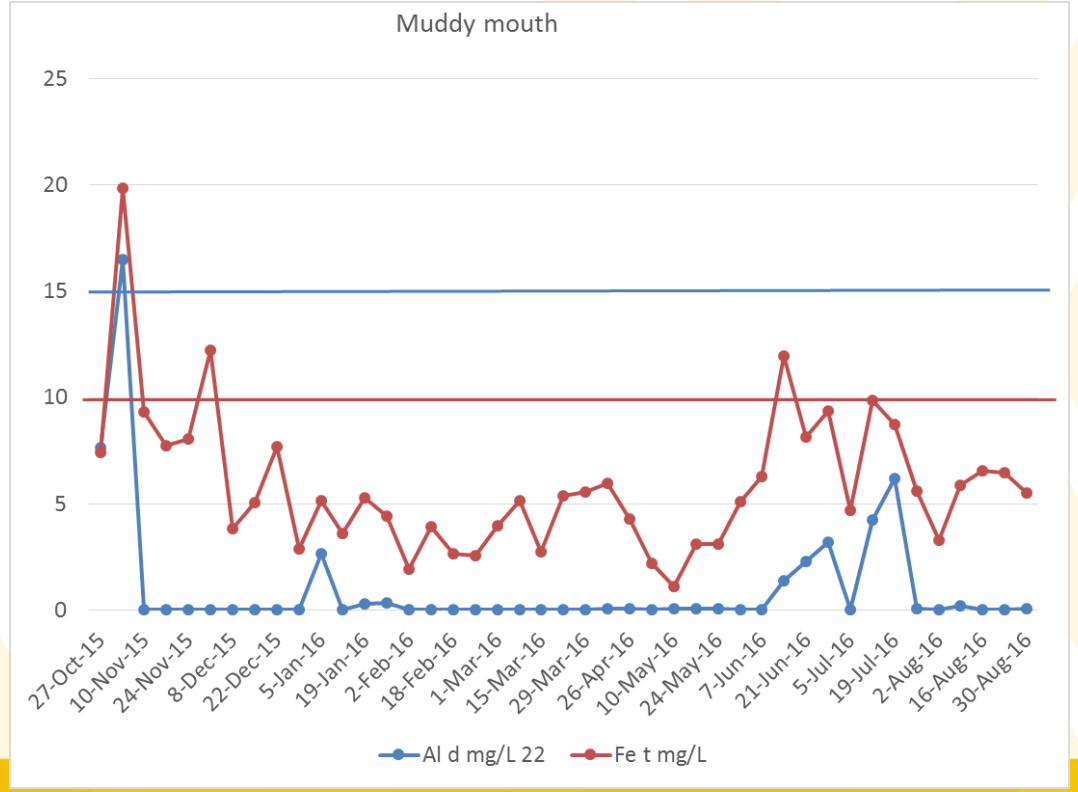
Martin Creek Project

Dosers
M1, F1 went on line around
3 nov 15
F1 offline 1 dec 15

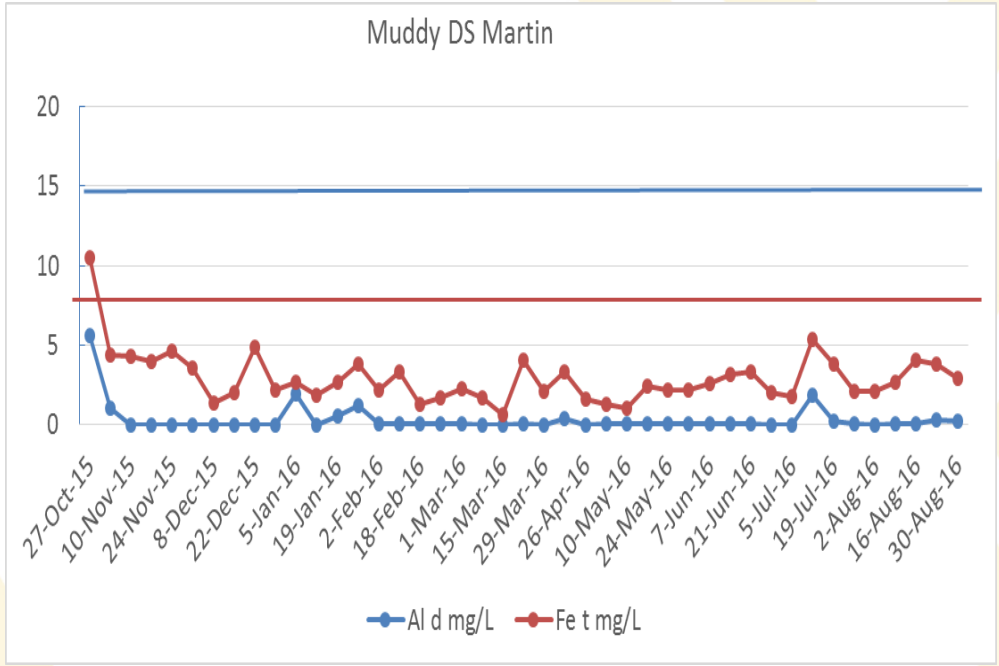
G1 went online
15 dec 15



Lower Muddy Creek near the Cheat River

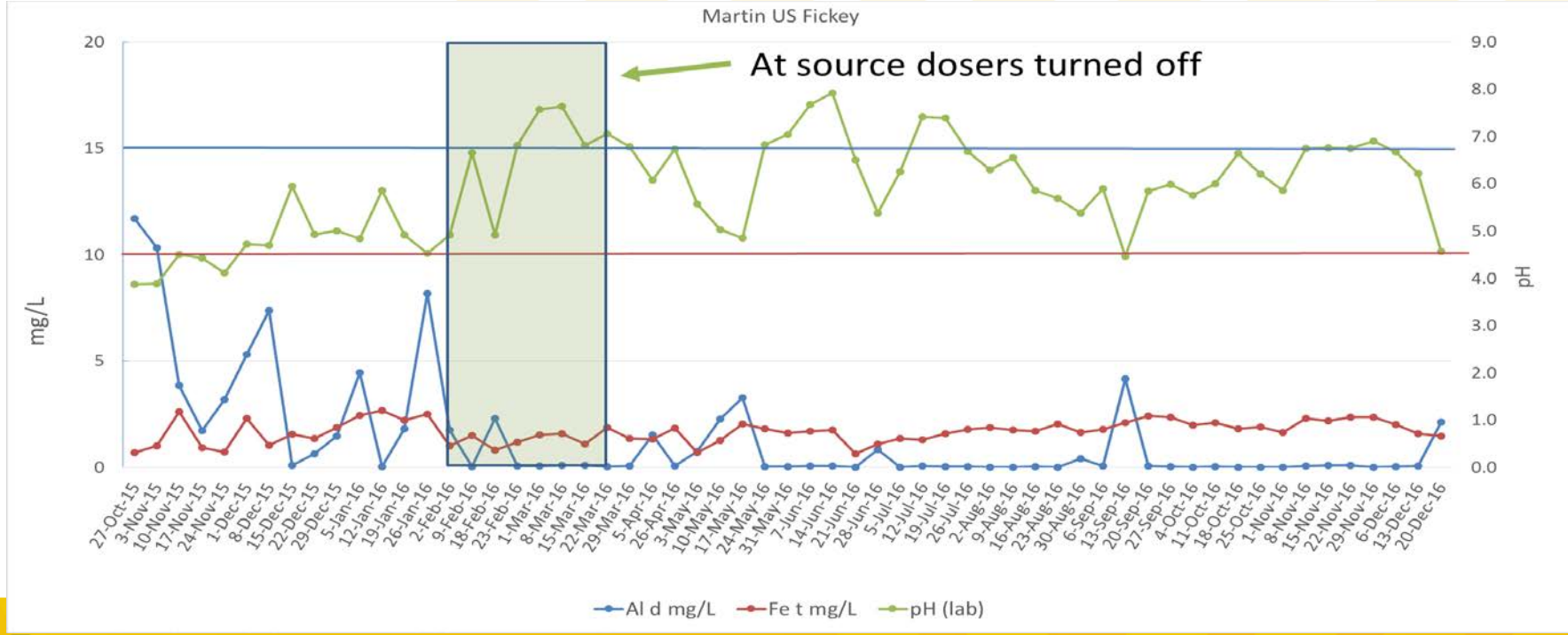


Muddy Creek Downstream Martin Ck.



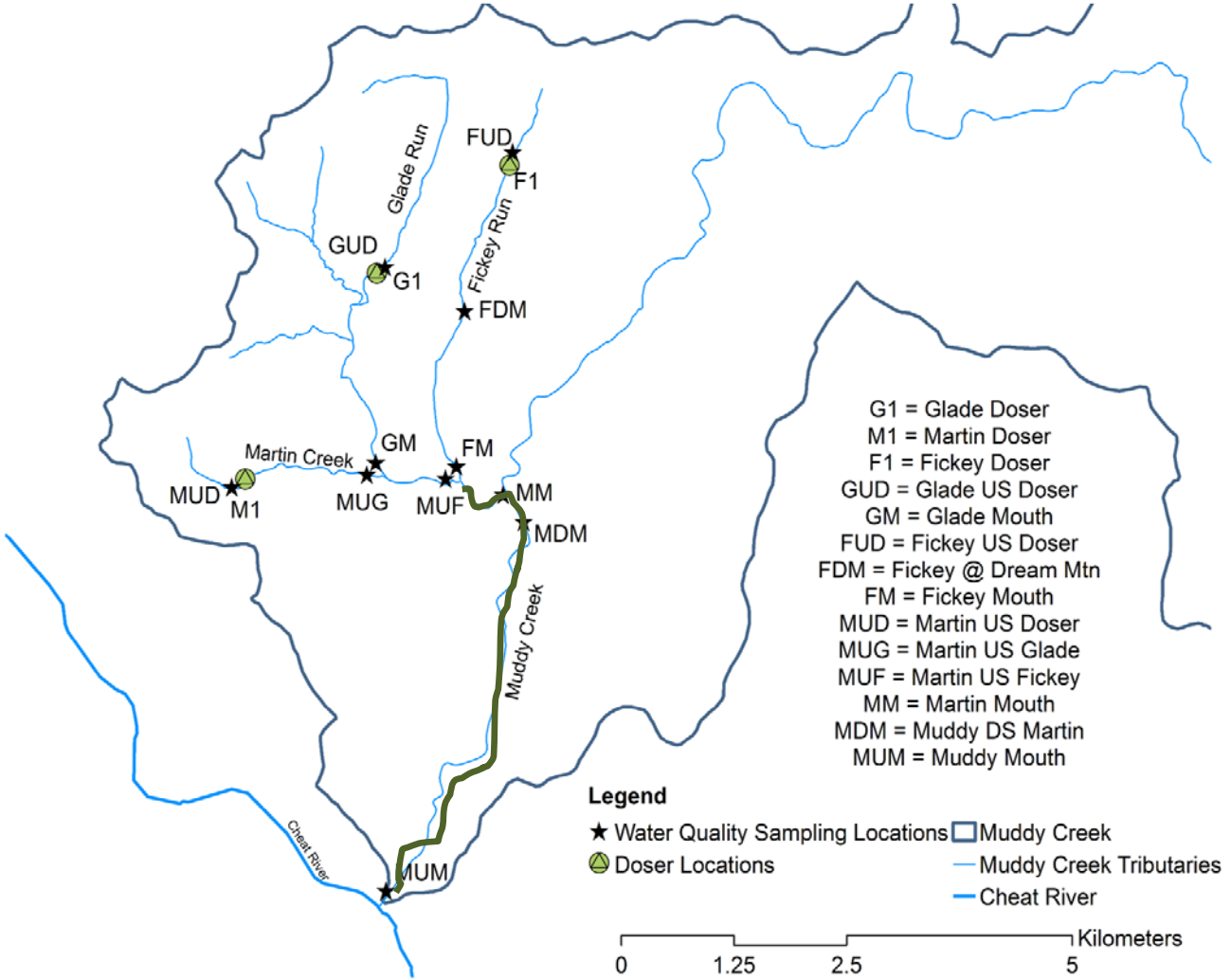
5 Jul 16

Martin Ck. at Compliance Point



Martin Creek Project

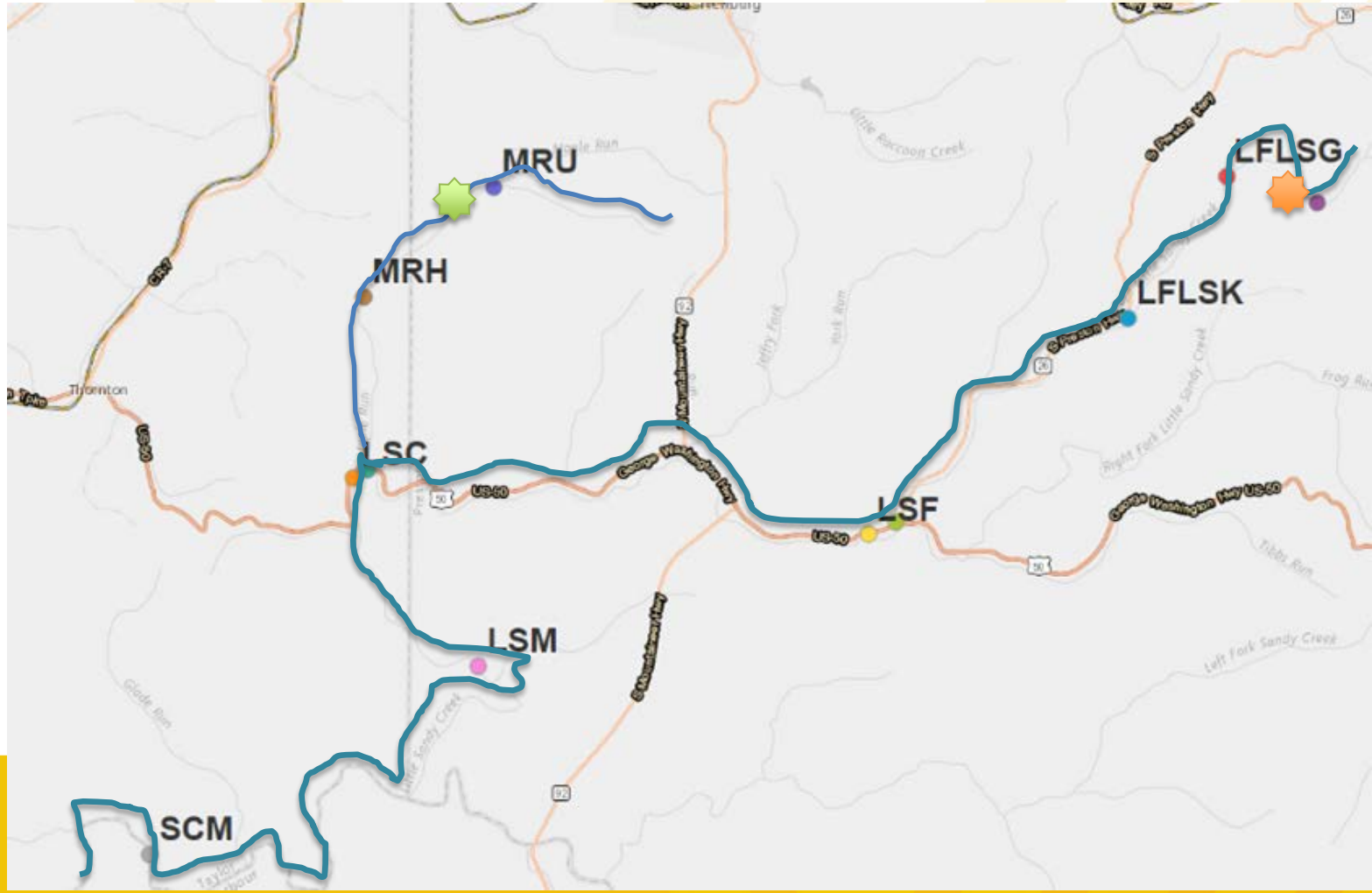
Benefits: 3.4 miles of stream recovery, Connect Cheat River to upper Muddy Ck. Brook trout fishery



Little Sandy Creek Project

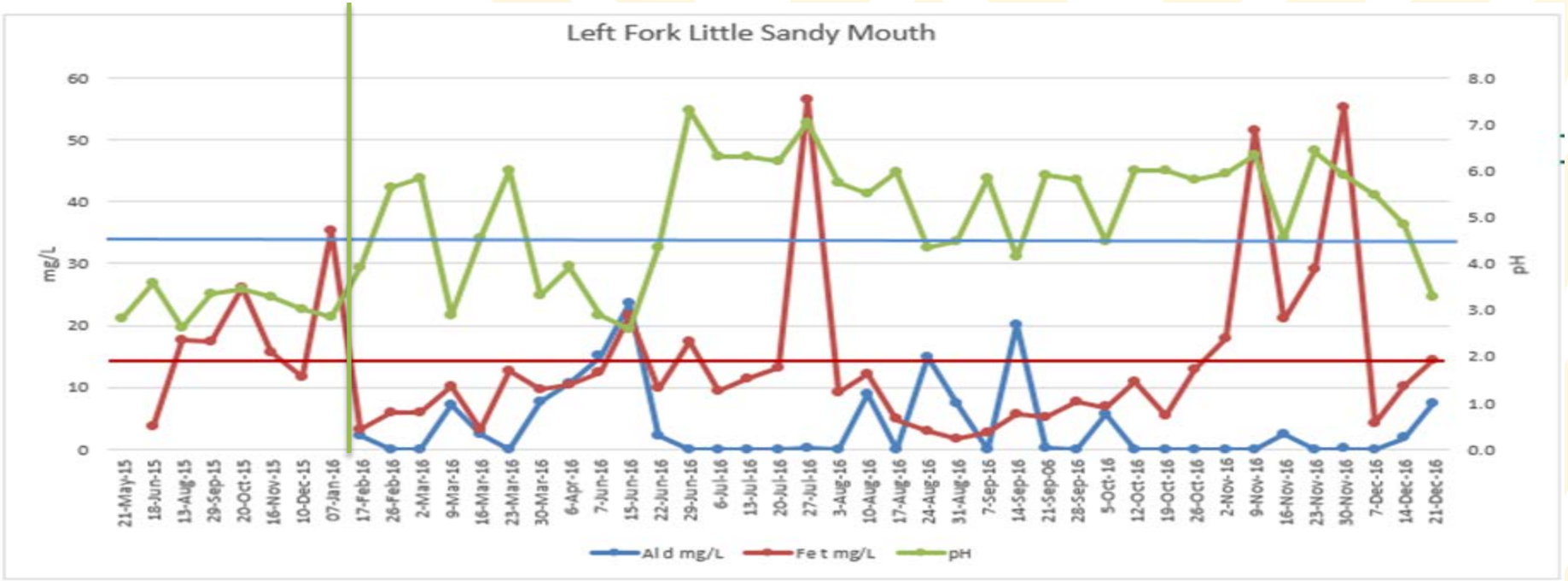
Dosers:

- LFLS Ck.
- Maple Run



Left Fork Little Sandy Ck. mouth

Dosers on



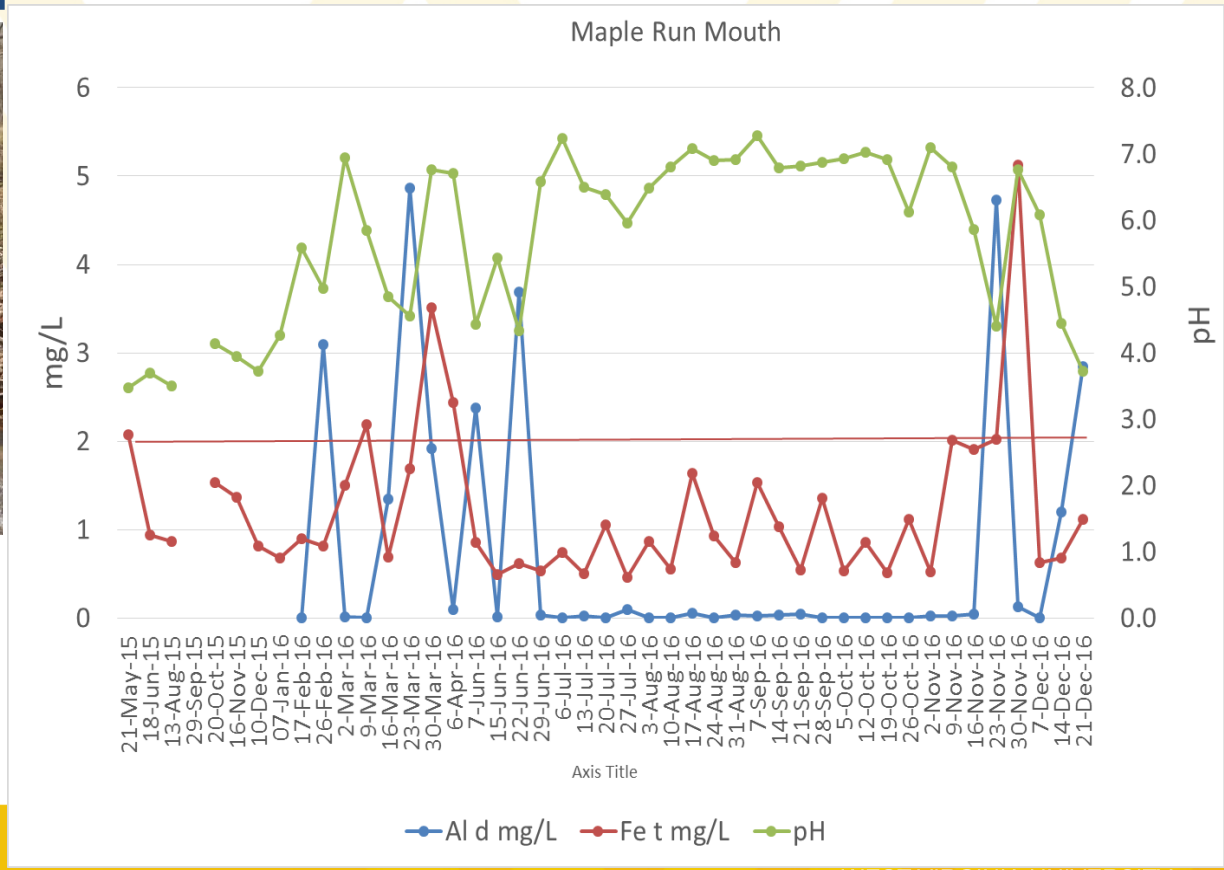
Left Fork Little Sandy Ck

Upstream of doser

Downstream Doser
Conn Bridge 28 Sep16

Downstream Doser
Conn Bridge 12 Dec 16

Maple Run mouth



Little Sandy Mouth

Sandy Ck Mouth

Cost centers

At-source treatment

Capital	O&M
Doser	Lime
Installation	Manpower
Sludge handling system	Sludge handling
	Sludge disposal
	Maintenance

In-stream treatment

Capital	O&M
Doser	Lime
Installation	Manpower
	Maintenance

Cost/benefit

Martin Creek		At-source treatment		In-stream treatment
O&M cost projection (years)		20		20
Annual O&M	$	218,084	$	145,533
Total Capital Cost	$	4,825,824	$	1,200,000
Treatment units		6		2
Total O&M	$	4,361,684	$	2,910,664
Total cost	$	9,187,508	$	4,110,664
Projected stream mile recovery*		**0**		**3.4**
Sandy Creek				
O&M cost projection (years)		20		20
Annual O&M	$	189,568	$	223,708
Total Capital Cost	$	2,609,587	$	1,444,032
Treatment units		4		3
Total O&M	$	3,791,369	$	4,474,166
Total cost	$	6,400,955	$	5,918,198
Projected stream mile recovery**		**0**		**10.8**

* With completion of the T&T AMD project

** Includes a passive treatment unit at Barlow Portal

Lime Costs: Martin Ck and Glade Run Dosers

At-source treatment

- capX: $840k
- Annual lime cost
  - $130k
- Stream miles recovered
  - 0

In-stream treatment

- capX: $240k
- Annual lime cost:
  - $84k
- Stream miles recovered
  - ?

LOW FLOW CONDITIONS

Pre dosing-29oct15

Post dosing-10nov15

HIGH FLOW CONDITIONS

Post dosing

29nov15-Muddy DS Martin Ck

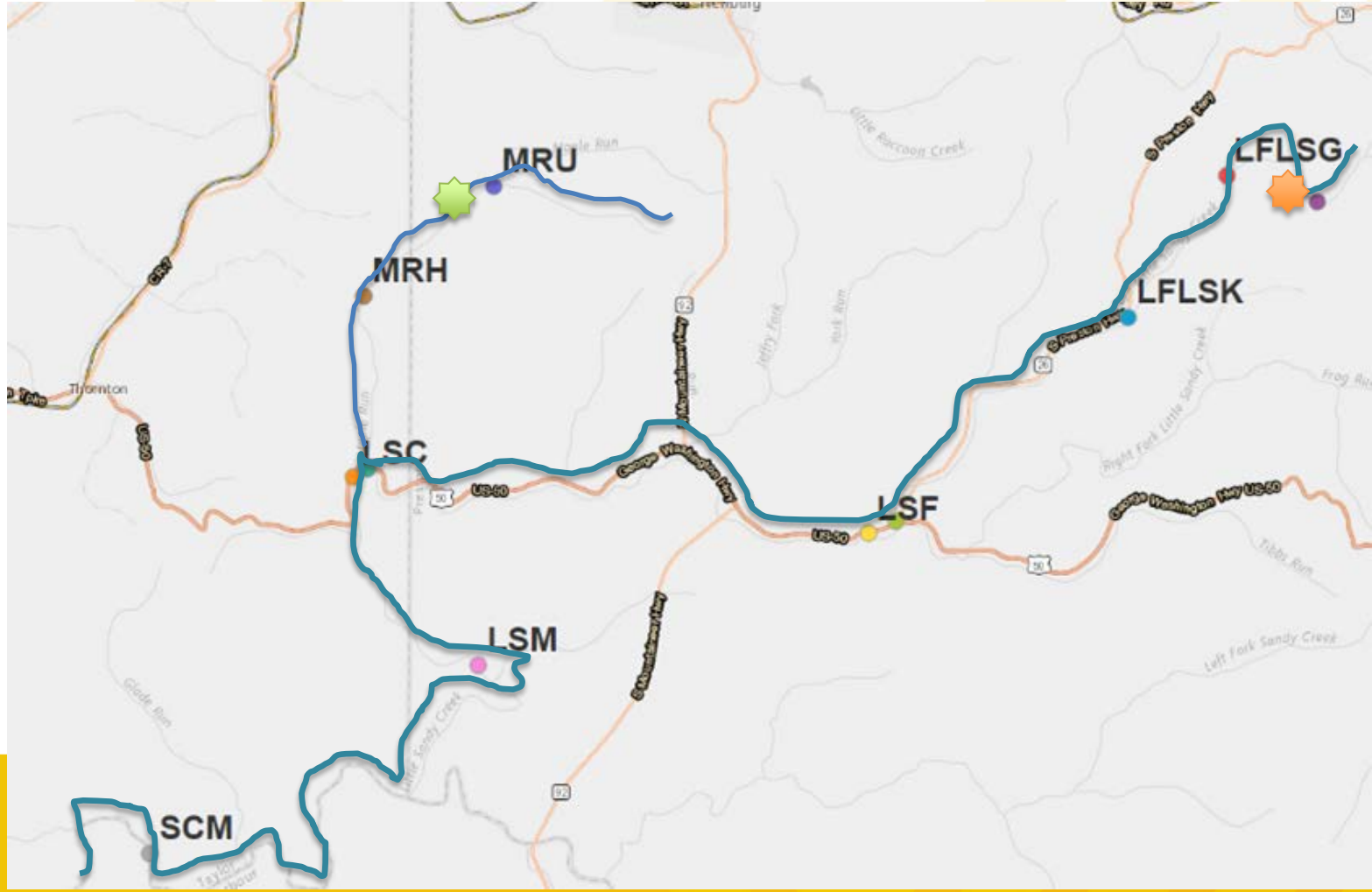
Post dosing

29nov15-Muddy @ Beech Run

Little Sandy Creek Project

Dosers:

- Sandy Creek
- Maple Run



Conclusions:

- High variation in doser output
- High variation in stream flow
- Water quality variance achieved at The Martin Ck US Fickey Run compliance point
- No effect from turning off the Martin Ck at- source dosers
- Since 1 Feb 16 > 6.0 77% of the time
- opX: Lime cost about $84k/year
- capX: 2 dosers at ~ $140k each installed

Martin Ck. Conceptual Plan

Install Dosing Units on Martin Ck. and Glade Run

- Lime slurry
- Municipal water makeup
- Line power

WVDEP/OSR's Omega Site lime slurry doser