POLLUTION LOADING TRACKING TO CHARACTERIZE SUCCESS OF ANOXIC LIMESTONE DRAIN INSTALLATION AT LAMBERT'S RUN AMD TREATMENT SITE

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Overview

- Site Background
- Purpose
- Pollution Loading
- Conclusions

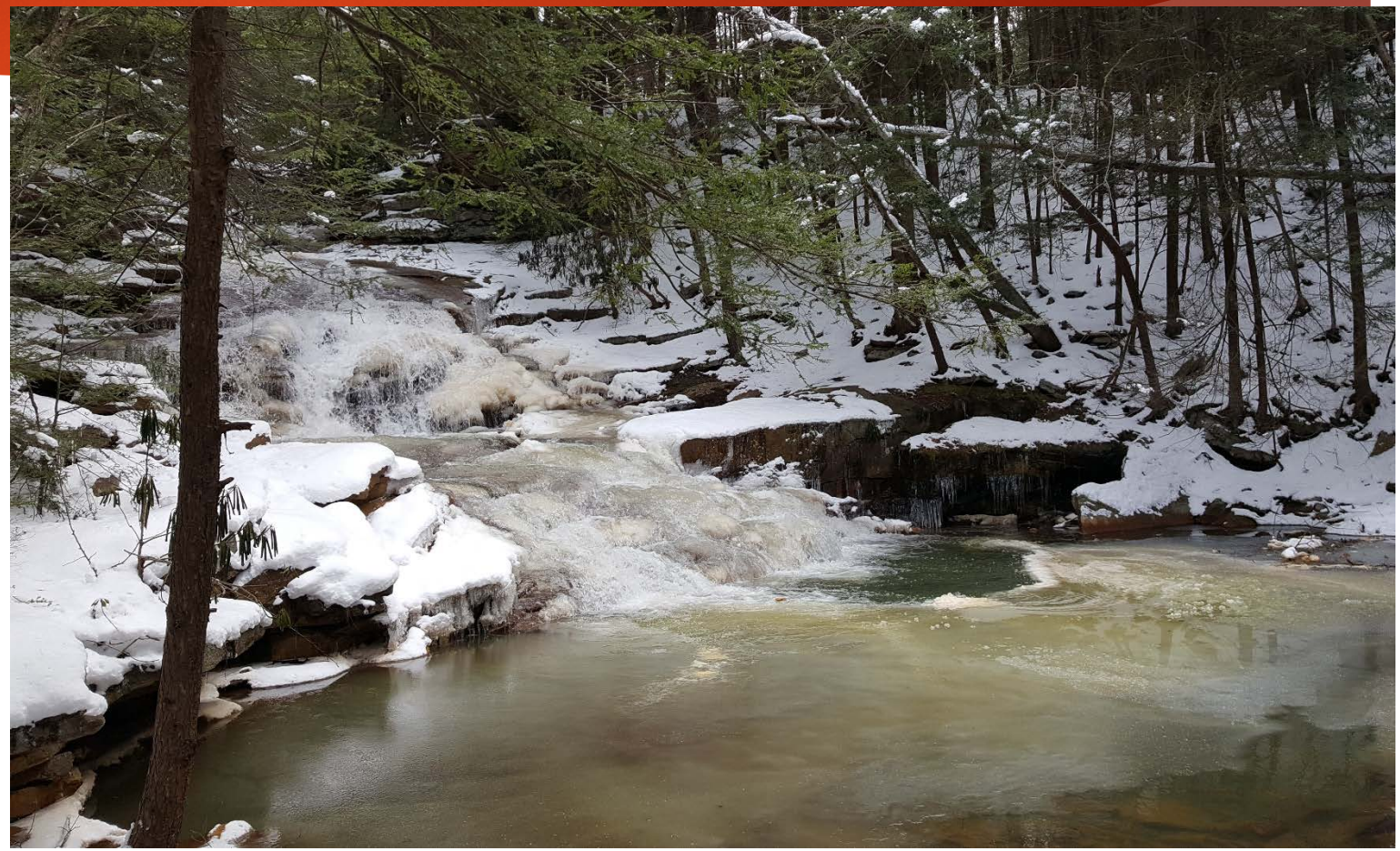


Figure 1: Waterfall at most downstream site on Lambert's Run

Site Background

- Well drilled in early 2000s
- Discharge
  - pH 5 – 6
  - high Fe & SO_4
- Low alkalinity

Figure 2: Map of Lambert's Run Sampling sites

System Design

Figure 3: ALD Discharge

Figure 4: ALD Sampling Sites

Study Purpose

- Next steps
  - Variable flow
  - System function
  - Alternate sources

Figure 5: Sampling at most downstream site, February 2017

Sampling

Figure 6, 7, 8: Sampling, February 2017

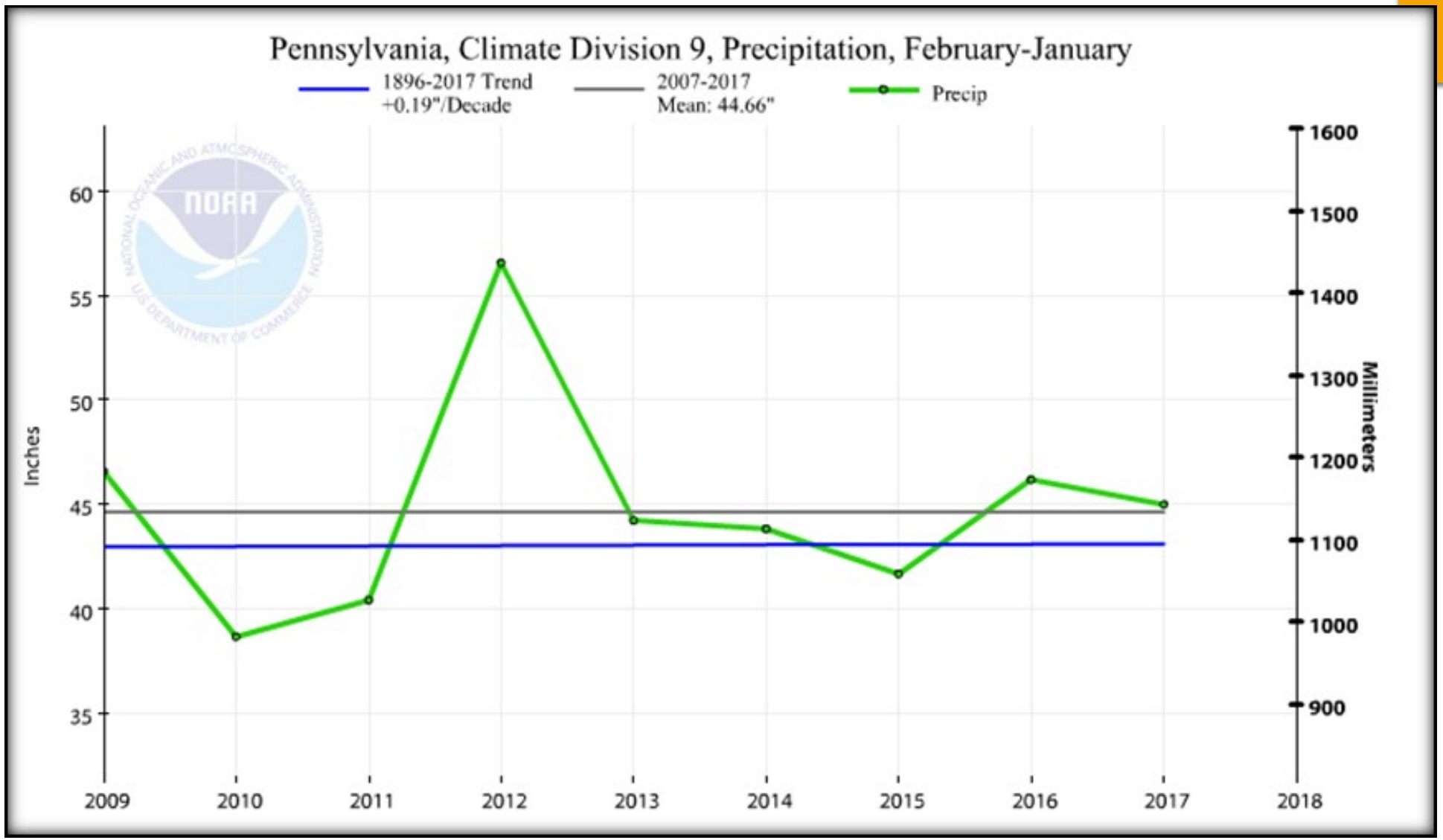
Data Analysis

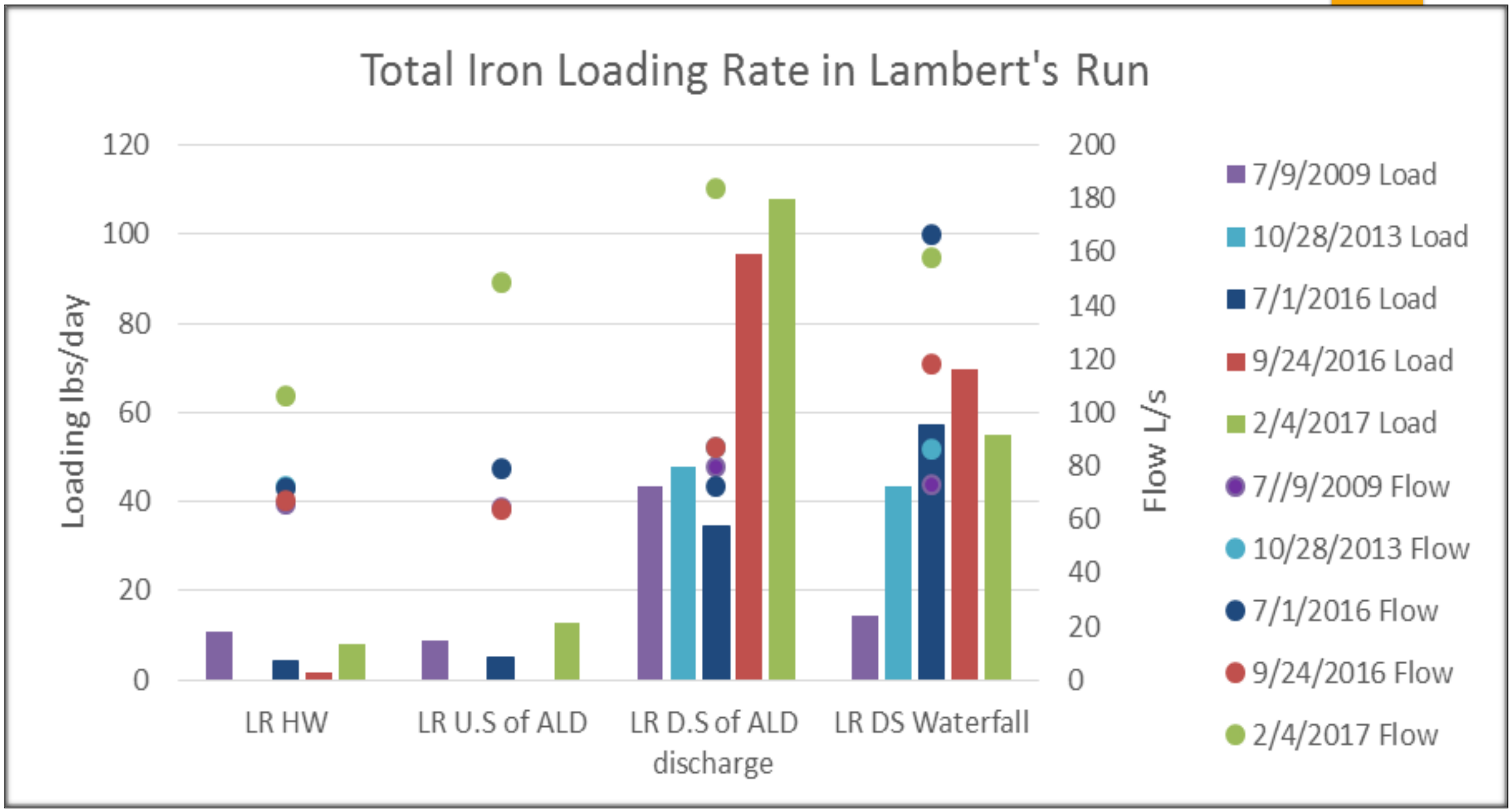
- Precipitation Trends
- Iron
- Manganese
- Alkalinity
- SO_4

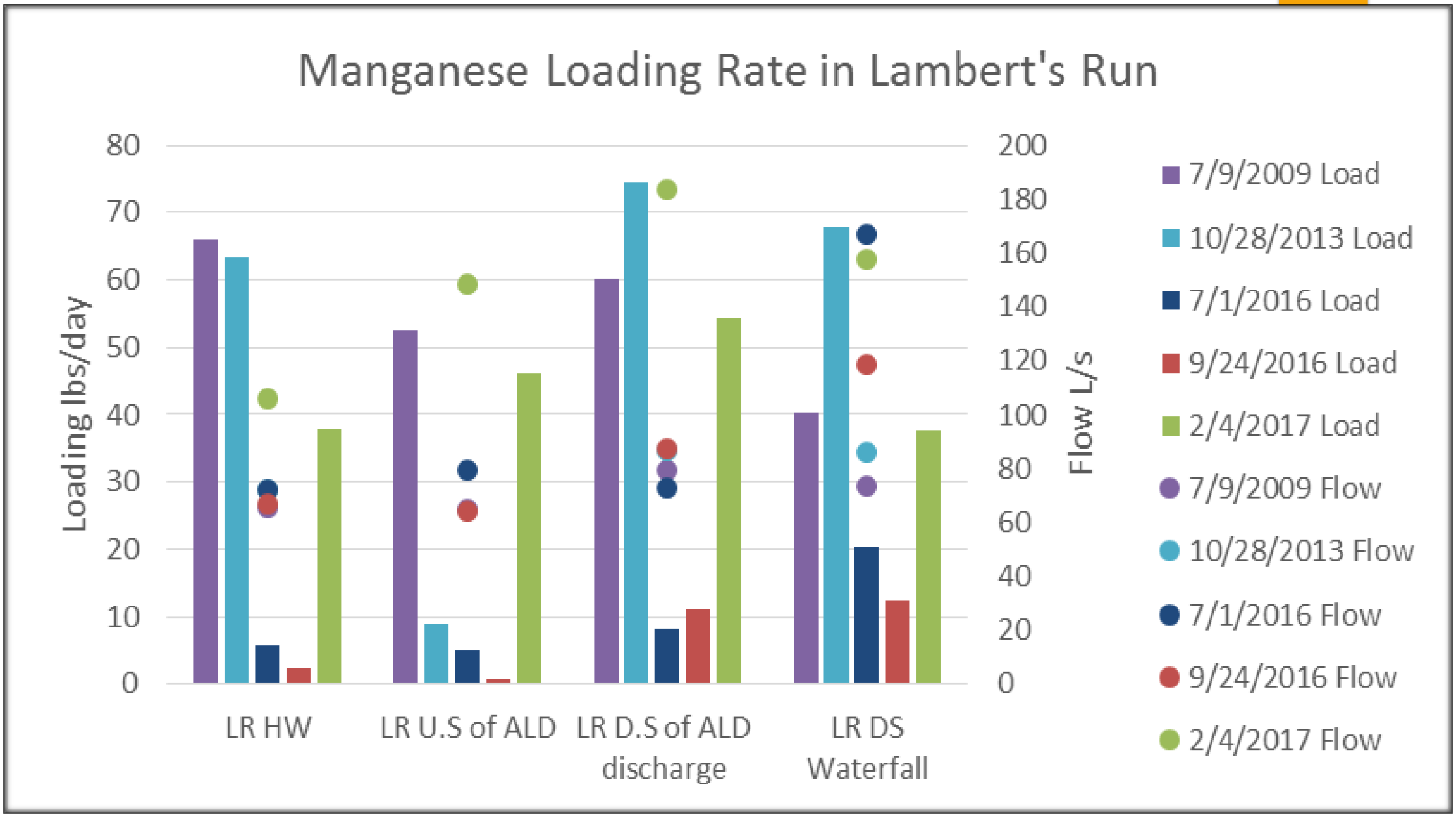
Discharge at a Glance – 9/24/2016

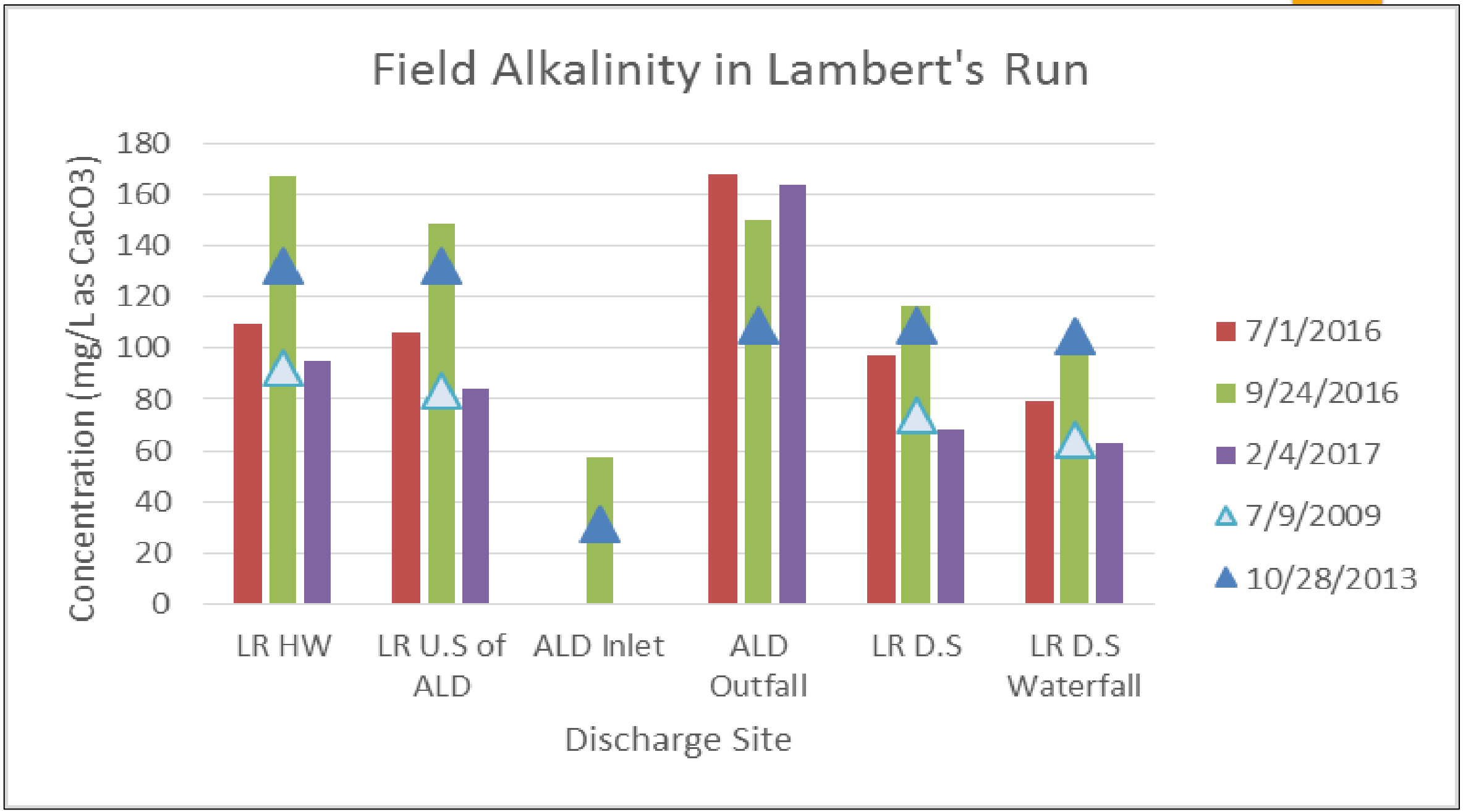
	Discharge	Post Treatment
pH	5.95	6.48
Alkalinity (mg/L as $CaCO_3$)	57.5	150
Total Fe (mg/L)	20.1	18.7
Mn (mg/L)	12.8	13.2
SO_4 (mg/L)	1236	1182

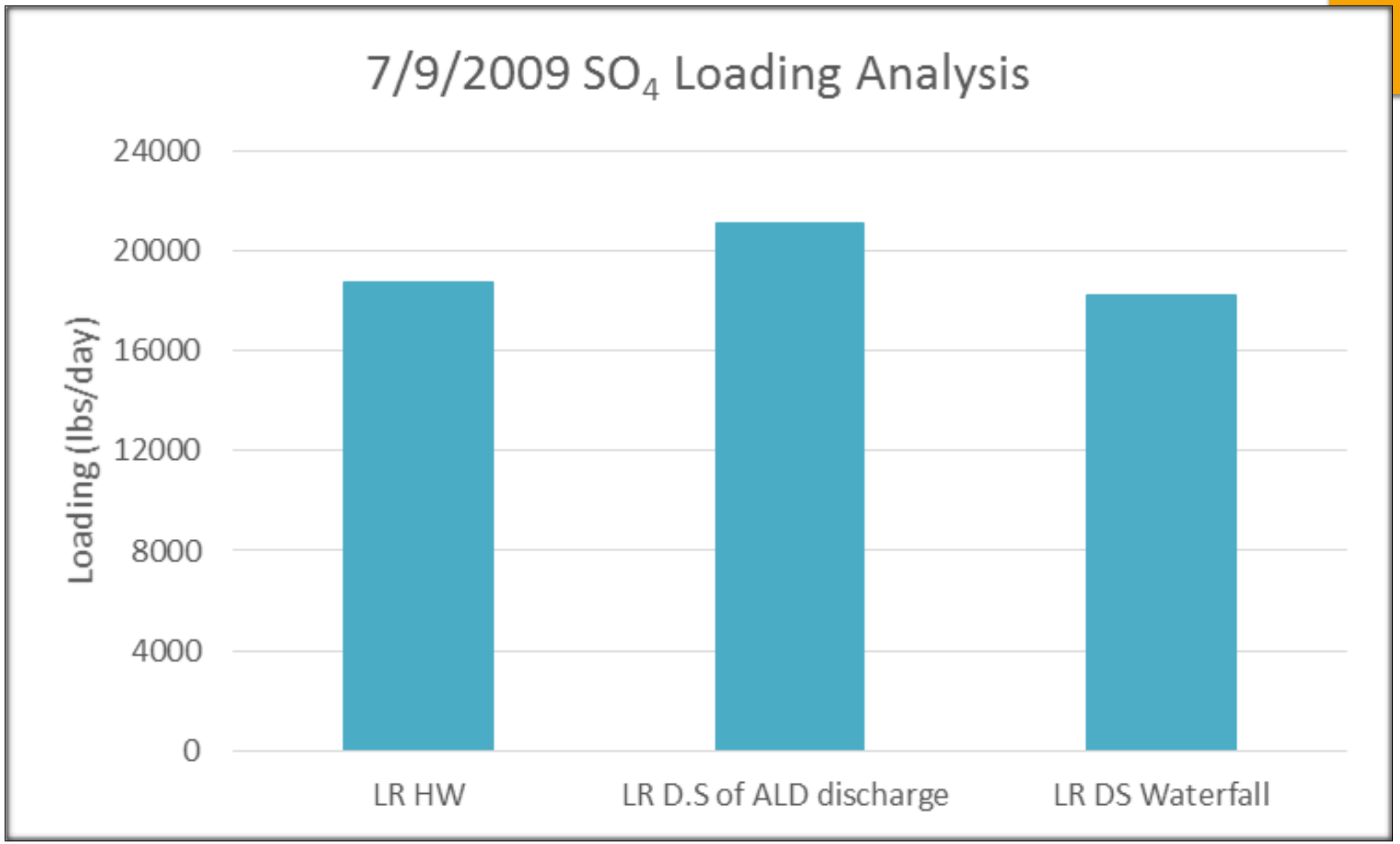
Table 1: Lambert's Run data before and after ALD

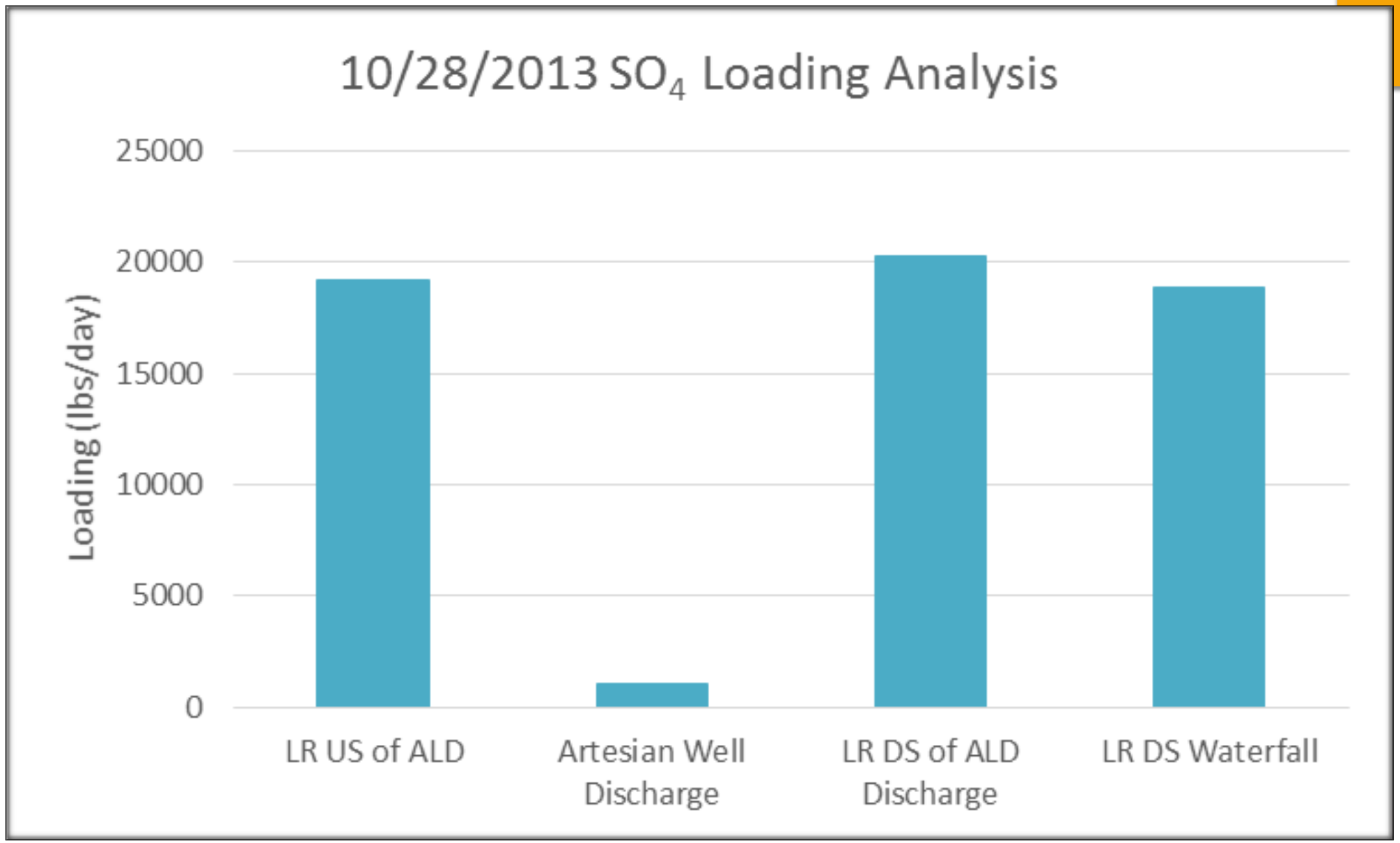

Pennsylvania, Climate Division 9, Precipitation, February-January
1896-2017 Trend
+0.19"/Decade
2007-2017
Mean: 44.66"
Precip
Inches
Millimeters
60
55
50
45
40
35
1600
1500
1400
1300
1200
1100
1000
900
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018

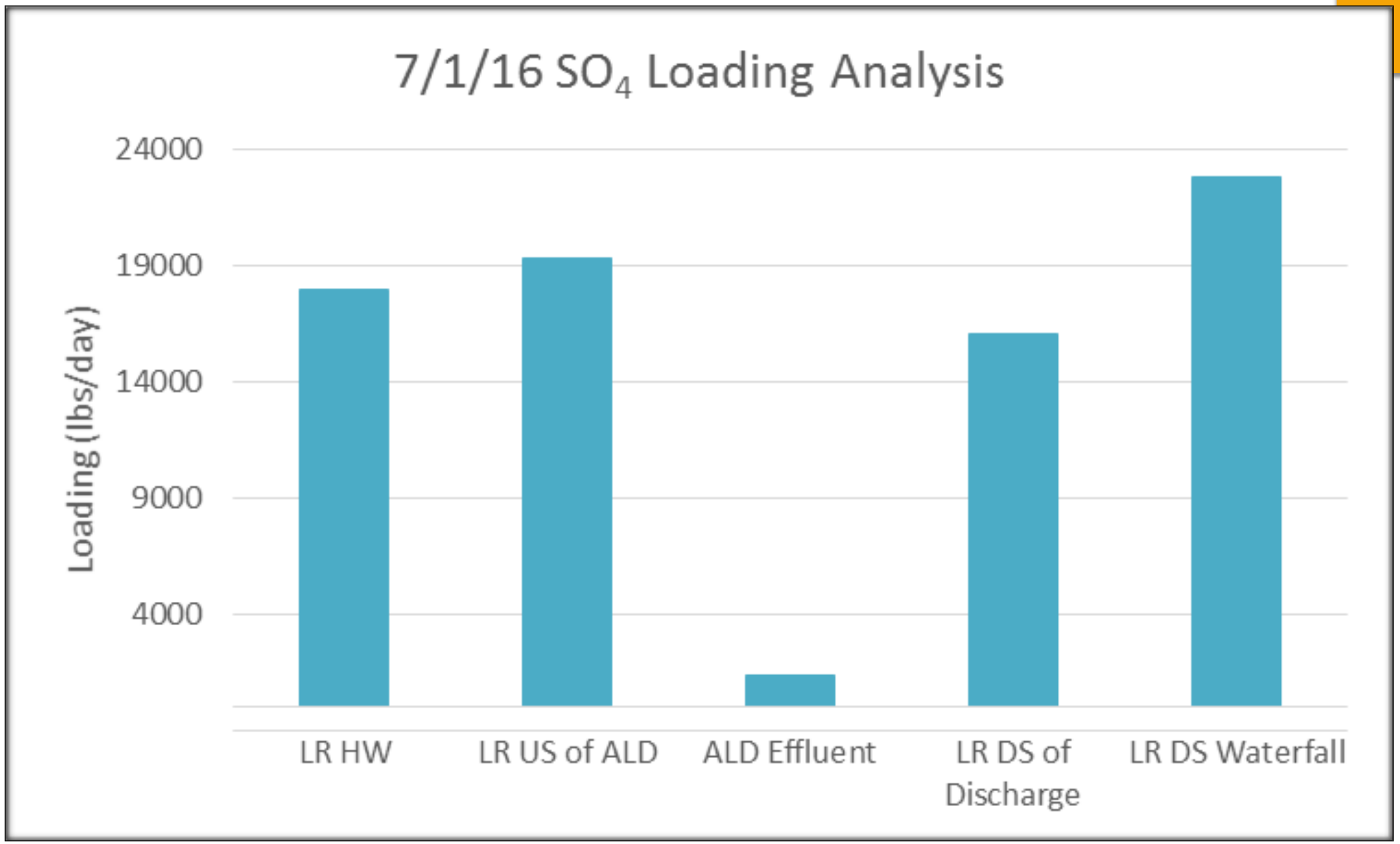

Total Iron Loading Rate in Lambert's Run
Loading lbs/day
Flow L/s
120
100
80
60
40
20
0
200
180
160
140
120
100
80
60
40
20
0
LR HW
LR U.S of ALD
LR D.S of ALD discharge
LR DS Waterfall
7/9/2009 Load
10/28/2013 Load
7/1/2016 Load
9/24/2016 Load
2/4/2017 Load
7//9/2009 Flow
10/28/2013 Flow
7/1/2016 Flow
9/24/2016 Flow
2/4/2017 Flow


Manganese Loading Rate in Lambert's Run
Loading lbs/day
Flow L/s
80
70
60
50
40
30
20
10
0
200
180
160
140
120
100
80
60
40
20
0
LR HW
LR U.S of ALD
LR D.S of ALD discharge
LR DS Waterfall
7/9/2009 Load
10/28/2013 Load
7/1/2016 Load
9/24/2016 Load
2/4/2017 Load
7/9/2009 Flow
10/28/2013 Flow
7/1/2016 Flow
9/24/2016 Flow
2/4/2017 Flow


Field Alkalinity in Lambert's Run
Concentration (mg/L as CaCO3)
180
160
140
120
100
80
60
40
20
0
LR HW
LR U.S of ALD
ALD Inlet
ALD Outfall
LR D.S
LR D.S Waterfall
Discharge Site
7/1/2016
9/24/2016
2/4/2017
7/9/2009
10/28/2013


7/9/2009 SO_4 Loading Analysis
Loading (lbs/day)
24000
20000
16000
12000
8000
4000
0
LR HW
LR D.S of ALD discharge
LR DS Waterfall

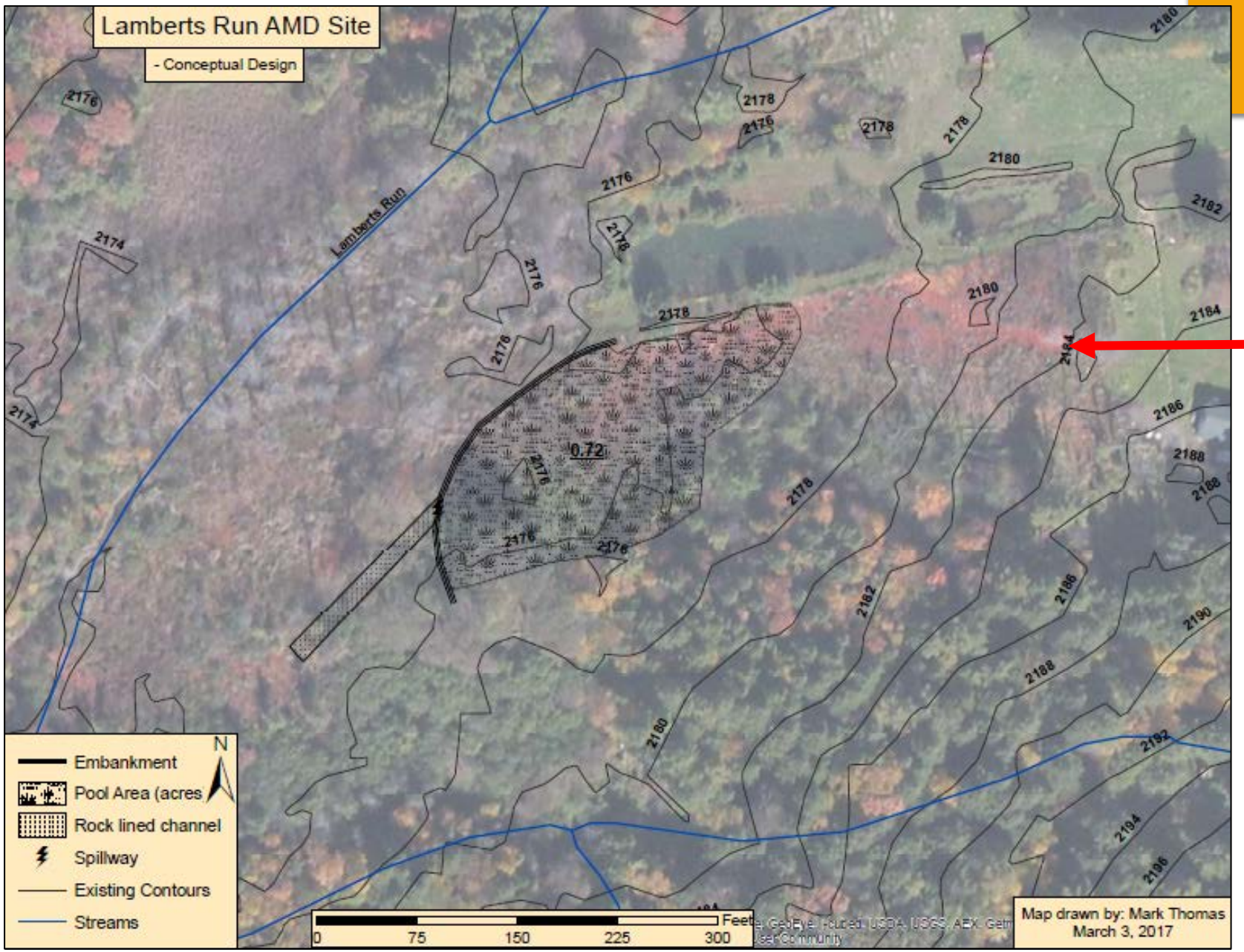

10/28/2013 SO_4 Loading Analysis
Loading (lbs/day)
25000
20000
15000
10000
5000
0
LR US of ALD
Artesian Well Discharge
LR DS of ALD Discharge
LR DS Waterfall


7/1/16 SO_4 Loading Analysis
Loading (lbs/day)
24000
19000
14000
9000
4000
LR HW
LR US of ALD
ALD Effluent
LR DS of Discharge
LR DS Waterfall

Potential System Additions

- Berm wetland
- Vertical flow pond
- Sedimentation basin

Figure 8: Somerset County Conservation District Map of Lambert's Run



Conclusions

- Flow is indeed seasonally variable
- ALD is functioning as intended
- Iron loading is quite variable
- Manganese is being removed
- ALD is adding alkalinity
- Other sources of contamination appear unlikely

Acknowledgements

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Questions?