

Updates to July 11th Presentation: Asylum Lake Assessment Following BTR2 Sediment Loss Event

(All slides presented here were also presented at the July 11th meeting; updated information is denoted by text in blue font color.)

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August 15, 2019

Presentation to the Asylum Lake Policy and Management Council
on behalf of Western Michigan University

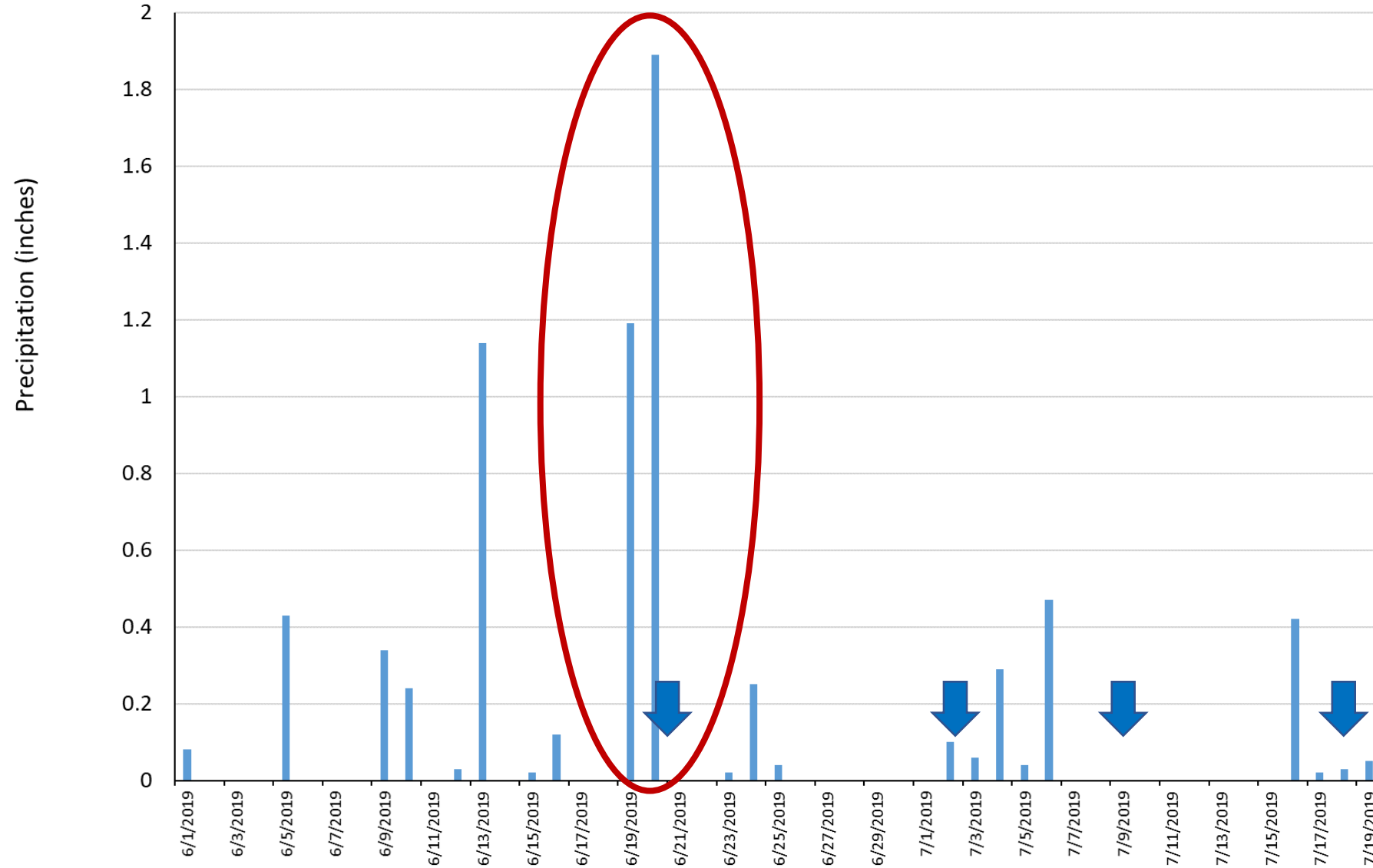
K&A Scope

- Initial characterization of the 6/19-20 BTR2 erosion event with respect to suspended solids and phosphorus concentrations, water clarity, and arsenic transport to Asylum Lake
- Identification of potential short-term/long-term impacts to Asylum Lake associated with the erosion event
- Assessment of additional sampling needs to characterize extent of potential arsenic transport to Asylum Lake

Runoff Event Information

- Rainfall of 3-4 inches over June 19-20th
- Asylum Lake Preserve aerial drone video and photos from June 20th after erosion event started
- WMU asked K&A on June 20th to undertake a 3rd party evaluation of the erosion event
- K&A site inspections and sampling began morning of June 21st
- K&A observations noted site erosion corrections being addressed by contractor on June 21th

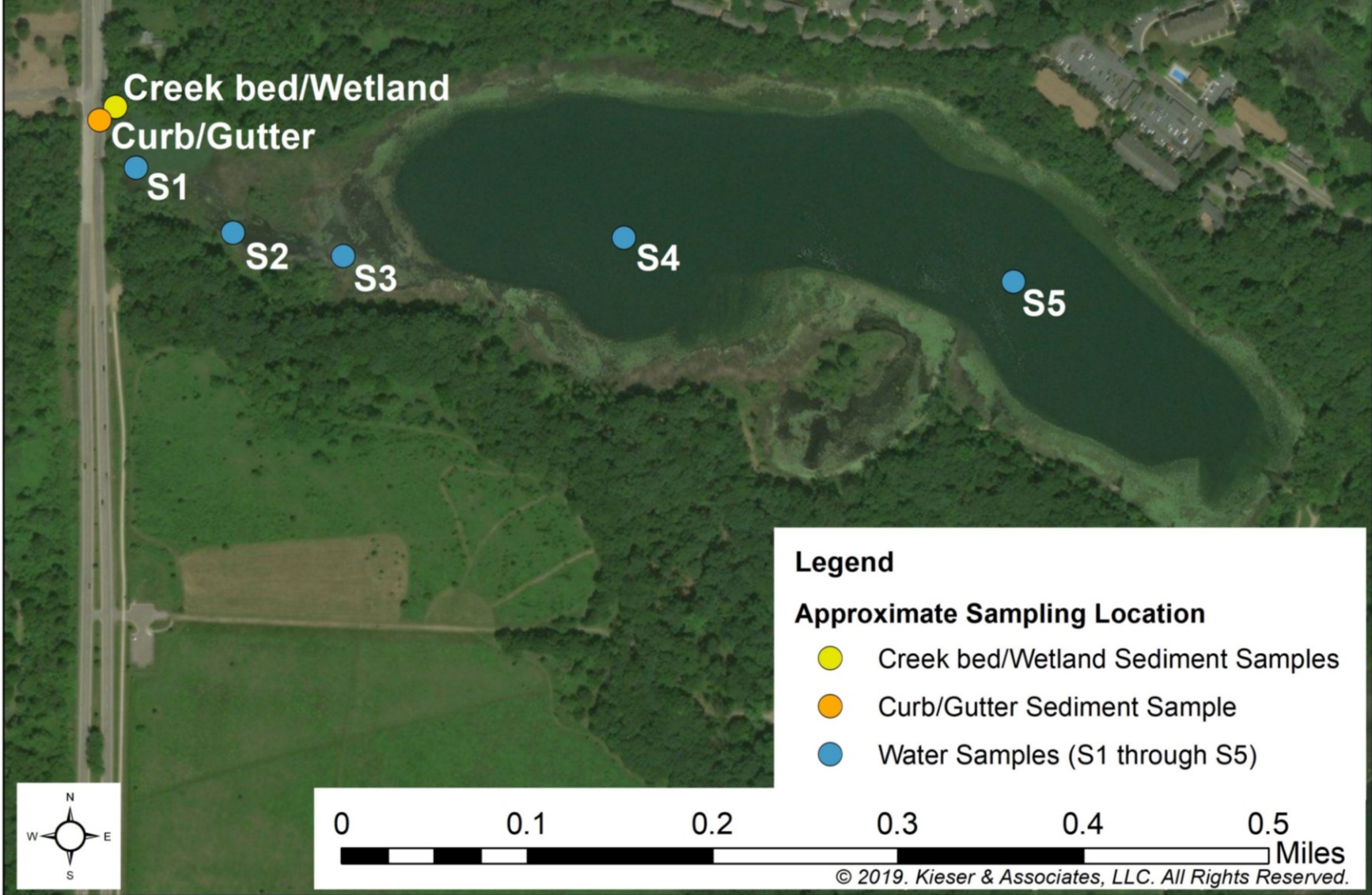
Precipitation – June 1 - July 19, 2019



K&A Activities Timeline Overview

- June 21 – first water and sediment sampling event
- June 24 – site inspection/assessment to evaluate likely sediment flow path
- June 25 – first drone video acquired on behalf of WMU
- June 25 – second site inspection
- July 2 – second water and sediment sampling event
- July 3 – third site inspection
- July 3 – second drone video acquired on behalf of WMU
- July 9 – third water sampling event ([updated results](#))
- July 11 – ALPMC presentation
- [July 18 – fourth water sampling event](#)
- [August 15 – ALPMC presentation Update](#)

K&A Sampling Locations



Asylum Lake Monitoring Data

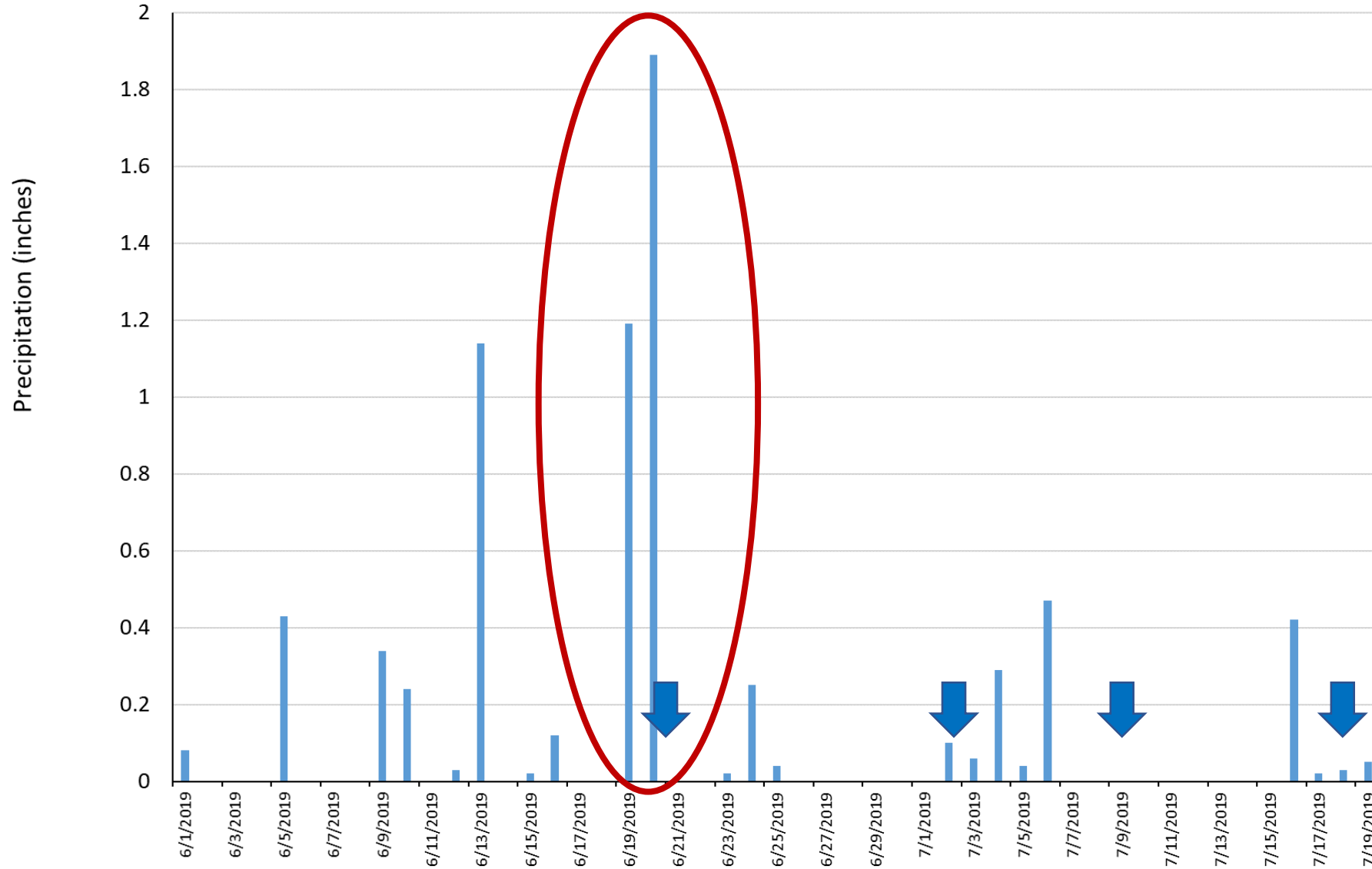
Date	Total Phosphorus - TP (ppb)	Soluble Reactive Phosphorus - SRP (ppb)	Total Suspended Solids - TSS (ppm)	Secchi Depth (ft)	Turbidity (NTU)	
7/26/76 ^a	"Non-detect"	--	--	11.5 - 16.5	--	
8/9/06 ^b	13 - 22	2 - 3	<4	12.5		↑ Historic
6/21/19 ^c	30 - 110	--	7 - 20	2.8 - 3.8	23 - 35	↓ Recent
7/2/19 ^c	30 - 80	--	5 - 24	--		
7/9/19 ^c	<10 - 50	<2.1	<3 - 16	10.5 - 11.0	23 - 24.5	
7/18/19 ^c	10 - 50	--	<3 - 28	9.7 - 10.3	17 - 21.5	

^a Engemann, E. (circa) 1977. "Observations on Asylum Lake, Kalamazoo, Michigan." unpublished. (NOTE: Bottom water TP in Sept. 1976 was 1,500 ppb.)

^b Kieser & Associates, LLC. (K&A) 2008. "Water Quality Evaluation of Asylum Lake and Little Asylum Lake with Management Recommendations." Prepared for WMU Asylum Lake Policy and Management Council, May 5, 2008, 194pp. (NOTE: Bottom water TP in Aug. 2006 was 565 ppb; SRP was 334 ppb.)

^c K&A preliminary monitoring results following the BTR2 erosion discharge to Asylum Lake.

Precipitation – June 1 - July 19, 2019 (repeat of slide 4)



Arsenic Water Sampling in Asylum Lake

Date	Water Sampling Location	Arsenic Concentration (ppb)
6/21/2019	S1	3
6/21/2019	S2	3
6/21/2019	S3	2
6/21/2019	S4	<2 (non-detect)
7/2/2019	S1	<2 (non-detect)
7/2/2019	S2	<2 (non-detect)
7/2/2019	S3	<2 (non-detect)
7/2/2019	S4	<2 (non-detect)
7/9/2019	S1	<2 (non-detect)
7/9/2019	S2	<2 (non-detect)
7/9/2019	S3	<2 (non-detect)
7/9/2019	S4	<2 (non-detect)

Water Quality Criteria for Comparison:

Criterion Value (ppb)	Category	Definition
10	HNV-Drink	Human non-cancer value, includes drinking water exposure
280	HNV Non-drink	Human non-cancer value, does not include drinking water exposure
10	HCV-Drink	Human cancer value, includes drinking water exposure
10	HCV-Non-drink	Human cancer value, does not include drinking water exposure
150	FCV	Final Chronic Value (aquatic life)
340	AMV	Aquatic Maximum Value (aquatic life)
680	FAV	Final Acute Value (aquatic life)

Asylum Lake Sediment Sampling Results

Surficial (top 0.5-in) Composite Sediment Sample >>	Curb/ Gutter (ppb)	Creek Bed (ppb)	Creek Bed (ppb)	Wetland Soil Surface (ppb)	Non-residential Direct Contact Criteria ² (ppb)	EGLE WRD-048 Table 2 Aquatic Life and Wildlife Screening Guidelines (ppb)	Statewide Default Background Level (ppb) ¹	Residential Direct Contact Criteria ¹ (ppb)
Date >>	6/21/2019	6/21/2019	7/2/2019	7/2/2019				
Arsenic	420	1,180	1,980	12,700	37,000	33,000	5,800 (<300-22,800)	7,600
Barium	2,960	16,900	22,300	187,000	130,000,000	none	75,000	37,000,000
Cadmium	<200	<200	<200	450	2,100,000	4,980	1,200	550,000
Chromium	640	6,730	7,040	25,300	9,200,000	111,000	18,000	2,500,000
Copper	1,620	9,030	6,840	46,200	73,000,000	149,000	32,000	20,000,000
Lead	830	28,100	5,770	69,700	900,000	128,000	21,000	400,000
Mercury	<50	<50	<50	<50	580,000	1,060	130	160,000
Selenium	<400	570	<400	<500	9,600,000	1,900	410	2,600,000
Silver	<200	<200	<200	<200	9,000,000	none	1,000	2,500,000
Zinc	4,120	55,800	44,000	329,000	630,000,000	459,000	47,000	170,000,000

¹ Table 2. Soil: Residential Part 201 generic cleanup criteria and screening levels/Part 213 risk-based screening levels.

² Table 3. Soil: Non-residential Part 201 generic cleanup criteria and screening levels/Part 213 risk-based screening levels.

Updated Findings

- Low to non-detect Arsenic measured in water from wetland and lake has shown no exceedances of relevant water quality criteria
- Loss of Arsenic-contaminated soils via erosion event appears to have been limited
 - Comparatively low levels of Arsenic in representative curb/gutter soil sample
 - No exposed contaminated soils observed/reported at BTR2 erosion locations during rain event
 - Some sediment was recovered from roadway and ditch west of Drake post-event
 - Observations of mostly fine sediment discharges to Asylum Lake and wetland
- Evidence of legacy stormwater loading impacts on wetland sediment contaminants (consistent with previous historic reporting)
- Short-term phosphorus, turbidity, algal bloom impacts **were** evident, **though largely dissipated after 2-3 weeks following erosion event**
- **Subsequent sampling confirms historically reported (non-BTR2) stormwater loading persists**
- Limited historic sediment data/limited access to water quality data; both needed to clearly establish baseline conditions from post-event conditions

Next Steps

- None recommended for post-event

Questions?