

## Group 6: Massey Draw – 2023

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**Table 1.** Site information

Site ID	Latitude	Longitude	Site Description
MD1	39°33'31.13"N	105°4'23.86"W	East of Chatfield pedestrian footbridge
MD2	39°33'35.78"N	105°4'49.29"W	Confluence of North and South Massey Draw
NMD1	39°33'36.51"N	105°4'50.69"W	100 feet upstream of confluence on North Massey Draw
NMD2	39°34'8.68"N	105°6'4.57"W	West of Willow Creek residential area, south of the roundabout on Garrison Way
SMD1	39°33'35.56"N	105°4'50.89"W	100 feet upstream of confluence on South Massey Draw
SMD2	39°33'38.58"N	105°6'4.35"W	Surrounded by a pool, Falcon Bluffs middle school, and residential development

### Main Findings

- Metals at all sampled sites were higher than in similarly developed areas (ex: Sterling Ranch)
  - Five sites (MD1, NMD1, NMD2, SMD1, SMD2) were above the limit for CDPHE Regulation 38 chronic level for arsenic.
  - Five sites (MD1, MD2, NMD1, NMD2, SMD1) were above the CDPHE Regulation 38 Acute and Chronic levels for selenium.
  - Three sites (MD1, MD2, NMD1) were above the limit for EPA human recreation of thallium.
- All six sites were above the proposed limit for CDPHE Regulation 38 Chronic for total nitrogen with most nitrogen in organic form.
- SMD2 was the only site with detectable phosphorus levels in water, but both soil leachate samples (MD2 and NMD2) were above the CDPHE Regulation 38 Chronic limit.
- MD1, MD2, and SMD1 exceed USDA livestock standard for total coliform but are below *E. coli* limits.

**Table 2.** Measured water quality parameters and flow rates

Date	Site ID	pH*	Conductivity (µs/cm)	Temp** (°C)	Dissolved Oxygen <sup>▲</sup> (mg/L)	Alkalinity* (mg CaCO <sub>3</sub> /L)	Turbidity (NTU)	Flow Rate (cfs)
5/16/2023	MD1	8.09	869	13.9	8.25	146.8	13.0	8.9 <sup>#</sup>
5/16/2023	MD2	8.07	886	13.3	8.60	145.2	12.1	N/M
5/16/2023	NMD1	7.98	821	15.5	8.38	132.8	11.9	0.3 <sup>#</sup>
5/16/2023	NMD2	7.96	829	16.2	7.75	139.2	11.1	N/M
5/16/2023	SMD1	7.94	1451	16.2	7.78	265	2.33	N/M
5/16/2023	SMD2	8.01	1322	22.2	10.27	214	2.24	4.8 <sup>#</sup>

N/M = Not Measured; \*Standard limit 6.5 to 9 [4]; \*\*Daily Max 24.3°C; <sup>▲</sup>Standard min 6.0 mg/L [4]; <sup>#</sup>Standard limit 20 mg CaCO<sub>3</sub>/L [1]; <sup>#</sup>Measurement taken 5/19/2023



**Figure 1.** Site map

**Table 3. Metals, anions, solids, organics, nutrients, and pathogens**

2023 Group 6 – Massey Draw			Concentrations												
			Metals (mg/L)					Anions (mg/L)		Solids (mg/L)	Organics (mg/L)	Nutrients (mg/L)		Pathogens (mpn/100 mL)	
			As	Fe	Mn	Se	Tl	NO <sub>2</sub> <sup>-</sup> -N	NO <sub>3</sub> <sup>-</sup> -N	TSS	TOC	P	TN	Coliform	<i>E. coli</i>
EPA	Aquatic Life Chronic [1]		0.15	1.0	-	-	-	-	-	-	-	-	-	-	-
	Aquatic Life Acute [1]		0.34	-	-	-	-	-	-	-	-	-	-	-	-
	Human Recreation [2]		1.8E-05	-	0.05	0.17	2.4E-04	-	10	-	-	-	-	-	-
	Drinking Water [3]		0.01	-	-	0.05	0.002	1	10	-	-	-	-	-	-
	Secondary Drinking Water [3]		-	0.3	0.05	-	-	-	-	-	-	-	-	-	-
CDPHE	Regulation 38 Chronic [4]		2.0E-05*	1.0*	1.7**	0.0046	-	0.05	-	-	-	0.11 <sup>▲</sup>	0.53 <sup>•</sup>	-	126
	Regulation 38 Acute [4]		0.34	-	3.1**	0.0184	-	-	10	-	-	-	-	-	-
USDA	USDA Livestock [5]		0.01	0.3	0.05	0.05	-	10	30	-	-	-	-	200	-
	Detection Limit (mg/L)		0.0168	0.0003	0.0001	0.0109	0.0049	0.1	0.1	-	0.17	0.029	0.17	1	1
Sample	Site ID	Date	As	Fe	Mn	Se	Tl	NO <sub>2</sub> <sup>-</sup> -N	NO <sub>3</sub> <sup>-</sup> -N	TSS	TOC	P	TN	Coliform	<i>E. coli</i>
Water	MD1	5/16/23	<b>0.022</b>	0.050	0.025	0.021	0.011	BDL	0.51	8	8.95	BDL	1.14	659	41.4
	MD2	5/16/23	BDL	0.055	0.030	0.024	0.007	BDL	0.81	0	9.55	BDL	1.43	689	62.2
	SMD1	5/16/23	<b>0.025</b>	0.081	0.026	0.023	BDL	BDL	0.39	4	9.48	BDL	0.91	1200	57.3
	NMD1	5/16/23	<b>0.018</b>	0.022	0.048	0.027	0.005	BDL	2.93	4	7.95	BDL	4.18	51.2	37.7
	SMD2	5/16/23	<b>0.019</b>	0.064	0.032	BDL	BDL	BDL	0.25	8	9.83	0.03	0.88	10.5	12.7
	NMD2	5/16/23	<b>0.017</b>	0.063	0.052	0.033	BDL	BDL	3.95	4	10.7	BDL	4.73	152	17.1
Soil	MD2	5/16/23	BDL	0.055	0.003	0.022	BDL	BDL	0.99	N/M	N/M	0.14	N/M	N/M	N/M
	NMD2	5/16/23	BDL	0.194	0.021	0.022	BDL	BDL	0.47	N/M	N/M	1.12	N/M	N/M	N/M
<b>Notes:</b>								[1] US EPA National Recommended Water Quality Criteria - Aquatic Life Criteria Table; freshwater standards ( <a href="https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table">https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table</a> )							
A/BDL = Above/Below Detection Limit								[2] US EPA National Recommended Water Quality Criteria - Human Health Criteria Table; consumption of water & organisms ( <a href="https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table">https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table</a> )							
N/M = Not Measured								[3] US EPA Drinking Water ( <a href="https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations">https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations</a> )							
*Total Recoverable Standards (all other standards are for dissolved metals)								[4] CDPHE Regulation 38 for Upper South Platte River Basin ( <a href="https://cdphe.colorado.gov/water-quality-control-commission-regulations">https://cdphe.colorado.gov/water-quality-control-commission-regulations</a> )							
**Calculated using Table Value Standards assuming 111 mg CaCO <sub>3</sub> /L average low flow hardness [6]								[5] USDA Livestock Drinking Water ( <a href="https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051302.pdf">https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_051302.pdf</a> )							
▲Phosphorus standard is 0.03 mg/L within Chatfield Reservoir and 0.11 mg/L for most tributaries								[6] Chatfield Reservoir Storage Reallocation Feasibility Study 2013							
• Average of Regulation 38 proposed standards for cold and warm waters															
<b>Bold values represent total metal concentrations. All other concentrations are dissolved.</b>															
For information on other constituents, please see Data Appendix															

**Recommendations**

- Sample Massey Draw at regular intervals to determine baseline conditions contributing to the overall health of the watershed – both soil and water samples should be collected when appropriate.
- Strengthen erosion banks at the confluence of SMD1, NMD1, and MD2 to prevent further influx of constituents of concern during precipitation events.
- Monitor arsenic, selenium, and thallium concentrations throughout Massey Draw to determine if point sources can be identified and addressed or if remediation efforts would be warranted.
- Investigate major sources of constituents in runoff, especially within the residential neighborhoods, to locate anthropogenic sources of constituents.
- Monitor South Massey Draw for any sources of coliform and/or *E. coli* entering the stream between SMD2 and SMD1.
- Monitor water levels along North Massey Draw as it has a high potential for both phosphorus and nitrogen conveyance into the Chatfield Reservoir, which would negatively impact the overall water quality.
- Given the proposed changes to CDPHE Reg. 38 and preliminary organic nitrogen results, investigate levels and sources of organic nitrogen, and the difficulty of removing organic nitrogen.