BIG DRY CREEK
ANNUAL WATER QUALITY SUMMARY
FOR 2021

Prepared for the
Big Dry Creek Watershed Association
Board of Directors

Prepared by
Wright Water Engineers, Inc.

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Contacts for More Information:
Big Dry Creek 2021-2022 Board of Directors

Lesa Julian, City and County of Broomfield
John Winterton, City of Northglenn
David Carter, City of Westminster
Juliana Archuleta, Adams County
Lyndsay Holbrook, Weld County
Al Quintana, City of Thornton

Big Dry Creek Watershed Association Website

www.bigdrycreek.org

Watershed Coordination/Report Preparation

Jane Clary, Project Manager
Wright Water Engineers, Inc.
2490 West 26th Ave., Suite 100A
Denver, CO 80122
303-480-1700
clary@wrightwater.com

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Abbreviations and Acronyms

ac	acute
BDCWA	Big Dry Creek Watershed Association
BMP	best management practice
BMW	Barr Milton Watershed
CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Discharge Permit System
CDWR	Colorado Division of Water Resources
cfs	cubic feet per second
ch	chronic
cfu	colony forming unit
CWQCC	Colorado Water Quality Control Commission
CWQCD	Colorado Water Quality Control Division
DM	daily maximum
DMR	discharge monitoring report
DO	dissolved oxygen
EDAS	Ecological Data Application System
EPA	U.S. Environmental Protection Agency
HBI	Hilsenhoff Biotic Index
HSW	high scoring water
kg/yr	kilograms per year
MCL	maximum contaminant level
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter
mg/L	milligrams per liter
MG/YR	million gallons per year
mL	milliliter
MMI	multi-metric index
MPN	most probable number
MS4	municipal separate storm sewer system
MWAT	maximum weekly average temperature
NTU	nephelometric turbidity unit
QA/QC	quality assurance/quality control
RPD	relative percent difference
SAP	sampling and analysis plan
SDI	Shannon Diversity Index
TIN	total inorganic nitrogen
TKN	total Kjeldahl nitrogen
TMDL	total maximum daily load
TOC	total organic carbon
TN	total nitrogen

TP	total phosphorus
TSS	total suspended solids
USGS	U.S. Geological Survey
WWTP	wastewater treatment plant

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1. INTRODUCTION AND BACKGROUND

The Big Dry Creek Watershed Association (BDCWA) is a 501(c)(3) non-profit corporation focused on developing a sound scientific understanding of water quality, flow, aquatic life, and habitat conditions in the Big Dry Creek watershed and acting to improve these conditions. To support these objectives, BDCWA implements an instream monitoring program and analyzes results from the program on an annual basis. The monitoring program is described in the *Cooperative Sampling and Analysis Plan for the Mainstem of Big Dry Creek* (SAP), which was reviewed and updated in 2018 and can be obtained from the BDCWA website (www.bigdrycreek.org). The monitoring program is conducted by the City and County of Broomfield, City of Westminster, City of Northglenn, and the City of Thornton (Cities). The program includes water quality, flow, and biological monitoring. On an annual basis, data collected under this program are reviewed by the BDCWA Board and uploaded into a master database and then analyzed for compliance with stream standards, for water quality trends, and with regard to other priorities or areas of interest to BDCWA.

Following a brief introduction to the monitoring program and an overview of field conditions during 2021, this report summarizes findings from the 2021 monitoring program, focusing on these primary topics:

- Annual data summary and comparison to stream standards
- Targeted discussion regarding these key water quality constituents:
  - *Escherichia coli* (*E. coli*)
  - Selected metals (selenium, iron, manganese, arsenic)
  - Chloride and sulfate
  - Nutrients
- Biological monitoring
- Annual flow conditions
- Quality assurance/quality control (QA/QC)
- Recommendations and conclusions

A map of the watershed and sampling locations is provided in Appendix A, and statistical data summaries supporting these discussions are provided in Appendix B.

2. Overview of Monitoring Activities and Field Conditions During 2021

During 2021, BDCWA members worked together to collect water quality and flow data along the main stem of Big Dry Creek (Figure 1), consistent with the long-term BDCWA monitoring program, as described in the SAP (BDCWA 2018) and in Table 1. The Cities and BDCWA also helped to fund operation of the U.S. Geological Survey (USGS) gauging station at Westminster behind Front Range Community College.

A conceptual-level understanding of the hydrologic regime for Big Dry Creek is important due to its significant effect on pollutant loading and instream concentrations. For general context, Figure 35 (later in this report) provides a conceptual summary of the key discharges and diversions along the creek, along with the USGS gauging station locations.

Figure 1. Big Dry Creek Watershed Location Map

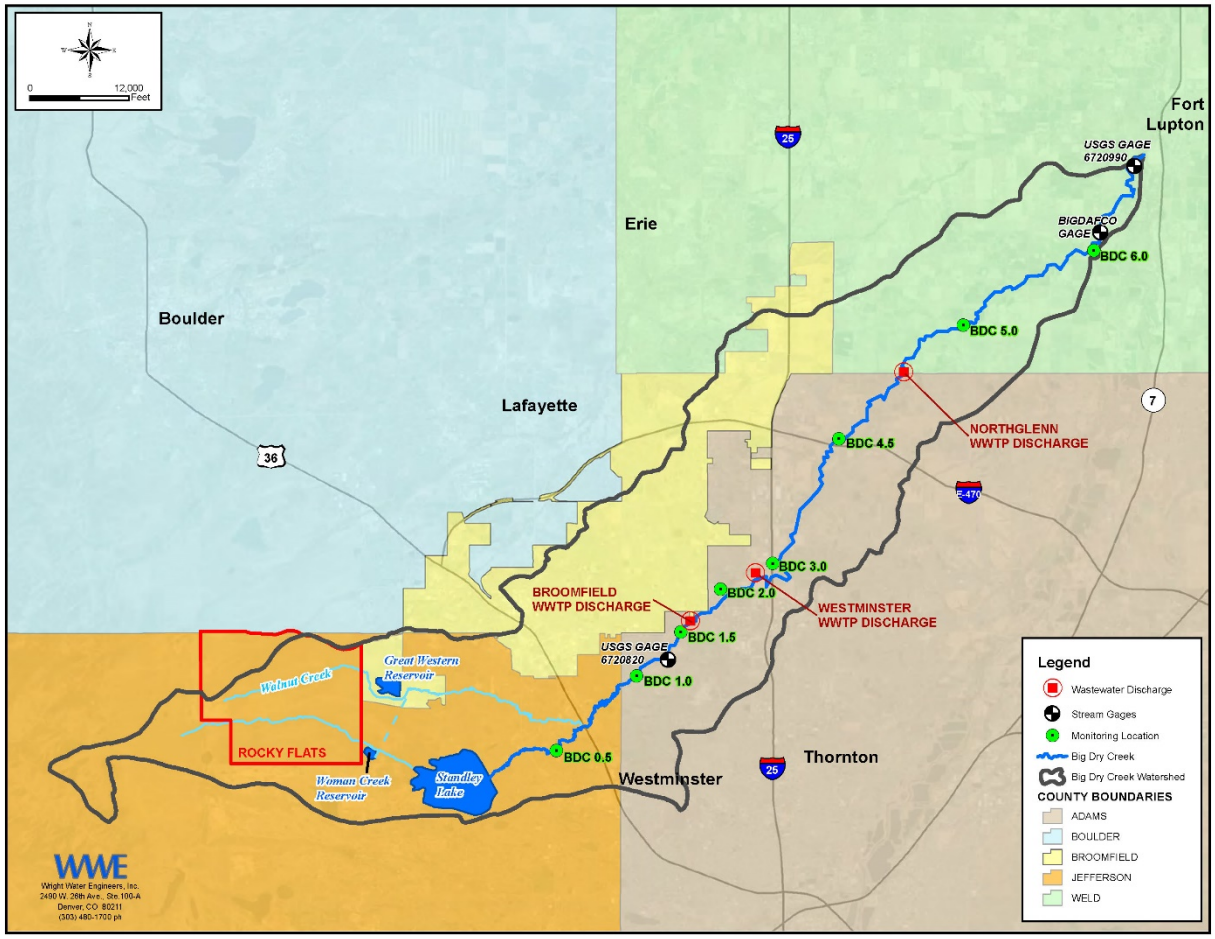


Table 1. Description of Instream Monitoring Locations in 2021

Site	Location/Selection Criteria	Constituents
bdc0.5	Big Dry Creek at Old Wadsworth Ave. Represents background conditions upstream of the WWTP outfalls, and urbanization impacts.	Water Quality, Habitat, Macroinvertebrates, Fish, Flow
bdc1.0	Big Dry Creek at 112th Ave. Represents conditions downstream of the confluence with Walnut Creek and Rocky Flats discharge.	Water Quality, Habitat, Macroinvertebrates, Fish, Flow
bdc1.5	Big Dry Creek at 120th Ave. Represents conditions immediately upstream of the Broomfield WWTP outfall.	Water Quality, Flow
bdc1.5C	Big Dry Creek downstream of 120th Ave. upstream of the Broomfield WWTP. Serves as reference site representing habitat conditions prior to the Broomfield WWTP outfall.	Habitat, Macroinvertebrates, Fish
bdc2.0	Big Dry Creek at 128th Ave. Represents conditions downstream of the Broomfield WWTP and upstream of the Westminster WWTP outfall.	Water Quality, Habitat, Macroinvertebrates, Fish, Flow
bdc3.0	Big Dry Creek at I-25 Represents conditions downstream of the Westminster WWTP outfall, but upstream of Northglenn.	Water Quality, Habitat, Macroinvertebrates, Fish, Flow
bdc4.5	Big Dry Creek downstream of York St. Represents urban development impacts, agricultural impacts, and background conditions for the Northglenn WWTP. (Replaces bdc4.0; site moved downstream April 2011 for safety reasons.)	Water Quality
bdc5.0	Big Dry Creek at Weld County Rd. 4. Represents conditions downstream of the Northglenn WWTP and agricultural influences.	Water Quality, Habitat, Macroinvertebrates, Fish
bdc6.0	Big Dry Creek at Weld County Rd. 23 near the confluence with the S. Platte. Represents conditions just prior to the confluence with the South Platte River (end of Segment 15).	Water Quality
120th & BDC	Big Dry Creek at 120th Avenue. Same approximate location as bdc1.5.	Mercury

During 2021, city staff collected and analyzed water quality samples for a variety of constituents, resulting in over 3,000 records being added into the BDCWA water quality database. Most metals, boron, and cyanide were monitored on a quarterly basis, with the exception of total recoverable iron and dissolved selenium, which are monitored monthly. Iron is monitored monthly because of elevated iron concentrations in the lower watershed. The selenium monitoring frequency has been increased to monthly to support potential future longevity plan requirements for site-specific standards. Mercury is monitored quarterly at only one location at 120th Avenue due to the high cost of mercury analysis at sufficiently low detection limits. All other constituents are monitored on a monthly basis. The Big Dry Creek monitoring program is an ambient-based program. The program does not target wet-weather events, but typically includes one or more sampling events associated with precipitation that happens to fall on or prior to the designated sampling date.

Table 2 summarizes field conditions during each sampling event during 2021, as recorded at various locations in the watershed. Standley Lake releases and instream flow on the sample date are provided in cubic feet per second (cfs). Based on information shown in Table 2, Standley Lake releases occurred from June through December 1, 2021, with the exception of October. This release pattern differs from historical release patterns, which have typically begun earlier in the spring and not included releases in November and December. Some of the January and February samples at upstream locations were affected by icy conditions, which is common. Most of the sampling events during 2021 represent dry weather conditions, with the exception of the May sampling event that occurred following several days of snowfall. The 2021 data set did not include samples influenced by summer thunderstorms.

Table 2. Summary of Field Conditions during 2021 Sampling Events

Date	Precip. (inches)[1,3]	Release (cfs)[1]	Flow (cfs)[2]		Update Comments
	Standley Lake	Standley Lake	USGS Westminster	USGS Ft. Lupton	
14-Jan-21	0.00	0.0	1.8	22.2	No Standley releases this month. bdc0.5 & 1.0 frozen.
11-Feb-21	0.00	0.0	0.7	25.1	No Standley releases this month. bdc0.5, 1.0 & 1.5 frozen.
11-Mar-21	0.00	0.0	1.8	23.3	No Standley releases this month.
08-Apr-21	0.14 (prior)	0.0	4.0	16.1	No Standley releases this month. 0.14" of precip. At Standley Lake Dam on 4/7.
13-May-21	~0.28 (prior)	0.0	13.8	58.1	No Standley releases this month. 0.84" of precip as snow at 0.2 to 0.28"/day at Standley Lake Dam between 5/9-5/12. Also 2.3" snow (0.42" precip) at Northglenn on 5/11.
10-Jun-21	0.00	20.3	22.7	54.5	Standley releasing at 20.3 cfs on sample date.
15-Jul-21	0.02	10.6	4.2	45.2	Standley releasing at 10.6 cfs on sample date.
12-Aug-21	0.00	13.1	17.8	65.1	Standley releasing 13.1 cfs on sample date.
09-Sep-21	0.00	12.1	16.9	50.7	Standley releasing at 12.1 cfs on sample date.
07-Oct-21	0.00	0.0	0.6	33.3	No Standley releases this month.
18-Nov-21	0.00	7.6	9.6	22.2	Standley released at ~7.6 during 11/8 to 12/1. Standley releasing at 7.6 cfs on sample date.
09-Dec-21	0.00	0.0	1.9	20.8	No Standley releases on sample date.

[1] Standley Lake precipitation and release data recorded at Standley Lake Dam by dam tender.

[2] USGS flow data were obtained from USGS NWIS website for USGS 06720820 Big Dry Creek at Westminster and USGS 06720990 Big Dry Creek at Mouth near Fort Lupton.

[3]Precipitation at Northglenn (Colorado Climate Center - Data (colostate.edu) also reviewed to represent a central location in watershed.

3. APPLICABLE STREAM STANDARDS, DATA SUMMARY, AND STANDARDS ASSESSMENT

In 2020, the Colorado Water Quality Control Commission (CWQCC) adopted major changes to stream standards for Segment 1 of Big Dry Creek. These changes applied more stringent designated uses including an upgrade of the stream from Aquatic Life 2 to Aquatic Life 1, upgrade from Potential Recreation to Existing Recreation, and addition of a Water Supply use. Agricultural use standards continue to apply. Big Dry Creek is also identified as a "Use Protected" stream, which means that it is not subject to anti-degradation review.[1]

Table 3 identifies the currently applicable Regulation 38 stream standards for Segment 1 of Big Dry Creek. Attainment of stream standards is evaluated based on comparison of specific statistical values to chronic stream standards and determining whether acute standards are exceeded in any samples. For most constituents, the relevant statistic for comparison to the chronic standard is the 85th percentile value. Exceptions include use of the 50th percentile value for metals with standards in the total recoverable form, the geometric mean[2] for *E. coli*, and the 15th percentile value for dissolved oxygen (DO) and the lower acceptable range for pH. For total phosphorus and total nitrogen, annual medians with an allowable exceedance of no more than once every three years are used as "interim values" until final stream standards are adopted. For nitrate, the maximum value is used, with no more than one exceedance every three years. More complex evaluation approaches are required for *E. coli*, selenium, ammonia, and temperature, as described later in this report. (*Note that from a regulatory perspective, five years of data would be used in such a comparison to standards*.)

As part of the 2020 Regulation 38 Rulemaking Hearing, the CWQCC adopted Segment 1 stream standards for chloride, sulfate, dissolved iron, and dissolved manganese that are based on "secondary" drinking water standards developed pursuant to the federal Safe Drinking Water Act. These secondary standards are not health based, but rather are based upon "welfare" impacts such as taste, odor and discoloration of laundry or fixtures. Stream standards for these parameters can either be based on the "table value standards" in Regulation 31, or they can be based on "existing conditions" as of January 1, 2000, with the exception of chloride. Assessment procedures for these constituents are discussed in more detail later in this report.

The time periods evaluated in this report vary, depending on the nature of the water quality and/or regulatory issue. For constituents with current or historic water quality concerns, five to ten years of data may be included in the discussion, whereas for most other constituents, new data collected during 2021 are the primary focus.

[1] For more information on Use Protected and Reviewable designations related to antidegradation requirements in Regulation 31, see 5 CCR 1002-31 Section 31.8 Antidegradation.

[2] The geometric mean is calculated as the nth root of the product of n values. The geometric mean is used for regulatory purposes because it dampens the impact of extremely high or low values, relative to the arithmetic mean.

Table 3. Regulation 38 Stream Standards for Big Dry Creek Adopted in 2020

1. Mainstem of Big Dry Creek, including all tributaries and wetlands, from the outlet of Standley Lake to the confluence with the South Platte River. Walnut Creek, including tributaries and wetlands, from the outlet of Great Western Reservoir to the confluence with Big Dry Creek.

COSPBD01	Classifications
Designation	Agriculture
UP	Aq Life Warm 1
	Water Supply
	Recreation E

Qualifiers:

Fish Ingestion Standards Do Not Apply

Other:

*chlorophyll a (mg/m^2)(chronic) = applies only above the facilities listed at 38.5(4).
*Phosphorus(chronic) = applies only above the facilities listed at 38.5(4).
*Selenium(acute) = 19.1 ug/L from 11/1 - 3/31
TVS from 4/1 - 10/31.
Refer to Section 38.6(4)(d).
*Selenium(chronic) = 15 ug/L from 11/1 - 3/31
7.4 ug/L from 4/1 - 10/31.
Refer to Section 38.6(4)(d).
*Uranium(acute) = See 38.5(3) for details.
*Uranium(chronic) = See 38.5(3) for details.

Physical and Biological	DM	MWAT
Temperature °C	WS-I	WS-I
	acute	**chronic**
D.O. (mg/L)	---	5.0
pH	6.5 - 9.0	---
chlorophyll a (mg/m^2)	---	150*
E. Coli (per 100 mL)	---	126
Inorganic (mg/L)		
	acute	**chronic**
Ammonia	TVS	TVS
Boron	---	0.75
Chloride	---	250
Chlorine	0.019	0.011
Cyanide	0.005	---
Nitrate	10	---
Nitrite	---	4.5
Phosphorus	---	0.17*
Sulfate	---	WS
Sulfide	---	0.002

Metals (ug/L)	acute	chronic
Arsenic	340	---
Arsenic(T)	---	0.02-10 [A]
Beryllium(T)	---	100
Cadmium	TVS	TVS
Cadmium(T)	5.0	---
Chromium III	---	TVS
Chromium III(T)	50	---
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	---	WS
Iron(T)	---	1000
Lead	TVS	TVS
Lead(T)	50	---
Manganese	TVS	TVS/WS
Mercury(T)	---	0.01
Molybdenum(T)	---	150
Nickel	TVS	TVS
Nickel(T)	---	100
Selenium	varies*	---
Selenium	---	varies*
Silver	TVS	TVS
Uranium	varies*	varies*
Zinc	TVS	TVS

To calculate hardness-based stream standards, a hardness value of 361 milligrams per liter (mg/L) was used, consistent with the value used by the Colorado Water Quality Control Division (CWQCD) in 2019 wastewater discharge permits for Broomfield, Westminster, and Northglenn. The mean hardness value for the stream as a whole during 2021 was 373 mg/L. Hardness values have a significant effect on certain metals standards. For example, a hardness value of 250 mg/L results in a chronic zinc standard of 271 micrograms per liter (µg/L), whereas a hardness value of 350 mg/L results in a chronic zinc standard of 362 µg/L (i.e., the higher the hardness value, the less stringent the water quality standard is for certain metals). For purposes of the 303(d) List (which identifies impaired stream segments), the CWQCD uses the mean hardness value associated with the five-year assessment period for assessment of chronic table value standards for metals. Alternatively, a detailed assessment may also be conducted calculating the chronic table value standard for each pair of hardness and concentration data. The acute table value standards for metals are calculated for each paired hardness/concentration and attainment is determined for each data pair (CWQCD 2019).

In addition to the stream standards and classifications for Big Dry Creek, it is also important to be aware of the 303(d) Listing Methodology, which provides additional information on how impairment decisions are made and how streams can be delisted as impaired on the 303(d) List. This methodology is updated every two years, with several notable changes to the *E. coli* listing methodology included in the 2024 303(d) Listing Methodology (Division 2022).

4. Overview of Water Quality Data

Table 4 provides a summary of the numbers of instream water quality samples collected and key summary statistics for each constituent analyzed during 2021 and identifies whether the stream attained the standard for each constituent with an applicable stream standard.

A complete summary of individual sampling event results during 2021 for each monitoring station is provided in Appendix B. Quality control (QC) samples, collected in accordance with the Big Dry Creek SAP (BDCWA 2018), are provided in Appendix C.

Discharge monitoring report (DMR) data from municipal wastewater treatment plant (WWTP) discharges to Big Dry Creek during 2021 are provided in Appendix D. The DMR samples were collected in accordance with Colorado Department of Public Health and Environment (CDPHE) Colorado Discharge Permit System (CDPS) permit requirements and are provided as a courtesy from the City and County of Broomfield, the City of Westminster, and the City of Northglenn to provide supplemental information on the quality of discharges to Big Dry Creek at the time of instream sample collection. Broomfield, Westminster, and Northglenn are permitted to discharge to Big Dry Creek, and all three did so during 2021.

Appendix E provides instream iron monitoring results at two sites on lower Big Dry Creek that are monitored by Metro Wastewater Reclamation District (Metro Wastewater) biweekly.

Table 4. Statistical Summary for 2021 Big Dry Creek Data and Comparison to Standards

Analyte	Nbr	Min	Max	Mean	15th	Median	85th	Standard	Standard Exceeded?
General									
ALKALINITY (mg/L)	91	60	360	168	115	166	205	N/A	N/A
BORON, T (mg/L)	32	ND	0.31	0.19	0.10	0.20	0.26	0.75	No
CHLORIDE, D (mg/L)	91	47	740	188	101	162	247	250	No
CHLOROPHYLL-a, corrected (ug/L)	91	ND	67	6	1	3	7	N/A	N/A
CHLOROPHYLL-a, uncorrected (ug/L)	91	2	33	7	3	6	10	N/A	N/A
CONDUCTIVITY (uS/cm)	91	403	3638	1442	905	1421	1853	N/A	N/A
DO (mg/L)	91	7	20	11	8	10	12	5 (min)	No
pH (SU)	91	6.4	8.4	7.8	7.4	7.9	8.2	6.5-9.0	No
E. coli (MPN/100 mL)	91	1	2420	**129**	51	110	461	126	**Yes**
CALCIUM, Total (mg/L)	91	37	183	99	69	100	129	N/A	N/A
MAGNESIUM, D (mg/L)	91	8	57	30	31	38	20	N/A	N/A
HARDNESS (mg/L)	91	126	690	373	255	386	463	N/A	N/A
POTASSIUM, D (mg/L)	91	2	13	7	3	7	10	N/A	N/A
SODIUM, D (mg/L)	91	29	490	166	90	161	219	N/A	N/A
SULFATE (mg/L)	91	59	566	277	163	282	**358**	250 (WS)	**Yes***
TDS (mg/L)	90	219	2250	906	539	920	1170	N/A	N/A
TEMPERATURE (°C)	90	ND	22	11	4	12	19	WS-1 Stds.	Not Assessed
TOC (mg/L)	91	3	10	6	4	7	8	N/A	N/A
TSS (mg/L)	91	ND	103	22	8	18	35	N/A	N/A
TURBIDITY (NTU)	90	1	41	12	5	10	17	N/A	N/A
CYANIDE, Total (mg/L)	32	ND	ND	ND	ND	ND	ND	0.005	No
Nutrients									
NITROGEN, TOTAL (mg/L)	91	ND	13.33	4.63	0.97	**4.90**	8.00	2.01	**Yes (future std.)**
NO3+NO2 (mg/L)	91	0.04	**12.55**	4.01	0.44	4.10	7.32	10	**Yes**
NO2 (mg/L)	91	ND	0.31	0.05	ND	0.03	0.10	4.5	No
PHOSPHORUS, TOTAL (mg/L)	91	0.04	0.40	0.17	0.08	0.16	0.26	0.17	No
PHOSPHORUS, ORTHO AS P (mg/L)	91	ND	0.23	0.05	ND	0.04	0.12	N/A	N/A
AMMONIA, Total (mg/L)	91	ND	0.56	0.06	ND	0.02	0.10	Varies	No
Metals									
ARSENIC, Trec (ug/L)	32	0.47	1.72	0.91	0.61	0.87	1.15	0.02-10	No (for hyphenated)
CADMIUM, D (ug/L)	32	ND	0.09	0.02	ND	ND	0.06	1.1 / 8.4	No
CADMIUM, T (ug/L)	32	ND	0.13	0.05	ND	0.06	0.08	5 (ac)	No
CHROMIUM, D (ug/L)	32	ND	0.34	0.06	ND	ND	0.15	Cr-III: 212 / 1,630 Cr-VI: 11 / 16	No
CHROMIUM, T (ug/L)	24	0.14	2.07	0.76	0.26	0.71	1.13	Cr-III: 50 (ac)	No
COPPER, D (ug/L)	32	ND	12.77	3.06	0.28	2.43	4.38	27 / 45	No
IRON, D (ug/L)	32	4.77	25.98	12.68	6.36	12.10	17.40	300	No
IRON, Trec (mg/L)	91	ND	2.54	0.55	0.21	0.40	0.90	1	No
LEAD, D (ug/L)	32	ND	0.53	0.23	ND	0.25	0.39	9.8 / 253	No
LEAD, T (ug/L)	32	0.48	2.71	1.24	0.68	1.11	1.89	50	No
MANGANESE, D (ug/L)	32	16	815	123	21	40	**120**	50 (WS)	**Yes***
MERCURY, Trec (µg/L)	4	0.0007	0.0020	0.0013	0.0007	0.0012	0.0017	0.01	No
NICKEL, D (ug/L)	32	0.71	3.28	1.92	1.19	1.96	2.53	154 / 1,387	No
NICKEL, T (ug/L)	32	0.89	4.69	2.33	1.55	2.22	3.08	100	No
SELENIUM, D (ug/L)	91	ND	13.14	4.30	2.56	4.26	5.98	Site-specific	No
SILVER, D (ug/L)	32	ND	ND	ND	ND	ND	ND	2.9 / 18	No
ZINC, D (ug/L)	32	ND	48.44	14.74	1.59	11.48	27.30	389 / 514	No

Notes: Geometric mean provided for *E. coli* instead of arithmetic mean. Table Value Standards (TVS) calculated based on a hardness of 361 mg/L. N/A = no standard; #/# = acute/chronic; ND = Non-detect. WS-1 indicates warm water tier 1 temperature standard, but was not evaluated. * = can also be assessed based on "existing conditions" as of January 1, 2000.

Segment 1 (the main stem) of Big Dry Creek is listed on the 2022 303(d) List for Colorado for non-attainment of stream standards for *E. coli* for the entire segment (Category 4a Impaired with an Approved TMDL) and for total recoverable iron for the portion of the stream below Weld County Road 8 (CWQCC 2021). The iron impairment in the lower watershed is based on data collected by Metro Wastewater. A brief synopsis of these two regulatory issues as of 2022 includes:

- *E. coli*: Big Dry Creek did not meet the *E. coli* standard during 2021. A Total Maximum Daily Load (TMDL) for *E. coli* in Big Dry Creek segment COSPBD01 was approved by the U.S. Environmental Protection Agency (EPA) in September 2016. This TMDL was based on a Potential Recreational Contact standard of 205 colony forming units per 100 milliliters (cfu/100 mL). As a result of the 2020 standards change to Big Dry Creek Segment 1, this standard is now 126 cfu/100 mL. Special studies to identify sources of *E. coli* in the watershed are on-going for the stream reach between Standley Lake and I-25.

- Iron: Although BDCWA's long-term water quality data set shows attainment of the total recoverable iron standard, the portion of Big Dry Creek below Weld County 8 was originally identified as impaired on the 2016 303(d) List based on data submitted to the CWQCD by Metro Wastewater. The Metro Wastewater data set is also discussed in this report and summarized in Appendix E. Based on the last five years of total recoverable iron data, the stream currently attains the stream standard.

The 2020 changes to the applicable stream standards for Big Dry Creek result in additional anticipated impairment listings in the future, driven primarily by the addition of Water Supply standards based on identification of alluvial wells used for drinking water in the lower watershed. These impairments are discussed later in the report but potentially include sulfate, chloride, dissolved manganese, and nitrate, depending on the assessment time period and methodology.

Other future impairment concerns include total nitrogen and total phosphorus, which are constituents included in the CWQCC's 10-Year Water Quality Road Map (https://cdphe.colorado.gov/water-quality-10-year-roadmap). Currently, interim values for total nitrogen and total phosphorus are exceeded for the portion of the stream segment beginning below the WWTP discharges. Total phosphorus concentrations below the WWTPs are decreasing and are approaching the standard for the stream as a whole. A final decision by the CWQCC on application of these instream standards is expected in 2027.

More detailed discussion of constituents of interest to Big Dry Creek is provided in the remainder of this report. See Appendix B for tabular summaries for 2021 water quality data.

5. *E. COLI*

In 2020, the recreational use classification and associated stream standards for *E. coli* changed from a potential primary contact recreation use classification to existing primary contact recreation use, based on the potential for waterplay by children and lack of fencing to preclude access. This change decreased the stream standard for *E. coli* from 205 cfu/100 mL to 126/100 mL. Neither standard is attained for the stream and a TMDL was completed in 2016 for *E. coli* based on the 205 cfu/100 mL standard. This section summarizes the data analysis for *E. coli* and provides a brief summary of the 2016 *E. coli* TMDL.

E. coli Data Summary

BDCWA has 22 years of *E. coli* data collected on a monthly basis at eight instream locations, as well as DMR data from the WWTPs (Tables 5 through 7 and Figures 2 through 5). Standards assessment methods for *E. coli* have changed several times over the years with regard to the duration (timeframe) during which standards are assessed. The 2024 303(d) Listing Methodology included the most recent changes to the *E. coli* assessment method. This method is now based on calculation of geometric mean values for fixed two-month periods for future 303(d) listing and delisting decisions. To remove a segment from the 303(d) List, the geometric mean for at least one two-month period that includes at least five samples from the most recent two years of available data in the period of record must demonstrate attainment (CWQCD 2022). Because the BDCWA sampling program is based on a monthly program, only two samples per assessment period are available. For this reason, BDCWA applies a seasonal approach for data analysis in this report, dividing the analysis into a recreation season (May-October) and a non-recreation season (November-April). This approach provides six samples for calculation of a geometric mean for each season at most sites. The CWQCD also used these seasons in the 2016 *E. coli* TMDL. If sampling results begin to approach attainment of the stream standard, then more frequent sampling by BDCWA may be warranted to demonstrate attainment of the stream standard.

Prior to discussion of findings related to *E. coli*, the following tables and figures are presented:

- Table 5 summarizes *E. coli* data by monitoring location on an annual basis for the entire period of record. (Note: most probable number per 100 milliliter [MPN/100 mL] units are associated with the IDEXX Colilert analysis method, but can be compared directly against the stream standard expressed as cfu/100 mL.) Values shaded in pink exceed the previous standard of 205 cfu/100 mL and values shaded in yellow are "new" exceedances due to the change in standard to 126 cfu/100 mL. Although annual geometric means are not used by the CWQCD to assess attainment, the tabular summary is still useful for general information regarding trends over time and identifying locations where *E. coli* is persistently elevated.

- Tables 6 and 7 summarize data for the last five years and 2021 only, respectively. Table 6 is useful for evaluating seasonally elevated *E. coli*.

- Figure 2 shows seasonal geometric mean bar charts of *E. coli* from 2017-2021 from upstream to downstream. Figure 3 shows the 2017-2021 *E. coli* boxplots from upstream to downstream, and Figure 4 shows the geometric mean of the 2021 concentrations for all monitoring locations on a monthly basis. Figure 5 provides a matrix of seasonal *E. coli* boxplots from 2017-2021.

Table 5. Annual Geometric Mean Summary of Big Dry Creek *E. coli* Data (MPN/100 mL)

Year	bdc0.5	bdc1.0	bdc1.5	Broom. WWTP[2]	bdc2.0	West. WWTP[2]	bdc3.0 (I-25)	bdc4.5	North. WWTP[2]	bdc5.0	bdc6.0
2000	212	151	389	--	574	--	294	500	--	212	323
2001	477	118	332	215	649	68	387	634	--	442	510
2002	858	230	363	364	934	16	536	441	--	451	572
2003 [3]	191	210	293	27	615	24	382	225	--	249	339
2004	279	181	217	18	346	28	205	187	--	156	377
2005	152	122	281	26	328	35	204	113	--	182	301
2006	76	241	316	20	309	48	214	163	--	179	333
2007	196	177	257	14	324	66	230	231	--	198	364
2008	266	197	267	10	461	6	439	376	--	290	380
2009 [4]	61	78	147	5	207	14	251	137	--	149	197
2010	111	191	193	12	483	16	376	280	--	235	368
2011	64	228	323	6	622	8	518	537	--	380	730
2012	267	397	260	7	555	8	544	497	--	390	545
2013	239	214	292	3	398	10	424	342	--	272	505
2014	119	269	254	5	323	9	371	410	--	287	1085
2015	257	251	230	4	311	9	528	415	18	266	490
2016	207	254	221	5	312	18	358	315	10	300	536
2017	178	194	217	5	327	19	444	392	5	349	371
2018	81	89	194	3	277	15	352	273	5	314	300
2019	163	117	157	2	192	25	490	204	2	275	350
2020	220	121	106	2	138	15	389	174	2	211	256
2021	98	50	113	2	85	10	405	96	9	126	273

1. Pink-shaded cells exceed the pre-2020 205 cfu/100 mL stream standard. Yellow-shaded cells exceed the more stringent 2020 stream standard of 126 cfu/100 mL but not the less stringent previous standard of 205 cfu/100 mL.
2. Broom. = Broomfield; West. = Westminster; Northglenn historically excluded due to infrequent discharge to Big Dry Creek. During 2015-2021, Northglenn discharged to Big Dry Creek more frequently.
3. For consistency between sampling years, the 2003 weekly samples were converted to monthly geometric means prior to calculating the annual geometric mean for 2003.
4. The 2009-2021 Broomfield, Westminster and Northglenn geometric means are based on DMR values. Prior samples were based on synoptic monitoring program grab samples.

Table 6. Seasonal Summary of Instream Big Dry Creek *E. coli* Data for 2017-2021

	Geometric Mean *E. coli* (MPN/100 mL)	
	Recreation Season	Non-recreation Season
Station	May-Oct	Nov-Apr
bdc0.5	245	58
bdc1.0	229	30
bdc1.5	296	66
bdc2.0	277	123
bdc3.0	406	421
bdc4.5	232	183
bdc5.0	364	157
bdc6.0	659	140

Note: Shaded cells exceed the stream standard of 126 cfu/100 mL.

Table 7. 2021 *E. coli* Data (MPN/100 mL)

Station ID	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Geomean
bdc0.5	ice	ice	11	110	62	236	461	162	173	365	80	12	98
bdc1.0	ice	ice	17	73	59	462	225	180	57	63	18	1	50
bdc1.5	43	ice	93	44	80	366	192	111	134	435	75	77	113
bdc2.0	38	96	12	54	44	436	266	157	84	387	75	31	85
bdc3.0	1733	1733	326	66	68	388	548	462	291	461	770	436	405
bdc4.5	308	222	77	36	70	132	81	102	65	69	157	63	96
bdc5.0	206	83	54	68	91	518	115	326	107	126	178	59	126
bdc6.0	70	91	102	488	121	580	770	2420	981	921	121	38	273
Geomean All Sites	152	195	48	79	71	358	260	257	147	248	110	34	126

Note: Shaded cells exceed the stream standard of 126 cfu/100 mL.

Figure 2. Big Dry Creek *E. coli* Geometric Mean Values (2017-2021)

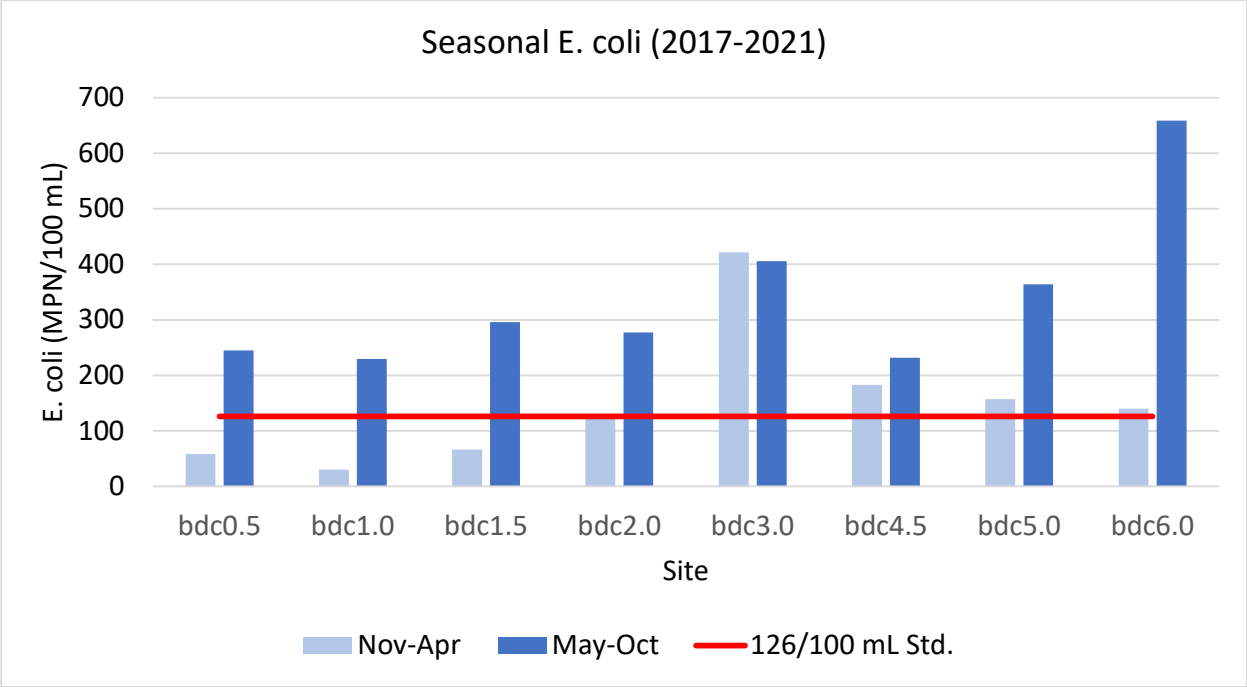
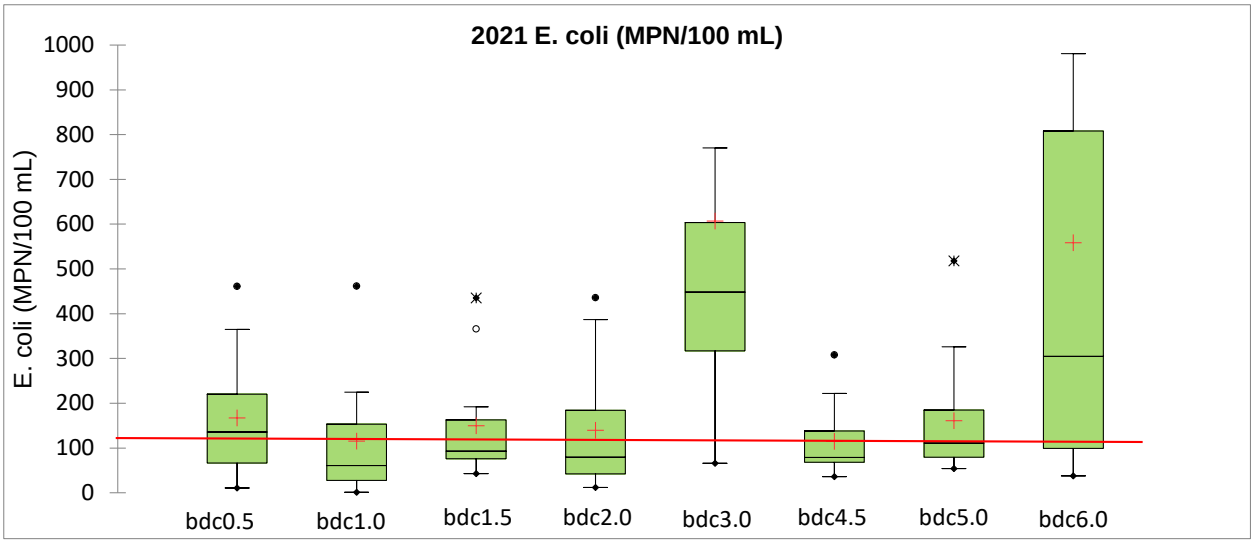
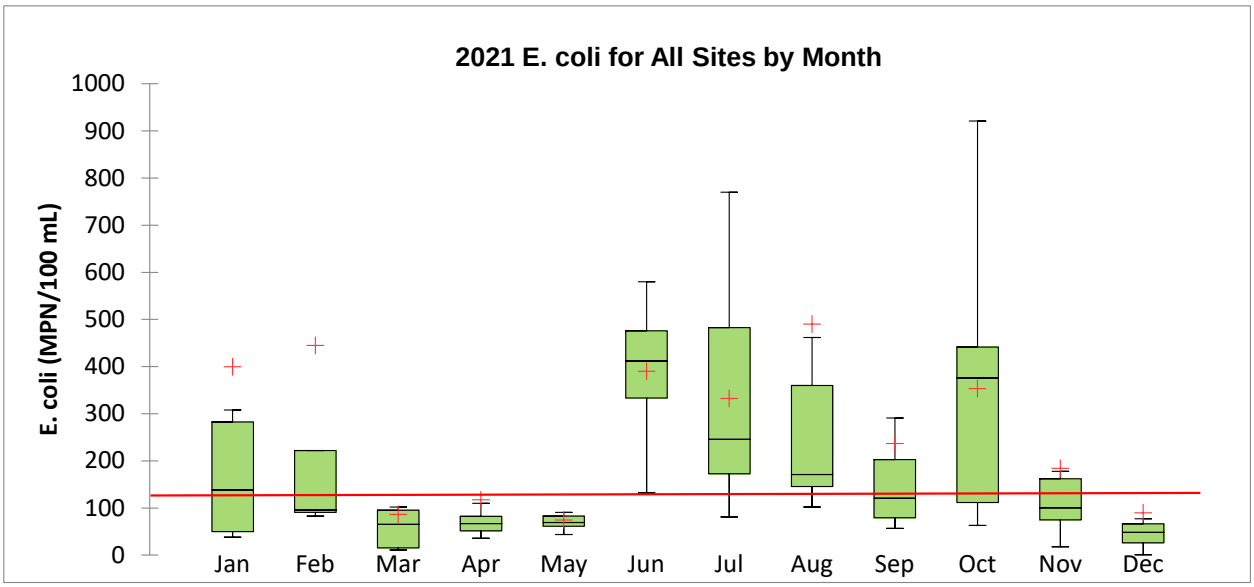


Figure 3. Big Dry Creek *E. coli* (2021)



Note: Outlier values >1,000 MPN/100 mL at bdc3.0 and bdc6.0 not displayed on figure.

Figure 4. Big Dry Creek Monthly *E. coli* 2021 for all Sites



Based on review of the *E. coli* data, the following observations are noteworthy:

- Table 5 indicates the *E. coli* concentrations in 2019 through 2021 were on the lower end of the range of geometric means that have been observed since about 2010 at most monitoring locations. Samples in 2021 are notably lower at locations other than bdc3.0 and bdc6.0, which may be due to sampling events not being influenced by urban stormwater runoff during summer thunderstorms.

- The historic data in Table 5 show significant reductions in the Broomfield WWTP's effluent concentrations following plant upgrades and expansion in the 2001-2004 time period. Significant reductions in Westminster's WWTP effluent concentrations are also apparent beginning in 2008, following plant upgrades including ultraviolet (UV) treatment and other operational changes. Based on review of geometric mean concentrations from 2003-2021, *E. coli* concentrations are consistently well below the stream standard in samples from the Broomfield, Westminster and Northglenn WWTP discharges (Table 5).

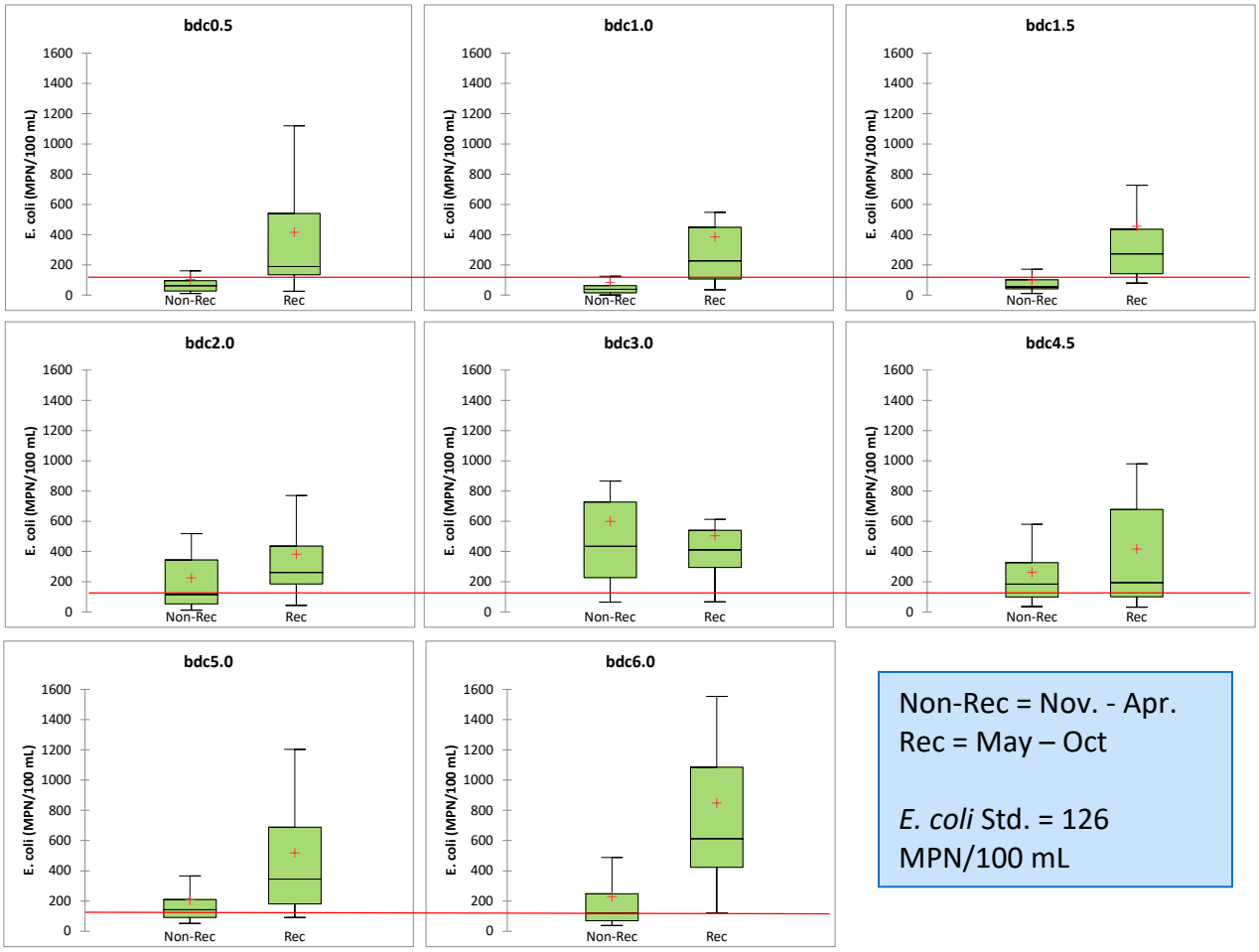
- The 2021 data set does not meet stream standards, although upstream sites bdc0.5 through bdc2.0 attained the standard during November to May. Based on field observations and Google Earth aerial photos, cattle are present in and along the stream above bdc6.0 and are hypothesized to contribute to elevated *E. coli* in this portion of the stream. Cattle access to the stream is still present in 2022 aerial imagery.

- For 2017-2021, the highest *E. coli* concentrations for most stations were experienced during the May-October recreation season, which is the typical pattern for the stream.

Statistically significant seasonal differences in *E. coli* concentrations have been consistently observed, with winter values being significantly lower than summer values. Boxplots of upstream to downstream monitoring locations for 2021 (Figure 3) show the highest ranges of *E. coli* concentrations occurred at bdc3.0 (I-25) and bdc6.0. At bdc3.0, birds are suspected as a possible source warranting further field documentation at the time of sampling if birds are present.

- Figure 5 provides a boxplot matrix of seasonal *E. coli* by monitoring location for the past five years, with recreation season (May-October) consistently having higher *E. coli*. However, the seasonal pattern is weaker at locations bdc2.0 to bdc4.5 through the more urbanized portion of the watershed. Special studies are underway to identify sources of *E. coli* in the watershed between Standley Lake and I-25. Section 14 of this report provides additional trend analysis for multiple pollutants in this report, including *E. coli*.

Figure 5. Seasonal *E. coli* Matrix (2017-2021)



E. coli TMDL Summary

As part of the TMDL for Big Dry Creek, the CWQCD developed load duration curves for three portions of Big Dry Creek. The segment was divided into three distinct reaches to account for changes in land use, influences from instream flow (diversions, reservoir releases, WWTP contributions, etc.), and location of permitted point sources. The three reaches correspond to Standley Lake to bdc1.5 (bdc0.5 to bdc1.5), from bdc1.5 to 152nd Avenue (bdc2.0 and bdc3.0), and 152nd Avenue to the Weld County Line (bdc4.0/4.5 to bdc6.0). These curves are based on data from 2003 through 2014 and are shown in Figures 6 through 8. These figures illustrate that recreation season (May-October) stream loads generally exceed the allowable stream load for *E. coli* during all flow regimes. The TMDL has assigned load reductions needed for each of these three portions of the stream. BDCWA is currently working on source identification and potentially feasible load reductions in the urbanized portion of the watershed. These investigations are prioritizing potential human waste sources. Since development of the TMDL, the stream standard has become more stringent (126 cfu/100 mL vs. 205 cfu/100 mL.)

Figure 6. Load Duration Curve for BDC1.5 and the USGS Gauge at Westminster
(Source: CWQCD 2016)

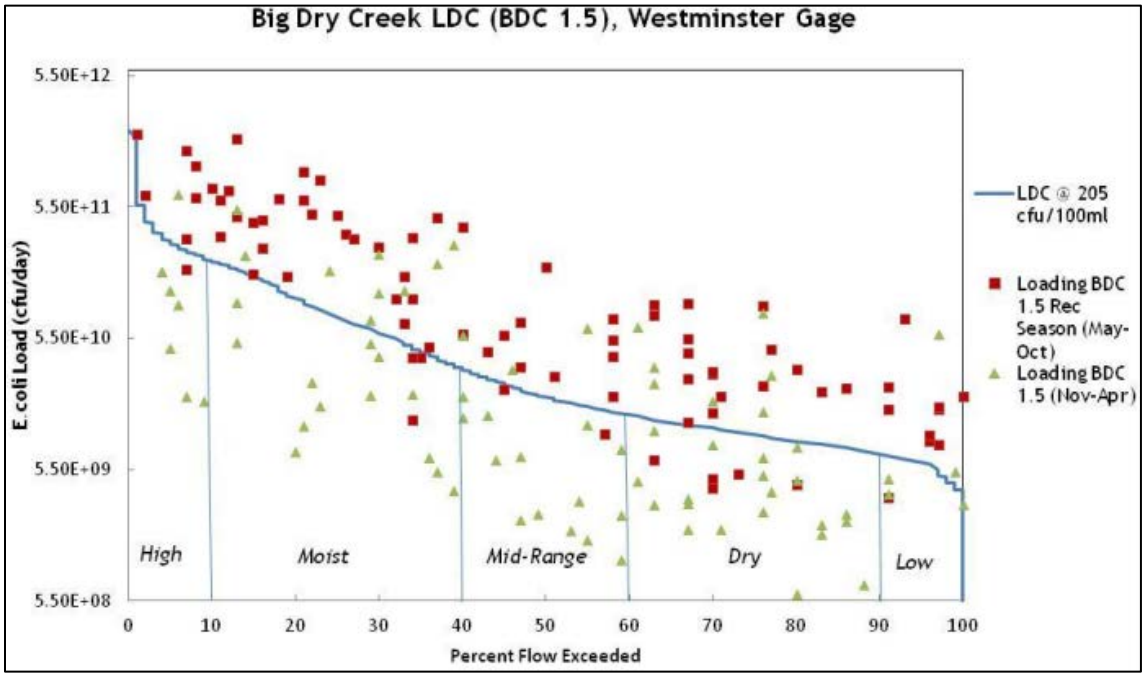


Figure 7. Load Duration Curve for BDC2.0 and the USGS Gauge at Westminster
(Source: CWQCD 2016)

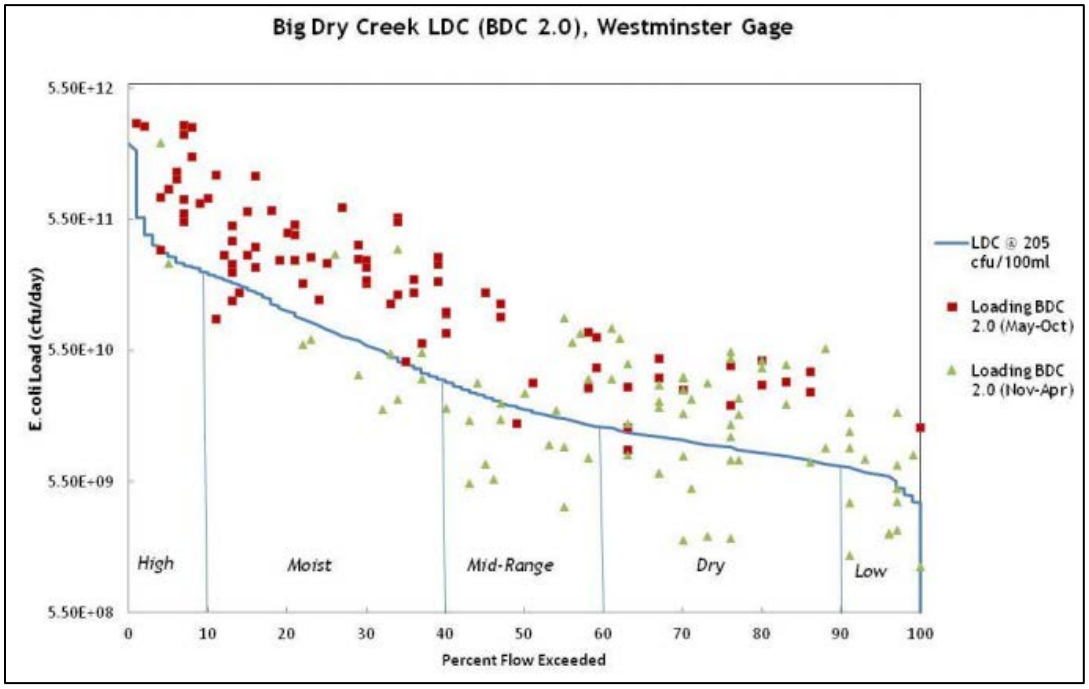
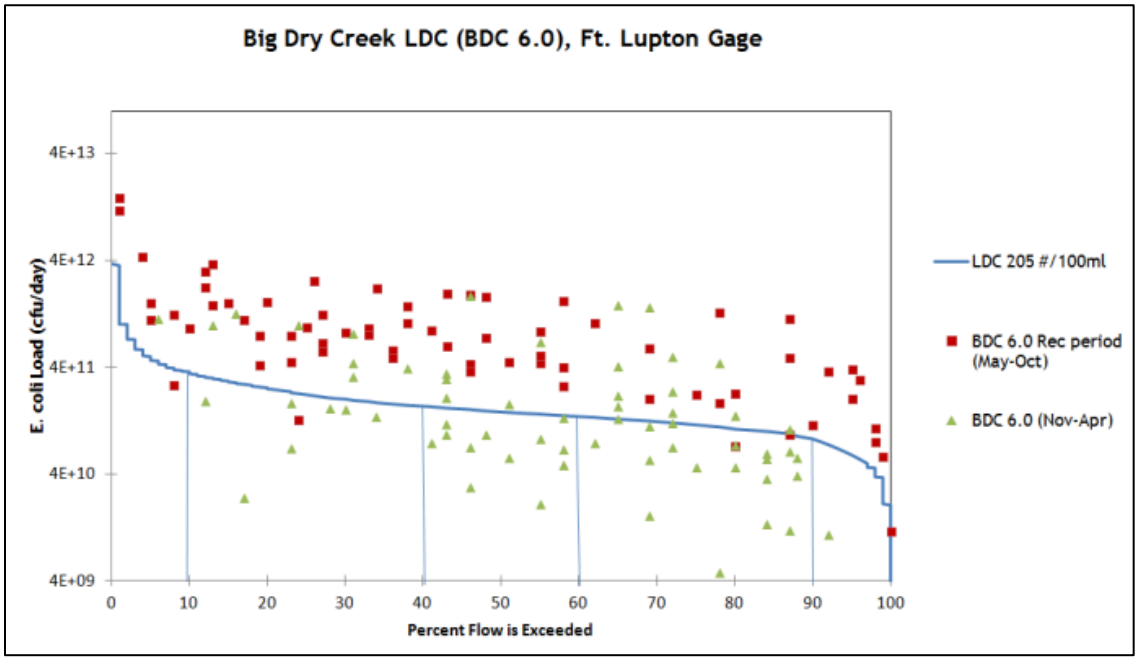


Figure 8. Load Duration Curve for BDC6.0 and the USGS Gauge at Fort Lupton
(Source: CWQCD 2016)



6. METALS

Big Dry Creek attains most metals standards assigned for protection of aquatic life, including arsenic, cadmium, chromium, copper, lead, selenium, silver, zinc, and mercury. Since 2016, a portion of Big Dry Creek below Weld County Road 8 has been identified as impaired on the 303(d) List for total recoverable iron. In the past, selenium was a metal of concern; however, adoption of a site-specific standard for selenium on Big Dry Creek in 2007 and some changes to assessment methodology for ambient-based standards have resulted in attainment of the selenium standard. In 2020, a new Water Supply classification resulted in addition of more metals standards to the stream segment, including more stringent total recoverable arsenic and dissolved manganese standards and new standards for dissolved iron and total cadmium, chromium, lead, and nickel. Dissolved manganese is expected to be a future impairment for Big Dry Creek due to adoption of a Water Supply standard for the stream and is also discussed further.

See Appendix B for tabular statistical summaries for Big Dry Creek samples analyzed for metals, with additional information on selenium, iron, manganese, and arsenic discussed further below.

Selenium

Elevated selenium concentrations in the upper reach of Big Dry Creek are due to naturally occurring selenium in geologic formations. BDCWA conducted special studies in 2006-2007 to support a site-specific standard. Background on this site-specific standard can be obtained in the 2015 Statement of Basis and Purpose in Regulation 38. The site-specific standard includes irrigation and non-irrigation seasonal standards assessed at three specific monitoring locations: bdc1.5, bdc2.0 and bdc4.0/4.5.[3] In 2021, BDCWA increased the sampling frequency for selenium from quarterly to monthly. This change was made due to "longevity plans" for site-specific standards that may include more detailed review of the basis of the underlying standard as part of triennial reviews of stream standards in the future.

Based on the site-specific selenium standards for Big Dry Creek, the 2021 data set and the data set for the most recent five years (2017 through 2021) attain both the non-irrigation season (winter) and irrigation season (summer) standards for Big Dry Creek, as summarized in Table 8. WWTP grab samples collected during this time period were below chronic and acute stream standards for selenium. As an additional observation in the context of longevity plans for the standards, the stream still needs a site-specific standard—the underlying chronic standard for selenium of 4.6 µg/L would not be attained.

[3] In 2015, the CWQCC adopted a formal change to the site-specific selenium standard assessment locations in Regulation 38 because sampling location bdc4.0 was relocated in 2011 for safety reasons and has been replaced with bdc4.5, although both sites may still be used for standards assessment, if needed.

Table 8. Big Dry Creek Selenium Data Summary (2017-2021)

Selenium (µg/L)				
	Irrigation Season		Non-irrigation Season	
	2017-2021 (Apr-Oct)	Reg. 38 Standard	2017-2021 (Nov-Mar)	Reg. 38 Standard
bdc1.5, 2.0, 4.5 (85th Percentile)	6.3	7.4 (ch)	9.0	15.0 (ch)
bdc1.5, 2.0, 4.5 (Maximum)	13.4	18.4 (ac)	11.2	19.1 (ac)

Table Notes: ch = chronic; ac = acute

Iron

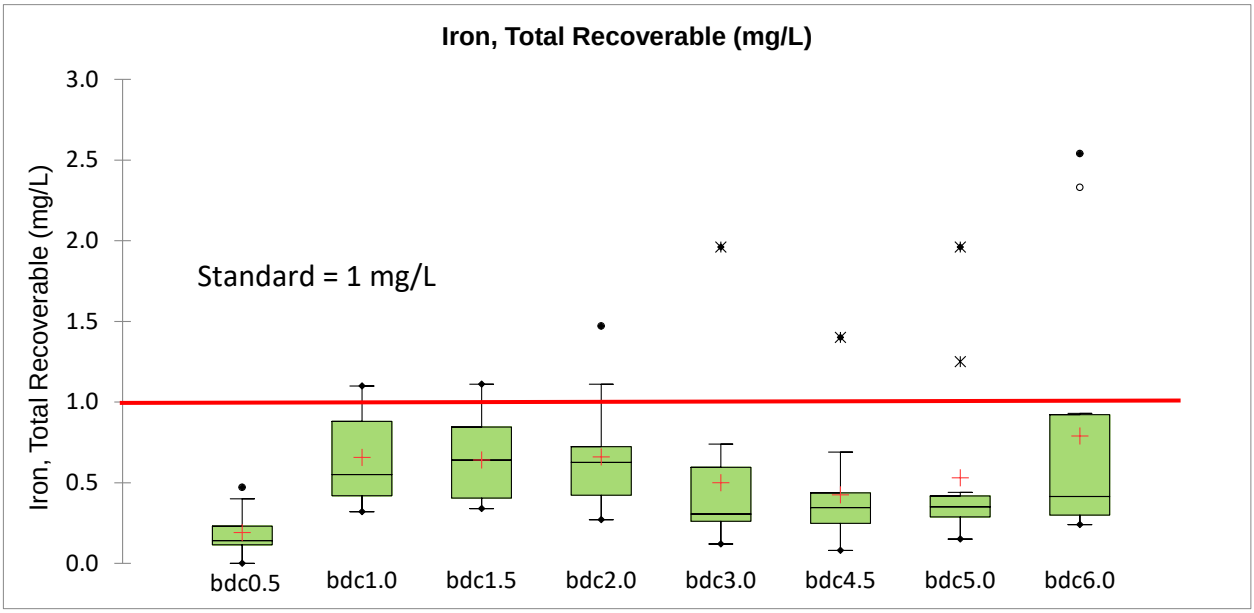
BDCWA currently monitors total recoverable iron (Figure 9) on a monthly basis, after increasing the sample frequency from quarterly to monthly in May 2018 due to Big Dry Creek being added to the 303(d) List for total recoverable iron based on monitoring conducted by Metro Wastewater. Metro Wastewater conducts sampling twice per month at two locations in the lower watershed. Metro Wastewater's upstream-most site, "BDC-8," is located where Big Dry Creek crosses Weld County Road 8 and has been monitored by Metro Wastewater since 2007. This site is located in proximity to BDCWA site bdc6.0. Metro Wastewater's downstream site, "BDC," is located approximately 30-50 yards upstream of the State Engineer's gauge "Big Dry Creek at Mouth" also known as BIGDAFCO (see Figure 32 for general location). Both of these sites were below the stream standard of 1 mg/L during 2021, with median values of 0.77 mg/L and 0.84 mg/L for BDC-8 and BDC, respectively. For the 2017-2021 timeframe, BDCWA's five-year data set for iron standard for the stream as a whole and at bdc6.0 at Weld County Road 8 show attainment of the iron standard. Additionally, Metro Wastewater's five-year data set at its two sites suggest attainment with a median value of 0.96 mg/L total recoverable iron. Attainment of the total recoverable iron standard in the lower watershed is expected to vary year-to-year, depending on the timing of sampling events relative to storm events.

The expected source of elevated iron is streambank and soil erosion in the watershed. Previous analyses by BDCWA have shown that total iron and total suspended solids (TSS) are highly correlated (Figure 10), with both concentrations tending to be elevated during storm events. Also see discussion in Section 14 of this report related to runoff-influenced pollutants in the agricultural area.

In 2020, a dissolved iron standard of 300 µg/L was added to Big Dry Creek to protect water supply uses. BDCWA began monitoring for dissolved iron in June of 2020. The 85th percentile value of 17.4 µg/L is well below the dissolve iron stream standard. Metro Wastewater's dissolved iron monitoring in the lower watershed also shows attainment of the dissolved iron standard. Additionally, review of the CWQCD's existing quality data library for Big Dry Creek shows an

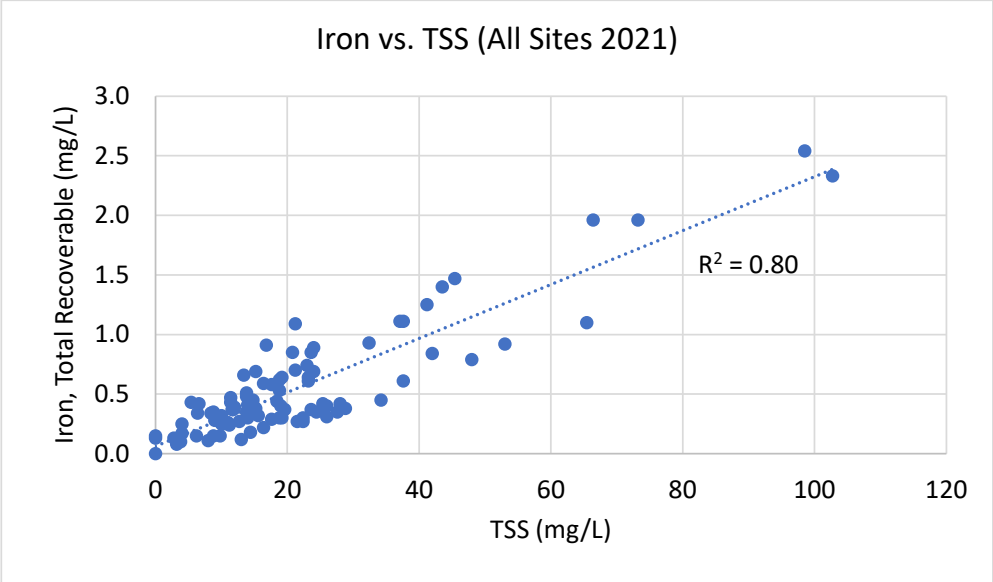
existing condition for dissolved iron of 90 µg/L, further indicating that dissolved iron is likely to attain the new stream standard.

Figure 9. BDCWA Monitoring Locations for Total Iron (2021)



Note: Total recoverable iron is assessed as a median (50th percentile), which corresponds to the line in the box portion of the boxplot.

Figure 10. 2021 Iron vs. TSS at All BDC Monitoring Locations



Manganese

In the 2020 Regulation 38 Rulemaking Hearing, the CWQCC adopted a dissolved manganese standard to protect Water Supply uses associated with alluvial wells near Big Dry Creek in the lower watershed. Dissolved manganese standards can be applied as either of the less restrictive of the following two options:

1. existing quality as of January 1, 2000; or

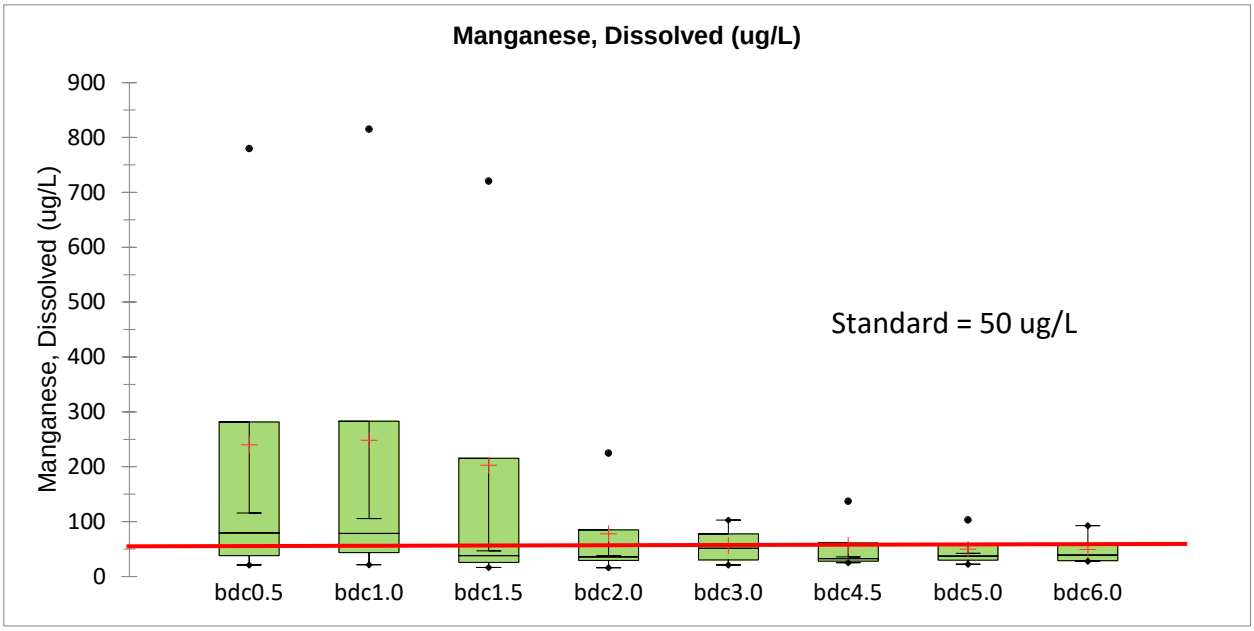
2. a table value criterion of 50 µg/L dissolved manganese.

Based on dissolved manganese in the CWQCD's existing quality library,[4] which does not currently include BDCWA's data set, existing quality for 1995-1999 would be 85 µg/L. Using the entire period of record in the library, the existing quality value would be 78 µg/L. BDCWA's database only includes dissolved manganese for 30 samples in 1999, with an 85th percentile value of 57 µg/L.

The primary cause of the elevated dissolved manganese is thought to be groundwater inflows in the upper watershed. Review of seasonal patterns shows elevated concentrations in the winter, when Standley Lake is not releasing and the stream is dominated by groundwater above the WWTP discharges. This is also the cause of higher variation in the upper watershed, as illustrated by the large ranges in the boxplots for bdc0.5, bdc1.0 and bdc1.5 in Figure 11. The 85th percentile value for dissolved manganese is 120 µg/L for the 2021 Big Dry Creek data set, which exceeds both the underlying standard of 50 µg/L and the existing quality standard as of January 1, 2000.

[4] The CWQCD library is in the process of being updated and the most current working version of the database was provided as a courtesy from the CWQCD on 6/24/2020.

Figure 11. Big Dry Creek 2021 Dissolved Manganese

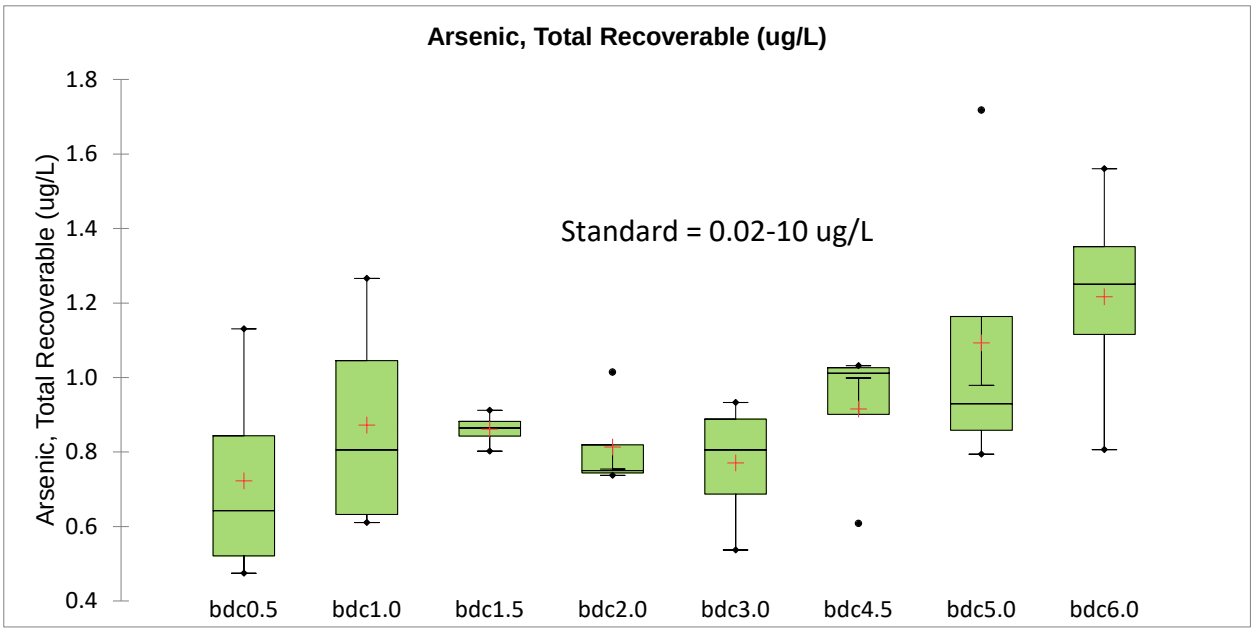


Arsenic

In the 2020 Regulation 38 Rulemaking Hearing, the CWQCC adopted a more stringent total recoverable arsenic standard to protect Water Supply uses associated with alluvial wells near Big Dry Creek. Previously, Big Dry Creek's arsenic standard was much higher at 100 µg/L. The new Water Supply standard is expressed as a hyphenated standard of 0.02-10 µg/L. The first number in the range is a strictly health-based value, based on the CWQCC's established methodology for human health-based standards. The second number in the range (i.e., 10 µg/L) is a maximum contaminant level (MCL), as established under the federal Safe Drinking Water Act, that has been determined to be an upper limit for arsenic in public water supplies, taking treatability and laboratory detection limits into account. Discharge permit effluent limitations are established using the first number in the range as the ambient water quality target, provided that no effluent limitation will require an "end-of-pipe" discharge concentration more restrictive than the second number in the range. Waterbodies are considered in attainment of this standard and not included on the 303(d) List, provided that the existing ambient quality does not exceed the second number in the range (i.e., 10 µg/L).

Big Dry Creek attains the 10 µg/L MCL for total recoverable arsenic and exceeds the 0.02 µg/L underlying health-based value. Thus, the segment would be considered to attain the hyphenated arsenic standard. In the 2020 Regulation 38 Rulemaking Hearing, the CWQCC considered adoption of a more stringent Water + Fish standard of 0.02 µg/L (without the hyphenated 10 µg/L value). Because there was no evidence of fish ingestion for Big Dry Creek meeting the criterion of "fish normally consumed on a recurring basis," the Water + Fish standard was not adopted.

Figure 12. Big Dry Creek 2021 Total Recoverable Arsenic



7. WATER SUPPLY STANDARDS FOR INORGANIC POLLUTANTS (SULFATE AND CHLORIDE)

In the 2020 Regulation 38 Rulemaking Hearing, the CWQCC adopted sulfate and chloride standards to protect Water Supply uses associated with alluvial wells near Big Dry Creek.

Sulfate

The sulfate standard can be applied as either of the less restrictive of the following two options

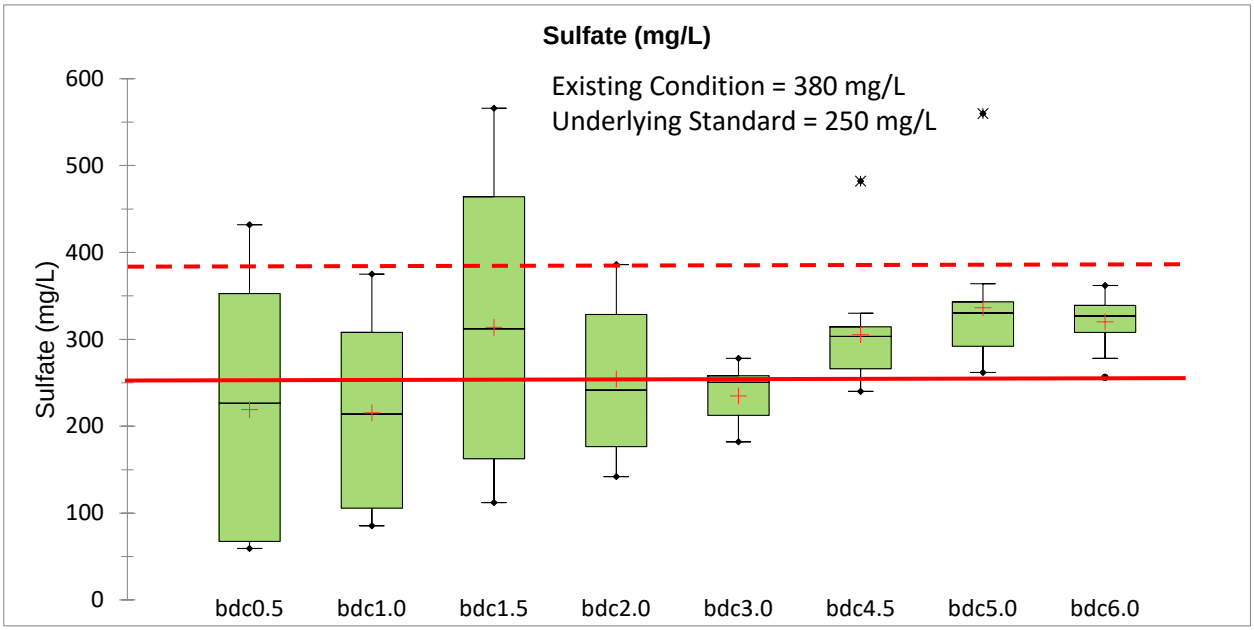
1. existing quality as of January 1, 2000; or
2. sulfate at 250 mg/L.

Based on sulfate data in the BDCWA database from 1995-1999, the existing quality standard for sulfate would be 380 mg/L. Based on sulfate in the CWQCD's existing quality library,[5] which does not currently include BDCWA's data set, existing quality for 1995-1999 would be 308 mg/L. Using the entire period of record in the library, existing quality would be 383 mg/L. Based on review of sulfate data, Big Dry Creek would not be expected to attain the sulfate standard.

[5] The CWQCD library is in the process of being updated and the most current working version of the database was provided as a courtesy from the CWQCD on 6/24/2020.

For sulfate (Figure 13), the 85th percentile value for the overall stream segment is 358 mg/L for 2021, which is less than BDCWA's existing condition calculation of 380 mg/L. However, the 85th percentile value for the past five years of samples on Big Dry Creek exceeds both standards. The primary cause of this standards exceedance is seasonally elevated sulfate in the upper portion of the watershed above the WWTP discharges. During time periods when Standley Lake is not releasing flows to the stream, the stream flows are dominated by groundwater, which is high in sulfate (as well as other parameters like chloride, total dissolved solids, selenium, and manganese). Other sources in the lower watershed could potentially include ammonium sulfate fertilizer. A potential solution to this potential standards issue would be to apply the existing condition provision on a sampling location-specific basis. For example, the 85th percentile value for bdc1.5 for 1995-1999 was 555 µg/L. If recent monitoring data for bdc1.5 are compared to historic water quality data as of the January 1, 2000 for bdc1.5, then the standard would be attained. Although this location-specific comparison technique is not currently expressly included in the 303(d) Listing Methodology, there is precedent for this approach (CWQCD 2020). Additionally, historic data may not be representative of hydrologic conditions in the upper watershed in the future because releases from Standley Lake to the stream are expected to decrease as a result of changes in water rights administration.

Figure 13. Big Dry Creek 2021 Sulfate



Chloride

The chloride standard added to Big Dry Creek in the 2020 Regulation 38 Rulemaking Hearing is 250 mg/L. For chloride, an existing condition provision is not provided in Regulation 31, so the 250 mg/L standard applies (Figure 14). Big Dry Creek's 2021 85th percentile value for chloride is 247 mg/L, which does not exceed the stream standard. The 5-year 85th percentile value for the stream is 250 mg/L, which is at the stream standard. Review of annual 85th percentile values from 1997 through 2021 (Figure 15) suggest that chloride concentrations may be increasing over time, with half of the annual 85th percentile values exceeding the stream standard during the past six years. More in-depth review of the chloride data may be warranted given that Big Dry Creek could potentially cycle on-and-off the 303(d) list for chloride, depending on the data set. A few observations regarding potential sources and trends include:

- Further review of the chloride data set during May through October (summer from 2017-2021) showed that chloride sample results exceeded 250 mg/L only once (at bdc1.5), regardless of location in the watershed (Figure 16). Conversely, most of the elevated values occurred during the winter and non-irrigation months of November through April. The concentrations of chloride were generally highest above the WWTPs (upper sites: bdc0.5, bdc1.0, bdc1.5) during the winter months.

- As discussed for sulfate, groundwater inflows are expected to be the primary cause of elevated chloride in Big Dry Creek.

- In the lower watershed, the 85th percentile for chloride is typically lower than 250 mg/L, even though a winter increase is evident (Figure 16). The observed winter increase could potentially be due to road deicing chemicals.

- In the upper watershed, elevated chloride during the winter months is expected to be affected by a groundwater-dominated flow regime above the WWTP discharges in the winter when Standley Lake is not releasing, similar to sulfate, selenium and manganese. Road deicing may also contribute; additional analysis could be conducted to compare winter instream concentrations during snow and non-snow influenced sampling events.

Figure 14. Big Dry Creek 2021 Chloride

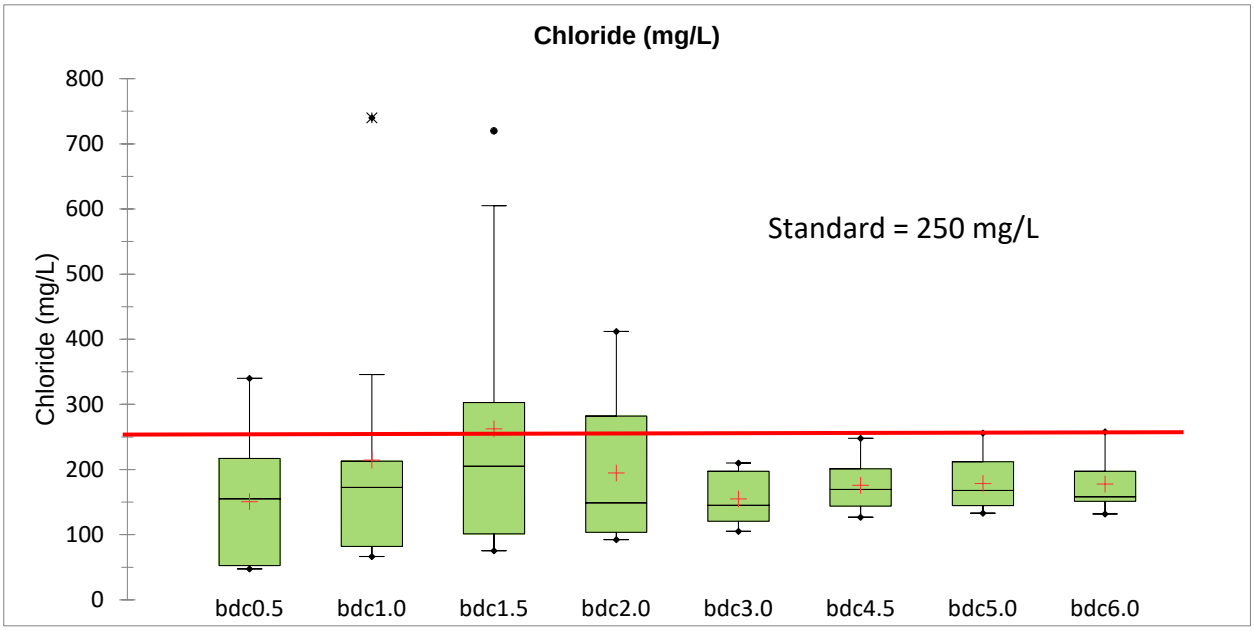


Figure 15. Big Dry Creek Chloride Annual 85th Percentile Values

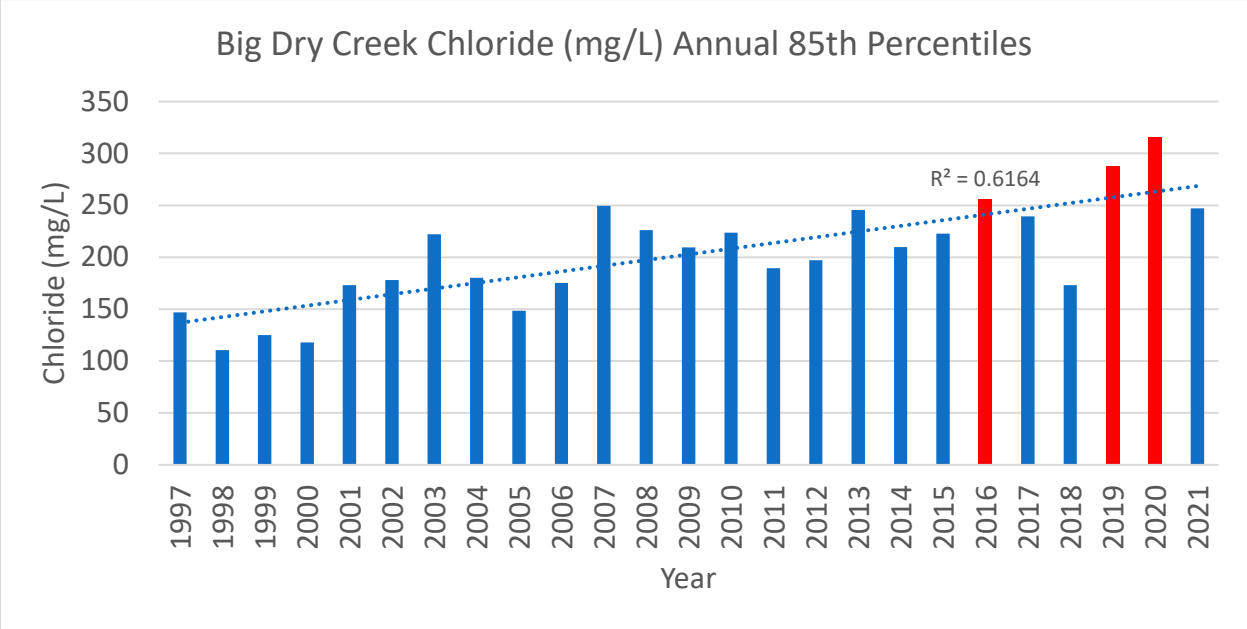
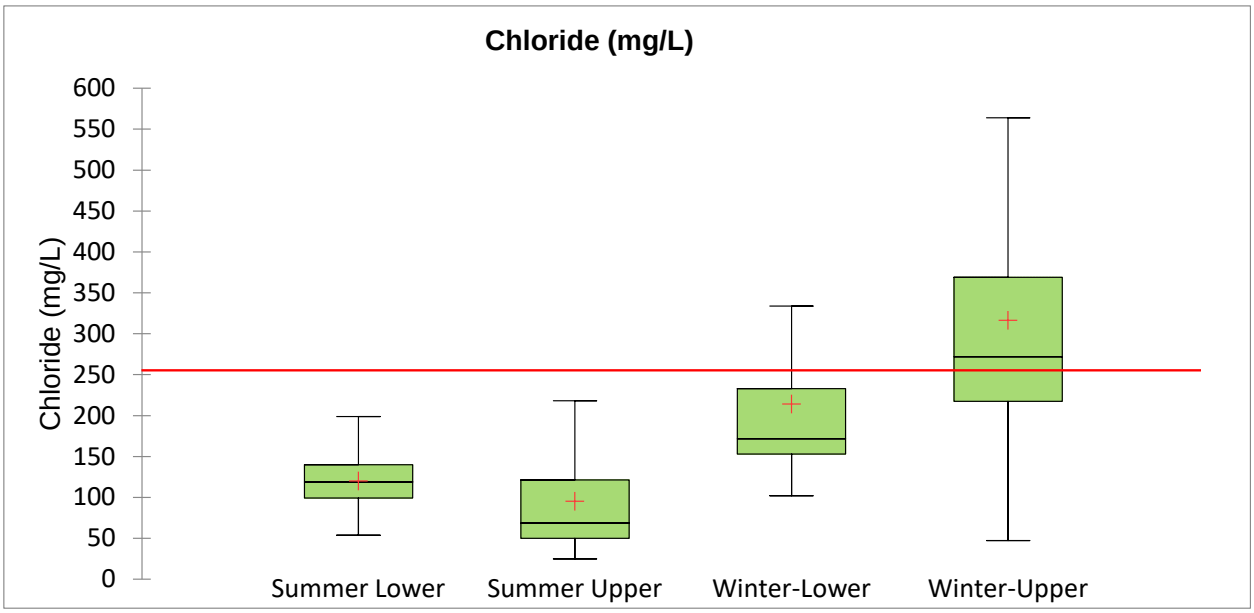


Figure 16. Big Dry Creek Chloride Boxplots by Season and Location (2017-2021)



Note: For this figure, upper sites include bdc0.5, 1.0 & 1.5. Lower sites include bdc2.0 through 6.0.

8. NUTRIENTS

Currently applicable nutrient standards for the main stem of Big Dry Creek include ammonia, nitrate and nitrite. In 2012, the CWQCC adopted new interim nutrient criteria for total phosphorus and total nitrogen, which are expected to become effective for the main stem of Big Dry Creek in 2027 (CWQCC 2012, 2017). Additionally, Big Dry Creek has been assigned a Load Allocation in a downstream TMDL for Barr Lake and Milton Reservoir and has been assigned a phosphorus load reduction target for total phosphorus.

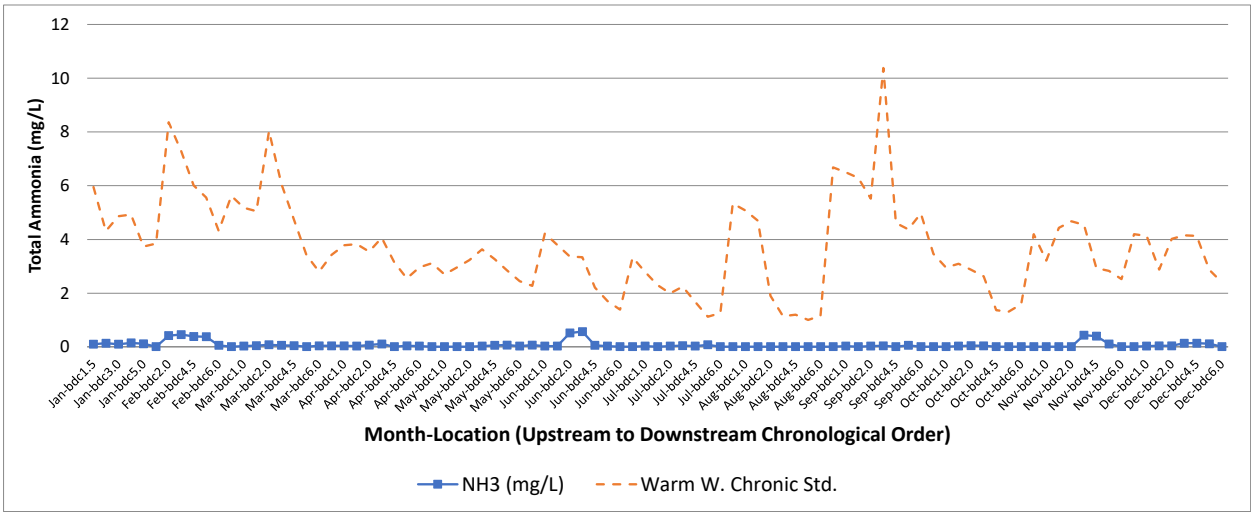
A discussion of ammonia, nitrate and nitrite results, total nitrogen, and total phosphorus data for Big Dry Creek are provided below.

Ammonia

After a five-year transition period from an unionized ammonia standard to a total ammonia standard, a total ammonia standard became effective on Big Dry Creek on January 1, 2012. In 2013, EPA published a revision to the aquatic life criteria for ammonia. Although these criteria have not yet been adopted in Colorado, these criteria can be accessed at EPA's website: http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/ammonia/index.cfm.
As part of Colorado's 10-year Water Quality Road Map, ammonia standards will be revisited in 2027.

Total ammonia concentrations for Big Dry Creek are plotted in Figure 17, along with the chronic standards, which are calculated using a formula based on pH and temperature. During 2021, the stream attained both chronic and acute total ammonia standards. Acute standards are higher than chronic standards and are not shown in Figure 17 since all results were below chronic standards.

Figure 17. Comparison of Big Dry Creek 2021 Ammonia Data to Chronic Ammonia Standards

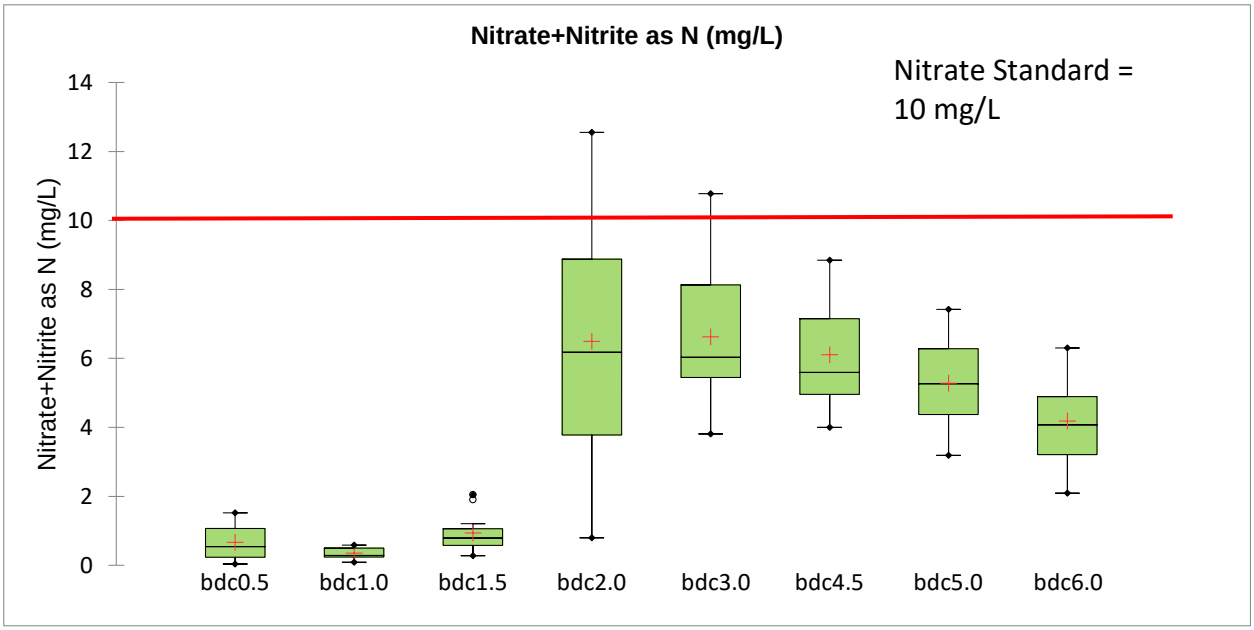


Nitrate and Nitrite

The CWQCC adopted a nitrate standard of 10 mg/L for Big Dry Creek in 2020 for the protection of Water Supply uses, which is a more stringent standard than the previously applicable 100 mg/L for agricultural uses. Big Dry Creek monitors for nitrate+nitrite instead of nitrate; however, the nitrite component is very small. For this reason, nitrate+nitrite results are compared against the 10 mg/L nitrate standard in this report. As shown in Figure 18, Big Dry Creek's instream nitrate+nitrite concentrations are below 10 mg/L at most sampling locations; however, bdc2.0 and bdc3.0 (below the Broomfield and Westminster WWTPs, respectively) have a few nitrate+nitrite results above 10 mg/L, resulting in exceedance of the stream standard. The stream standard is assessed based on the maximum daily value and allows only one exceedance of the 10 mg/L every three years. An increase in instream nitrate concentrations occurs below the WWTP discharges, but gradually decreases in the agricultural area, consistent with the trend for total nitrogen.

Nitrite concentrations at all locations on Big Dry Creek are well below the 4.5 mg/L stream standard, with an 85th percentile value of 0.10 mg/L for 2021.

Figure 18. Big Dry Creek 2021 Nitrate + Nitrite



Colorado's 2012 Nutrient Criteria for Nitrogen and Phosphorus (as updated Dec. 2017)

Nationally, statewide, and locally, control of nutrient loading to streams is a significant regulatory topic. In June 2012, the CWQCC adopted Regulation 85 (Nutrient Management Control) and updated the nutrient portion of Regulation 31 (Colorado Basic Standards). Although many requirements under these regulations originally had a 10-year delay until May 31, 2022, some requirements became effective in 2013. For example, monitoring requirements for municipal WWTPs, a data gap evaluation process for the municipal separate storm sewer (MS4) discharge permit holders, and other requirements, became effective in 2013. Additionally, municipal wastewater dischargers to Big Dry Creek now have compliance plans to attain new discharge permit limits for total phosphorus and total inorganic nitrogen (TIN) in accordance with Regulation 85. Compliance plans allow time to implement upgrades to meet the limits.

As a result of requirements under Regulation 85, BDCWA has developed an instream nutrient monitoring plan, which was implemented in March 2013. Additionally, MS4s in the Big Dry Creek watershed participated in a joint nutrient data gap analysis for stormwater runoff characterization in conjunction with the Colorado Stormwater Council and Urban Drainage and Flood Control District (WWE et al. 2013). This "data gap analysis" was submitted to and accepted by the CWQCD in fulfillment of the Regulation 85 requirement for MS4s pertaining characterizing nutrients in urban runoff.

Under Regulation 31, interim nutrient "values" were developed that may be applicable to Big Dry Creek in the future.[6] These interim values include:

- Median annual total phosphorus concentration of 0.17 mg/L, and
- Median annual total nitrogen concentration of 2.01 mg/L.

Both interim values have a once every five years allowable exceedance frequency. Additionally, streams with recreational uses have a not-to-exceed 150 milligrams per square meter (mg/m^2) chlorophyll-*a* interim value for attached algae. At the June 2015 Regulation 38 Rulemaking Hearing, it was determined that the total phosphorus and chlorophyll-a standards would not apply at this time to the mainstem of Big Dry Creek downstream of Standley Lake, because the lake is filled by ditches that withdraw water downstream of multiple permitted domestic wastewater treatment facilities. These standards may, however, apply in the future after the 2027 rulemaking hearing.

At the October 2017 CWQCC Rulemaking Hearing related to nutrients, the CWQCD presented its 10-year water quality roadmap for pollutants including total nitrogen, total phosphorus, cadmium, ammonia, selenium, arsenic and temperature. As a result of this hearing, phased adoption of instream total nitrogen and total phosphorus standards was extended from 2022 to 2027. As part of this decision, a new CWQCC policy, Policy 17-1 Voluntary Incentive Program for Early Nutrient Reductions, was adopted. The Roadmap and Incentives Policy were a result of extensive stakeholder meetings and dialogue through the Water Quality Forum. Among other provisions, the Incentive Program will allow a WWTP to accrue time under a post-2027 compliance schedule through trading or watershed nutrient reductions as part of its nutrient reduction plan. Such opportunities should be further explored as part of the Big Dry Creek Watershed Management Plan update. All three municipal WWTPs discharging to Big Dry Creek are participating in the Voluntary Incentive Program.

The Voluntary Incentive Program is intended to encourage facilities to make voluntary reductions of nutrients, and in exchange the facility will receive an extended compliance schedule as well as certainty about the year in which the facility will need to meet water-quality-based effluent limits. An extended compliance schedule means the facility will be given additional time to comply with effluent limits that would be based on water quality standards or variances adopted in 2027 or nutrient-related wasteload allocations.

Big Dry Creek data for nitrogen and phosphorus are discussed further below. Monitoring for chlorophyll-*a* as attached algae has not been conducted for Big Dry Creek to date. Monitoring

[6] For consistency with terminology used in Regulation 31, the term interim nutrient "value" has been used, as opposed to criterion or standard. These "values" may be adopted as stream standards in the future but have not been adopted as stream standards on the main stem of Big Dry Creek.

procedures are not currently well-defined for a stream like Big Dry Creek which has a sandy bottom through much of the watershed.

Total Nitrogen

Total nitrogen is calculated based on total Kjeldahl nitrogen (TKN) plus nitrate/nitrite or through direct analysis of total nitrogen. TKN includes organic nitrogen and ammonia. During 2017, BDCWA changed its analysis methodology for total nitrogen from a calculation-based method to a laboratory analysis method (conductimetric persulfate determination of total nitrogen using Timberline analyzer; 4500-N C). Figure 19 provides box plots of total nitrogen from upstream to downstream during 2021, also showing the interim total nitrogen value in Regulation 31 of 2.01 mg/L. Figure 20 provides a matrix of boxplots illustrating total nitrogen trends from 2013 to 2021. Total nitrogen data were not available instream prior to 2013.

Municipal WWTPs discharging to Big Dry Creek have compliance plans to achieve total inorganic nitrogen limits. During 2021, annual median TIN values for the WWTPs were 14.1 mg/L for Broomfield, 7.5 mg/L for Westminster, and 6.8 mg/L for Northglenn. All three facilities have a compliance schedule to attain a running annual median of 15 mg/L and maximum of 20 mg/L by July 1, 2024.

Figure 19. Big Dry Creek 2021 Total Nitrogen

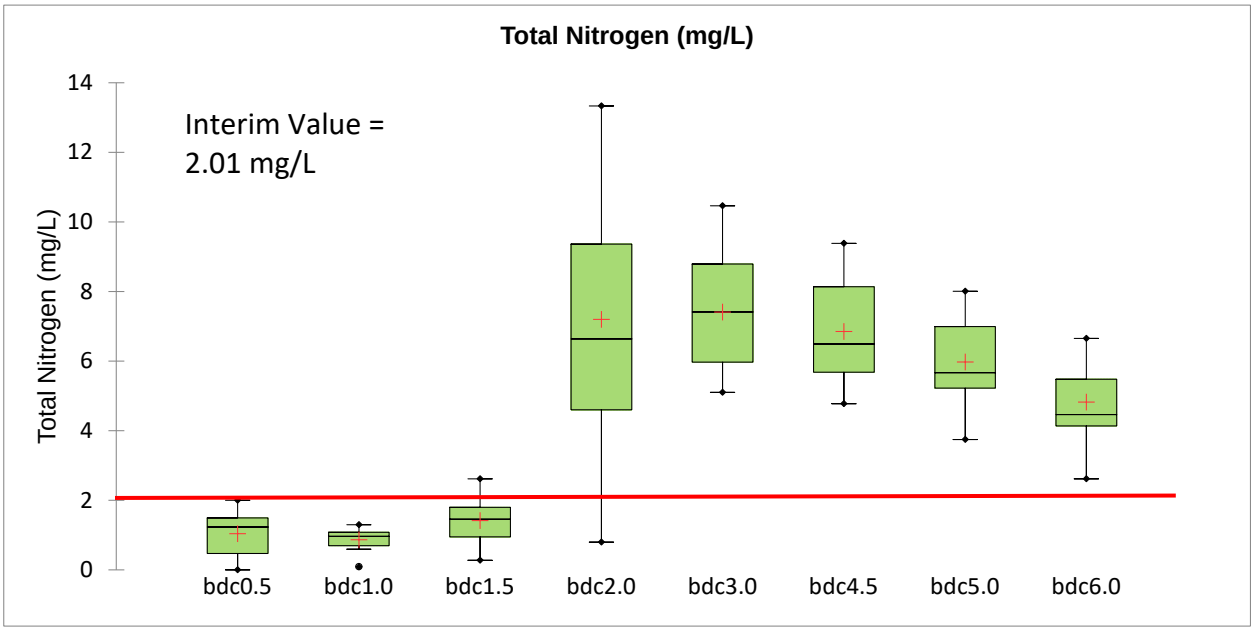
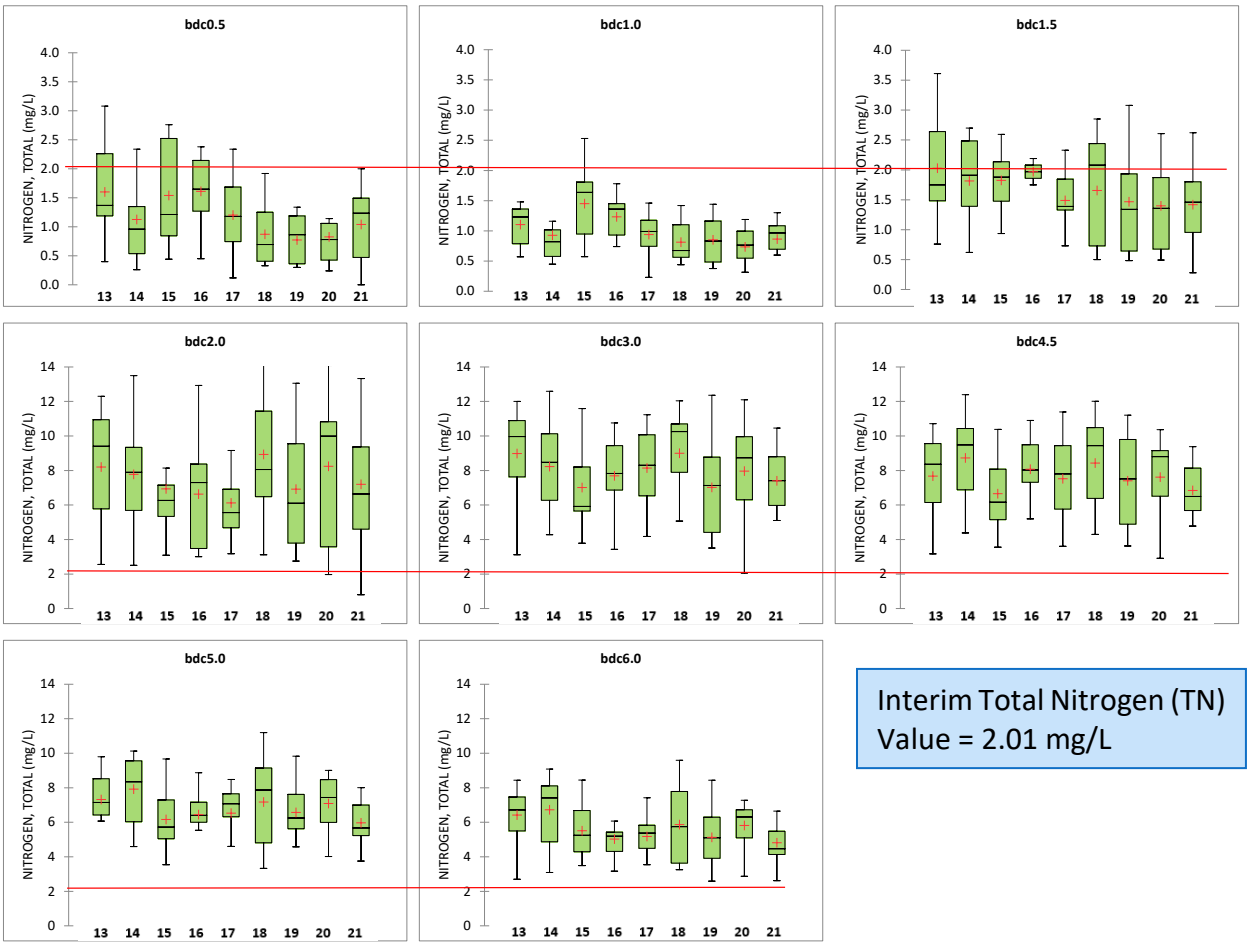


Figure 20. Big Dry Creek Total Nitrogen Trends (2014-2021)



Key observations from Figure 19 and Figure 20 include:

- At locations upstream of the WWTP discharges to Big Dry Creek (bdc0.5, bdc1.0 and bdc1.5), the 2021 median total nitrogen values ranged from 0.97 to 1.46 mg/L. This indicates that locations upstream of the WWTPs are likely to meet the interim stream value.

- Below the Broomfield WWTP at bdc2.0, a noticeable increase in total nitrogen concentrations is observed. The 2021 median concentration at bdc2.0 was 6.64 mg/L, exceeding the interim total nitrogen value. Below the Westminster WWTP at bdc3.0, the 2021 median total nitrogen concentration was 7.41 mg/L, exceeding the interim total nitrogen value. Although total nitrogen concentrations decline in the lower watershed, instream total nitrogen is still well above the interim nitrogen value at all locations downstream from the WWTP discharges. Dilution from instream flows and natural losses associated with the nitrogen cycle result in lower total nitrogen concentrations downstream.

- From Figure 20, there are not clear trends over time at individual monitoring locations from 2013 to 2021, with year-to-year variability present at each location; however, the last several years have lower median total nitrogen above the Broomfield WWTP. City of Westminster staff indicate that this decrease may be due to operational changes in the outlet used for Standley Lake releases. The upper release outlet is used from approximately the end of July to after lake turnover and mixing in October (Personal Communication with Kelly Cline, May 2021). Upstream to downstream trends for the period of record are similar to those discussed for 2021. In summary, despite WWTP upgrades over the past decade at the Broomfield and Westminster WWTPs, the interim total nitrogen value would not be attained under current conditions in Big Dry Creek from below the Broomfield WWTP discharge to the South Platte River.

Phosphorus

Phosphorus is of interest to BDCWA in two contexts: 1) Colorado's interim total phosphorus values in the context of Colorado's 10-year Water Quality Road Map, and 2) the downstream Barr-Milton TMDL, as discussed below.

Phosphorus in Relation to Colorado's Interim Total Phosphorus Values

Total phosphorus concentrations in Big Dry Creek are of interest with regard to the interim warm water total phosphorus value (0.17 mg/L) adopted by the CWQCC in June 2012. Based on conditions described in nutrient-related criteria in Regulation 31, these interim values are not expected to be adopted as stream standards for the main stem of Big Dry Creek prior to 2027, as part of Colorado's 10-year Water Quality Roadmap. Nonetheless, it is important to develop an understanding of nutrient conditions in Big Dry Creek with regard to these interim values.

Table 9 and Figure 21 show that Big Dry Creek would have difficulty meeting the phosphorus interim value from below the Westminster WWTP to the South Platte River, with the median phosphorus concentration during 2021 ranging from 0.21 to 0.25 mg/L at locations in this reach. Figures 22a-d provide boxplots of annual total phosphorus concentrations over time at selected monitoring locations upstream of the Broomfield WWTP (bdc1.5), below Broomfield's discharge (bdc2.0), below Westminster's discharge (bdc3.0), and in the agricultural area (bdc6.0). These figures show that locations upstream of the Westminster WWTP can meet the interim total phosphorus value. Significant reductions in total phosphorus are evident beginning in 2010 below Broomfield's discharge. Significant reductions in total phosphorus below Westminster's discharge are evident beginning in 2009. Despite overall phosphorus reductions at both WWTPs (Figure 23 and Figure 24), median annual total phosphorus concentrations instream are still above the interim total phosphorus value from below the Westminster WWTP to the confluence with the South Platte River. Although not shown in a figure due to a shorter period of record for regular discharges to Big Dry Creek, Northglenn's 2021 median total phosphorus discharge from WWTP outfall 007 was 0.23 mg/L. All three WWTPs are now required to attain a running annual median of 1.0 mg/L and a 95th percentile value of 2.5 mg/L effective January 1, 2021.

Figure 21. Big Dry Creek 2021 Total Phosphorus

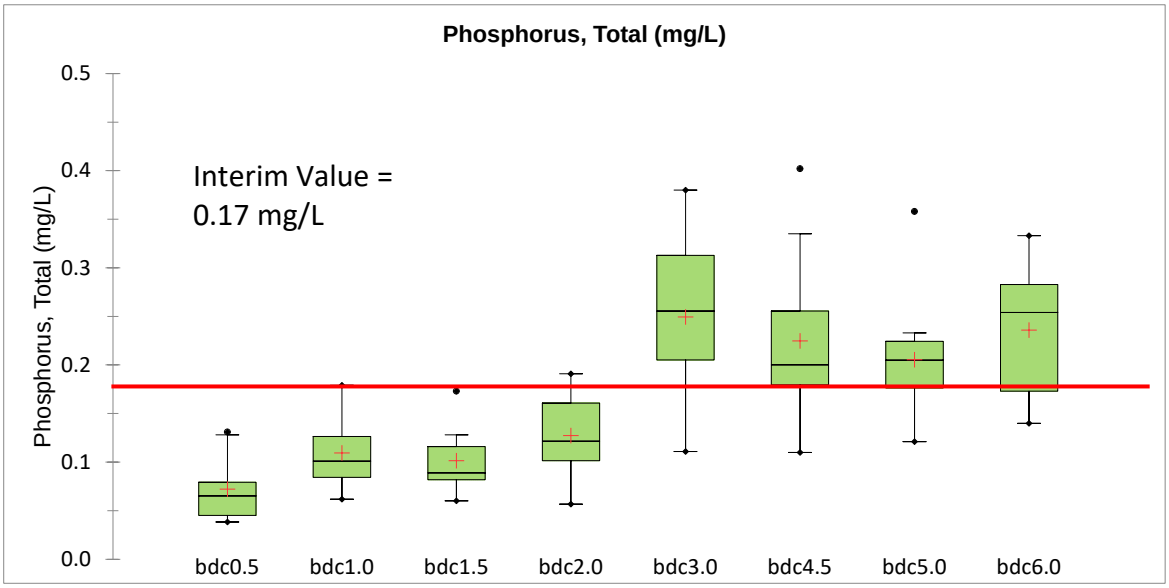
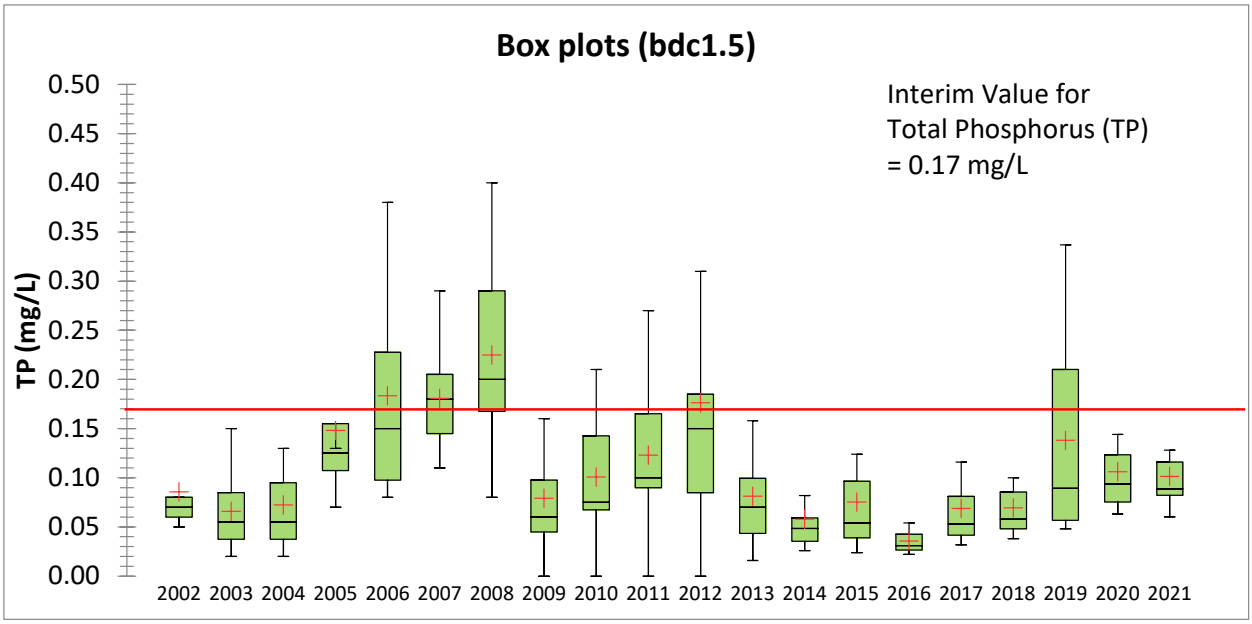


Table 9. Median Annual Total Phosphorus (mg/L) 1999-2021

Year	bdc0.5	bdc1.0	bdc1.5	bdc2.0	bdc3.0	bdc4.0/4.5	bdc5.0	bdc6.0
2000	0.00	0.07	0.04	0.43	1.85	1.60	1.45	1.25
2001	0.00	0.06	0.06	0.47	1.90	1.10	1.20	0.93
2002	0.00	0.06	0.07	1.20	2.25	1.50	1.80	1.60
2003	0.04	0.04	0.05	0.75	2.25	1.55	1.40	1.15
2004	0.04	0.05	0.05	0.23	1.75	1.15	1.10	0.94
2005	0.09	0.12	0.12	1.32	2.54	1.68	1.68	1.40
2006	0.12	0.13	0.15	0.48	2.04	1.38	1.30	1.13
2007	0.12	0.16	0.18	0.85	2.21	1.24	1.29	1.23
2008	0.14	0.23	0.20	0.90	1.73	1.18	1.10	1.22
2009	0.03	0.07	0.06	0.84	0.76	0.57	0.77	0.60
2010	0.06	0.09	0.08	0.13	0.34	0.31	0.33	0.44
2011	0.07	0.10	0.10	0.17	0.55	0.49	0.32	0.49
2012	0.11	0.13	0.15	0.27	0.96	0.85	0.68	0.62
2013	0.04	0.07	0.07	0.27	0.78	0.64	0.52	0.48
2014	0.04	0.04	0.05	0.48	0.52	0.63	0.58	0.53
2015	0.04	0.09	0.05	0.20	0.66	0.50	0.45	0.55
2016	0.04	0.06	0.03	0.21	0.72	0.68	0.56	0.43
2017	0.08	0.06	0.05	0.30	0.99	0.78	0.64	0.55
2018	0.05	0.07	0.06	0.16	0.36	0.46	0.35	0.40
2019	0.15	0.14	0.09	0.24	0.34	0.36	0.32	0.28
2020	0.07	0.11	0.09	0.15	0.31	0.39	0.45	0.43
2021	0.07	0.11	0.10	0.13	0.25	0.23	0.21	0.24

Pink-shaded cells exceed the interim value of 0.17 mg/L total phosphorus.

Figure 22 (a-d). Total Phosphorus over Time at Selected Big Dry Creek Monitoring Locations



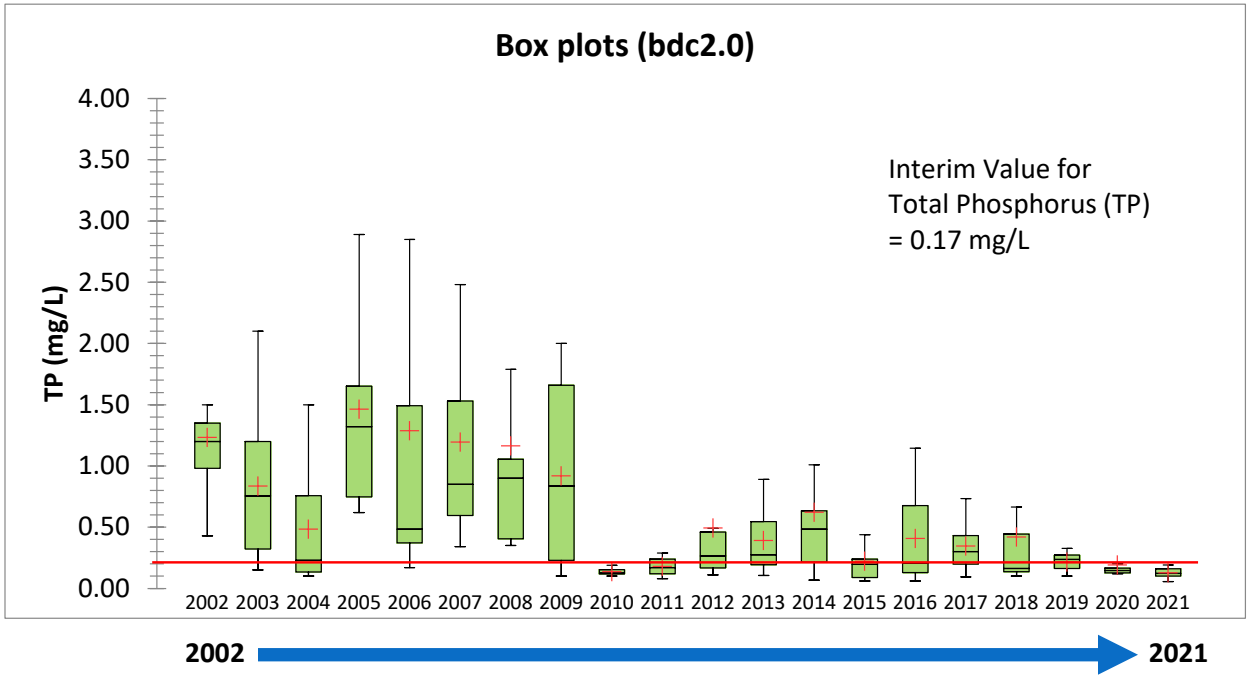
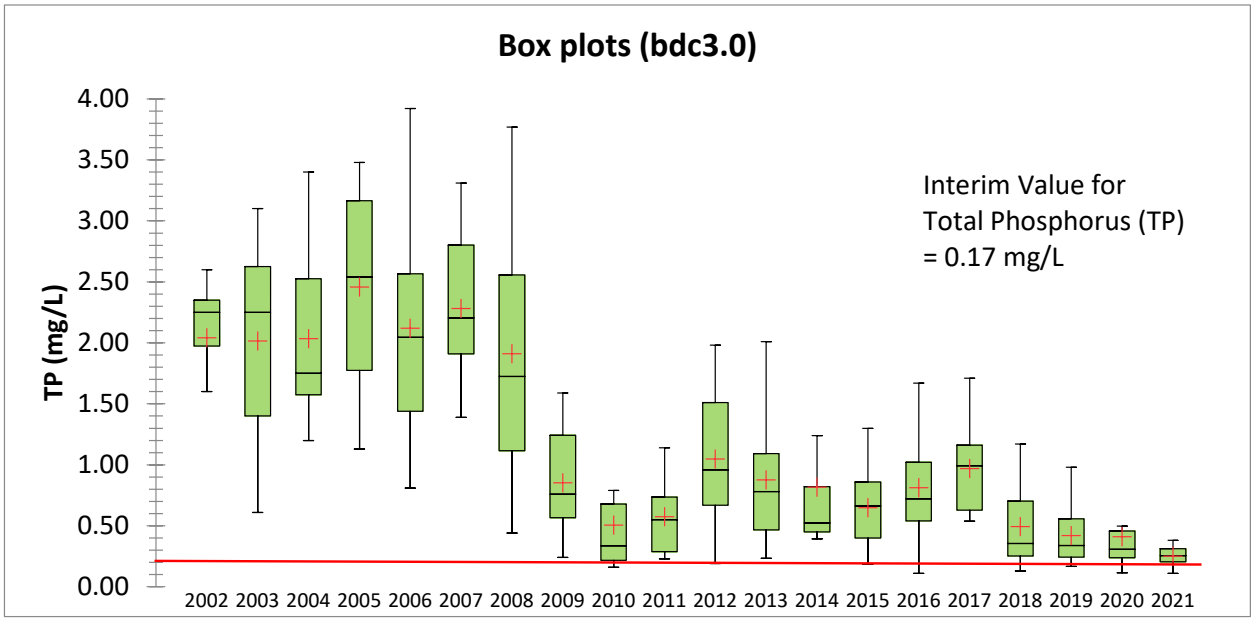
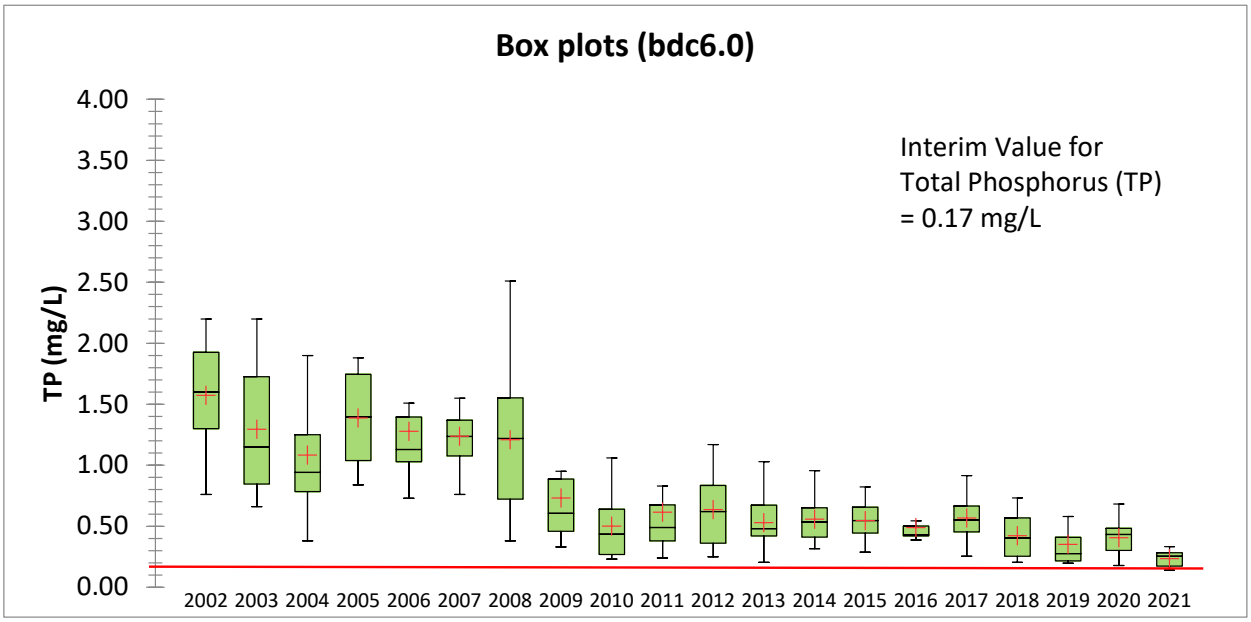


Figure 22 (a-d) (cont). Total Phosphorus over Time at Selected Big Dry Creek Monitoring Locations





2002 → **2021**

Figure 23. Decreases in Total P Concentrations in Broomfield WWTP Discharge (2002-2021)

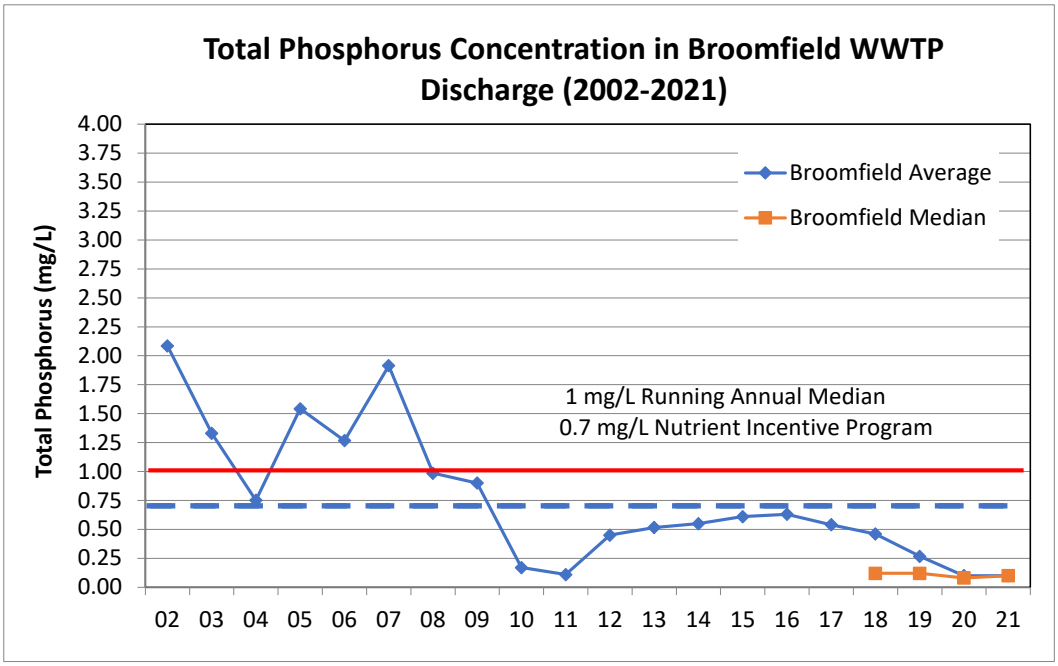


Figure 24. Decreases in Total P Concentrations in Westminster WWTP Discharge (2004-2021)

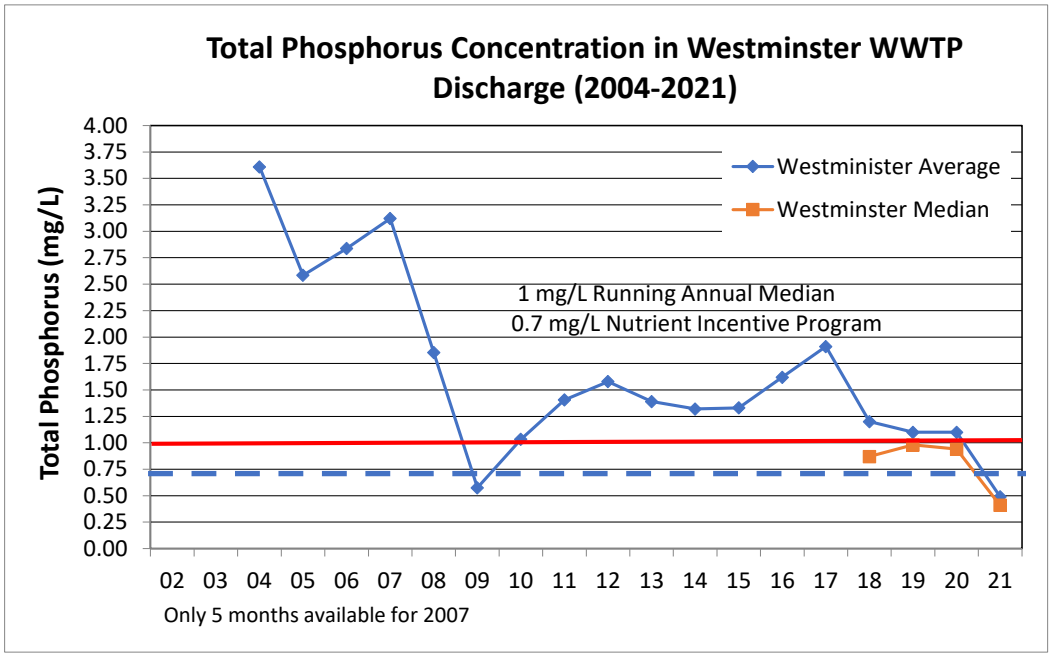


Figure Note: Medians are calculated for the past three years because this statistic forms the basis for accrual of additional compliance schedule time under the Voluntary Nutrient Incentive Program. Both WWTPs attain the 0.7 mg/L total phosphorus target under this program.

Phosphorus in Relation to Barr-Milton TMDL

The Barr-Milton Watershed Association (BMW) is addressing pH exceedances and low dissolved oxygen in the Barr-Milton reservoir system. These pH exceedances and low dissolved oxygen are attributed to excessive algal growth caused by nutrient loading, specifically phosphorus. BMW has established a database for modeling conditions in the reservoirs and has included water quality data from Big Dry Creek, as well as many other tributaries upstream of the Barr-Milton system. BDCWA representatives have participated in various aspects of the BMW effort over the years. In August 2009, AECOM released the final report titled "Watershed and Lake Modeling for a TMDL Evaluation of Barr Lake and Milton Reservoir," which forms the underlying basis for the TMDL.[7] In July 2013, EPA approved the Barr-Milton TMDL for pH and DO, which is focused on controlling phosphorus loads to the reservoirs. In the final TMDL, Big Dry Creek was identified as contributing approximately 5.9 percent of the phosphorus loading to Milton Reservoir. Big Dry Creek has been targeted for a 20 percent total phosphorus load reduction from 2,301 kilograms per year (kg/yr) (baseline year of 2003-2004) down to 1,840 kg/yr (Integral 2011).[8] Because Big Dry Creek is identified as a nonpoint source of loading, "application of best management practices (BMPs) to the greatest extent feasible" is the recommended approach for achieving these reductions. BMW updated their watershed plan in 2017 (BMW 2017).

As a result of the Barr-Milton TMDL process, BDCWA reviewed phosphorus data collected along Big Dry Creek, with primary focus on monitoring station bdc6.0, which is the downstream-most instream monitoring location on Big Dry Creek in the agricultural portion of Weld County. Although instantaneous flow measurements are conducted by BDCWA on a monthly basis, the USGS Fort Lupton gauging station is combined with the bdc6.0 water quality data to estimate loads because the USGS gauge provides a more comprehensive data set. Table 10 and Figure 25 summarize changes in total phosphorus concentrations at bdc6.0 over time, indicating total phosphorus concentration reductions on the order of 78 percent since 2003 and 73 percent since 2004. Total phosphorus load reductions for the overall watershed (based on bdc6.0) over time are also shown in Figure 25. Phosphorus load reductions are also substantial, with some year-to-

[7] In 2019, BMW began updating this model. Since then, BMW has concluded that the SWAT model provides reasonable predictive estimates of the phosphorus loads to the reservoirs; however, the in-reservoir WASP model may need to be recalibrated or another model option selection. BDCWA provided data to the BMW Association to support the model update initiated in 2019. With the floods of 2013 and recent phosphorus treatment at Metro Wastewater, phosphorus concentrations in both Barr and Milton Reservoirs are at about half of the 2003-2004 concentrations. Over the last four years, BMW has also removed over 6,000 carp from Barr Lake; carp disturb bottom sediments and can be a source of phosphorus release. More details are at www.barr-milton.org (Personal Communication with Steve Lundt, May 2021).

[8] This load reduction applies to the portion of the Big Dry Creek load that enters Milton Reservoir, which is a significantly smaller load than occurs at bdc6.0.

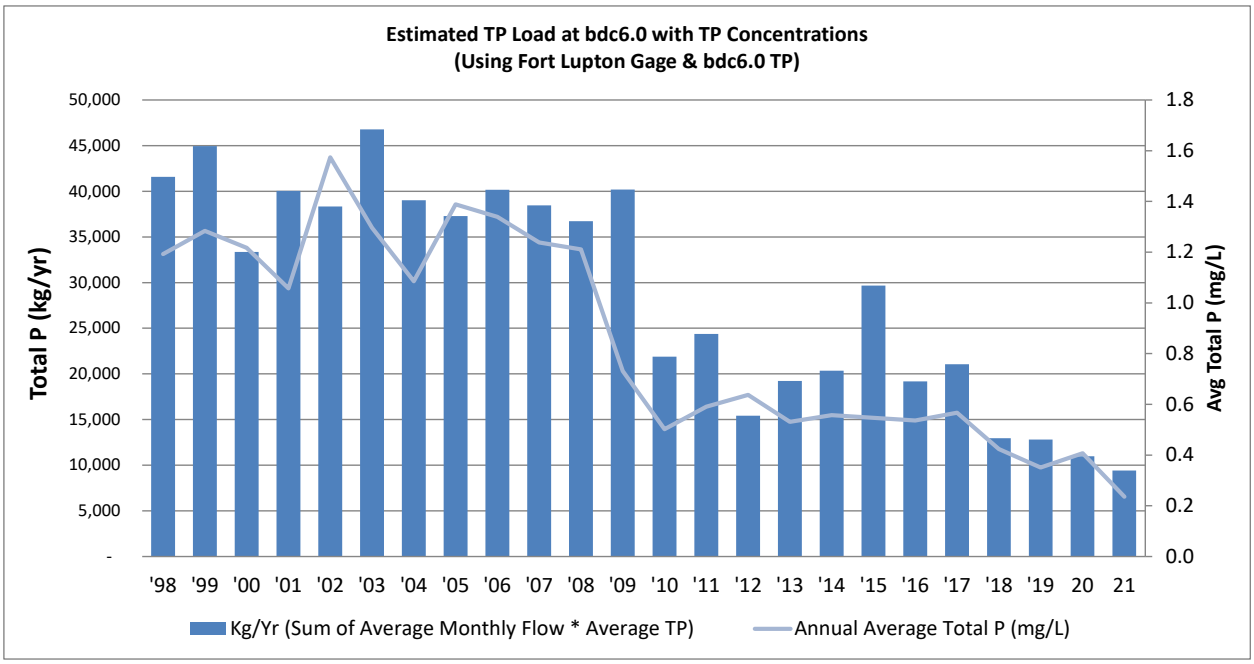
year variation depending on flow volumes. The 2021 phosphorus loads are 82 and 78 percent lower than loads in 2003 and 2004, respectively.

Table 10. Total Phosphorus Concentrations at bdc6.0 (2003-2021)

Year	No. of Samples	Median	Mean	Min.	Max.	25th Percentile	75th Percentile
2003	12	1.15	1.30	0.66	2.20	0.85	1.73
2004	12	0.94	1.08	0.38	2.00	0.78	1.25
2005	12	1.40	1.39	0.84	1.88	1.04	1.75
2006	11	1.13	1.28	0.73	2.65	1.03	1.39
2007	12	1.23	1.24	0.76	1.97	1.08	1.37
2008	12	1.22	1.21	0.38	2.51	0.72	1.55
2009	12	0.60	0.73	0.33	2.10	0.46	0.89
2010	12	0.44	0.50	0.23	1.06	0.27	0.64
2011	11	0.49	0.62	0.24	1.83	0.38	0.68
2012	12	0.62	0.64	0.25	1.17	0.36	0.84
2013	12	0.48	0.53	0.2	1.03	0.42	0.67
2014	12	0.53	0.56	0.32	0.96	0.41	0.65
2015	12	0.55	0.55	0.29	0.82	0.45	0.66
2016	10	0.43	0.49	0.39	0.86	0.42	0.50
2017	12	0.55	0.57	0.25	0.92	0.45	0.66
2018	12	0.40	0.42	0.21	0.73	0.25	0.57
2019	12	0.28	0.35	0.20	0.80	0.22	0.41
2020	12	0.43	0.41	0.18	0.68	0.30	0.48
2021	12	0.25	0.24	0.14	0.33	0.17	0.28
Percent Reduction in P (mg/L) (2003 - 2021)		**78%**	**82%**				
Percent Reduction in P (mg/L) (2004 - 2021)		**73%**	**78%**				

Note: For 2016 data, May and December total phosphorus results were not available for use in these calculations.

Figure 25. Decreases in Total P Loads at bdc6.0 Plotted with Total P Concentration Data



Note: 2013 load estimate uncertain due to missing flow data following September Flood. The 2016 load estimate is uncertain due to missing phosphorus results for May and December 2016. Estimated phosphorus concentrations were substituted for those months for purposes of an annual load estimate.

Several additional observations related to the volume-related component of phosphorus load reductions include:

- In addition to phosphorus concentration reductions at the Broomfield and Westminster WWTPs, both cities have implemented significant reclaimed water programs, which help to manage nutrient loading to Big Dry Creek. Factors such as population growth and demand for reclaimed water affect volumes discharged. The current and future effects of reclaimed water programs have not been fully evaluated for purposes of this report but are important considerations should more in-depth analysis be conducted related to Big Dry Creek phosphorus loading to the South Platte River.

- Historically, Northglenn has discharged infrequently to Big Dry Creek; however, during 2015 through 2021, Northglenn discharged to Big Dry Creek much more frequently. These discharges represent a new source of phosphorus loads to Big Dry Creek relative to the 2003-2004 baseline conditions used in the Barr Milton TMDL.

- As illustrated in Figure 35 (later in this report), the hydrology of Big Dry Creek is highly managed and complex. Future evaluation of measures to reduce phosphorus loading from Big Dry Creek must consider these complexities. Other hydrology-related considerations include:

- It is important to be aware that bdc6.0 is located upstream from the USGS gauge. Instantaneous flow measurements at bdc6.0 and the average daily flow measurements at the USGS Fort Lupton gauge vary substantially. On average, flows at the USGS gauge are approximately 20 percent higher than measured flows at bdc6.0; however, there is large variation in the magnitude of the difference between individual pairs of flow measurements.

- It is important that the water quality sample location used for modeling Big Dry Creek phosphorus contributions to the South Platte River be located upstream of the Lupton Bottoms Ditch discharge to Big Dry Creek. Sampling location bdc6.0 is upstream of Lupton Bottoms Ditch, but Metro Wastewater Reclamation District also collects water quality samples below Lupton Bottoms ditch, which may be influenced by South Platte water discharged from the Lupton Bottoms Ditch to Big Dry Creek.

9. TEMPERATURE

The currently applicable classification for temperature standards on Big Dry Creek is Warm Stream Tier I (WS-I), due to the presence of the Johnny darter in some locations in the upper portion of the stream. Attainment of standards is assessed based on comparison of the maximum weekly average temperature (MWAT) and daily maximum (DM) temperature to seasonal temperature standards established for March-November and December-February. Values above these standards are allowed under these conditions:

- The DM may exceed the acute temperature standard once every three years. The DM means the highest two-hour average water temperature recorded during a given 24-hour period.

- The MWAT may exceed the chronic standard once every three years (1E3). The MWAT is calculated as the largest mathematical mean of multiple, equally spaced, daily temperatures over a seven-day consecutive period, with a minimum of three data points spaced equally through the day.

- Values measured during conditions “warming event” excursion criteria in Regulation 31 and the 2024 303(d) Listing Methodology are not considered exceedances.

The CWQCD determines whether temperature limits are to be included in permits in accordance with the Basic Standards 31.14(14) “Integration into Discharge Permits.” Currently, the municipal WWTP dischargers to Big Dry Creek are required to “report only” under terms of the 2019 permits, but temperature limits are anticipated in the next permit renewals. Additional instream monitoring data have been collected at several instream locations in support of this effort using HOBO data loggers recording temperature measurements at 15-minute intervals. For a more

robust evaluation of temperatures on Big Dry Creek in the vicinities of the WWTP discharges, 15-minute incremental temperature data collected as part of CDPS DMRs for each WWTP should be obtained and reviewed but is beyond the scope of this report.

10. MACROINVERTEBRATE DATA AND MMI ANALYSIS[9]

BDCWA conducts a biennial macroinvertebrate monitoring program during the month of October in even years. This section provides a summary of multi-metric index (MMI) results for macroinvertebrate data collected in the fall of 2012, 2014, 2016, 2018 and 2020 for the aquatic monitoring program on Big Dry Creek. Analysis in this section was provided by Aquatics Associates, Inc., with more detailed information for fish, macroinvertebrates, and habitat available in biennial reports completed by Aquatics Associates (2014, 2019a, 2019b), along with a forthcoming report addressing sampling conducted during 2020. Aquatics Associates presented the findings from the 2020 monitoring program at the December 2021 BDCWA quarterly meeting.

Background on Aquatic Life Use Attainment Policy 10-1

The CWQCC adopted Policy 10-1 on October 12, 2010 (CWQCC 2010), which provides for the evaluation of the biotic integrity of streams through use of a multi-metric index (MMI) calibrated for the State of Colorado (Jessup 2010). Policy 10-1 was updated on August 7, 2017 (CWQCC 2017) and included a recalibration of the MMI (Jessup and Stribling 2017). This recalibration resulted in a different algorithm used in the CWQCD's Ecological Data Application System (EDAS) to calculate the MMI, as well as different attainment and impairment thresholds for determining attainment and impairment.

EDAS (Version 4.0 CO) was used to calculate MMI and other metrics for the Big Dry Creek analysis summarized below. Application of this method requires the collection and analysis of benthic macroinvertebrate samples according to Policy 10-1 protocols (CWQCC 2017). Use-attainment thresholds have been established for three separate stream biotypes which include Transition (Biotype 1), Mountain (Biotype 2), and Plains & Xeric (Biotype 3). The Big Dry Creek study sites are all designated as Biotype 3 per EDAS. The thresholds for Biotype 3 streams are MMI >42 for use attainment and MMI <29 for impairment. Class 1 streams (Cold or Warm) with MMI scores falling in between the attainment and impairment thresholds require additional analysis using two auxiliary metrics: the Hilsenhoff Biotic Index (HBI) and the Shannon Diversity Index (SDI). Also, MMI scores >51 for Biotype 3 streams indicate a high scoring water (HSW) and any drop in HSW scores of 22 points or more for samples collected 12 or more months apart within a 5-year span of time may indicate impairment. Failure to meet use attainment thresholds for streams in

[9] This section was also included in the 2021 Big Dry Creek Annual Water Quality Report but is repeated for ease of reference since biological monitoring is conducted every two years.

their particular biotype may result in the affected segment(s) being listed as provisionally impaired for aquatic life on the 303(d) List. For differing MMI scores on the same representative segment taken in different calendar years, the most recent MMI score is used in the impairment listing decision. The representative nature of all aquatic life data is to be considered before listing decisions are made. Clear and convincing evidence is required to show impairment (CWQCC 2018).

Big Dry Creek MMI Results

Results of the MMI analyses for the macroinvertebrate samples collected at the six BDC sites in the fall of 2012, 2014, 2016, 2018 and 2020 are presented in Table 11 and Figure 26. The changes to EDAS in 2018 and the new Warm Water 1 stream classification required re-evaluation of historic data presented in previous annual reports; therefore, previous tabulations of these data sets will show different results. As described above, the main difference in evaluation methodology for Class 1 and Class 2 streams is that MMI values between the attainment (MMI > 42) and impairment (MMI < 29) thresholds require evaluation of two auxiliary metrics (the HBI and SDI). If either the SDI is >7.6 or the HBI is < 2.4 for values in the "grey zone", then the stream is considered impaired for aquatic life under Policy 10-1.

All samples for the five years met or were better than the impairment threshold (MMI score of 29) with the exception of bdc5.0 in 2016. No consistent upward or downward trends were noted. All sites attained the HBI and SDI thresholds for these five sampling years.

During 2016, the MMI at bdc5.0 was the lowest on record; however, field observations did not identify unusual conditions that would be contributing to these scores. Preliminary review of the raw data suggested that the score may be due in part to relatively high numbers of aquatic worms (Personal Communication with Tami Schneck, 2017).

Based on the MMI results for the six sampling sites for the five most recent years analyzed, the aquatic macroinvertebrate community in Big Dry Creek is generally healthy and meets MMI use-attainment criteria for Aquatic Life Class 1 warm water streams. Additionally, the long-term data set demonstrates the significant year-to-year variability that can occur at individual sites. Although the last five sampling events show attainment (other than 2016), a retrospective analysis of the effects of a regulatory upgrade of the stream from Aquatic Life Warm 2 to Aquatic Life Warm 1 indicates an increase in frequency of impairment determinations using Policy 10-1 from 4 percent to 19 percent for the longer monitoring record.

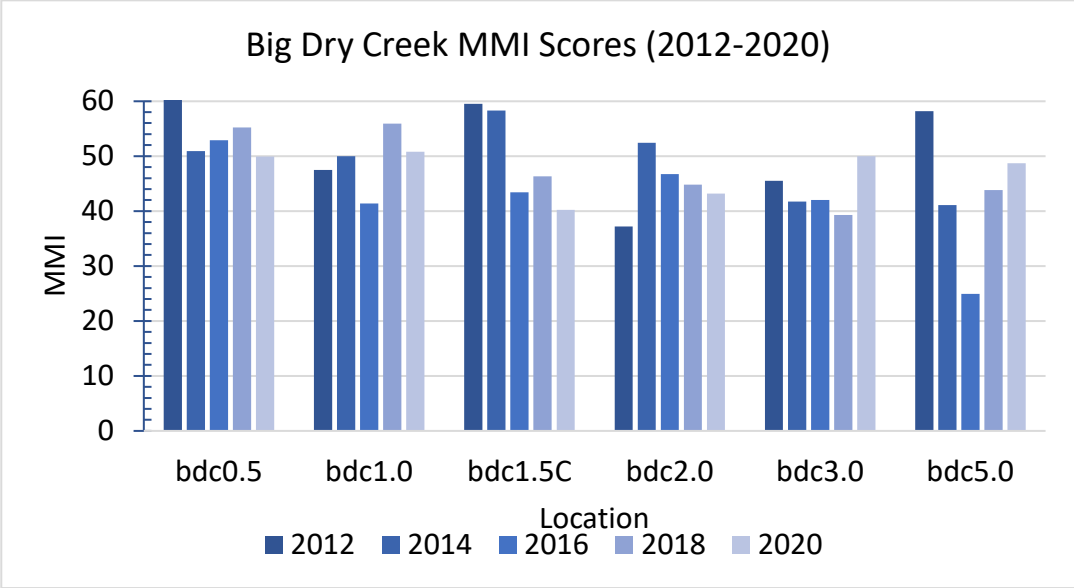
More detailed analysis of the 2020 monitoring will be provided in a written report by Aquatics Associates later in 2022.

Table 11. Fall MMI Scores for Big Dry Creek Sites (2012-2020)
(Source: Aquatics Associates 2020)

MMI Scores					
Site	**2012**	**2014**	**2016**	**2018**	**2020**
0.5	**60.2**	50.9	**52.9**	**55.2**	49.9
1.0	47.5	50.0	41.4	**55.9**	50.8
1.5C	**59.5**	**58.3**	43.4	46.3	40.2
2.0	37.2	**52.4**	46.7	44.8	43.2
3.0	45.5	41.7	42	39.3	50.0
5.0	**58.2**	41.1	24.9	43.8	48.7
Shannon Diversity Index (SDI) Scores					
Site	**2012**	**2014**	**2016**	**2018**	**2020**
0.5	4.23	3.60	3.63	3.63	3.28
1.0	3.64	3.78	4.00	4.13	3.97
1.5C	3.00	3.83	3.75	3.41	3.34
2.0	2.75	3.73	3.73	3.69	3.63
3.0	3.44	4.06	3.20	3.73	3.44
5.0	3.78	3.25	2.25	3.58	3.11
Hilsenhoff Biotic Index (HBI) Scores					
Site	**2012**	**2014**	**2016**	**2018**	**2020**
0.5	6.44	6.15	6.62	6.45	5.79
1.0	6.66	6.31	6.17	6.45	6.18
1.5C	6.61	6.92	6.74	7.27	6.68
2.0	7.02	6.43	6.87	7.10	6.37
3.0	8.01	7.29	7.90	7.11	6.95
5.0	6.40	5.65	7.77	6.56	6.38

Notes: Pink-shaded MMIs are below the impairment threshold. Yellow-shaded cells are between attainment and impairment thresholds and require evaluation of auxiliary metrics for assessment. Bold MMI scores indicate High Scoring Water (MMI >51 for Biotype 3). MMI Impairment threshold for Warm Water Class 1 streams is <29. SDI scores >7.6 and HBI scores <2.4 are thresholds for evaluation of auxiliary metrics for "grey zone" MMI scores.

Figure 26. Biennial Big Dry Creek MMI Scores (2012-2020)



11. Flow Conditions

The hydrology of Big Dry Creek is discussed below in terms of: 1) annual stream flows relative to period of record, 2) WWTP discharges, and 3) seasonal variation related to release and diversion patterns.

Stream Flows

Stream gauges are managed by several entities in the watershed. A discussion of USGS gauges and a Colorado Division of Water Resources (CDWR) gauge are discussed further below.

USGS Stream Flow Measurements for 2021

USGS mean daily discharge data for the Westminster and Fort Lupton gauges are shown in Figures 27 and 28. Figures 29 and 30 identify peak stream flows for the period of record at both gauges. Figure 31 shows the average annual stream flows at both gauges.

During 2021, average daily flows at the Westminster gauge ranged from 0. 6 cfs to 230 cfs with an average of 10.8 cfs. Average daily flows for the Fort Lupton gauge data ranged from 8.8 cfs to 370 cfs with an average of 41.6 cfs. Peak flows at both gauges were within historic ranges (Figures 29 and 30). Flows in 2021 were within the range of historic average flow conditions.

Figure 27. Mean Daily Discharge at USGS Gauge Big Dry Creek at Westminster, CO

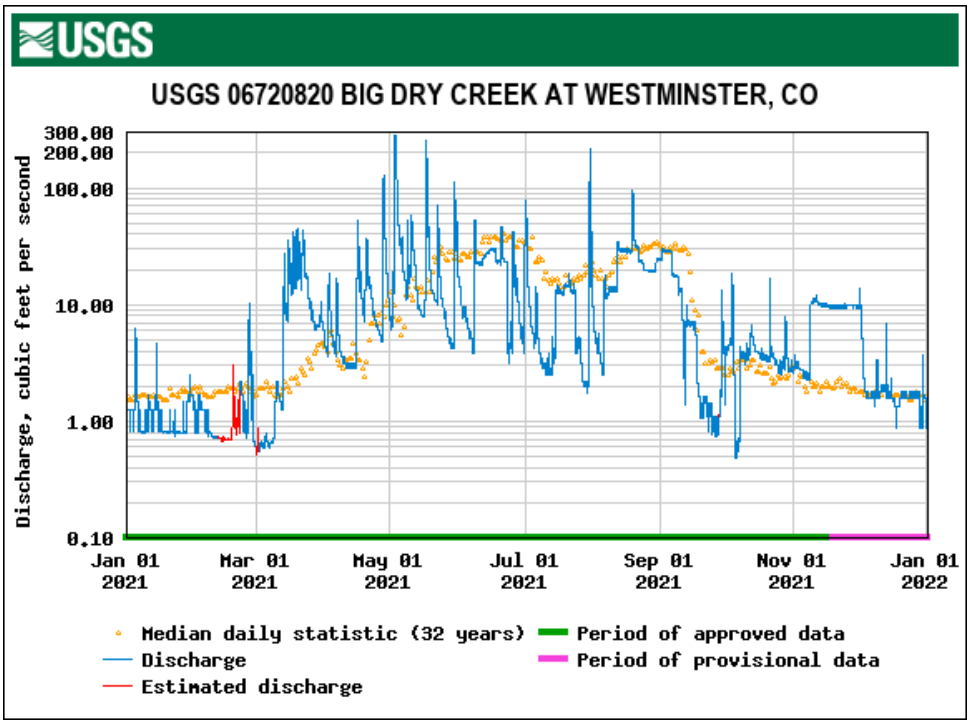


Figure 28. Mean Daily Discharge at USGS Gauge Big Dry Creek at Fort Lupton, CO

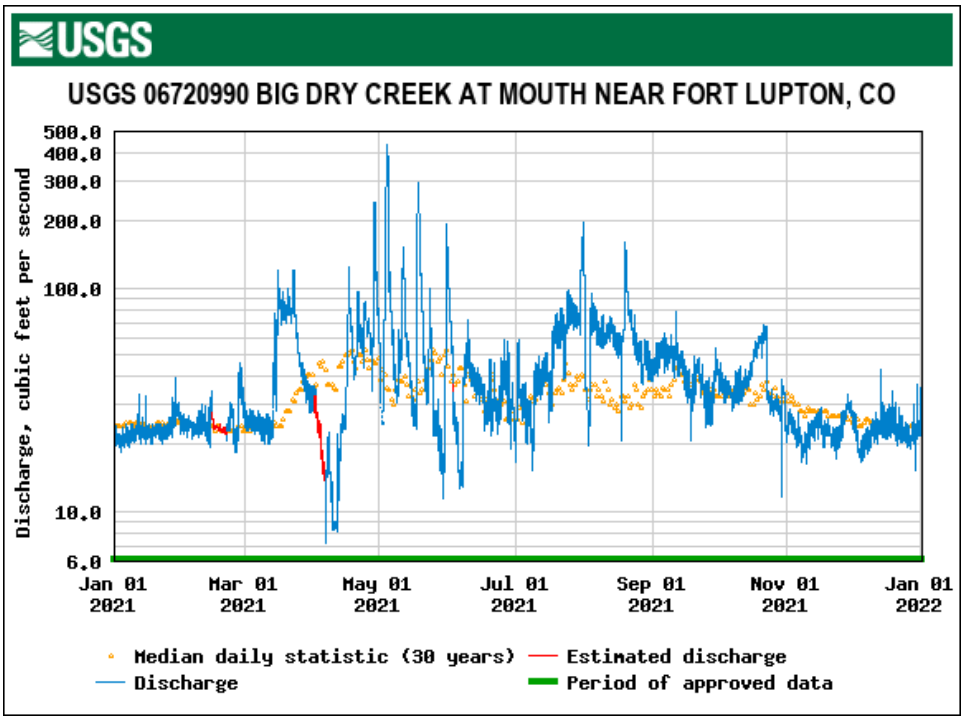


Figure 29. Annual Peak Streamflow at USGS Gauge Big Dry Creek at Westminster

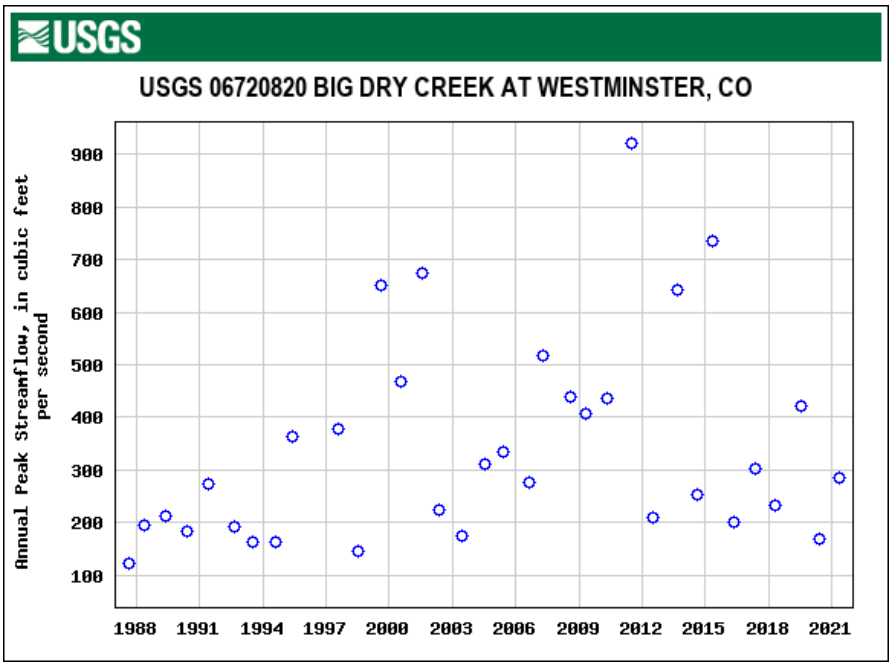


Figure 30. Annual Peak Streamflow at USGS Gauge Big Dry Creek at Fort Lupton

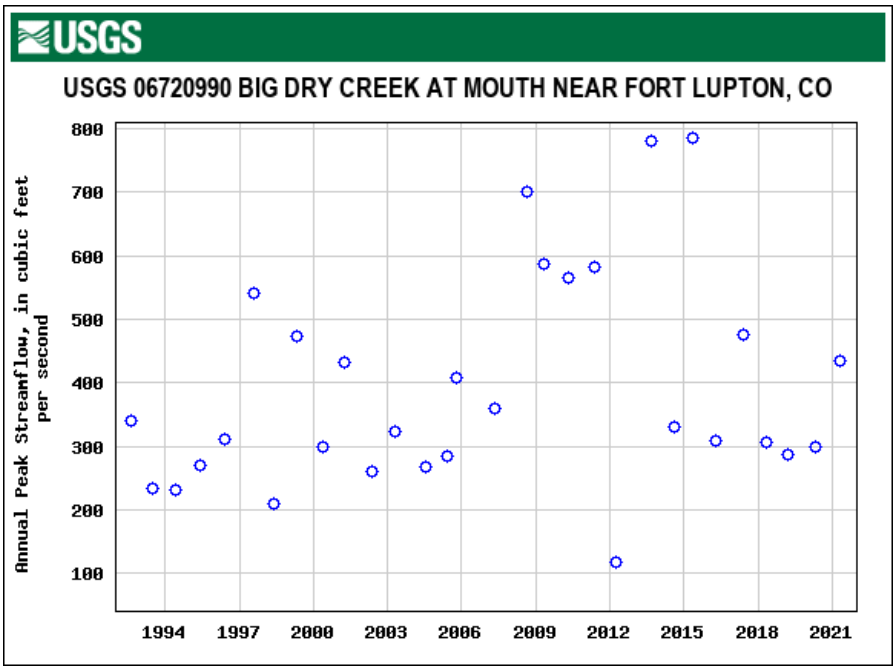
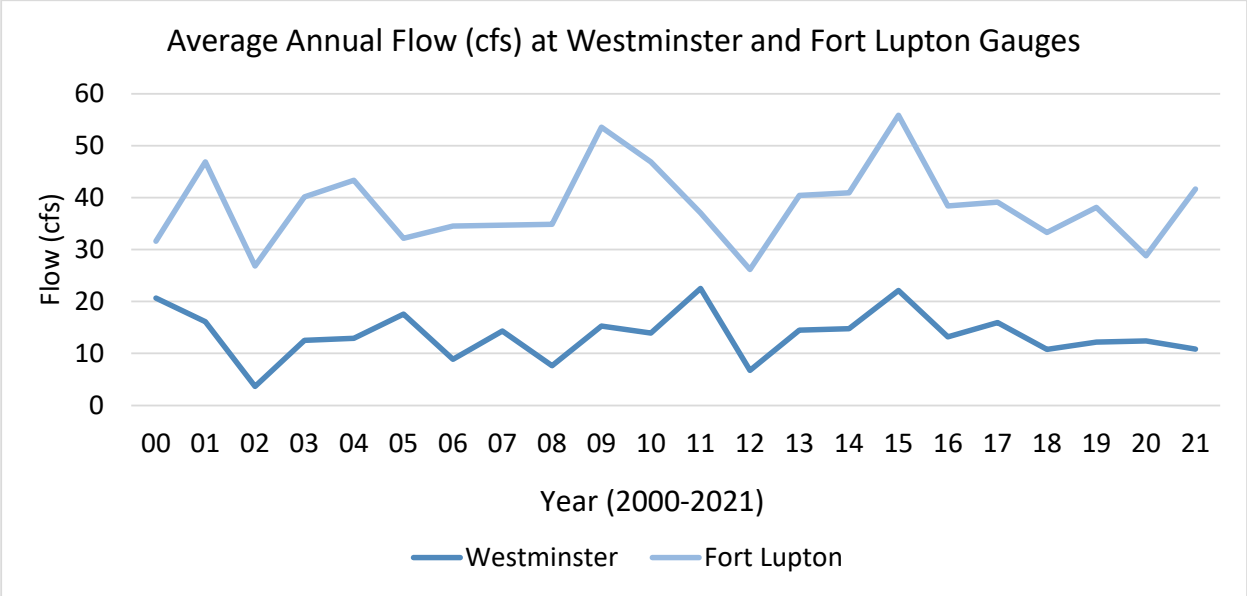


Figure 31. Average Annual Stream Flows Measured at USGS Gauges



Note: Some data missing at Ft. Lupton gauge in December 2013 due to ice.

Colorado Division of Water Resources Stream Flow Measurements for 2021

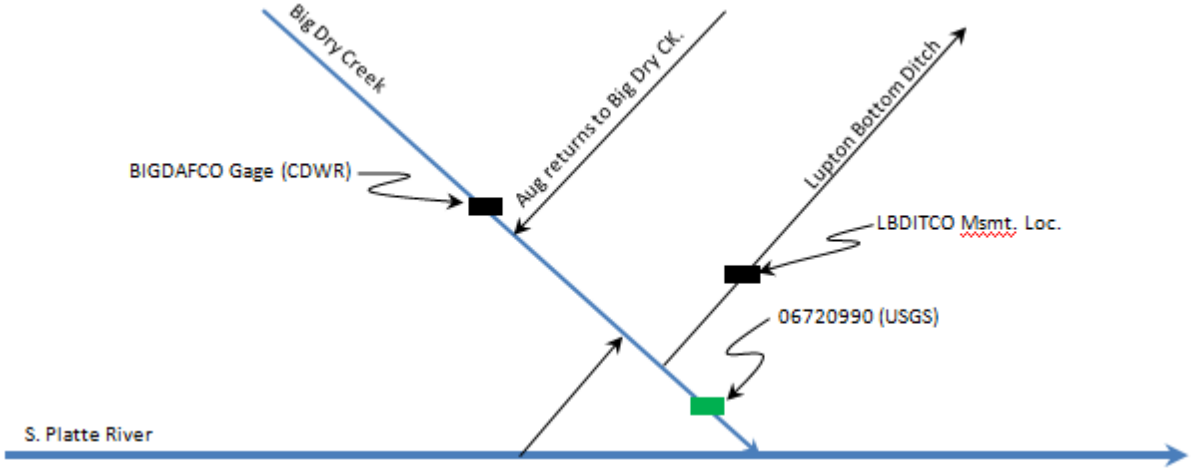
Although BDCWA has historically used the two USGS stream gauges on Big Dry Creek for purposes of analysis in this annual report, other gauge data are or have been available for various locations on Big Dry Creek. These locations include four relatively new (<10 years old) gauges installed by Northern Water; however, these gauges have had a series of issues over the years and are no longer expected to be a source of flow data for Big Dry Creek. A flood alert gauge was installed by Mile High Flood District near I-25 and Thorn Creek golf course, but it is not calibrated to measure baseflow conditions.

Another gauge operated by CDWR is named Big Dry Creek Near Ft. Lupton, CO (BIGDAFCO). BIGDAFCO is located approximately 3.8 stream miles upstream of the USGS's 06720990 Big Dry Creek at Fort Lupton stream gauge.[10] Between the two gauges, several notable hydrologic influences occur (Figure 32), including augmentation returns to Big Dry Creek, a diversion off of the South Platte River to Big Dry Creek and a diversion from Big Dry Creek to the Lupton Bottoms Ditch. Additionally, there are irrigation tailwaters accruing to the system in the intervening reach due to irrigation practices as well as percolation return flows from irrigation. The Lupton Bottoms Ditch has a diversion structure on the South Platte River that diverts water to Big Dry Creek. The diversion is situated in such a way that it can receive water from both Big Dry Creek and the South Platte River. Below this confluence point, another diversion structure diverts water from Big Dry

[10] Metro Wastewater's instream monitoring location "BDC" is located 30-50 yards upstream of BIGDAFCO.

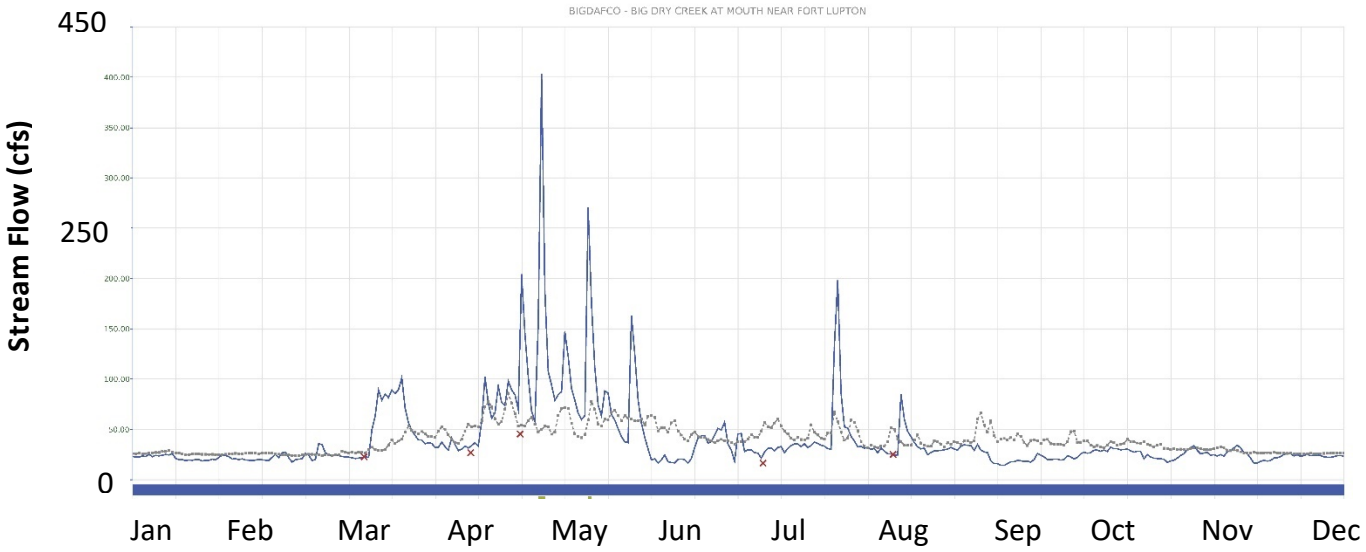
Creek into their ditch system. Regardless of the irrigation waters returning to the system between the two gauges, the interactions among the Lupton Bottoms Ditch, the South Platte River and Big Dry Creek cause significant and regular differences in flows measured by CDWR (Figure 33) and the USGS.[11] (Personal Communication with Russel Stroud, CDWR).

Figure 32. Relationship between BIGDAFCO and USGS 06720990
(Source: Russell Stroud, CDWR)



[11]CDWR recently relocated the BIGDAFCO stream gauge slightly downstream from its historic location. This relocation was done to address several issues including aging infrastructure, damage incurred to the gauge by the 2013 flood event and frequent and regular backwater conditions due to debris as a result of farming and ranching practices in the immediate vicinity of the old gauge location.

Figure 33. Colorado Division of Water Resources Gauge Measurements for BIGDAFCO 2021



Wastewater Treatment Plant Discharges

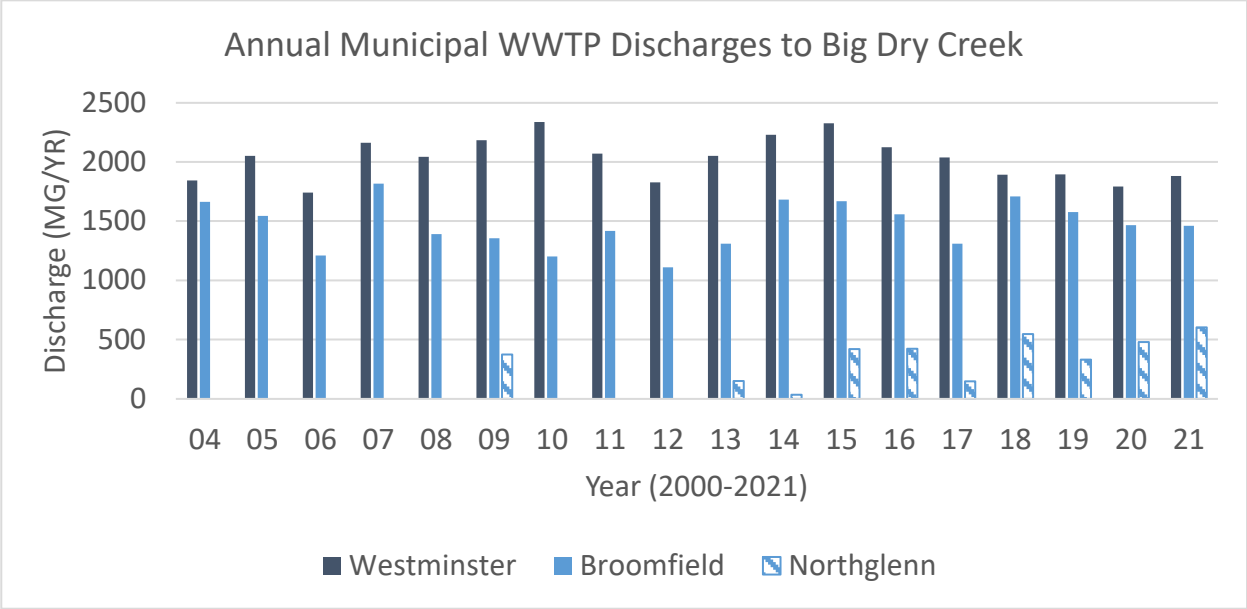
Table 12 and Figure 34 summarize total annual WWTP discharges to Big Dry Creek over time for the Westminster, Broomfield and Northglenn WWTPs since 2004. Through implementation of reclaimed water programs, both Broomfield and Westminster have been working to limit or reduce discharges from their WWTPs to Big Dry Creek. The volume of wastewater discharged is a critically important component in determining nutrient loading to the stream. For purposes of the Barr-Milton TMDL load reduction objectives, the year 2004 is the baseline year for measuring progress relative to the TMDL. Thus, volume changes relative to 2004 can affect overall nutrient loading relative to the TMDL.

Table 12. Annual WWTP Discharges to Big Dry Creek

	Westminster WWTP (MG/YR)	Broomfield WWTP (MG/YR)	Northglenn WWTP (MG/YR)
2004	1843	1663	NR
2005	2051	1545	NR
2006	1742	1211	NR
2007	2161	1817	NR
2008	2043	1392	NR
2009	2183	1355	374
2010	2337	1201	0
2011	2070	1418	0
2012	1827	1109	0
2013	2050	1310	151
2014	2229	1681	34
2015	2326	1668	420
2016	2123	1559	423
2017	2039	1309	147
2018	1891	1709	546
2019	1894	1576	331
2020	1792	1467	480
2021	1882	1462	604

NR = not reported for purposes of report; historically, Northglenn rarely discharged to Big Dry Creek.

Figure 34. Annual WWTP Discharges to Big Dry Creek



Seasonal Flow Regime[12]

In 2011, an evaluation of Standley Lake discharges, irrigation diversions and WWTP discharges was completed for the 2005-2009 time period (WWE 2011). This evaluation was updated in 2018 as part of the ongoing BDCWA watershed plan update, with flows included through 2017. Figure 35 summarizes the primary hydrologic influences on Big Dry Creek, based on analysis of five years of data for 2013-2017. This analysis was not updated for purposes of this report, but will be updated periodically to support trend evaluation in the watershed.

Figure 36 and Figure 37 illustrate how sources of flows in the creek vary seasonally. Figure 36 illustrates months when the stream is dominated by releases from Standley Lake. Figure 37 illustrates the relative proportion of wastewater flows in the creek in the lower watershed seasonally. Key observations include:

- Significant seasonal variation in release patterns from Standley Lake is present in accordance with releases for irrigation purposes. During June through September, Standley Lake releases comprise 50 to 75 percent of the flows measured at the USGS Westminster gauge. During April, May and October the percent of instream flow from Standley releases is on the order of 5 to 10 percent of the flows at the Westminster gauge.

[12] This section is repeated from previous annual water quality reports for convenience.

- With regard to relative percentages of WWTP discharges, during the winter months of December through March, WWTP flows comprise roughly 50 percent or more of the flows present at bdc6.0. During the summer and fall months, WWTP flows are on the order of 25 to 40 percent of the flows at bdc6.0.

Variations in dominant sources of water in the creek during different seasons affect water quality conditions in the creek. For example, in the absence of Standley Lake releases, selenium, chloride, dissolved manganese, sulfate, total dissolved solids and other groundwater-related parameters may be elevated in the upper watershed. With regard to nutrient loading, it is important to recognize that winter months are dominated by wastewater contributions and relatively low flow conditions. Summer months have higher flows with lower relative contributions from wastewater.

Figure 35. Hydrologic Influences Affecting the Main Stem of Big Dry Creek

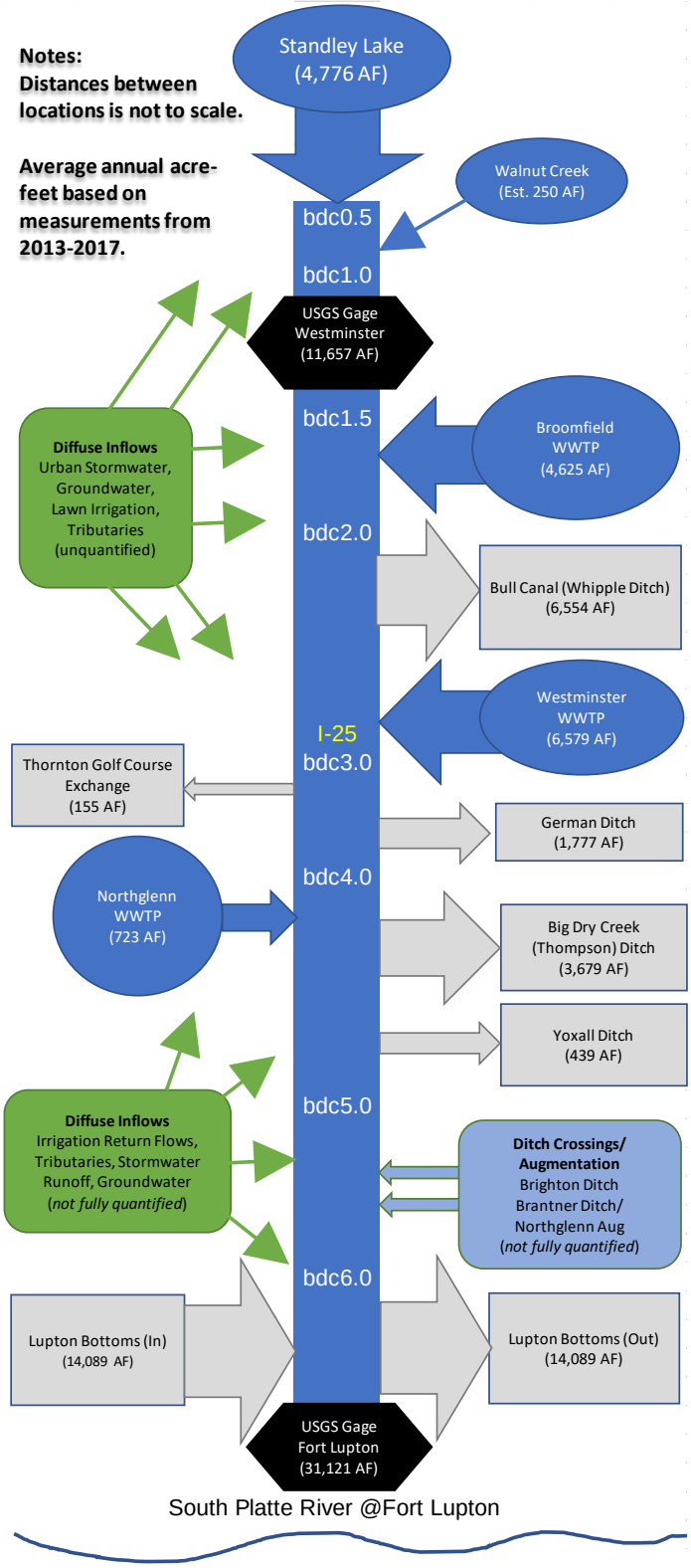


Figure 36. Average Monthly Percentage of Standley Lake Releases Relative to Big Dry Creek Flows at the USGS Westminster Gauge (2013-2017)

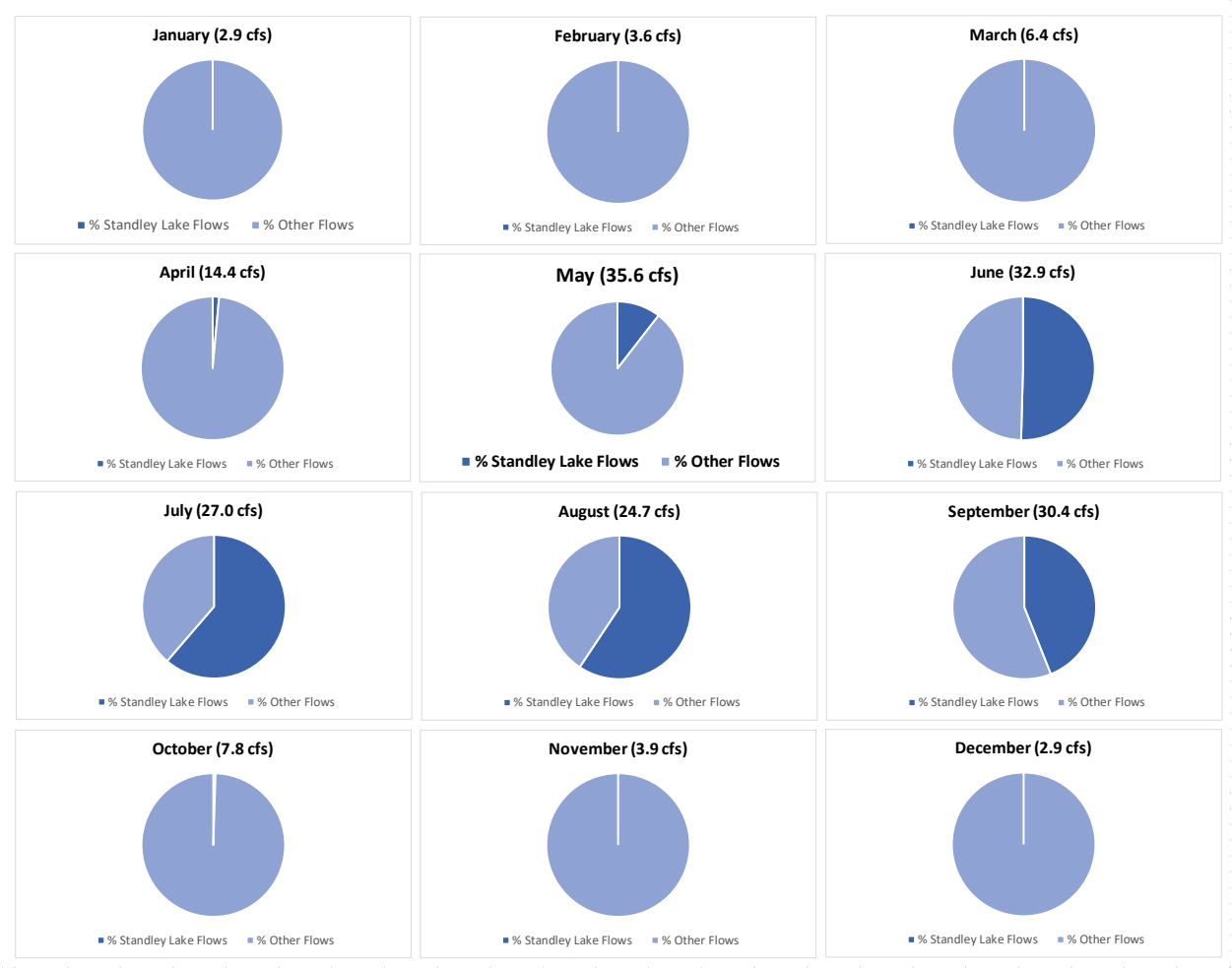
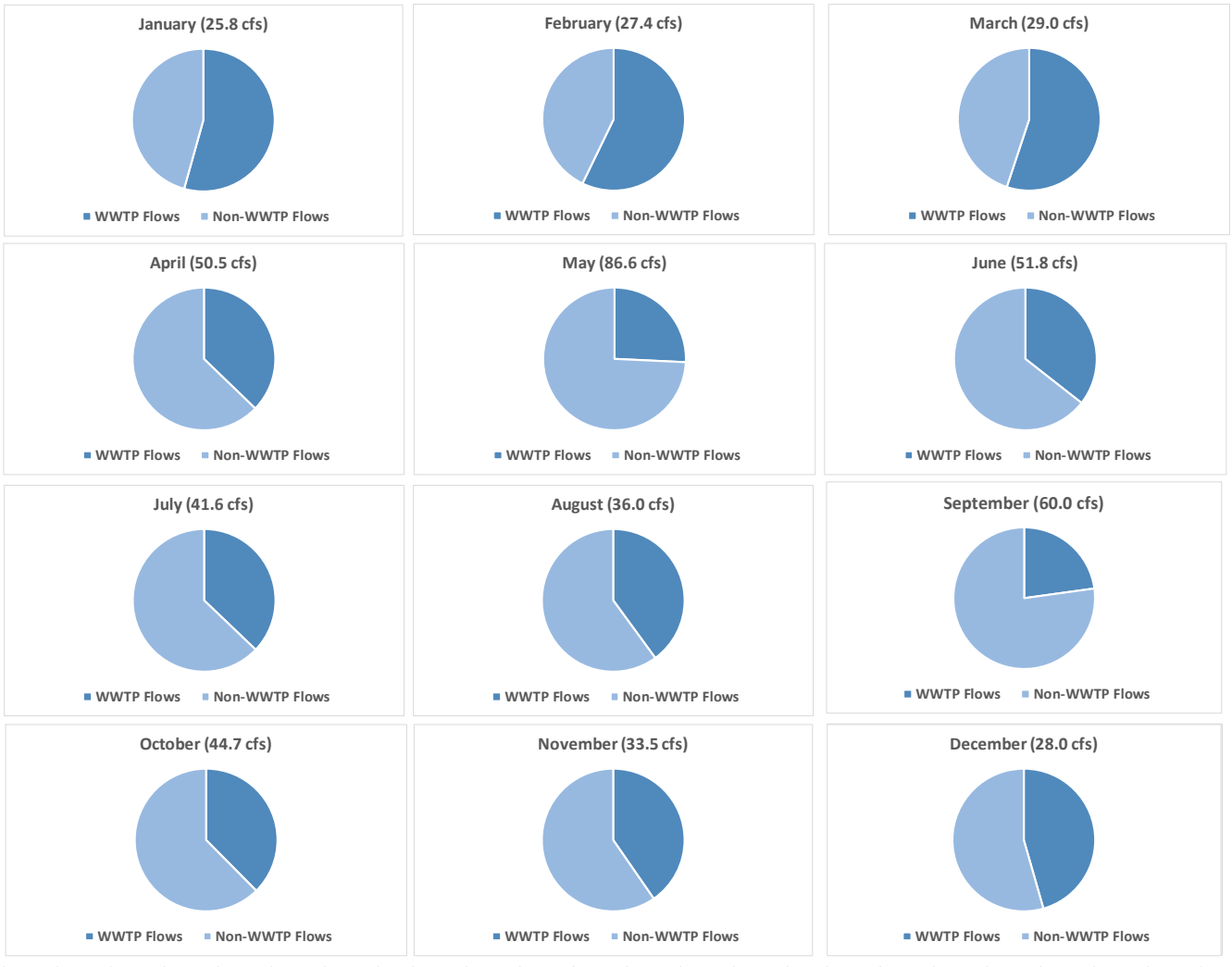


Figure 37. Average Monthly Percentage of Municipal WWTP Releases Relative to Big Dry Creek Flows at the USGS Fort Lupton Gauge (2013-2017)



12. QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

During 2021, quality assurance/quality control (QA/QC) samples were collected using the guidelines set forth in the Big Dry Creek SAP (BDCWA 2018). Under this program, field blanks and duplicates are collected and analyzed in accordance with Table 13.

Table 13. Field Quality Control Program in Sampling and Analysis Plan

Month	QC Test	Site
March	Field blanks, full set	bdc6.0
	Field duplicates and blanks for nutrients	bdc2.0
June	Field duplicates for Selenium, Dis. and Iron, Trec	bdc1.5
	Field duplicate for *E. coli*	bdc2.0
	Field duplicates for nutrients @bdc2.0	bdc2.0
September	Field duplicates, full set	bdc5.0
	Field blanks and duplicates for nutrients @ bdc2.0	bdc2.0
December	Field duplicates for Selenium, Dis. and Iron, Trec	bdc1.5
	Field duplicate for *E. coli*	bdc2.0
	Field duplicates for nutrients	bdc2.0

Appendix C summarizes analysis of field blank, trip blank, and duplicate samples for 2021. The QC program was followed in 2021. Analysis of relative percent differences (RPD) for the sample duplicates and review of field blanks show acceptable accuracy for most constituents, with these exceptions:

- The March 11, 2021 field blanks showed several analytes detected above detection limits. These results were reviewed by the city laboratory staff. City of Broomfield staff conducted additional review of total organic carbon and total dissolved solids results and determined that detected concentrations were in acceptable ranges (Hubbard, May 2022). Other detected concentrations are suspected to be related to the source water used to pour the field blank.

- Several elevated RPD results for total recoverable iron and dissolved selenium were identified for sample pairs collected in 2021, as shown in Appendix C. Additionally. a single elevated RPD was present for chlorophyll-a, dissolved copper and dissolved zinc.

13. DATA GAPS IN CURRENT MONITORING PROGRAM

In June 2020, BDCWA began sampling for additional sample fractions for several metals with new stream standards adopted. Total chromium-III is not currently included in the sampling program; however, given historical data on Big Dry Creek that indicates total chromium is typically below stream standards, total chromium was added in June 2021, as opposed to total chromium-III.

Other constituents with stream standards not analyzed under the monitoring program include sulfide, beryllium, uranium and molybdenum. Additionally, chlorophyll-a as attached periphyton is not currently part of the monitoring program. (Chlorophyll measurements in the water column are, however, part of the monitoring program.) At this time, the BDCWA Board has chosen not to add these constituents to the program. Chlorophyll-a standards for streams are scheduled to be adopted in November 2022 as part of Colorado's 10-year Water Quality Roadmap.

14. INTEGRATED TREND ANALYSIS AND SOURCE CHARACTERIZATION[13]

Given the increased focus on monitoring requirements in municipal separate storm sewer system (MS4) discharge permit renewals, an analysis of 10 years of instream monitoring data from 2011 through 2020 was completed in the 2021 Big Dry Creek Annual Report for pollutants of interest to better characterize portions of the watershed with elevated pollutant concentrations and to identify conditions under which the pollutants are elevated. WWE recommends that this analysis be updated every two years (and has not been updated for purposes of this 2022 report). For purposes of this targeted analysis, pollutants of interest include:

- *E. coli*, which has a TMDL;
- total phosphorus, which is high priority due to the Barr-Milton TMDL and Regulation 85;
- total nitrogen and nitrate due to Regulation 85 and nitrate standards exceedances;
- secondary drinking water parameters exceeding the new stream standard (chloride, sulfate, manganese); and
- selenium, which has a site-specific standard.

The targeted analysis was limited to three monitoring locations representing different conditions:

- bdc1.5 represents conditions above the WWTPs with hydrology controlled by Standley Lake;
- bdc3.0 represents conditions below the dominant WWTPs discharging to the creek; and
- bdc6.0, which represents agricultural conditions in Weld County.

[13] This section was also included in the 2021 Big Dry Creek Annual Water Quality Report but is repeated for ease of reference.

The analysis included these components:

- Spearman correlation analysis (Table 14) to identify potential relationships for further exploration (i.e., pollutants and flow conditions that tend to trend together, either positively or inversely). In Table 14, statistically significant correlations are shown in bold. Shading is added to highlight stronger correlations (e.g., positive correlations >0.5 and inverse correlations < -0.5), with positive correlations shaded in pink and inverse correlations shaded in green.

- For the upper watershed monitoring location of bdc1.5, categorizing sampling events as during Standley Lake releases (or not) for the purpose of characterizing conditions where groundwater is the dominant inflow to baseflow conditions. Results are shown in boxplots in Figure 38.

- Retrieval of storm event data for the past 10 years for purposes of identifying streamflow as influenced by wet or dry weather conditions. A sampling event was categorized as wet weather if 0.1 inch or more precipitation occurred on the day preceding the sampling event or on the date of the sampling event. The National Oceanic and Atmospheric Administration Northglenn gauge was used for convenience and simplicity (but other precipitation gauges could also be used for a more refined analysis in the future.) On average, May is the wettest month with 2.9 inches of precipitation. Results are shown in boxplots in Figures 39 through 41. (Note: most of the sampling events during 2021 were dry weather samples, which is an additional reason that this comparative analysis was not updated in 2022.)

- Seasonal boxplots were also prepared; however, seasonal trends are similar to, and interrelated with, the wet vs. dry and Standley release vs. non-Standley release data and are not reproduced in the report.

Table 14. Spearman Correlation Matrix Big Dry Creek 2011-2020

Correlation matrix (Spearman) / Group bdc1.5:

Variables	E_ coli (MPN/100 mL)	IRON, Trec (mg/L)	TSS (mg/L)	TP (mg/L)	TN (mg/L)	NO3+NO2 (mg/L)	SELENIUM, D (mg/L)	CHLORIDE, D (mg/L)	MANGANESE, D (mg/L)	SULFATE, D (mg/L)	TEMPERATURE (°C)	Westminster (cfs)	Fort Lupton (cfs)
E_ coli (MPN/100 mL)	**1.00**	**0.29**	**0.50**	**0.29**	-0.19	**-0.34**	**-0.39**	**-0.47**	**-0.51**	**-0.45**	**0.43**	**0.52**	**0.34**
IRON, Trec (mg/L)	**0.29**	**1.00**	**0.82**	**0.54**	**-0.52**	**-0.62**	**-0.68**	**-0.53**	**-0.36**	**-0.64**	**0.52**	**0.62**	**0.36**
TSS (mg/L)	**0.50**	**0.82**	**1.00**	**0.55**	**-0.44**	**-0.65**	**-0.73**	**-0.68**	**-0.59**	**-0.70**	**0.62**	**0.70**	**0.29**
TP (mg/L)	**0.29**	**0.54**	**0.55**	**1.00**	**-0.41**	**-0.49**	**-0.36**	**-0.34**	-0.05	**-0.45**	**0.41**	**0.40**	**0.28**
TN (mg/L)	-0.19	**-0.52**	**-0.44**	**-0.41**	**1.00**	**0.93**	**0.91**	**0.66**	**0.68**	**0.84**	**-0.63**	**-0.71**	-0.17
NO3+NO2 (mg/L)	**-0.34**	**-0.62**	**-0.65**	**-0.49**	**0.93**	**1.00**	**0.95**	**0.72**	**0.66**	**0.92**	**-0.72**	**-0.82**	**-0.24**
SELENIUM, D (mg/L)	**-0.39**	**-0.68**	**-0.73**	**-0.36**	**0.91**	**0.95**	**1.00**	**0.75**	**0.72**	**0.94**	**-0.70**	**-0.89**	**-0.33**
CHLORIDE, D (mg/L)	**-0.47**	**-0.53**	**-0.68**	**-0.34**	**0.66**	**0.72**	**0.75**	**1.00**	**0.80**	**0.84**	**-0.78**	**-0.70**	**-0.23**
MANGANESE, D (mg/L)	**-0.51**	**-0.36**	**-0.59**	-0.05	**0.68**	**0.66**	**0.72**	**0.80**	**1.00**	**0.74**	**-0.55**	**-0.73**	-0.27
SULFATE, D (mg/L)	**-0.45**	**-0.64**	**-0.70**	**-0.45**	**0.84**	**0.92**	**0.94**	**0.84**	**0.74**	**1.00**	**-0.74**	**-0.89**	**-0.32**
TEMPERATURE (°C)	**0.43**	**0.52**	**0.62**	**0.41**	**-0.63**	**-0.72**	**-0.70**	**-0.78**	**-0.55**	**-0.74**	**1.00**	**0.63**	**0.27**
Westminster (cfs)	**0.52**	**0.62**	**0.70**	**0.40**	**-0.71**	**-0.82**	**-0.89**	**-0.70**	**-0.73**	**-0.89**	**0.63**	**1.00**	**0.44**
Fort Lupton (cfs)	**0.34**	**0.36**	**0.29**	**0.28**	-0.17	**-0.24**	**-0.33**	**-0.23**	-0.27	**-0.32**	**0.27**	**0.44**	**1.00**

Values in bold are different from 0 with a significance level alpha=0.05

Correlation matrix (Spearman) / Group bdc3.0:

Variables	E_ coli (MPN/100 mL)	IRON, Trec (mg/L)	TSS (mg/L)	TP (mg/L)	TN (mg/L)	NO3+NO2 (mg/L)	SELENIUM, D (mg/L)	CHLORIDE, D (mg/L)	MANGANESE, D (mg/L)	SULFATE, D (mg/L)	TEMPERATURE (°C)	Westminster (cfs)	Fort Lupton (cfs)
E_ coli (MPN/100 mL)	**1.00**	**0.33**	**0.45**	-0.16	-0.13	-0.18	-0.03	**-0.34**	**-0.41**	-0.17	0.18	0.15	0.08
IRON, Trec (mg/L)	**0.33**	**1.00**	**0.78**	**-0.38**	**-0.54**	**-0.60**	**-0.46**	**-0.58**	**-0.49**	**-0.61**	**0.61**	**0.73**	**0.49**
TSS (mg/L)	**0.45**	**0.78**	**1.00**	**-0.28**	**-0.37**	**-0.43**	-0.18	**-0.39**	**-0.50**	**-0.37**	**0.44**	**0.59**	**0.41**
TP (mg/L)	-0.16	**-0.38**	**-0.28**	**1.00**	**0.37**	**0.38**	**0.38**	**0.30**	**0.34**	**0.32**	**-0.19**	**-0.35**	-0.07
TN (mg/L)	-0.13	**-0.54**	**-0.37**	**0.37**	**1.00**	**0.98**	**0.50**	**0.34**	**0.56**	**0.47**	**-0.28**	**-0.76**	**-0.22**
NO3+NO2 (mg/L)	-0.18	**-0.60**	**-0.43**	**0.38**	**0.98**	**1.00**	**0.37**	**0.34**	**0.51**	**0.40**	**-0.30**	**-0.75**	**-0.27**
SELENIUM, D (mg/L)	-0.03	**-0.46**	-0.18	**0.38**	**0.50**	**0.37**	**1.00**	**0.38**	**0.52**	**0.84**	-0.09	**-0.32**	-0.12
CHLORIDE, D (mg/L)	**-0.34**	**-0.58**	**-0.39**	**0.30**	**0.34**	**0.34**	**0.38**	**1.00**	**0.73**	**0.60**	**-0.64**	**-0.45**	-0.07
MANGANESE, D (mg/L)	**-0.41**	**-0.49**	**-0.50**	**0.34**	**0.56**	**0.51**	**0.52**	**0.73**	**1.00**	**0.64**	**-0.57**	**-0.61**	**-0.35**
SULFATE, D (mg/L)	-0.17	**-0.61**	**-0.37**	**0.32**	**0.47**	**0.40**	**0.84**	**0.60**	**0.64**	**1.00**	**-0.27**	**-0.52**	-0.13
TEMPERATURE (°C)	0.18	**0.61**	**0.44**	**-0.19**	**-0.28**	**-0.30**	-0.09	**-0.64**	**-0.57**	**-0.27**	**1.00**	**0.48**	**0.20**
Westminster (cfs)	0.15	**0.73**	**0.59**	**-0.35**	**-0.76**	**-0.75**	**-0.32**	**-0.45**	**-0.61**	**-0.52**	**0.48**	**1.00**	**0.39**
Fort Lupton (cfs)	0.08	**0.49**	**0.41**	-0.07	**-0.22**	**-0.27**	-0.12	-0.07	**-0.35**	-0.13	**0.20**	**0.39**	**1.00**

Values in bold are different from 0 with a significance level alpha=0.05

Correlation matrix (Spearman) / Group bdc6.0:

Variables	E_ coli (MPN/100 mL)	IRON, Trec (mg/L)	TSS (mg/L)	TP (mg/L)	TN (mg/L)	NO3+NO2 (mg/L)	SELENIUM, D (mg/L)	CHLORIDE, D (mg/L)	MANGANESE, D (mg/L)	SULFATE, D (mg/L)	TEMPERATURE (°C)	West-minster (cfs)	Fort Lupton (cfs)
E_ coli (MPN/100 mL)	**1.00**	**0.57**	**0.52**	**0.24**	**-0.28**	**-0.51**	**-0.54**	**-0.50**	**-0.41**	**-0.51**	**0.57**	**0.55**	**0.41**
IRON, Trec (mg/L)	**0.57**	**1.00**	**0.85**	**0.40**	-0.19	**-0.31**	**-0.48**	**-0.48**	**-0.65**	**-0.63**	**0.39**	**0.51**	**0.65**
TSS (mg/L)	**0.52**	**0.85**	**1.00**	**0.56**	-0.17	**-0.33**	**-0.46**	**-0.36**	**-0.64**	**-0.56**	**0.31**	**0.51**	**0.51**
TP (mg/L)	**0.24**	**0.40**	**0.56**	**1.00**	0.03	-0.10	**-0.32**	-0.09	**-0.35**	**-0.31**	0.07	**0.23**	**0.27**
TN (mg/L)	**-0.28**	-0.19	-0.17	0.03	**1.00**	**0.93**	**0.64**	**0.42**	0.26	**0.36**	**-0.56**	**-0.66**	-0.18
NO3+NO2 (mg/L)	**-0.51**	**-0.31**	**-0.33**	-0.10	**0.93**	**1.00**	**0.66**	**0.47**	**0.36**	**0.43**	**-0.64**	**-0.66**	**-0.23**
SELENIUM, D (mg/L)	**-0.54**	**-0.48**	**-0.46**	**-0.32**	**0.64**	**0.66**	**1.00**	**0.60**	**0.46**	**0.84**	**-0.66**	**-0.67**	**-0.28**
CHLORIDE, D (mg/L)	**-0.50**	**-0.48**	**-0.36**	-0.09	**0.42**	**0.47**	**0.60**	**1.00**	**0.51**	**0.57**	**-0.67**	**-0.51**	**-0.24**
MANGANESE, D (mg/L)	**-0.41**	**-0.65**	**-0.64**	**-0.35**	0.26	**0.36**	**0.46**	**0.51**	**1.00**	**0.47**	**-0.52**	-0.31	**-0.49**
SULFATE, D (mg/L)	**-0.51**	**-0.63**	**-0.56**	**-0.31**	**0.36**	**0.43**	**0.84**	**0.57**	**0.47**	**1.00**	**-0.45**	**-0.57**	**-0.35**
TEMPERATURE (°C)	**0.57**	**0.39**	**0.31**	0.07	**-0.56**	**-0.64**	**-0.66**	**-0.67**	**-0.52**	**-0.45**	**1.00**	**0.66**	**0.19**
Westminster (cfs)	**0.55**	**0.51**	**0.51**	**0.23**	**-0.66**	**-0.66**	**-0.67**	**-0.51**	-0.31	**-0.57**	**0.66**	**1.00**	**0.41**
Fort Lupton (cfs)	**0.41**	**0.65**	**0.51**	**0.27**	-0.18	**-0.23**	**-0.28**	**-0.24**	**-0.49**	**-0.35**	**0.19**	**0.41**	**1.00**

Values in bold are different from 0 with a significance level alpha=0.05

Figure 38. Selected Pollutant Concentrations by Location During Standley Lake Releases (2011-2020)

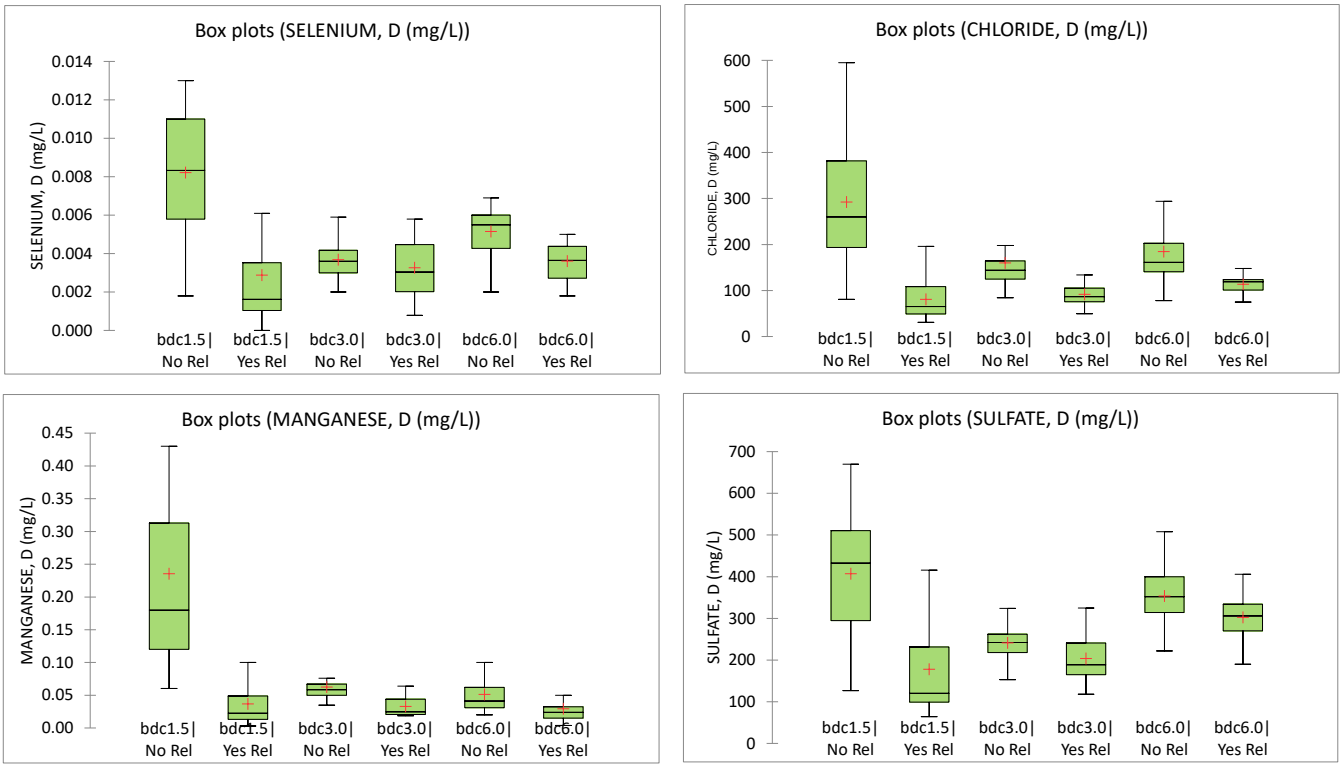
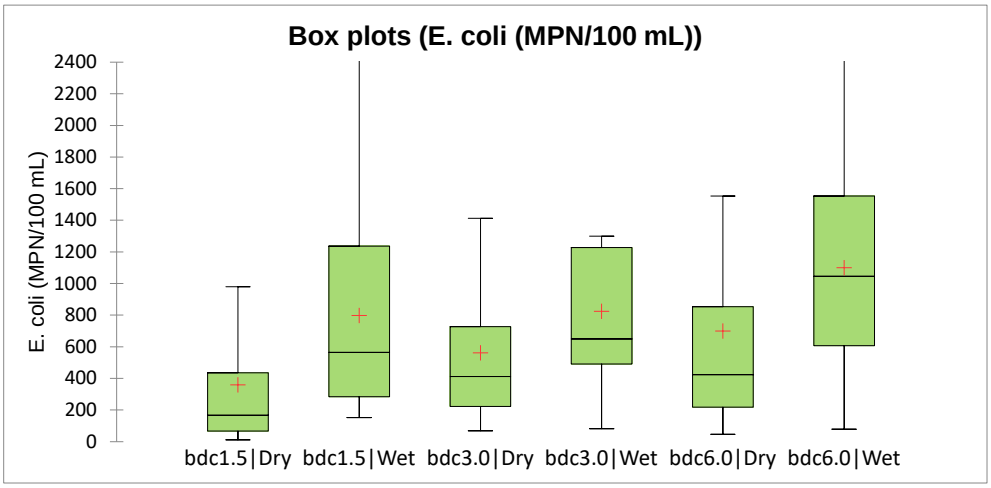
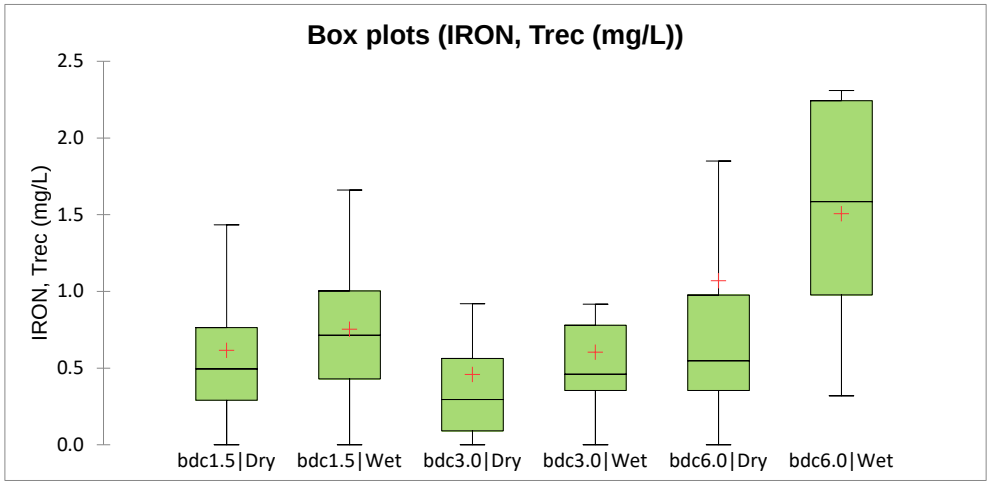


Figure 39. Boxplots of Selected Pollutants Influenced by Stormwater/Runoff Conditions (2011-2020)





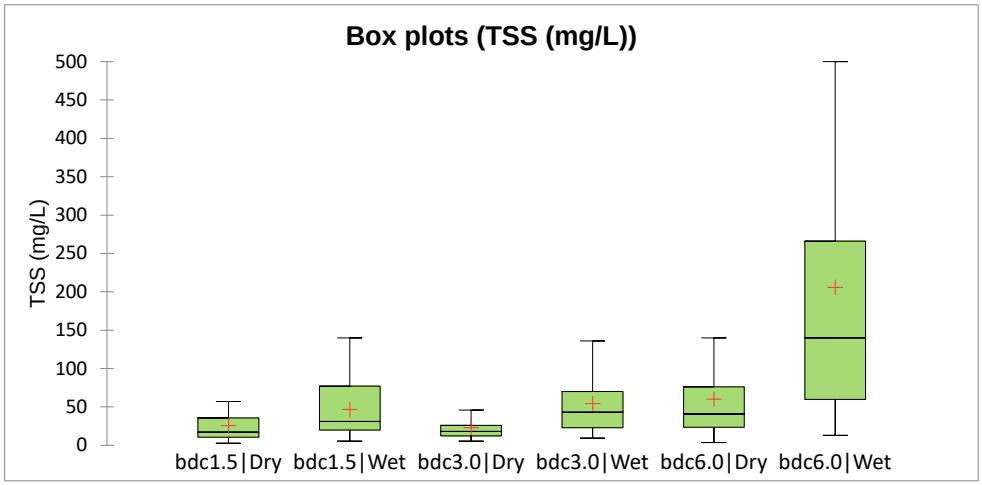
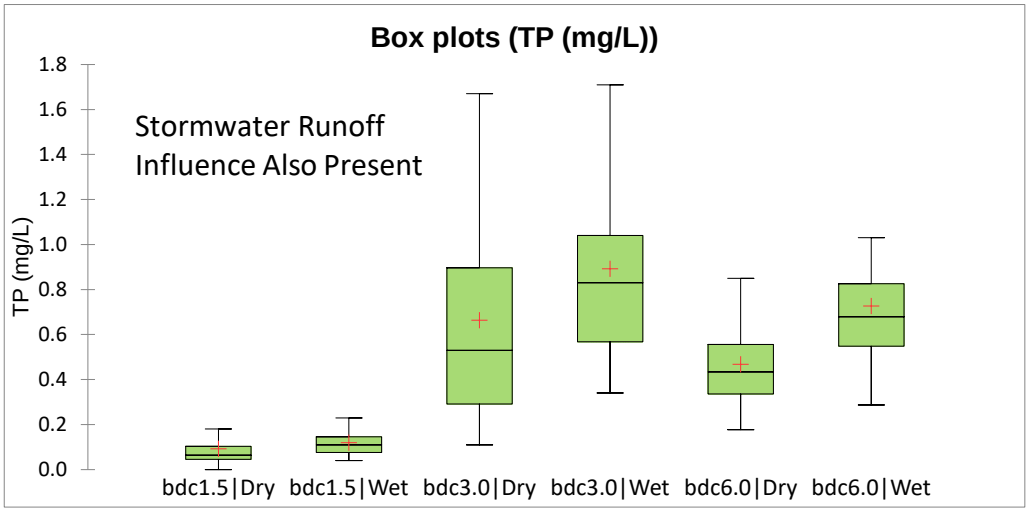
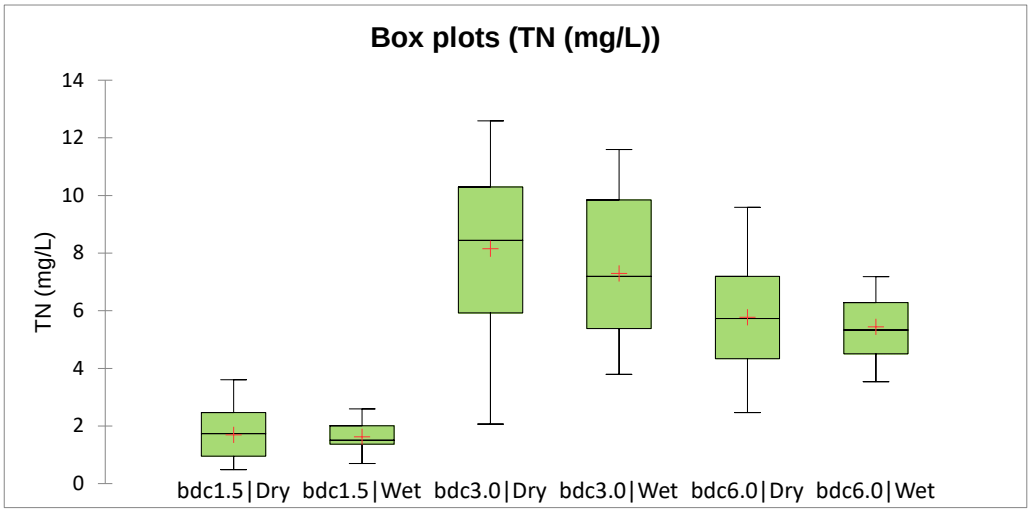


Figure 40. Boxplots of Selected Pollutants Influenced by Wastewater Discharges (2011-2020)





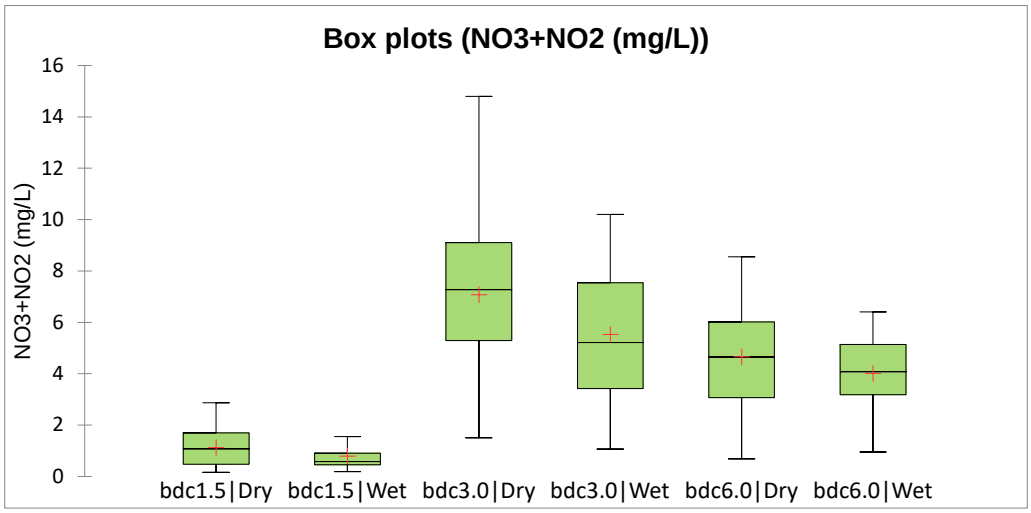


Figure 41. Boxplots of Selected Pollutants Not Influenced by Stormwater (2011-2020)

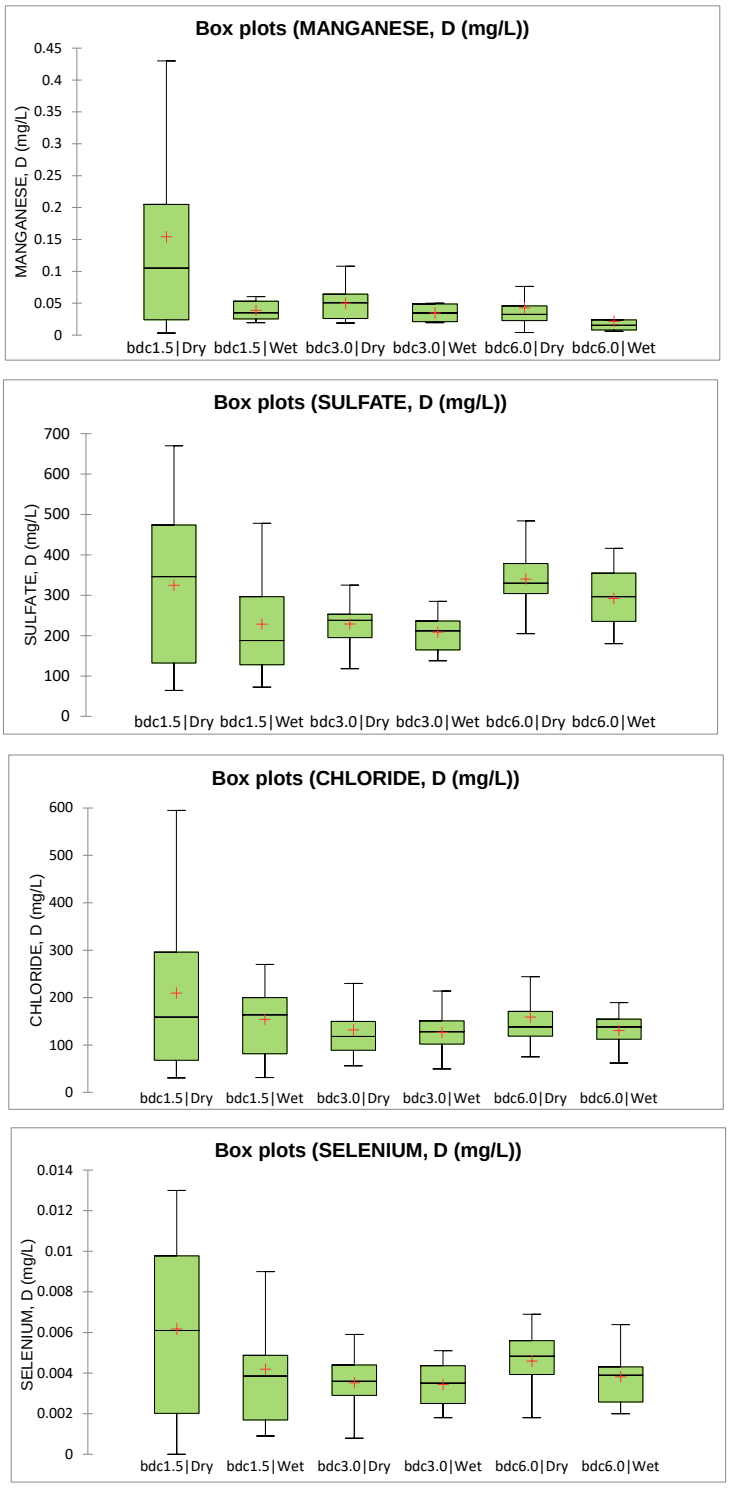


Table 15 provides a summary of wet vs. dry weather influences on selected pollutants to simplify observations in Figures 38 through 41. Table 16 provides a summary of anticipated sources and control strategies that should be further considered by BDCWA as part of watershed planning activities and future Regulation 38 rulemaking hearings based in part on this analysis. Key findings from the analysis for pollutants of interest include:

1. ***E. coli*:** *E. coli* is elevated throughout the watershed under both dry and wet flow conditions. *E. coli* concentrations are higher during wet weather influenced sampling events throughout the watershed. Nonetheless, because *E. coli* is also elevated under dry weather conditions, it is recommended that BDCWA continue to focus on identifying persistent dry weather sources of *E. coli*.

2. **Nitrogen:** Elevated nitrogen in the watershed is limited to the portion of the stream between the Broomfield WWTP and the confluence with the South Platte River. The dominant influence on the nitrogen conditions at this time is the wastewater facilities.

3. **Phosphorus:** Elevated total phosphorus above the interim limit of 0.17 mg/L in the watershed is limited to the portion of the stream between the Broomfield WWTP and the confluence with the South Platte River. Wet weather influenced events have higher phosphorus concentrations throughout the watershed; however, the wet weather influenced events above the WWTP discharges still attain the interim limit of 0.17 mg/L.

4. **Total Recoverable Iron:** Total recoverable iron is elevated under wet weather-influenced conditions throughout the watershed; however, the only portion of the watershed exceeding the total recoverable iron standard under any condition is the lower watershed in the agricultural area.

5. **Secondary Drinking Water Parameters:** Chloride, manganese and sulfate are elevated in the upper watershed above the WWTP discharges during dry weather, low-flow conditions when Standley Lake is not releasing. Groundwater-dominated flow conditions lead to these elevated values, similar to selenium, which has a site-specific standard due to natural or irreversible human-induced conditions. Stormwater runoff BMPs are not expected to be effective in addressing these pollutants.

Table 15. Pollutant Trends Related to Storm-influenced Stream Conditions

Watershed Portion	Bacteria	Iron	Nutrients		Secondary Drinking Water Params.			Se**
	E. coli	Iron	TP	TN & NO3	Mn	Cl	SO4	Se**
Upper (bdc1.5)	Higher	Higher*	Higher*	Lower*	Lower	Lower/ Neutral	Lower	Lower*
WWTP-Urban (bdc3.0)	Higher	Higher*	Higher	Lower	Lower*	Neutral*	Lower*	Lower*
Agricultural (bdd6.0)	Higher	Higher	Higher	Lower	Lower*	Neutral*	Lower*	Lower*

TP = total phosphorus; TN = total nitrogen; NO3 = nitrate; Mn = manganese; Cl = chloride; SO4 = sulfate; Se = selenium
*Meets stream standard. **Site-specific standard in place.

Table 16. Summary of Water Quality Issues, Sources and Potential Solutions

Watershed Portion	Pollutants of Interest	Observations for Sources and Trends	Treatment/BMPs/Solutions to Explore
Between Standley Lake Dam and Broomfield WWTP	Chloride, Manganese, Sulfate & Selenium	Groundwater.	Expected to be groundwater-related during low-flow conditions. Site-specific standard similar to selenium standard.
	E. coli	*E. coli* elevated under all conditions, with summer and storm-influenced concentrations notably higher.	Continue dry weather source investigations and source controls. Continue to implement MS4 permanent stormwater control measures, with preference toward Green Infrastructure practices providing volume reduction.
	Nutrients	Nutrients in this reach meet the stream standards. Phosphorus increases during runoff events, but not at levels exceeding standards.	Continue to implement MS4 nutrient-related programs and permanent stormwater control measures.
Broomfield WWTP to South Platte	Total Nitrogen & Nitrate	WWTP discharges.	WWTPs dominant source of nutrients; continued WWTP upgrades. Total phosphorus also increases under runoff conditions: stormwater BMPs & bank stabilization. Support agricultural BMPs for nutrients in lower watershed.
	Total Phosphorus	WWTP discharges; Stormwater Runoff.	
	E. coli	*E. coli* elevated under all conditions, with summer and storm-influenced concentrations notably higher.	Continue dry weather source investigations and source controls. Continue to implement MS4 permanent stormwater control measures, with preference toward Green Infrastructure practices providing volume reduction. Explore private property owner interest in agricultural BMPs where cattle are adjacent to stream.
Downstream of WCR 8*	Total Recoverable Iron	Storm events that mobilize sediment and associated iron.	Runoff-related agricultural and/or channel stabilization BMPs.

*Pollutants identified from Broomfield WWTP to South Platte are also applicable below Weld County Rd. 8.

15. CONCLUSIONS AND RECOMMENDATIONS

1. Water quality in Big Dry Creek attained many, but not all, applicable stream standards as of 2021. For known water quality issues with standards in place prior to 2021, *E. coli* concentrations remain elevated above the stream standard throughout the stream; however, total recoverable iron is now meeting the stream standard. For new stream standards assigned by the WQCC in 2020 related to addition of a Water Supply classification, Big Dry Creek exceeds the dissolved manganese and nitrate standards and may potentially exceed sulfate and chloride standards, depending on the time period used for assessment and the assessment methodology (e.g., individual site vs. entire stream). These pollutants could become future impairment listings for Big Dry Creek. With the exception of nitrate, the new potential impairments are related to secondary drinking water standards (e.g., taste, odor, staining) rather than human health concerns.

2. *E. coli* concentrations are elevated at multiple instream locations. *E. coli* concentrations in the WWTP discharges are very low and do not exceed stream standards. Efforts are underway to identify sources of *E. coli* upstream of I-25. The current monitoring program is useful for identifying elevated stream reaches and trends over time but is not sufficient for identifying and mitigating sources of *E. coli.* For this reason, BDCWA and partnering cities have begun a microbial source identification study on the creek and dry weather outfall sampling. Locations with the most elevated *E. coli* occur at I-25 (bdc3.0) and in an agricultural area with cattle in Weld County (bdc6.0).

3. Although total recoverable iron samples collected and analyzed by BDCWA show attainment of the total recoverable iron standard at all monitoring locations, additional data collected by Metro Wastewater in the lower watershed in recent years has shown elevated iron concentrations. For this reason, Big Dry Creek below Weld County Road 8 is listed as impaired on the 2022 303(d) List. Elevated iron concentrations are expected to be due to stream bank and soil erosion in the lower watershed. For the last five-year period, total recoverable iron attains the stream standard; however, this attainment status is expected to vary year-to-year depending on the extent to which water quality samples coincide with storm events sufficient to generate erosion.

4. Sources of sulfate, chloride and dissolved manganese in the watershed include groundwater inflows in the upper watershed, as evidenced by seasonal patterns in the data set. Other sources of sulfate may also be present in the lower watershed, but at levels below the stream standard. These constituents are secondary drinking water parameters, not related to human health risk. All of these constituents are expected to have exceedances of the stream standards potentially resulting in impairment listing on future 303(d) lists. For chloride, the most recent 5-year period attains the stream standard; however, a trend of increasing chloride concentrations over time is suggested by the data. Further exploration of existing

quality conditions as of January 1, 2000, and a targeted spatial assessment approach (individual sites or reaches) may provide regulatory relief for sulfate.

5. For the most recent five-year analysis period (2017-2021), Big Dry Creek attained its site-specific selenium standard. In 2016, the stream was removed from the 303(d) List of impaired waters. From a longevity plan perspective related to the site-specific standard, a site-specific standard for selenium is still needed in order for the stream to attain selenium standards.

6. Big Dry Creek exceeds the recently assigned nitrate standard of 10 mg/L for a few sampling events below the Broomfield and Westminster WWTPs. Compliance plans in the 2019 WWTP discharge permits are expected to address this issue in the next several years.

7. Big Dry Creek does not attain the interim warm water instream nitrogen and phosphorus "interim values" below municipal WWTP discharges (from the Broomfield WWTP to the South Platte River). The reach of stream between the Broomfield and Westminster WWTP has begun to meet the phosphorus standard over the past few years. Although the nutrient interim values are not expected to be adopted as stream standards on the main stem of Big Dry Creek prior to December 31, 2027, addressing nutrient sources to Big Dry Creek continues to be an area of focus for BDCWA. More stringent CDPS permit limits with compliance schedules have been included in the 2019 permit renewal for the WWTPs. Under the new CWQCC Policy 17-1, a Voluntary Incentive Program for Early Nutrient Reductions was established. The Incentive Program allows enrolled WWTPs to accrue time under a post-2027 compliance schedule through trading or watershed nutrient reductions as part of its nutrient reduction plan. All three of the municipal WWTP dischargers are enrolled in this program.

8. Phosphorus concentrations and loads to Big Dry Creek have decreased over time as a result of treatment plant upgrades at the Broomfield and Westminster WWTPs, along with reuse programs that continue to be implemented at these WWTPs. Phosphorus loads at bd6.0 in the lower watershed have decreased by 82 percent since 2003. Despite these improvements, the stream does not yet meet the interim total phosphorus criteria from below the Broomfield WWTP to the confluence with the South Platte River. Recent sampling at bdc2.0 below the Broomfield WWTP indicates attainment at this location for three of the past five years suggesting that attainment below the Broomfield WWTP is likely for the next five-year assessment window.

9. Aquatic life monitoring is conducted in even years for Big Dry Creek, so the most recent monitoring results are for 2020. Big Dry Creek does not show impairment of aquatic life uses in 2020, based on calculation of MMI scores in accordance with CWQCC's Aquatic Life Use Attainment Policy 10-1, EDAS Version 4. Scores were calculated at six biological monitoring locations for fall monitoring conducted during 2012, 2014, 2016, 2018 and 2020. MMI scores vary substantially, both temporally and spatially.

10. Stream flows were average during 2021. Stream flow is a significant factor influencing instream water quality and pollutant loads. WWTP discharges from Northglenn were higher than historic discharges, as were discharges from Broomfield.

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Appendix A. Supplemental Figures

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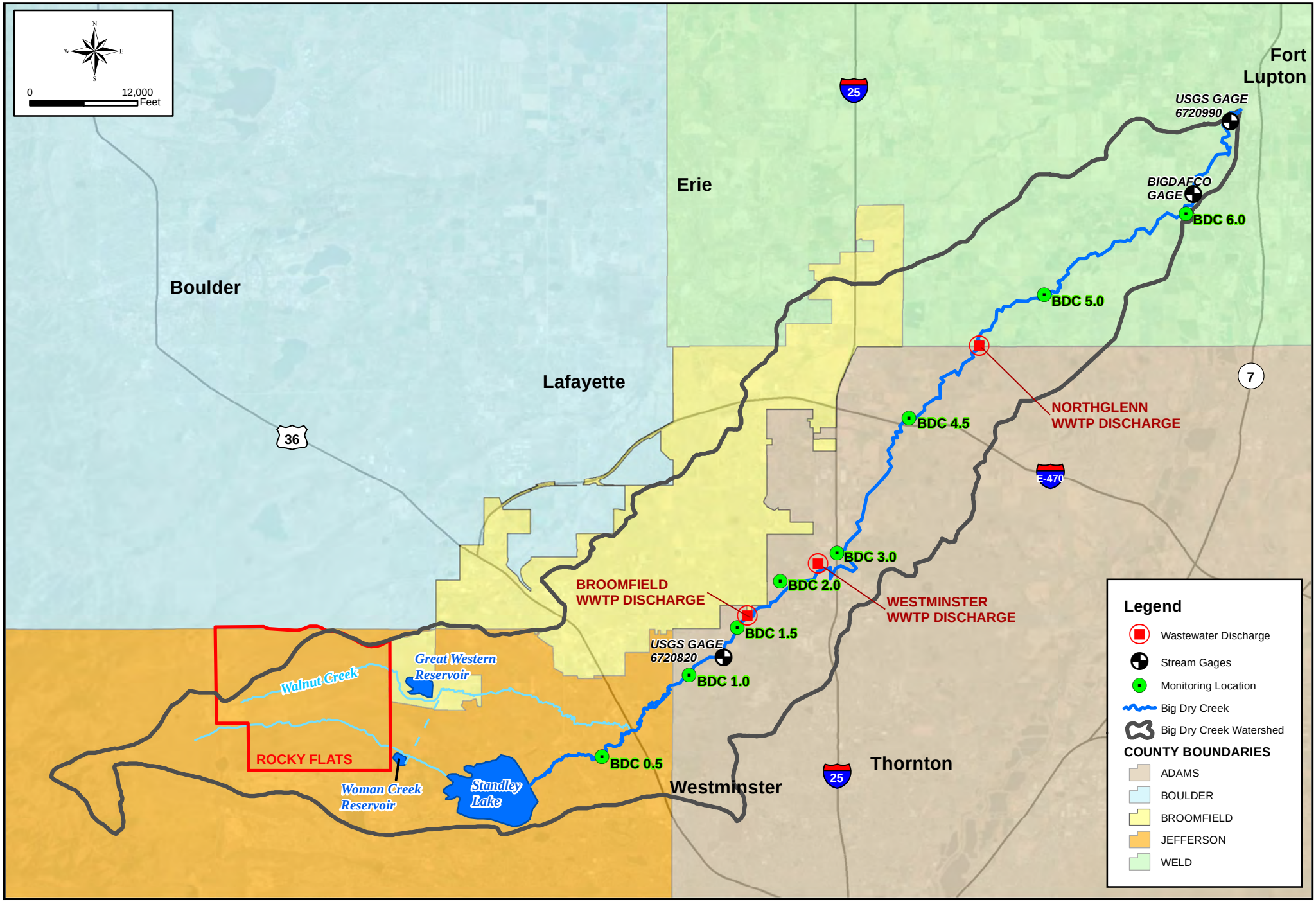

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User Name: bvonthaden

WWE
Wright Water Engineers, Inc.
2490 W. 26th Ave., Ste.100-A
Denver, CO 80211
(303) 480-1700 ph

BIG DRY CREEK WATERSHED - KEY FEATURES AND MONITORING LOCATIONS

BIG DRY CREEK WATERSHED ASSOCIATION

PROJECT NO. 971-179.101

FIGURE 1

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Appendix B. Big Dry Creek 2021 Instream Sampling Results

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Appendix B. General Monthly Water Quality Parameters and Total Recoverable Iron

Location ID	Activity Start Date	ALKALINITY (mg/L)	CHLORIDE, D (mg/L)	CHLOROPHYLL-a, corr_ (ug/L)	CHLOROPHYLL-a, uncor_ (ug/L)	CONDUCTIVITY (uS/cm)	DO (mg/L)	pH (SU)	E_ coli (MPN/100 mL)	IRON, Trec (mg/L)	CALCIUM, Total (mg/L)	MAGNESIUM, D (mg/L)	Hardness (mg/L)	POTASSIUM, D (mg/L)	SODIUM, D (mg/L)	SULFATE, D (mg/L)
bdc1.5	14-Jan	262	720	5	8	3638	11	7.7	43	0.38	183	57	690	5	478	560
bdc2.0	14-Jan	191	334	4	7	2203	10	7.9	38	0.40	124	35	453	8	260	322
bdc3.0	14-Jan	151	204	2	4	1601	10	7.9	1733	0.27	94	27	346	10	178	266
bdc4.5	14-Jan	151	208	2	3	1602	11	7.8	308	0.37	96	28	355	11	184	268
bdc5.0	14-Jan	160	212	3	6	1655	12	8.0	206	0.35	104	31	389	11	195	294
bdc6.0	14-Jan	203	258	6	9	1970	12	8.0	70	0.30	122	38	461	9	229	356
bdc2.0	11-Feb	200	276	20	8	1905	11	7.3	96	0.79	129	33	458	8	212	348
bdc3.0	11-Feb	166	195	3	5	1478	10	7.5	1733	0.42	109	27	385	11	161	278
bdc4.5	11-Feb	158	174	2	8	1436	11	7.7	222	0.29	112	27	389	10	142	284
bdc5.0	11-Feb	168	174	3	5	1496	12	7.7	83	0.32	113	29	402	10	152	312
bdc6.0	11-Feb	183	172	7	10	1537	14	7.9	91	0.30	125	31	439	10	155	332
bdc0.5	11-Mar	238	340	67	33	2280	12	7.7	11	0.40	136	42	513	4	299	432
bdc1.0	11-Mar	206	740	62	31	3272	11	7.8	17	0.85	130	42	496	5	490	354
bdc1.5	11-Mar	244	605	21	11	3187	14	7.8	93	0.43	142	44	537	5	452	437
bdc2.0	11-Mar	204	412	26	14	2399	12	7.3	12	0.53	124	37	463	6	316	386
bdc3.0	11-Mar	140	210	9	5	1555	13	7.7	326	0.26	87	25	322	11	179	254
bdc4.5	11-Mar	166	246	7	4	1745	14	7.9	77	0.39	106	31	392	10	203	314
bdc5.0	11-Mar	174	256	12	7	1820	16	8.1	54	0.41	110	33	411	9	215	342
bdc6.0	11-Mar	184	234	25	13	1777	19	8.2	102	0.25	107	34	406	9	214	338
bdc0.5	8-Apr	202	224	0	4	1615	9	7.7	110	0.13	107	33	404	5	204	304
bdc1.0	8-Apr	183	346	14	16	1915	9	7.7	73	0.42	113	33	419	5	244	266
bdc1.5	8-Apr	206	344	7	10	2078	10	7.6	44	0.34	130	38	480	5	269	334
bdc2.0	8-Apr	170	300	5	8	1826	10	7.7	54	0.28	109	33	407	7	227	282
bdc3.0	8-Apr	155	208	4	7	1514	10	7.6	66	0.15	106	29	384	10	170	258
bdc4.5	8-Apr	178	248	3	5	1756	12	7.8	36	0.15	119	35	443	8	206	316
bdc5.0	8-Apr	176	238	4	7	1744	12	8.0	68	0.35	123	37	458	9	207	336
bdc6.0	8-Apr	190	244	4	7	1804	11	7.9	488	0.45	118	41	462	9	233	342
bdc0.5	13-May	193	218	2	3	1555	11	7.8	62	0.15	94	35	377	6	179	278
bdc1.0	13-May	166	159	5	6	1133	11	7.9	59	1.09	80	23	294	5	117	168
bdc1.5	13-May	166	168	4	6	1218	11	7.9	80	0.91	88	25	322	5	133	199
bdc2.0	13-May	155	154	3	6	1233	10	7.8	44	0.69	88	26	327	7	135	220
bdc3.0	13-May	161	162	5	8	1319	10	7.7	68	0.74	92	30	353	8	148	250
bdc4.5	13-May	175	177	3	5	1459	10	7.8	70	1.40	99	34	386	7	164	312
bdc5.0	13-May	182	185	5	6	1561	10	7.9	91	1.96	103	37	407	7	179	364
bdc6.0	13-May	180	185	5	8	1542	10	8.0	121	2.54	106	35	410	7	178	362
bdc0.5	10-Jun	70	54	2	3	467	10	8.1	236	0.11	43	10	148	3	34	70
bdc1.0	10-Jun	110	78	3	5	628	10	7.5	462	0.37	51	14	183	3	54	97
bdc1.5	10-Jun	108	83	4	6	700	10	7.6	366	0.84	60	16	215	3	64	116
bdc2.0	10-Jun	120	99	3	7	878	9	7.6	436	0.61	72	19	258	5	83	154
bdc3.0	10-Jun	136	121	1	3	1080	9	7.6	388	0.30	79	25	299	7	111	214
bdc4.5	10-Jun	152	145	1	3	1327	10	7.9	132	0.18	104	32	389	6	140	307
bdc5.0	10-Jun	170	147	1	3	1396	10	8.1	518	0.22	107	36	414	7	149	346
bdc6.0	10-Jun	162	132	4	6	1239	10	8.1	580	0.38	92	30	356	6	128	278
bdc0.5	15-Jul	320	113	0	2	1012	9	7.6	461	0.00	73	24	279	4	102	175
bdc1.0	15-Jul	360	191	6	8	1485	9	7.8	225	0.48	98	33	379	5	161	260
bdc1.5	15-Jul	146	205	10	12	1657	9	7.9	192	0.37	118	39	453	4	185	312
bdc2.0	15-Jul	152	141	5	7	1286	9	8.0	266	0.27	82	28	320	10	140	223
bdc3.0	15-Jul	162	149	4	6	1344	9	7.8	548	0.31	84	29	328	10	142	251
bdc4.5	15-Jul	172	165	0	12	1569	10	8.0	81	0.27	99	35	392	9	168	330
bdc5.0	15-Jul	172	162	3	5	1540	10	8.2	115	0.30	100	34	389	10	163	325
bdc6.0	15-Jul	188	158	4	7	1546	10	8.2	770	0.92	104	36	409	9	165	322
bdc0.5	12-Aug	70	50	3	6	426	9	6.9	162	0.47	41	9	139	2	30	59
bdc1.0	12-Aug	82	67	4	10	572	8	7.0	180	1.10	47	12	167	3	48	86
bdc1.5	12-Aug	96	75	0	6	678	9	7.0	111	1.11	54	15	194	3	61	112
bdc2.0	12-Aug	106	93	0	4	855	8	8.0	157	0.64	64	18	235	6	83	142
bdc3.0	12-Aug	118	105	2	5	978	8	8.2	462	0.59	73	22	274	7	104	185
bdc4.5	12-Aug	148	128	0	3	1195	9	8.2	102	0.69	86	28	328	8	129	250

Appendix B. General Monthly Water Quality Parameters and Total Recoverable Iron

Location ID	Activity Start Date	ALKALINITY (mg/L)	CHLORIDE, D (mg/L)	CHLOROPHYLL-a, corr_ (ug/L)	CHLOROPHYLL-a, uncor_ (ug/L)	CONDUCTIVITY (uS/cm)	DO (mg/L)	pH (SU)	E_ coli (MPN/100 mL)	IRON, Trec (mg/L)	CALCIUM, Total (mg/L)	MAGNESIUM, D (mg/L)	Hardness (mg/L)	POTASSIUM, D (mg/L)	SODIUM, D (mg/L)	SULFATE, D (mg/L)
bdc5.0	12-Aug	148	135	3	6	1249	9	8.3	326	1.25	87	28	334	8	132	269
bdc6.0	12-Aug	178	140	4	10	1333	9	8.2	2420	2.33	94	33	369	7	145	290
bdc0.5	16-Sep	70	52	0	4	434	8	6.4	173	0.25	47	10	159	2	35	67
bdc1.0	16-Sep	112	94	3	10	743	7	6.4	57	0.89	65	17	231	3	73	128
bdc1.5	16-Sep	142	120	2	7	970	8	6.5	134	0.85	79	24	297	3	109	187
bdc2.0	16-Sep	112	104	2	10	920	7	6.6	84	1.11	75	21	274	8	103	175
bdc3.0	16-Sep	126	112	3	8	1014	8	6.7	291	1.96	80	24	299	8	118	208
bdc4.5	16-Sep	144	140	1	5	1206	8	6.9	65	0.58	96	30	361	10	146	261
bdc5.0	16-Sep	156	137	0	5	1243	9	6.9	107	0.44	95	31	365	9	150	286
bdc6.0	16-Sep	194	158	7	10	1403	9	6.7	981	0.93	111	37	427	9	173	323
bdc0.5	7-Oct	240	214	2	2	1809	8	7.9	365	0.13	144	45	544	5	205	376
bdc1.0	7-Oct	204	186	5	7	1844	8	7.9	63	0.62	136	42	512	5	206	322
bdc1.5	7-Oct	276	262	6	10	2281	8	7.9	435	0.64	158	53	614	4	275	566
bdc2.0	7-Oct	140	144	4	7	1335	8	7.8	387	0.70	83	29	327	10	147	260
bdc3.0	7-Oct	146	141	1	3	1304	8	7.8	461	0.61	93	28	349	11	145	258
bdc4.5	7-Oct	228	199	0	2	1913	10	8.4	69	0.08	132	48	528	7	215	482
bdc5.0	7-Oct	228	212	2	4	2073	11	8.4	126	0.15	146	57	599	7	244	560
bdc6.0	7-Oct	188	149	4	7	1335	10	8.2	921	0.45	134	28	448	13	146	256
bdc0.5	18-Nov	60	47	2	3	403	17	8.0	80	0.17	37	8	126	2	29	63
bdc1.0	18-Nov	90	66	2	3	620	19	8.1	18	0.42	50	13	180	2	55	99
bdc1.5	18-Nov	112	78	2	3	780	20	7.9	75	0.66	62	18	229	3	79	138
bdc2.0	18-Nov	128	102	1	2	922	19	7.9	75	0.43	70	21	263	3	94	177
bdc3.0	18-Nov	116	120	2	3	1031	13	7.6	770	0.26	66	21	250	11	116	182
bdc4.5	18-Nov	146	127	1	3	1230	12	8.2	157	0.34	82	27	317	9	136	240
bdc5.0	18-Nov	142	133	2	5	1272	12	8.2	178	0.35	87	28	331	10	142	262
bdc6.0	18-Nov	178	152	4	6	1421	12	8.3	121	0.37	102	34	394	8	161	314
bdc0.5	9-Dec	222	197	3	4	1532	11	8.0	12	0.10	131	38	482	3	191	369
bdc1.0	9-Dec	210	220	2	3	1598	11	8.0	1	0.32	144	39	519	4	188	375
bdc1.5	9-Dec	264	230	1	2	1870	11	8.2	77	0.51	166	48	613	3	240	491
bdc2.0	9-Dec	204	179	4	7	1523	11	8.0	31	1.47	123	38	463	6	190	362
bdc3.0	9-Dec	130	133	2	3	1018	10	7.6	436	0.12	83	22	298	12	122	216
bdc4.5	9-Dec	168	154	1	3	1270	11	7.9	63	0.35	106	31	391	11	154	300
bdc5.0	9-Dec	168	153	2	4	1347	13	8.2	59	0.25	115	34	427	10	167	340
bdc6.0	9-Dec	182	155	15	18	1331	15	8.3	38	0.24	118	34	433	9	162	331
Count		91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Min		60	47	0	2	403	7	6.4	1	0.00	37	8	126	2	29	59
Max		360	740	67	33	3638	20	8.4	2420	2.54	183	57	690	13	490	566
Mean		168	188	6	7	1442	11	7.8	129	0.55	99	30	373	7	166	277
15th		117	103	1	3	921	9	7.5	54	0.23	71	21	260	3	98	172
Median		166	162	3	6	1421	10	7.9	110	0.40	100	31	386	7	161	282
85th		205	247	7	10	1857	12	8.2	461	0.90	130	38	463	10	221	359

Appendix B. General Monthly Water Quality Parameters and Total Recoverable Iron

Location ID	Activity Start Date	ALKALINITY (mg/L)	CHLORIDE, D (mg/L)	CHLOROPHYLL-a, corr_ (ug/L)	CHLOROPHYLL-a, uncor_ (ug/L)	CONDUCTIVITY (uS/cm)	DO (mg/L)	pH (SU)	TDS (mg/L)	TEMPERATURE (°C)	TOC (mg/L)	TSS (mg/L)	TURBIDITY (NTU)	CYANIDE, Total (mg/L)
bdc1.5	14-Jan	262	720	5	8	3638	11	7.7	2250	2.5	5	15	10	
bdc2.0	14-Jan	191	334	4	7	2203	10	7.9	1300	4.0	7	19	10	
bdc3.0	14-Jan	151	204	2	4	1601	10	7.9	964	6.4	8	22	10	
bdc4.5	14-Jan	151	208	2	3	1602	11	7.8	976	4.4	8	20	13	
bdc5.0	14-Jan	160	212	3	6	1655	12	8.0	1020	3.3	7	28	13	
bdc6.0	14-Jan	203	258	6	9	1970	12	8.0	1240	2.6	6	14	10	
bdc2.0	11-Feb	200	276	20	8	1905	11	7.3	1200	3.5	7	48	29	
bdc3.0	11-Feb	166	195	3	5	1478	10	7.5	921	5.7	8	28	14	
bdc4.5	11-Feb	158	174	2	8	1436	11	7.7	876	2.9	8	18	12	
bdc5.0	11-Feb	168	174	3	5	1496	12	7.7	930	1.2	8	16	11	
bdc6.0	11-Feb	183	172	7	10	1537	14	7.9	974	0.0	7	22	10	
bdc0.5	11-Mar	238	340	67	33	2280	12	7.7	1440	3.9	6	26	7	0.000
bdc1.0	11-Mar	206	740	62	31	3272	11	7.8	1950	4.1	7	24	14	0.000
bdc1.5	11-Mar	244	605	21	11	3187	14	7.8	1930	3.1	7	11	9	0.000
bdc2.0	11-Mar	204	412	26	14	2399	12	7.3	1470	5.5	7	19	10	0.000
bdc3.0	11-Mar	140	210	9	5	1555	13	7.7	915	7.0	8	11	5	0.000
bdc4.5	11-Mar	166	246	7	4	1745	14	7.9	1070	6.7	8	12	9	0.000
bdc5.0	11-Mar	174	256	12	7	1820	16	8.1	1130	6.0	8	14	8	0.000
bdc6.0	11-Mar	184	234	25	13	1777	19	8.2		7.7	7	10		0.000
bdc0.5	8-Apr	202	224	0	4	1615	9	7.7	1000	8.9	9	0	2	
bdc1.0	8-Apr	183	346	14	16	1915	9	7.7	1120	9.1	10	25	9	
bdc1.5	8-Apr	206	344	7	10	2078	10	7.6	1260	9.0	8	8	7	
bdc2.0	8-Apr	170	300	5	8	1826	10	7.7	1090	9.5	8	9	6	
bdc3.0	8-Apr	155	208	4	7	1514	10	7.6	921	12.7	8	10	5	
bdc4.5	8-Apr	178	248	3	5	1756	12	7.8	1090	12.1	8	6	5	
bdc5.0	8-Apr	176	238	4	7	1744	12	8.0	1090	12.3	8	24	12	
bdc6.0	8-Apr	190	244	4	7	1804	11	7.9	1130	11.7	9	34	16	
bdc0.5	13-May	193	218	2	3	1555	11	7.8	938	10.7	8	0	2	
bdc1.0	13-May	166	159	5	6	1133	11	7.9	681	10.7	8	21	21	
bdc1.5	13-May	166	168	4	6	1218	11	7.9	748	10.8	7	17	15	
bdc2.0	13-May	155	154	3	6	1233	10	7.8	773	12.7	7	15	12	
bdc3.0	13-May	161	162	5	8	1319	10	7.7	826	13.6	7	23	12	
bdc4.5	13-May	175	177	3	5	1459	10	7.8	920	13.5	7	44	22	
bdc5.0	13-May	182	185	5	6	1561	10	7.9	1010	13.5	8	66	31	
bdc6.0	13-May	180	185	5	8	1542	10	8.0	1000	13.6	7	99	41	
bdc0.5	10-Jun	70	54	2	3	467	10	8.1	274	12.0	3	8	4	0.000
bdc1.0	10-Jun	110	78	3	5	628	10	7.5	378	13.4	3	24	13	0.000
bdc1.5	10-Jun	108	83	4	6	700	10	7.6	420	14.8	4	42	20	0.000
bdc2.0	10-Jun	120	99	3	7	878	9	7.6	527	16.9	5	38	20	0.000
bdc3.0	10-Jun	136	121	1	3	1080	9	7.6	666	17.9	6	19	10	0.000
bdc4.5	10-Jun	152	145	1	3	1327	10	7.9	847	18.2	6	14	6	0.000
bdc5.0	10-Jun	170	147	1	3	1396	10	8.1	895	18.9	6	16	7	0.000
bdc6.0	10-Jun	162	132	4	6	1239	10	8.1	782	20.6	5	29	17	0.000
bdc0.5	15-Jul	320	113	0	2	1012	9	7.6	615	17.0	5	0	1	
bdc1.0	15-Jul	360	191	6	8	1485	9	7.8	926	17.3	7	14	11	
bdc1.5	15-Jul	146	205	10	12	1657	9	7.9	1060	17.4	7	12	8	
bdc2.0	15-Jul	152	141	5	7	1286	9	8.0	808	18.6	8	22	9	
bdc3.0	15-Jul	162	149	4	6	1344	9	7.8	852	19.2	7	26	12	
bdc4.5	15-Jul	172	165	0	12	1569	10	8.0	995	19.9	8	13	7	
bdc5.0	15-Jul	172	162	3	5	1540	10	8.2	978	21.6	7	19	13	
bdc6.0	15-Jul	188	158	4	7	1546	10	8.2	995	20.6	6	53	26	
bdc0.5	12-Aug	70	50	3	6	426	9	6.9	259	16.6	3	11	8	
bdc1.0	12-Aug	82	67	4	10	572	8	7.0	328	17.1	3	65	11	
bdc1.5	12-Aug	96	75	0	6	678	9	7.0	403	18.1	3	37	19	
bdc2.0	12-Aug	106	93	0	4	855	8	8.0	504	18.6	5	19	14	
bdc3.0	12-Aug	118	105	2	5	978	8	8.2	606	22.3	6	16	13	
bdc4.5	12-Aug	148	128	0	3	1195	9	8.2	731	20.2	7	24	13	

Appendix B. General Monthly Water Quality Parameters and Total Recoverable Iron

Location ID	Activity Start Date	ALKALINITY (mg/L)	CHLORIDE, D (mg/L)	CHLOROPHYLL-a, corr_ (ug/L)	CHLOROPHYLL-a, uncor_ (ug/L)	CONDUCTIVITY (uS/cm)	DO (mg/L)	pH (SU)	TDS (mg/L)	TEMPERATURE (°C)	TOC (mg/L)	TSS (mg/L)	TURBIDITY (NTU)	CYANIDE, Total (mg/L)
bdc5.0	12-Aug	148	135	3	6	1249	9	8.3	783	20.4	6	41	22	
bdc6.0	12-Aug	178	140	4	10	1333	9	8.2	833	20.4	6	103	31	
bdc0.5	16-Sep	70	52	0	4	434	8	6.4	251	14.6	3	4	5	0.000
bdc1.0	16-Sep	112	94	3	10	743	7	6.4	439	15.1	4	24	17	0.000
bdc1.5	16-Sep	142	120	2	7	970	8	6.5	605	15.4	5	21	16	0.000
bdc2.0	16-Sep	112	104	2	10	920	7	6.6	581	17.2	7	38	18	0.000
bdc3.0	16-Sep	126	112	3	8	1014	8	6.7	665		7	73	34	0.000
bdc4.5	16-Sep	144	140	1	5	1206	8	6.9	824	18.8	7	18	10	0.000
bdc5.0	16-Sep	156	137	0	5	1243	9	6.9	846	19.7	7	18	9	0.000
bdc6.0	16-Sep	194	158	7	10	1403	9	6.7	952	18.6	7	32	9	0.000
bdc0.5	7-Oct	240	214	2	2	1809	8	7.9	1150	11.5	6	3	2	
bdc1.0	7-Oct	204	186	5	7	1844	8	7.9	1190	12.9	7	19	13	
bdc1.5	7-Oct	276	262	6	10	2281	8	7.9	1540	12.4	6	23	14	
bdc2.0	7-Oct	140	144	4	7	1335	8	7.8	841	16.4	8	21	13	
bdc3.0	7-Oct	146	141	1	3	1304	8	7.8	797	17.4	7	23	10	
bdc4.5	7-Oct	228	199	0	2	1913	10	8.4	1270	14.5	6	3	2	
bdc5.0	7-Oct	228	212	2	4	2073	11	8.4	1380	15.4	6	9	4	
bdc6.0	7-Oct	188	149	4	7	1335	10	8.2	826	16.5	6	15	7	
bdc0.5	18-Nov	60	47	2	3	403	17	8.0	219	5.0	3	4	3	
bdc1.0	18-Nov	90	66	2	3	620	19	8.1	367	2.7	3	7	8	
bdc1.5	18-Nov	112	78	2	3	780	20	7.9	466	2.6	3	13	11	
bdc2.0	18-Nov	128	102	1	2	922	19	7.9	551	3.8	4	5	8	
bdc3.0	18-Nov	116	120	2	3	1031	13	7.6	629	12.2	8	11	5	
bdc4.5	18-Nov	146	127	1	3	1230	12	8.2	762	7.4	7	6	6	
bdc5.0	18-Nov	142	133	2	5	1272	12	8.2	812	6.8	7	9	7	
bdc6.0	18-Nov	178	152	4	6	1421	12	8.3	920	5.4	6	12	9	
bdc0.5	9-Dec	222	197	3	4	1532	11	8.0	1100	3.1	4	4	3	0.000
bdc1.0	9-Dec	210	220	2	3	1598	11	8.0	1110	2.6	5	10	7	0.000
bdc1.5	9-Dec	264	230	1	2	1870	11	8.2	1410	3.2	5	14	10	0.000
bdc2.0	9-Dec	204	179	4	7	1523	11	8.0	1070	5.8	5	45	23	0.000
bdc3.0	9-Dec	130	133	2	3	1018	10	7.6	629	13.4	8	13	5	0.000
bdc4.5	9-Dec	168	154	1	3	1270	11	7.9	834	7.9	7	14	7	0.000
bdc5.0	9-Dec	168	153	2	4	1347	13	8.2	939	7.0	7	10	6	0.000
bdc6.0	9-Dec	182	155	15	18	1331	15	8.3	946	6.5	7	11	6	0.000
Count		91	91	91	91	91	91	91	90	90	91	91	90	32
Min		60	47	0	2	403	7	6.4	219	0	3	0	1	0.000
Max		360	740	67	33	3638	20	8.4	2250	22	10	103	41	0.000
Mean		168	188	6	7	1442	11	7.8	906	11	6	22	12	0.000
15th		117	103	1	3	921	9	7.5	562	4	5	9	5	0.000
Median		166	162	3	6	1421	10	7.9	920	12	7	18	10	0.000
85th		205	247	7	10	1857	12	8.2	1176	19	8	36	18	0.000

Appendix B. Nutrients

Location ID	Activity Start Date	NITROGEN, TOTAL (mg/L)	NO3+NO2 (mg/L)	NO2 (mg/L)	AMMONIA, Total (mg/L)	PHOSPHORUS, TOTAL (mg/L)	PHOSPHORUS, ORTHO AS P (mg/L)
bdc1.5	14-Jan	2.62	1.90	0.02	0.09	0.08	0.01
bdc2.0	14-Jan	9.17	8.85	0.14	0.13	0.19	0.03
bdc3.0	14-Jan	8.77	8.04	0.11	0.09	0.32	0.13
bdc4.5	14-Jan	9.38	8.58	0.27	0.14	0.34	0.18
bdc5.0	14-Jan	8.01	7.26	0.11	0.11	0.23	0.09
bdc6.0	14-Jan	6.54	6.19	0.05	0.00	0.19	0.11
bdc2.0	11-Feb	9.71	8.15	0.20	0.41	0.16	0.03
bdc3.0	11-Feb	8.01	6.36	0.17	0.45	0.27	0.06
bdc4.5	11-Feb	8.00	6.91	0.31	0.38	0.21	0.07
bdc5.0	11-Feb	6.85	5.48	0.09	0.37	0.20	0.07
bdc6.0	11-Feb	6.65	5.75	0.10	0.05	0.18	0.04
bdc0.5	11-Mar	1.25	0.43	0.01	0.00	0.08	0.00
bdc1.0	11-Mar	1.11	0.24	0.01	0.02	0.17	0.00
bdc1.5	11-Mar	1.79	0.92	0.02	0.04	0.12	0.00
bdc2.0	11-Mar	4.39	3.28	0.07	0.07	0.11	0.00
bdc3.0	11-Mar	7.21	5.71	0.04	0.05	0.21	0.05
bdc4.5	11-Mar	6.74	5.46	0.07	0.04	0.19	0.07
bdc5.0	11-Mar	5.59	4.47	0.05	0.00	0.17	0.07
bdc6.0	11-Mar	5.17	4.02	0.06	0.03	0.16	0.06
bdc0.5	8-Apr	1.22	0.66	0.03	0.03	0.07	0.00
bdc1.0	8-Apr	1.01	0.24	0.01	0.03	0.11	0.00
bdc1.5	8-Apr	1.46	0.78	0.01	0.02	0.13	0.00
bdc2.0	8-Apr	4.48	3.90	0.09	0.06	0.10	0.01
bdc3.0	8-Apr	6.70	5.63	0.05	0.10	0.32	0.07
bdc4.5	8-Apr	5.69	4.98	0.03	0.00	0.22	0.09
bdc5.0	8-Apr	5.24	4.46	0.03	0.03	0.22	0.08
bdc6.0	8-Apr	4.21	3.02	0.02	0.02	0.26	0.08
bdc0.5	13-May	2.00	1.52	0.02	0.00	0.13	0.01
bdc1.0	13-May	1.14	0.52	0.01	0.00	0.18	0.01
bdc1.5	13-May	1.25	0.71	0.01	0.00	0.11	0.01
bdc2.0	13-May	5.01	4.14	0.03	0.00	0.17	0.02
bdc3.0	13-May	5.39	4.29	0.03	0.02	0.38	0.19
bdc4.5	13-May	5.16	4.13	0.07	0.05	0.40	0.19
bdc5.0	13-May	5.19	4.10	0.06	0.06	0.36	0.18
bdc6.0	13-May	4.10	3.09	0.04	0.02	0.33	0.14
bdc0.5	10-Jun	0.46	0.18	0.00	0.06	0.13	0.00
bdc1.0	10-Jun	0.60	0.25	0.01	0.02	0.10	0.00
bdc1.5	10-Jun	0.72	0.38	0.00	0.02	0.17	0.00
bdc2.0	10-Jun	4.64	3.43	0.09	0.51	0.14	0.02
bdc3.0	10-Jun	5.10	3.81	0.08	0.56	0.21	0.10
bdc4.5	10-Jun	4.78	4.00	0.06	0.05	0.29	0.15
bdc5.0	10-Jun	3.85	3.34	0.05	0.02	0.18	0.08
bdc6.0	10-Jun	2.62	2.09	0.03	0.00	0.32	0.12
bdc0.5	15-Jul	1.29	0.90	0.02	0.00	0.08	0.00
bdc1.0	15-Jul	0.98	0.33	0.00	0.02	0.13	0.01
bdc1.5	15-Jul	1.48	0.87	0.00	0.00	0.11	0.00
bdc2.0	15-Jul	12.31	11.53	0.03	0.02	0.17	0.02
bdc3.0	15-Jul	10.46	10.78	0.03	0.04	0.31	0.12
bdc4.5	15-Jul	9.06	8.85	0.04	0.02	0.24	0.13
bdc5.0	15-Jul	7.71	7.42	0.12	0.07	0.23	0.12

Appendix B. Nutrients

Location ID	Activity Start Date	NITROGEN, TOTAL (mg/L)	NO3+NO2 (mg/L)	NO2 (mg/L)	AMMONIA, Total (mg/L)	PHOSPHORUS, TOTAL (mg/L)	PHOSPHORUS, ORTHO AS P (mg/L)
bdc6.0	15-Jul	6.41	6.30	0.05	0.00	0.27	0.13
bdc0.5	12-Aug	0.47	0.22	0.00	0.00	0.05	0.00
bdc1.0	12-Aug	0.66	0.25	0.00	0.00	0.11	0.00
bdc1.5	12-Aug	0.79	0.45	0.00	0.00	0.09	0.00
bdc2.0	12-Aug	5.61	4.89	0.01	0.00	0.09	0.02
bdc3.0	12-Aug	5.84	5.26	0.02	0.00	0.11	0.04
bdc4.5	12-Aug	5.65	4.88	0.02	0.00	0.17	0.09
bdc5.0	12-Aug	5.59	5.05	0.04	0.00	0.21	0.10
bdc6.0	12-Aug	4.30	3.54	0.02	0.00	0.26	0.13
bdc0.5	16-Sep	0.48	0.28	0.00	0.00	0.04	0.00
bdc1.0	16-Sep	0.81	0.44	0.00	0.02	0.09	0.00
bdc1.5	16-Sep	1.12	0.79	0.00	0.00	0.07	0.00
bdc2.0	16-Sep	9.25	8.95	0.01	0.02	0.10	0.01
bdc3.0	16-Sep	8.92	8.41	0.02	0.03	0.16	0.03
bdc4.5	16-Sep	8.55	7.88	0.03	0.00	0.18	0.10
bdc5.0	16-Sep	7.43	6.86	0.16	0.05	0.16	0.05
bdc6.0	16-Sep	4.90	4.61	0.04	0.00	0.25	0.12
bdc0.5	7-Oct	1.68	1.13	0.02	0.00	0.06	0.00
bdc1.0	7-Oct	1.30	0.59	0.00	0.00	0.08	0.00
bdc1.5	7-Oct	1.81	1.21	0.02	0.02	0.08	0.00
bdc2.0	7-Oct	13.33	12.55	0.04	0.04	0.12	0.02
bdc3.0	7-Oct	8.86	8.89	0.05	0.03	0.20	0.09
bdc4.5	7-Oct	5.81	5.27	0.04	0.00	0.11	0.05
bdc5.0	7-Oct	3.75	3.19	0.05	0.00	0.12	0.05
bdc6.0	7-Oct	4.14	3.25	0.08	0.00	0.33	0.23
bdc0.5	18-Nov	0.00	0.04	0.00	0.00	0.04	0.00
bdc1.0	18-Nov	0.09	0.09	0.00	0.00	0.07	0.00
bdc1.5	18-Nov	0.28	0.28	0.00	0.00	0.09	0.00
bdc2.0	18-Nov	0.80	0.80	0.00	0.00	0.06	0.00
bdc3.0	18-Nov	6.02	5.51	0.13	0.43	0.25	0.07
bdc4.5	18-Nov	6.25	5.73	0.19	0.39	0.15	0.07
bdc5.0	18-Nov	5.75	5.63	0.14	0.10	0.18	0.08
bdc6.0	18-Nov	4.13	4.13	0.09	0.00	0.14	0.08
bdc0.5	9-Dec	1.56	1.30	0.00	0.00	0.04	0.00
bdc1.0	9-Dec	0.95	0.59	0.00	0.02	0.06	0.00
bdc1.5	9-Dec	2.29	2.05	0.01	0.03	0.06	0.00
bdc2.0	9-Dec	7.67	7.47	0.02	0.03	0.13	0.04
bdc3.0	9-Dec	7.61	6.78	0.08	0.13	0.26	0.09
bdc4.5	9-Dec	7.10	6.62	0.13	0.13	0.19	0.10
bdc5.0	9-Dec	6.69	6.09	0.11	0.11	0.21	0.11
bdc6.0	9-Dec	4.63	4.25	0.06	0.00	0.14	0.07
Count		91	91	91	91	91	91
Min		0.00	0.04	0.00	0.00	0.04	0.00
Max		13.33	12.55	0.31	0.56	0.40	0.23
Mean		4.63	4.01	0.05	0.06	0.17	0.05
15th		1.00	0.45	0.00	0.00	0.08	0.00
Median		4.90	4.10	0.03	0.02	0.16	0.04
85th		8.01	7.34	0.10	0.11	0.26	0.12

Location ID	Activity Start Date	ARSENIC, Trec (ug/L)	BORON, Total (mg/L)	CADMIUM, D (ug/L)	CADMIUM, T (ug/L)	CHROMIUM, D (ug/L)	CHROMIUM, T (ug/L)	COPPER, D (ug/L)	IRON, D (ug/L)	LEAD, D (ug/L)	LEAD, T (ug/L)	MANGANESE, D (ug/L)	NICKEL, D (ug/L)	NICKEL, T (ug/L)	SELENIUM, D (ug/L)	SILVER, D (ug/L)	ZINC, D (ug/L)
bdc1.5	14-Jan														11.21		
bdc2.0	14-Jan														7.57		
bdc3.0	14-Jan														4.44		
bdc4.5	14-Jan														4.73		
bdc5.0	14-Jan														5.78		
bdc6.0	14-Jan														6.12		
bdc2.0	11-Feb														6.76		
bdc3.0	11-Feb														5.83		
bdc4.5	11-Feb														6.92		
bdc5.0	11-Feb														3.65		
bdc6.0	11-Feb														5.58		
bdc0.5	11-Mar	0.75	0.14	0.00	0.00	0.00		3.49	15.51	0.15	0.62	780	2.13	1.82	4.34	0.00	2.14
bdc1.0	11-Mar	1.27	0.14	0.00	0.00	0.00		4.36	13.14	0.26	1.23	815	2.75	2.94	3.77	0.00	1.61
bdc1.5	11-Mar	0.91	0.20	0.00	0.00	0.00		2.22	10.32	0.19	0.65	721	2.74	2.31	6.13	0.00	1.59
bdc2.0	11-Mar	0.75	0.20	0.00	0.00	0.11		2.47	13.62	0.11	0.69	225	2.29	2.18	5.99	0.00	4.06
bdc3.0	11-Mar	0.54	0.20	0.00	0.00	0.19		2.04	25.98	0.21	0.48	103	1.80	1.62	3.38	0.00	30.75
bdc4.5	11-Mar	0.61	0.23	0.00	0.00	0.15		2.48	23.96	0.27	0.68	137	2.10	1.94	4.93	0.00	30.11
bdc5.0	11-Mar	0.79	0.22	0.00	0.07	0.12		3.66	13.92	0.22	0.81	103	2.44	2.27	4.69	0.00	26.59
bdc6.0	11-Mar	0.81	0.23	0.06	0.06	0.11		2.72	11.68	0.27	0.66	93	2.68	2.18	4.36	0.00	23.31
bdc0.5	8-Apr														3.54		
bdc1.0	8-Apr														3.98		
bdc1.5	8-Apr														5.52		
bdc2.0	8-Apr														3.28		
bdc3.0	8-Apr														3.33		
bdc4.5	8-Apr														5.58		
bdc5.0	8-Apr														4.17		
bdc6.0	8-Apr														4.35		
bdc0.5	13-May														3.69		
bdc1.0	13-May														3.44		
bdc1.5	13-May														4.26		
bdc2.0	13-May														4.22		
bdc3.0	13-May														5.50		
bdc4.5	13-May														6.71		
bdc5.0	13-May														5.47		
bdc6.0	13-May														5.24		
bdc0.5	10-Jun	0.47	0.00	0.00	0.00	0.00	0.14	0.00	4.77	0.00	0.83	21	0.81	0.89	0.00	0.00	0.00
bdc1.0	10-Jun	0.61	0.01	0.00	0.00	0.00	0.49	0.29	9.14	0.00	1.00	21	0.98	1.29	0.00	0.00	0.00
bdc1.5	10-Jun	0.87	0.10	0.00	0.07	0.00	0.89	0.46	8.16	0.00	1.50	16	1.01	1.68	2.09	0.00	0.00
bdc2.0	10-Jun	0.75	0.14	0.00	0.05	0.00	0.67	0.00	10.92	0.00	1.13	16	1.40	1.77	2.41	0.00	2.69
bdc3.0	10-Jun	0.74	0.17	0.00	0.05	0.00	0.43	0.00	16.19	0.00	0.83	33	1.63	1.84	2.92	0.00	10.72
bdc4.5	10-Jun	1.03	0.20	0.00	0.07	0.00	0.29	0.66	8.63	0.00	0.72	36	2.00	2.08	4.72	0.00	10.02
bdc5.0	10-Jun	0.98	0.23	0.00	0.08	0.00	0.36	0.93	6.36	0.00	0.84	42	2.32	2.39	3.69	0.00	13.10
bdc6.0	10-Jun	1.28	0.20	0.00	0.09	0.00	0.46	0.26	4.91	0.00	0.98	28	2.47	2.52	3.71	0.00	5.79
bdc0.5	15-Jul														2.73		
bdc1.0	15-Jul														3.54		
bdc1.5	15-Jul														4.73		
bdc2.0	15-Jul														4.42		
bdc3.0	15-Jul														4.38		
bdc4.5	15-Jul														5.98		
bdc5.0	15-Jul														4.53		
bdc6.0	15-Jul														5.15		
bdc0.5	12-Aug														0.00		
bdc1.0	12-Aug														0.00		

Location ID	Activity Start Date	ARSENIC, Trec (ug/L)	BORON, Total (mg/L)	CADMIUM, D (ug/L)	CADMIUM, T (ug/L)	CHROMIUM, D (ug/L)	CHROMIUM, T (ug/L)	COPPER, D (ug/L)	IRON, D (ug/L)	LEAD, D (ug/L)	LEAD, T (ug/L)	MANGANESE, D (ug/L)	NICKEL, D (ug/L)	NICKEL, T (ug/L)	SELENIUM, D (ug/L)	SILVER, D (ug/L)	ZINC, D (ug/L)
bdc1.5	12-Aug														0.00		
bdc2.0	12-Aug														2.71		
bdc3.0	12-Aug														2.46		
bdc4.5	12-Aug														2.61		
bdc5.0	12-Aug														3.47		
bdc6.0	12-Aug														3.58		
bdc0.5	16-Sep	0.54	0.06	0.00	0.00	0.00	0.21	1.41	7.75	0.37	0.89	43	0.71	0.96	0.00	0.00	1.56
bdc1.0	16-Sep	0.97	0.09	0.00	0.06	0.10	0.92	1.57	12.53	0.41	1.70	51	1.24	1.87	1.41	0.00	2.26
bdc1.5	16-Sep	0.86	0.13	0.00	0.05	0.00	0.94	1.69	7.07	0.38	1.57	29	1.35	2.01	2.75	0.00	4.37
bdc2.0	16-Sep	0.74	0.18	0.00	0.06	0.10	1.14	1.44	17.16	0.39	1.62	34	1.93	2.67	2.84	0.00	25.10
bdc3.0	16-Sep	0.87	0.20	0.00	0.07	0.00	2.07	10.81	13.61	0.39	2.71	21	2.05	3.36	3.10	0.00	12.99
bdc4.5	16-Sep	1.00	0.24	0.06	0.07	0.18	0.76	6.44	15.92	0.46	1.17	25	2.50	2.71	3.31	0.00	19.54
bdc5.0	16-Sep	0.88	0.26	0.00	0.09	0.13	0.55	9.40	11.25	0.53	1.09	32	2.64	2.84	4.02	0.00	20.90
bdc6.0	16-Sep	1.56	0.31	0.08	0.13	0.00	1.11	12.77	6.34	0.45	2.09	48	3.28	3.97	3.92	0.00	11.46
bdc0.5	7-Oct														5.46		
bdc1.0	7-Oct														4.81		
bdc1.5	7-Oct														7.64		
bdc2.0	7-Oct														5.37		
bdc3.0	7-Oct														4.34		
bdc4.5	7-Oct														8.21		
bdc5.0	7-Oct														13.14		
bdc6.0	7-Oct														2.73		
bdc0.5	18-Nov														1.37		
bdc1.0	18-Nov														1.39		
bdc1.5	18-Nov														2.41		
bdc2.0	18-Nov														3.66		
bdc3.0	18-Nov														3.05		
bdc4.5	18-Nov														4.39		
bdc5.0	18-Nov														3.41		
bdc6.0	18-Nov														4.99		
bdc0.5	9-Dec	1.13	0.18	0.00	0.05	0.00	1.13	2.62	7.56	0.12	1.88	116	1.33	2.33	4.29	0.00	22.18
bdc1.0	9-Dec	0.64	0.18	0.00	0.00	0.00	0.23	2.47	7.47	0.28	1.05	106	1.64	1.04	3.13	0.00	20.53
bdc1.5	9-Dec	0.80	0.24	0.00	0.08	0.00	1.27	2.39	5.58	0.20	1.93	47	1.77	3.07	9.45	0.00	9.94
bdc2.0	9-Dec	1.01	0.27	0.06	0.09	0.15	0.81	2.23	16.03	0.23	1.41	38	2.10	3.09	6.99	0.00	11.49
bdc3.0	9-Dec	0.93	0.23	0.09	0.07	0.34	0.62	4.45	25.87	0.42	1.31	69	1.37	3.08	4.05	0.00	48.44
bdc4.5	9-Dec	1.02	0.27	0.09	0.06	0.10	0.58	4.24	18.37	0.31	1.29	29	1.73	3.10	6.64	0.00	40.28
bdc5.0	9-Dec	1.72	0.30	0.05	0.12	0.19	1.20	4.21	21.29	0.34	2.43	22	1.91	4.69	5.90	0.00	32.75
bdc6.0	9-Dec	1.22	0.30	0.09	0.07	0.00	1.02	3.83	14.83	0.34	2.02	29	2.44	2.10	4.76	0.00	25.37
Count		32	32	32	32	32	24	32	32	32	32	32	32	32	91	32	32
Min		0.47	0.00	0.00	0.00	0.00	0.14	0.00	4.77	0.00	0.48	16	0.71	0.89	0.00	0.00	0.00
Max		1.72	0.31	0.09	0.13	0.34	2.07	12.77	25.98	0.53	2.71	815	3.28	4.69	13.14	0.00	48.44
Mean		0.91	0.19	0.02	0.05	0.06	0.76	3.06	12.68	0.23	1.24	123	1.92	2.33	4.30	0.00	14.74
15th		0.63	0.12	0.00	0.00	0.00	0.32	0.40	6.82	0.00	0.69	22	1.30	1.66	2.66	0.00	1.60
Median		0.87	0.20	0.00	0.06	0.00	0.71	2.43	12.10	0.25	1.11	40	1.96	2.22	4.26	0.00	11.48
85th		1.16	0.26	0.06	0.08	0.15	1.14	4.39	17.58	0.40	1.90	123	2.55	3.08	5.99	0.00	27.82

Appendix B. Mercury Data

Activity Start Date	Location ID	MERCURY, Trec (µg/L)
bdc1.5	22-Feb	0.0014
bdc1.5	5-Apr	0.0007
bdc1.5	9-Aug	0.0020
bdc1.5	17-Nov	0.0010
Count		4
Min		0.0007
Max		0.0020
Mean		0.0013
15th		0.0008
Median		0.0012
85th		0.0017

Appendix B. Instantaneous Flow Measurements

Location ID	Activity Start Date	FLOW (cfs)
bdc1.5	14-Jan	0.8
bdc2.0	14-Jan	1.7
bdc3.0	14-Jan	9.1
bdc6.0	14-Jan	22.8
bdc2.0	11-Feb	1.7
bdc3.0	11-Feb	10.8
bdc6.0	11-Feb	26.5
bdc2.0	11-Mar	3.6
bdc3.0	11-Mar	12.7
bdc6.0	11-Mar	22.4
bdc2.0	8-Apr	8.0
bdc3.0	8-Apr	27.0
bdc6.0	8-Apr	14.7
bdc0.5	13-May	1.8
bdc1.0	13-May	16.5
bdc1.5	13-May	14.5
bdc2.0	13-May	33.0
bdc3.0	13-May	52.4
bdc6.0	13-May	69.3
bdc0.5	10-Jun	17.1
bdc1.0	10-Jun	16.7
bdc1.5	10-Jun	20.6
bdc3.0	10-Jun	21.7
bdc6.0	10-Jun	54.6
bdc1.0	15-Jul	0.8
bdc1.5	15-Jul	3.4
bdc2.0	15-Jul	13.8
bdc3.0	15-Jul	28.2
bdc6.0	15-Jul	45.1
bdc0.5	12-Aug	9.5
bdc1.5	12-Aug	12.1
bdc3.0	12-Aug	14.1
bdc6.0	12-Aug	52.6
bdc0.5	16-Sep	5.7
bdc1.5	16-Sep	5.7
bdc2.0	16-Sep	14.0
bdc3.0	16-Sep	15.6
bdc6.0	16-Sep	46.0
bdc2.0	7-Oct	3.6
bdc3.0	7-Oct	7.5
bdc6.0	7-Oct	37.3
bdc0.5	18-Nov	15.7
bdc1.5	18-Nov	7.5
bdc2.0	18-Nov	9.3
bdc3.0	18-Nov	9.4
bdc6.0	18-Nov	23.4
bdc2.0	9-Dec	2.4
bdc3.0	9-Dec	8.9
bdc6.0	9-Dec	23.1

Appendix C. Big Dry Creek 2021 Quality Control (QC) Samples

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Field Duplicates

SiteID	Date	Analyte	Field Duplicate	Sample	Relative Percent Difference
bdc1.5	6/10/2021	IRON, Total Recoverable (mg/L)	0.53	0.84	45%
bdc1.5	6/10/2021	Selenium, Dissolved (ug/L)	1.05	2.09	67%
bdc1.5	12/9/2021	IRON, Total Recoverable (mg/L)	0.00	0.51	NC
bdc1.5	12/9/2021	Selenium, Dissolved (ug/L)	7.71	9.45	20%
bdc2.0	3/11/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	3.41	3.28	4%
bdc2.0	3/11/2021	Phosphorus, Total (mg/L)	0.13	0.11	16%
bdc2.0	3/11/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.07	0.07	0%
bdc2.0	3/11/2021	Total Nitrogen (TN), Total (mg/L)	4.29	4.39	2%
bdc2.0	6/10/2021	E. coli (MPN/100 mL)	388	436	12%
bdc2.0	6/10/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	3.42	3.43	0%
bdc2.0	6/10/2021	Phosphorus, Total (mg/L)	0.13	0.14	3%
bdc2.0	6/10/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.52	0.51	2%
bdc2.0	6/10/2021	Total Nitrogen (TN), Total (mg/L)	4.48	4.64	4%
bdc2.0	9/16/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	8.97	8.95	0%
bdc2.0	9/16/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.02	0.02	0%
bdc2.0	9/16/2021	Total Nitrogen (TN), Total (mg/L)	9.43	9.25	2%
bdc2.0	12/9/2021	E. coli (MPN/100 mL)	41	31	28%
bdc2.0	12/9/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	7.40	7.47	1%
bdc2.0	12/9/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.03	0.03	0%
bdc2.0	12/9/2021	Total Nitrogen (TN), Total (mg/L)	7.55	7.67	2%
bdc5.0	6/10/2021	Alkalinity, Total (mg/L)	170	170	0%
bdc5.0	6/10/2021	Chlorophyll-a, corrected, Total (ug/L)	2.10	1.30	47%
bdc5.0	6/10/2021	Chlorophyll-a, Total (ug/L)	3.80	2.90	27%
bdc5.0	6/10/2021	Cyanide, Total (ug/L)	0.00	0.00	0%
bdc5.0	9/16/2021	Alkalinity, Total (mg/L)	150	156	4%
bdc5.0	9/16/2021	Arsenic, Total Recoverable (ug/L)	0.85	0.88	4%
bdc5.0	9/16/2021	Boron, Total (mg/L)	0.28	0.26	7%
bdc5.0	9/16/2021	Cadmium, Dissolved (ug/L)	0.00	0.00	0%
bdc5.0	9/16/2021	Cadmium, Total (ug/L)	0.07	0.09	23%
bdc5.0	9/16/2021	CALCIUM, TOTAL (mg/L)	97.20	95.20	2%
bdc5.0	9/16/2021	CARBON, TOTAL ORGANIC, Total (mg/L)	7.71	7.14	8%
bdc5.0	9/16/2021	CHLORIDE, Dissolved (mg/L)	138	137	1%
bdc5.0	9/16/2021	Chlorophyll-a, corrected, Total (ug/L)	0.00	0.00	0%
bdc5.0	9/16/2021	Chlorophyll-a, Total (ug/L)	5.00	4.90	2%
bdc5.0	9/16/2021	Chromium, Dissolved (ug/L)	0.10	0.13	23%
bdc5.0	9/16/2021	Chromium, Total (ug/L)	0.57	0.55	2%
bdc5.0	9/16/2021	Copper, Dissolved (ug/L)	5.81	9.40	47%
bdc5.0	9/16/2021	Cyanide, Total (ug/L)	0.00	0.00	0%
bdc5.0	9/16/2021	E. coli (MPN/100 mL)	126	107	16%
bdc5.0	9/16/2021	Hardness (mg/L)	368	365	1%
bdc5.0	9/16/2021	Iron, Dissolved (ug/L)	8.70	11.25	26%
bdc5.0	9/16/2021	IRON, Total Recoverable (mg/L)	0.45	0.44	2%
bdc5.0	9/16/2021	Lead, Dissolved (ug/L)	0.52	0.53	1%
bdc5.0	9/16/2021	Lead, Total (ug/L)	1.12	1.09	3%
bdc5.0	9/16/2021	MAGNESIUM, Dissolved (mg/L)	30.40	30.90	2%
bdc5.0	9/16/2021	Manganese, Dissolved (ug/L)	33	32	3%
bdc5.0	9/16/2021	Nickel, Dissolved (ug/L)	2.38	2.64	10%
bdc5.0	9/16/2021	Nickel, Total (ug/L)	2.78	2.84	2%
bdc5.0	9/16/2021	NITROGEN, NITRITE (NO2), Dissolved (mg/L)	0.16	0.16	1%
bdc5.0	9/16/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	6.65	6.86	3%
bdc5.0	9/16/2021	PHOSPHORUS, ORTHOPHOSPHATE AS P, Dissolved (mg/L)	0.05	0.05	2%
bdc5.0	9/16/2021	POTASSIUM, Dissolved (mg/L)	9.35	9.48	1%
bdc5.0	9/16/2021	Selenium, Dissolved (ug/L)	3.09	4.02	26%
bdc5.0	9/16/2021	Silver, Dissolved (ug/L)	0.00	0.00	0%
bdc5.0	9/16/2021	SODIUM, Dissolved (mg/L)	148.00	150.00	1%
bdc5.0	9/16/2021	SOLIDS, DISSOLVED, Filterable (mg/L)	835.00	846.00	1%
bdc5.0	9/16/2021	SULFATE, Dissolved (mg/L)	287.00	286.00	0%
bdc5.0	9/16/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.05	0.05	0%
bdc5.0	9/16/2021	Total Nitrogen (TN), Total (mg/L)	7.68	7.43	3%
bdc5.0	9/16/2021	TSS (mg/L)	20	18	8%
bdc5.0	9/16/2021	TURBIDITY, Total (NTU)	9.32	9.00	3%
bdc5.0	9/16/2021	Zinc, Dissolved (ug/L)	15.21	20.90	32%

Field Blanks

SiteID	Date	Analyte_Plot	Field Blank
Field Blank	3/11/2021	Phosphorus, Total (mg/L)	0.05
Field Blank	3/11/2021	Phosphorus, Total (mg/L)	0.02
Field Blank	3/11/2021	Alkalinity, Total (mg/L)	0.00
Field Blank	3/11/2021	Arsenic, Total Recoverable (ug/L)	0.20
Field Blank	3/11/2021	Boron, Total (mg/L)	0.00
Field Blank	3/11/2021	Cadmium, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	Cadmium, Total (ug/L)	0.00
Field Blank	3/11/2021	CALCIUM, TOTAL (mg/L)	0.00
Field Blank	3/11/2021	CARBON, TOTAL ORGANIC, Total (mg/L)	0.33
Field Blank	3/11/2021	CHLORIDE, Dissolved (mg/L)	0.00
Field Blank	3/11/2021	Chlorophyll-a, corrected, Total (ug/L)	0.00
Field Blank	3/11/2021	Chlorophyll-a, Total (ug/L)	0.00
Field Blank	3/11/2021	Chromium, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	Conductivity (uS/cm)	3.00
Field Blank	3/11/2021	Copper, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	Cyanide, Total (ug/L)	0.00
Field Blank	3/11/2021	E. coli (MPN/100 mL)	1.00
Field Blank	3/11/2021	Hardness (mg/L)	0.00
Field Blank	3/11/2021	Iron, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	IRON, Total Recoverable (mg/L)	0.00
Field Blank	3/11/2021	Lead, Dissolved (ug/L)	0.13
Field Blank	3/11/2021	Lead, Total (ug/L)	0.00
Field Blank	3/11/2021	MAGNESIUM, Dissolved (mg/L)	0.00
Field Blank	3/11/2021	Manganese, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	Nickel, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	Nickel, Total (ug/L)	0.00
Field Blank	3/11/2021	NITROGEN, NITRITE (NO2), Dissolved (mg/L)	0.00
Field Blank	3/11/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	0.00
Field Blank	3/11/2021	Oxygen, Dissolved, Dissolved (mg/L)	10.11
Field Blank	3/11/2021	pH (su)	9.09
Field Blank	3/11/2021	Phosphorus, Orthophosphate as P, Dissolved (mg/L)	0.00
Field Blank	3/11/2021	POTASSIUM, Dissolved (mg/L)	0.00
Field Blank	3/11/2021	Selenium, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	Silver, Dissolved (ug/L)	0.00
Field Blank	3/11/2021	SODIUM, Dissolved (mg/L)	0.00
Field Blank	3/11/2021	SOLIDS, DISSOLVED, Filterable (mg/L)	12.00
Field Blank	3/11/2021	SULFATE, Dissolved (mg/L)	0.00
Field Blank	3/11/2021	Temperature (°C)	13.54
Field Blank	3/11/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.00
Field Blank	3/11/2021	Total Nitrogen (TN), Total (mg/L)	0.06
Field Blank	3/11/2021	TSS (mg/L)	0.00
Field Blank	3/11/2021	TURBIDITY, Total (NTU)	0.00
Field Blank	3/11/2021	Zinc, Dissolved (ug/L)	0.00
Field Blank	9/16/2021	NO3/NO2-N (NO3/NO2-N) (mg/L)	0.00
Field Blank	9/16/2021	Total Ammonia (NH3 and NH4), Total (mg/L)	0.00
Field Blank	9/16/2021	Total Nitrogen (TN), Total (mg/L)	0.00

Trip Blanks

SiteID	Date	Analyte	Trip Blank
Trip Blank	2/11/2021	Alkalinity, Total (mg/L)	0
Trip Blank	2/11/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	2/11/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	3/11/2021	Alkalinity, Total (mg/L)	0
Trip Blank	3/11/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	3/11/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	4/8/2021	Alkalinity, Total (mg/L)	3
Trip Blank	4/8/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	4/8/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	5/13/2021	Alkalinity, Total (mg/L)	3
Trip Blank	5/13/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	5/13/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	6/10/2021	Alkalinity, Total (mg/L)	0
Trip Blank	6/10/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	6/10/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	6/10/2021	Cyanide, Total (ug/L)	0
Trip Blank	7/15/2021	Alkalinity, Total (mg/L)	0
Trip Blank	7/15/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	7/15/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	8/12/2021	Alkalinity, Total (mg/L)	0
Trip Blank	8/12/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	8/12/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	9/16/2021	Alkalinity, Total (mg/L)	0
Trip Blank	9/16/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	9/16/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	10/7/2021	Alkalinity, Total (mg/L)	0
Trip Blank	10/7/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	10/7/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	11/18/2021	Alkalinity, Total (mg/L)	0
Trip Blank	11/18/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	11/18/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	12/9/2021	Alkalinity, Total (mg/L)	0
Trip Blank	12/9/2021	Chlorophyll-a, corrected, Total (ug/L)	0
Trip Blank	12/9/2021	Chlorophyll-a, Total (ug/L)	0
Trip Blank	12/9/2021	Cyanide, Total (ug/L)	0

Appendix D. 2021 WWTP Discharge Samples for Broomfield, Westminster and Northglenn Collected for CDPS Discharge Monitoring Reports

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Appendix D. Broomfield WWTP Sampling Data for 2021

NPDES 2020 permit Daily 1/1/2021 - 12/31/2021	Effluent TSS mg/L	Effluent cBod mg/L	Effluent Phosphorus Total mg/L	Effluent Ammonia mg/L	Effluent Nitrate + Nitrite mg/L	Effluent TKN mg/L	Effluent Total Inorganic Nitrogen mg/L	Effluent Total Nitrogen mg/L	Effluent Alkalinity mg/L	Effluent COD mg/L	Plnt Ef WAD CYANIDE ug/L	Effluent E.COLI #/100ML	Effluent Flow MGD
1/1/2021				0.82	14.8		15.6						0.97
1/2/2021													0.48
1/3/2021													1.106
1/4/2021			0.11	0.18	13.5	0.11	13.7	13.81		25		1	0.631
1/5/2021				0.07	13.5		13.6		49.2		<3.000		1.371
1/6/2021	2.07	1.18	0.1	0.19	14.9	0.63	15.1	15.73					0.903
1/7/2021			0.1	0.34	16.3	0.49	16.6	17.09					1.553
1/8/2021				0.27	16.9		17.2						1.206
1/9/2021													0.826
1/10/2021													0.946
1/11/2021	2.13		0.1	0.13	17.6	0.15	17.7	17.85				1	1.361
1/12/2021				0.25	13.7		14		50				1.733
1/13/2021	2.13	2.09	0.11	0.46	15	0.89	15.5	16.39					1.443
1/14/2021			0.11	0.45	16	1.02	16.5	17.52					0.812
1/15/2021	1.93			0.2	17.5		17.7						1.158
1/16/2021													1.475
1/17/2021													0.906
1/18/2021			0.08	0.17	16.2	0.95	16.4	17.35				5.2	1.192
1/19/2021				0.13	14.4		14.5		55.2				1.347
1/20/2021	2.33	2.79	0.13	0.19	14.3	0.79	14.5	15.29					1.124
1/21/2021			0.13	0.41	16	0.6	16.4	17					0.515
1/22/2021				0.25	17.3		17.6						0.77
1/23/2021													0.535
1/24/2021				0.21	17.3		17.5						1.232
1/25/2021			0.15	0.19	16.5	0.57	16.7	17.27				2	0.92
1/26/2021	2.47	2.36		0.16	12.5		12.7		59.2				2.803
1/27/2021			0.11	0.31	13.3	1.84	13.6	15.44					3
1/28/2021			0.12	0.47	15.6	1.25	16.1	17.35					3.262
1/29/2021													1.834
1/30/2021													0.665
1/31/2021													1.134
2/1/2021			0.1	0.2	17.5	0.32	17.7	18.02		35		2	1.058
2/2/2021				0.25	16.9		17.2						1.636
2/3/2021	2.13	3.59	0.16	0.33	16.6	1.46	16.9	18.36					1.38
2/4/2021			0.16	2.65	18.2	3.11	20.9	24.01					0.643
2/5/2021				0.89	20.9		21.8						0.746
2/6/2021													0.726
2/7/2021													1.368
2/8/2021			0.17	0.24	14.9	1.06	15.1	16.16				2.1	1.228
2/9/2021				0.29	12.7		13		78.2				1.025
2/10/2021	3.00	2.26	0.16	5.01	11.25	5.4	16.3	21.7					1.057
2/11/2021			0.17	0.74	14.3	1.3	15	16.3					0.837
2/12/2021				0.38	15.1		15.5						0.909
2/13/2021													0.962
2/14/2021													2.223
2/15/2021			0.22	1.91	13.1	3.1	15	18.1					1.496
2/16/2021				0.16	11.9		12.1		62.4			4.1	1.308
2/17/2021	2.20	2.27	0.13	0.33	11	0.77	11.3	12.07					0.864
2/18/2021			0.12	0.24	14.1	0.87	14.3	15.17					0.849
2/19/2021				0.89	14		14.9						0.854
2/20/2021													0.646
2/21/2021													1.587
2/22/2021			0.13	0.49	12.7	1.85	13.2	15.05				5.2	2.288
2/23/2021				0.56	10.8		11.4		57.4				0.941
2/24/2021	2.40	1.77	0.11	0.35	11.3	1.63	11.6	13.23					2.091
2/25/2021			0.12	0.27	11.6	0.6	11.9	12.5					0.991
2/26/2021				0.41	12.2		12.6						0.95
2/27/2021													0.764
2/28/2021													0.958
3/1/2021			0.11	0.49	13.3	1.37	13.8	15.17				3	1.514
3/2/2021				0.34	10.3		10.6		64.4				1.385
3/3/2021	2.40	2.16	0.11	0.23	11.3	1.48	11.5	12.98		31			1.401
3/4/2021			0.14	0.64	13.1	1.55	13.7	15.25					0.79
3/5/2021				0.6	14.4		15						1.111
3/6/2021													1.174
3/7/2021													1.078
3/8/2021			0.15	0.47	13.6	1.99	14.1	16.09				1	0.944
3/9/2021				0.26	12.3		12.6		64.4				1.157
3/10/2021	2.73	2.53	0.12	0.31	11.7	0.78	12	12.78					0.873
3/11/2021			0.09	0.43	12.2	6.1	12.6	18.7					1.344
3/12/2021				1.26	14		15.3						1.075
3/13/2021													1.323
3/14/2021													1.324
3/15/2021			0.14	0.13	10.8	2.56	10.9	13.46				2	1.267
3/16/2021				0.1	11		11.1		74				4.535
3/17/2021	2.60	2.51	0.11	0.11	9.85	0.75	10	10.75					2.274
3/18/2021			0.06	0.26	11.1	9.17	11.4	20.57					2.302

Appendix D. Broomfield WWTP Sampling Data for 2021

NPDES 2020 permit Daily 1/1/2021 - 12/31/2021	Effluent TSS mg/L	Effluent cBod mg/L	Effluent Phosphorus Total mg/L	Effluent Ammonia mg/L	Effluent Nitrate + Nitrite mg/L	Effluent TKN mg/L	Effluent Total Inorganic Nitrogen mg/L	Effluent Total Nitrogen mg/L	Effluent Alkalinity mg/L	Effluent COD mg/L	Plnt Ef WAD CYANIDE ug/L	Effluent E.COLI #/100ML	Effluent Flow MGD
3/19/2021				0.54	11		11.5						2.499
3/20/2021													2.609
3/21/2021													3.856
3/22/2021			0.12	0.25	10.8	1.05	11.1	12.15				4.1	4.164
3/23/2021				0.45	9.44		9.9		117				3.338
3/24/2021	3.67	3.39	0.13	0.84	9.11	1.57	9.9	11.47					2.328
3/25/2021			0.11	0.26	10.9	1.17	11.2	12.37					4.493
3/26/2021				0.58	10.3		10.9						2.343
3/27/2021													2.02
3/28/2021													2.785
3/29/2021			0.15	0.39	10.5	1.4	10.9	12.3				4.1	2.097
3/30/2021				0.2	9.94		10.1		116				1.819
3/31/2021	3.00	3.69	0.05	0.23	11.4	1.46	11.6	13.06					2.588
4/1/2021			0.16	1.03	11.7	2.24	12.7	14.94					2.35
4/2/2021				1.26	12.6		13.9				<3.000		2.481
4/3/2021													2.754
4/4/2021													2.789
4/5/2021	3.50		0.08	0.87	12.4	1.55	13.3	14.85		34		4.1	2.343
4/6/2021				0.57	10.4		11		104				2.22
4/7/2021	3.10	3.97	0.1	0.34	10.2	0.89	10.5	11.39					2.252
4/8/2021			0.06	0.21	10.8	1.2	11	12.2					1.852
4/9/2021	2.80			0.53	11.8		12.3						2.302
4/10/2021													5.25
4/11/2021													5.938
4/12/2021			0.12	0.26	11.9	1.24	12.2	13.44				5.2	5.161
4/13/2021				0.14	11		11.1		96.2				5.914
4/14/2021	2.40	3.11	0.08	0.2	11.8	1.43	12	13.43					5.285
4/15/2021			0.06	0.3	12.4	0.93	12.7	13.63					6.006
4/16/2021				0.26	12.3		12.6						6.521
4/17/2021													6.064
4/18/2021													5.906
4/19/2021			0.1	0.28	9.82	1.28	10.1	11.38				3.1	6.209
4/20/2021				0.15	10.6		10.8		106				6.783
4/21/2021	2.40	2.69	0.07	0.31	11.6	1.43	11.9	13.33					5.885
4/22/2021			0.07	0.25	12.36	1.41	12.6	14.01					6.573
4/23/2021				0.23	12.5		12.7						6.057
4/24/2021													6.291
4/25/2021													6.756
4/26/2021			0.07	0.64	11.4	1.53	12	13.53				1	5.329
4/27/2021				0.16	10.82		11		116				5.854
4/28/2021	2.40	3.54	0.05	0.12	11.6	2.11	11.7	13.81					7.508
4/29/2021			0.07	0.28	11.9	3.17	12.2	15.37					6.61
4/30/2021				0.46	13.3		13.8						6.772
5/1/2021													5.765
5/2/2021													5.992
5/3/2021			0.11	0.3	10.8	1.48	11.1	12.58				5.2	9.966
5/4/2021				1.02	8.1		9.1		179				7.97
5/5/2021	2.73	2.52	0.12	0.14	9.42	1.39	9.6	10.99					6.74
5/6/2021			0.04	0.2	11.7	0.93	11.9	12.83					6.283
5/7/2021				0.21	13.32		13.5						7.314
5/8/2021													7.027
5/9/2021													7.586
5/10/2021			0.08	0.26	13.7	2.82	14	16.82		26		1	7.194
5/11/2021				0.13	12.62		12.7		147				7.99
5/12/2021	1.97	2.14	0.09	0.22	11.6	2.06	11.8	13.86					8.048
5/13/2021			0.09	0.43	11.6	1.36	12	13.36					7.443
5/14/2021				0.59	15.26		15.8						7.166
5/15/2021													6.957
5/16/2021													7.276
5/17/2021			0.12	0.15	15.6	2.54	15.8	18.34				1	7.423
5/18/2021				0.16	11.78		11.9		152				8.672
5/19/2021	2.70	3.25	0.06	0.33	11	2.82	11.3	14.12					7.853
5/20/2021			0.07	0.4	12.52	2.68	12.9	15.58					7.269
5/21/2021				0.33	13		13.3						7.379
5/22/2021													6.766
5/23/2021													7.754
5/24/2021			0.13	0.62	12.58	1.29	13.2	14.49				1	7.132
5/25/2021				0.24	11.6		11.8		148				6.985
5/26/2021	0.93	1.54	0.12	0.3	11.82	1.8	12.1	13.9					6.92
5/27/2021			0.1	0.23	12.3	0.58	12.5	13.08					6.924
5/28/2021				0.26	12.9		13.2						6.916
5/29/2021													6.727
5/30/2021													7.652
5/31/2021			0.13	0.27	13.1	6.76	13.4	20.16					7.881
6/1/2021				0.3	9.71		10		163			1	7.983
6/2/2021	3.00	4.06	0.14	0.29	10.8	2.01	11.1	13.11					7.589
6/3/2021			0.13	0.35	11.42	2.26	11.8	14.06					7.041

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6/4/2021				0.28	12.5		12.8						7.324
6/5/2021													6.83
6/6/2021													7.154
6/7/2021			0.12	0.31	12.8	1.46	13.1	14.56		31		1	7.004
6/8/2021				0.63	11.5		12.1		136				6.939
6/9/2021	1.73	5.78	0.09	1.54	12.96	5.23	14.5	19.73					6.795
6/10/2021			0.11	1.61	13.8	3.53	15.4	18.93					6.753
6/11/2021				1.4	14.62		16						6.647
6/12/2021													6.777
6/13/2021													6.775
6/14/2021			0.22	0.16	15.2	0.87	15.4	16.27				1	6.66
6/15/2021				0.17	13.6		13.8		120				6.614
6/16/2021	2.73	7.14	0.1	0.16	14.16	2.2	14.3	16.5					6.558
6/17/2021			0.19	0.44	14.4	1.59	14.8	16.39					6.446
6/18/2021				0.28	15.3		15.6						6.554
6/19/2021													6.427
6/20/2021													6.903
6/21/2021			0.22	0.18	14.4	1.1	14.6	15.7				2	6.602
6/22/2021				0.12	11.94		12.1		111				6.82
6/23/2021	2.80	5.34	0.1	0.11	14.5	2.73	14.6	17.33					6.56
6/24/2021			0.11	0.16	15.3	0.75	15.5	16.25					6.56
6/25/2021				0.13	15.42		15.6						6.435
6/26/2021													7.205
6/27/2021													7.234
6/28/2021			0.12	0.12	13.62	8.2	13.7	21.9				3.1	6.676
6/29/2021				0.14	11.8		11.9		131				6.943
6/30/2021	2.27	2.14	0.08	0.19	13.4	3.93	13.6	17.53					6.377
7/1/2021			0.08	0.3	12.7	2.64	13	15.64					7.194
7/2/2021				0.18	15.22		15.4						7.103
7/3/2021													6.997
7/4/2021													6.54
7/5/2021			0.1	0.17	14.2	7.23	14.4	21.63		38			6.282
7/6/2021				0.14	13.1		13.2		118			1	6.677
7/7/2021	1.47	3.34	0.14	0.15	13.32	1.34	13.5	14.84					6.679
7/8/2021			0.08	0.12	14.3	0.54	14.4	14.94					6.903
7/9/2021				0.13	16.1		16.2						6.081
7/10/2021													6.242
7/11/2021													6.794
7/12/2021	1.40		0.08	0.13	14.6	2.54	14.7	17.24				1	6.519
7/13/2021				0.19	13.3		13.5		104				6.188
7/14/2021	1.27	1.18	0.09	0.14	15	2.87	15.1	17.97					6.125
7/15/2021			0.12	0.1	16.5	1.93	16.6	18.53					6.715
7/16/2021	2.07			0.14	18.1		18.2						6.442
7/17/2021													6.2
7/18/2021													6.261
7/19/2021			0.11	0.14	14.84	3.93	15	18.93				2.1	6.343
7/20/2021				0.14	14.1		14.2						6.439
7/21/2021	1.80	2.96	0.11	0.18	15.3	0.73	15.5	16.23	96				6.348
7/22/2021			0.11	0.2	14.5	5.2	14.7	19.9					6.36
7/23/2021				0.15	15.76		15.9						6.191
7/24/2021													6.32
7/25/2021													6.358
7/26/2021			0.12	0.12	15.9	0.94	16	16.94				2	6.501
7/27/2021				0.11	14.4		14.5		86.8				6.458
7/28/2021	1.67	2.22	0.13	0.33	15.9	0.78	16.2	16.98					6.092
7/29/2021			0.12	0.17	15.8	0.4	16	16.4					6.008
7/30/2021				0.15	15.3		15.4						6.465
7/31/2021													8.056
8/1/2021													7.165
8/2/2021			0.09	0.12	12.5	0.82	12.6	13.42		23		2	6.863
8/3/2021				0.22	11		11.2		122				6.715
8/4/2021	1.67	1.74	0.1	0.12	13.3	0.63	13.4	14.03					6.634
8/5/2021			0.09	0.16	15.36	0.61	15.5	16.11					6.519
8/6/2021				0.18	15.6		15.8						6.664
8/7/2021													6.383
8/8/2021													6.775
8/9/2021			0.09	0.16	15.4	1.93	15.6	17.53				1	6.46
8/10/2021				0.14	13.4		13.5		121				6.249
8/11/2021	1.87	1.86	0.1	0.12	13.6	4.3	13.7	18					6.124
8/12/2021			0.07	0.11	13.8	1.57	13.9	15.47					6.058
8/13/2021				0.13	13.4		13.5						6.292
8/14/2021													6.514
8/15/2021													6.39
8/16/2021			0.06	0.16	12.8	1.91	13	14.91				1	6.481
8/17/2021				0.16	11.62		11.8		100				6.301
8/18/2021	1.73	1.46	0.16	0.18	13.4	1.01	13.6	14.61					6.189
8/19/2021			0.06	0.18	13.5	1.57	13.7	15.27					6.01

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8/20/2021				0.16	14.14		14.3						6.899
8/21/2021													6.129
8/22/2021													6.236
8/23/2021			0.05	0.25	13.3	1.82	13.5	15.32				1	6.49
8/24/2021				0.12	12.1		12.2		96.2				6.34
8/25/2021	1.40	1.62	0.07	0.16	14.6	1.13	14.8	15.93					5.783
8/26/2021			0.06	0.13	14.8	1.12	14.9	16.02					5.93
8/27/2021				0.13	14.9		15						6.197
8/28/2021													5.495
8/29/2021													5.921
8/30/2021			0.07	0.14	13.4	0.52	13.5	14.02				2	6.197
8/31/2021				0.12	13.1		13.2		92.6				5.822
9/1/2021	1.73	1.34	0.05	0.16	13.86	0.59	14	14.59					5.645
9/2/2021			0.06	0.16	15.4	1	15.6	16.6					5.528
9/3/2021				0.21	15.8		16						5.839
9/4/2021													5.833
9/5/2021													5.901
9/6/2021			0.04	0.16	16.22	1.09	16.4	17.49		27			5.612
9/7/2021				0.16	14.2		14.4		90.8			1	5.817
9/8/2021	1.80	1.23	0.08	0.18	13.9	1.18	14.1	15.28					5.765
9/9/2021			0.06	0.15	14.8	0.75	15	15.75					5.663
9/10/2021				0.16	15.16		15.3						5.938
9/11/2021													5.339
9/12/2021													5.755
9/13/2021			0.08	0.16	15.3	0.51	15.5	16.01				1	5.97
9/14/2021				0.14	13.5		13.6		77				5.752
9/15/2021	1.40	1.86	0.07	0.15	14.9	0.39	15.1	15.49					5.978
9/16/2021			0.06	0.13	15.7	0.4	15.8	16.2					5.912
9/17/2021				0.16	16.02		16.2						5.28
9/18/2021													5.936
9/19/2021													5.886
9/20/2021			0.09	0.14	16.72	0.14	16.9	17.04				3.1	3.66
9/21/2021				0.18	13.6		13.8		62.4				3.03
9/22/2021	1.67	1.52	0.08	0.17	15.4	0.42	15.6	16.02					3.232
9/23/2021			0.07	0.2	16.62	0.57	16.8	17.37					3.19
9/24/2021				0.17	16.7		16.9						3.015
9/25/2021													3.151
9/26/2021													3.183
9/27/2021			0.11	0.14	15.5	0.7	15.6	16.3				1	3.533
9/28/2021				0.14	14.2		14.3		77.6		<3.000		3.058
9/29/2021	1.60	1.43	0.06	0.15	15.4	1.04	15.6	16.64					3.181
9/30/2021			0.1	0.15	16.2	1.2	16.4	17.6					3.145
10/1/2021				0.16	16.2		16.4						3.238
10/2/2021													2.652
10/3/2021													3.026
10/4/2021			0.09	0.16	15.12	0.34	15.3	15.64		20		1	2.683
10/5/2021				0.13	13.9		14		92.6		<3.000		2.681
10/6/2021	1.53	1.26	0.07	0.14	15.46	0.25	15.6	15.85					2.39
10/7/2021			0.12	0.14	16.1	0.42	16.2	16.62					2.491
10/8/2021				0.23	17		17.2						2.734
10/9/2021													2.578
10/10/2021													2.938
10/11/2021			0.09	0.13	15.2	0.13	15.3	15.43				1	3.029
10/12/2021				0.14	14.1		14.2		80				4.025
10/13/2021	0.93	1.10	0.1	0.23	16	0.49	16.2	16.69					4.532
10/14/2021			0.06	0.18	16.66	0.62	16.8	17.42					3.443
10/15/2021				0.16	17.1		17.3						4.9
10/16/2021													4.971
10/17/2021													5.973
10/18/2021			0.08	0.11	16.8	0.21	16.9	17.11				5.2	4.733
10/19/2021				0.14	14.2		14.3		76.4				3.807
10/20/2021	1.67	0.96	0.09	0.12	15.8	0.47	15.9	16.37					3.873
10/21/2021			0.08	0.13	16.34	0.55	16.5	17.05					4.873
10/22/2021				0.12	16.3		16.4						4.645
10/23/2021													4.871
10/24/2021													4.868
10/25/2021			0.08	0.14	15.6	0.17	15.7	15.87				1	5.342
10/26/2021				0.09	14.8		14.9		72				5.001
10/27/2021	1.73	0.54	0.09	0.12	17.5	<0.09	17.6						5.58
10/28/2021			0.09	0.1	18.58	0.43	18.7	19.13					4.761
10/29/2021				0.09	18.7		18.8						4.856
10/30/2021													4.81
10/31/2021													5.541
11/1/2021			0.09	0.1	15.4	0.37	15.5	15.87		19		4.1	4.12
11/2/2021				0.12	15		15.1		64.8				3.22
11/3/2021	1.67	1.40	0.06	0.09	16.12	0.42	16.2	16.62					2.174
11/4/2021			0.09	0.17	16	0.44	16.2	16.64					1.414

Appendix D. Broomfield WWTP Sampling Data for 2021

NPDES 2020 permit Daily 1/1/2021 - 12/31/2021	Effluent TSS mg/L	Effluent cBod mg/L	Effluent Phosphorus Total mg/L	Effluent Ammonia mg/L	Effluent Nitrate + Nitrite mg/L	Effluent TKN mg/L	Effluent Total Inorganic Nitrogen mg/L	Effluent Total Nitrogen mg/L	Effluent Alkalinity mg/L	Effluent COD mg/L	Plnt Ef WAD CYANIDE ug/L	Effluent E.COLI #/100ML	Effluent Flow MGD
11/5/2021				0.09	15.7		15.8						1.335
11/6/2021													1.05
11/7/2021													1.009
11/8/2021			0.1	0.12	14.92	0.19	15	15.19				1	1.59
11/9/2021				0.1	13		13.1		64				0.918
11/10/2021	1.87	1.16	0.04	0.12	14.5	0.9	14.6	15.5					0.59
11/11/2021			0.11	0.16	16.26	0.74	16.4	17.14					0.986
11/12/2021				0.11	16.7		16.8						1.732
11/13/2021													1.602
11/14/2021													1.433
11/15/2021	1.53		0.14	0.15	14.3	0.49	14.5	14.99				1	1.158
11/16/2021				0.1	13.2		13.3		63.8				1.918
11/17/2021	2.07	1.00	0.09	0.1	14.52	2.05	14.6	16.65					1.539
11/18/2021			0.11	0.11	16.4	6.56	16.5	23.06					1.047
11/19/2021	0.80			0.14	16		16.1						1.894
11/20/2021													1.781
11/21/2021													1.875
11/22/2021			0.1	0.09	14	0.52	14.1	14.62				3	1.719
11/23/2021				0.06	13.2		13.3		66				2.738
11/24/2021	1.93	1.09	0.09	0.09	13	0.45	13.1	13.55					1.539
11/25/2021			0.09	0.11	13.2	0.76	13.3	14.06					2.463
11/26/2021				0.1	11.1		11.2						2.598
11/27/2021													1.674
11/28/2021													1.564
11/29/2021			0.09	0.17	12.7	0.2	12.9	13.1				2	0.825
11/30/2021				0.19	12.38		12.6		64.4				0.382
12/1/2021	1.60	1.61	0.08	0.13	13	0.77	13.1	13.87					0.687
12/2/2021			0.06	0.16	14.34	0.7	14.5	15.2					0.38
12/3/2021				0.15	14.9		15.1						0.243
12/4/2021													0.358
12/5/2021													0.669
12/6/2021			0.08	0.12	14.7	<0.09	14.8	14.8				1	0.761
12/7/2021				0.11	14.1		14.2		57.2				0.761
12/8/2021	1.33	1.11	0.1	0.1	14.2	0.22	14.3	14.52					0.623
12/9/2021			0.13	0.1	15.36	0.23	15.5	15.73					0.737
12/10/2021				0.12	15.7		15.8						0.659
12/11/2021													0.824
12/12/2021													1.952
12/13/2021			0.12	0.12	14.3	0.34	14.4	14.74				2	1.159
12/14/2021				0.11	13.64		13.7		60.2				1.625
12/15/2021	2.20	1.32	0.06	0.11	13.4	0.48	13.5	13.98					1.134
12/16/2021			0.07	0.12	16.06	0.72	16.2	16.92					1.489
12/17/2021				0.25	15.9		16.1						0.906
12/18/2021													0.776
12/19/2021													1.476
12/20/2021			0.1	0.99	12.6	1.54	13.6	15.14				2	0.453
12/21/2021				0.12	11.1		11.2		67.6				0.77
12/22/2021	2.13	1.54	0.05	0.12	12.1	0.68	12.2	12.88					0.843
12/23/2021			0.07	0.21	10.98	1.44	11.2	12.64					0.568
12/24/2021				0.14	12.3		12.4						0.441
12/25/2021													0.487
12/26/2021													0.188
12/27/2021			0.05	0.14	11.9	5.13	12	17.13				2	0.916
12/28/2021				0.11	11.3		11.4		72.4				0.985
12/29/2021	1.80	1.48	0.06	0.1	11.24	1.48	11.3	12.78		23			1.16
12/30/2021			0.04	0.13	10.6	2.22	10.7	12.92					0.891
12/31/2021				0.21	10.62		10.8						0.477
Avg	2.07	2.29	0.10	0.29	13.77	1.57	14.06	15.67	92.20	27.67	<3	2.15	4.00
Max	3.67	7.14	0.22	5.01	20.9	9.17	21.8	24.01	179	38	0	5.2	9.966
Min	0.80	0.54	0.04	0.06	8.1	0.11	9.1	10.75	49.2	19	0	1	0.188
GMean												1.78	

City of Westminster - Big Dry Creek Wastewater Treatment Facility - 2021

Date	E004 Eff Flow MG	<	E004 Eff BOD mg/L	<	E004 Eff TSS mg/L	E004 Eff E. coli #/100ml	<	E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}$ +$NO5_{Lachat}$
Frequency	Daily		Weekly		Weekly	Weekly		2x/Month	5x/Week	5x/Week	
12/27/2020	6.20							0.51	6.19	6.91	6.70
12/28/2020	5.66				9.0			0.23	6.50	6.51	6.73
12/29/2020	5.70		7.48			26.2		0.18	6.68	6.47	6.86
12/30/2020	5.77							0.23	7.07	7.05	7.30
12/31/2020	5.96							0.42	7.68	7.63	8.10
1/1/2021	5.81										
1/2/2021	6.02										
1/3/2021	6.41							0.52	7.48	7.39	8.00
1/4/2021	6.07				10.4	12.0		0.16	7.01	6.75	7.17
1/5/2021	5.92		8.41					0.06	6.93	6.85	6.99
1/6/2021	5.73		7.87					0.09	7.67	7.29	7.76
1/7/2021	5.68							0.08	8.73	9.54	8.81
1/8/2021	5.68										
1/9/2021	5.85										
1/10/2021	6.05							0.45	8.04	8.93	8.49
1/11/2021	5.85							0.10	7.36	7.94	7.46
1/12/2021	5.81		9.54					0.07	7.84	8.41	7.91
1/13/2021	6.16		6.90				<	0.02	7.97	7.56	7.99
1/14/2021	5.79				8.8	11.0	J	0.02	8.19	8.11	8.21
1/15/2021	5.73										
1/16/2021	6.05										
1/17/2021	6.25				8.4			0.13	7.30	7.11	7.43
1/18/2021	5.94							0.04	6.83	6.82	6.87
1/19/2021	5.69		6.45			3.1		0.04	6.93	6.68	6.97
1/20/2021	5.88		5.18				J	0.02	7.64	7.59	7.66
1/21/2021	5.96						<	0.02	7.79	7.41	7.81
1/22/2021	5.68										
1/23/2021	5.97										
1/24/2021	6.07										
1/25/2021	5.69					14.6		0.05	6.14	6.04	6.19
1/26/2021	5.53		5.68		5.2			0.07	6.46	6.39	6.53
1/27/2021	5.52		5.74					0.15	7.22	7.60	7.37
1/28/2021	5.68							0.11	7.19	7.60	7.30
1/29/2021	5.84							0.11	7.15	7.63	7.26
1/30/2021	6.15										
1/31/2021	6.24							0.21	6.45	6.77	6.66
2/1/2021	5.90				6.8	9.8		0.09	5.86	6.02	5.95
2/2/2021	5.84		7.22					0.08	6.20	6.29	6.28
2/3/2021	5.97		6.00					0.09	6.54	6.65	6.63
2/4/2021	5.62							0.10	6.50	6.38	6.60
2/5/2021	5.68										
2/6/2021	5.98										
2/7/2021	6.22		6.20					0.21	6.24	6.14	6.45
2/8/2021	5.61							0.07	5.89	5.87	5.96
2/9/2021	5.46							0.06	6.16	6.53	6.22
2/10/2021	5.47		3.87					0.06	6.53	6.44	6.59
2/11/2021	5.45				6.2	15.8		0.06	6.61	6.13	6.67
2/12/2021	5.45										
2/13/2021	5.72										
2/14/2021	5.91				8.2			0.21	6.28	6.04	6.49
2/15/2021	5.93							0.08	5.55	5.24	5.63
2/16/2021	5.82							0.05	5.18	4.85	5.23
2/17/2021	5.54		6.41			19.9		0.05	5.55	5.13	5.60

Date	E004 Eff Flow MG		E004 Eff BOD mg/L		E004 Eff TSS mg/L	E004 Eff E. coli #/100ml		E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}$ +$NO5_{Lachat}$
Frequency	Daily	<	Weekly	<	Weekly	Weekly	<	2x/Month	5x/Week	5x/Week	
2/18/2021	5.51							0.06	6.03	5.74	6.09
2/19/2021	5.80										
2/20/2021	6.04										
2/21/2021	6.32							0.15	5.61	5.34	5.76
2/22/2021	6.05					75.4		0.05	5.24	4.97	5.29
2/23/2021	5.98		6.05		6.6			0.05	5.35	5.01	5.40
2/24/2021	5.70		6.45					0.04	5.96	5.68	6.00
2/25/2021	5.78							0.08	5.98	6.27	6.06
2/26/2021	5.89										
2/27/2021	5.99										
2/28/2021	6.18							0.12	5.98	5.49	6.10
3/1/2021	6.32				10	17.3		0.13	5.51	5.21	5.64
3/2/2021	5.86		7.01				J	0.04	5.69	5.46	5.73
3/3/2021	5.78		6.37				J	0.03	6.03	5.79	6.06
3/4/2021	5.70						J	0.03	5.78	5.87	5.81
3/5/2021	5.79										
3/6/2021	6.04										
3/7/2021	6.36							0.07	5.92	6.12	5.99
3/8/2021	5.94						J	0.03	5.58	5.70	5.61
3/9/2021	5.87		6.42				J	0.03	6.16	6.43	6.19
3/10/2021	5.71		5.31					0.04	6.82	6.85	6.86
3/11/2021	5.66				6.0	17.3	J	0.03	7.10	7.27	7.13
3/12/2021	5.76										
3/13/2021	6.13										
3/14/2021	6.08				8.0			0.14	7.04	7.24	7.18
3/15/2021	6.60							0.09	7.39	7.60	7.48
3/16/2021	6.49		5.48			17.1	J	0.04	6.76	6.87	6.80
3/17/2021	6.47		5.54				J	0.03	7.20	6.87	7.23
3/18/2021	6.54						J	0.02	7.34	7.06	7.36
3/19/2021	6.67										
3/20/2021	7.06										
3/21/2021	7.13							0.14	7.35	7.42	7.49
3/22/2021	7.05				7.2	16.0		0.07	7.18	7.51	7.25
3/23/2021	6.84		6.79					0.06	7.84	7.96	7.90
3/24/2021	6.83		4.36					0.06	8.75	8.76	8.81
3/25/2021	6.77							0.07	9.26	9.47	9.33
3/26/2021	6.77										
3/27/2021	6.90										
3/28/2021	7.01							0.07	8.32	8.25	8.39
3/29/2021	6.79				6.0	4.1		0.07	7.70	8.13	7.77
3/30/2021	6.49		5.35					0.06	8.06	7.95	8.12
3/31/2021	6.71		5.42					0.06	9.11	9.22	9.17
4/1/2021	6.70							0.06	8.94	8.91	9.00
4/2/2021	6.72										
4/3/2021	6.87										
4/4/2021	6.98		7.39					0.07	7.42	7.27	7.49
4/5/2021	6.75							0.05	7.29	7.01	7.34
4/6/2021	6.62		5.25					0.05	7.39	6.62	7.44
4/7/2021	6.49							0.05	8.08	7.31	8.13
4/8/2021	6.56				5.2	15.6		0.06	8.24	7.28	8.30
4/9/2021	6.50										
4/10/2021	5.70										
4/11/2021	6.87				7.4			0.17	8.17	7.29	8.34
4/12/2021	4.97					18.5		0.08	7.94	7.57	8.02
4/13/2021	6.47							0.07	7.85	8.13	7.92

Date	E004 Eff Flow MG		E004 Eff BOD mg/L		E004 Eff TSS mg/L	E004 Eff E. coli #/100ml		E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}$ +$NO5_{Lachat}$
Frequency	Daily	<	Weekly	<	Weekly	Weekly	<	2x/Month	5x/Week	5x/Week	
4/14/2021	6.36		5.68					0.07	8.71	8.95	8.78
4/15/2021	6.30		5.04					0.07	9.12	9.20	9.19
4/16/2021	6.88										
4/17/2021	7.02										
4/18/2021	7.38							0.27	8.09	8.48	8.36
4/19/2021	6.82				6.0	14.8		0.09	7.59	8.29	7.68
4/20/2021	5.94		4.28					0.08	8.46	9.00	8.54
4/21/2021	6.24		4.04					0.10	9.14	9.65	9.24
4/22/2021	6.63							0.11	9.58	9.66	9.69
4/23/2021	6.01										
4/24/2021	6.61										
4/25/2021	6.78							0.31	8.30	8.99	8.61
4/26/2021	6.32				5.4	14.5		0.11	7.55	8.28	7.66
4/27/2021	6.84		4.76					0.10	8.61	9.22	8.71
4/28/2021	6.95		4.13					0.09	9.23	9.84	9.32
4/29/2021	6.36							0.09	9.32	9.03	9.41
4/30/2021	6.45										
5/1/2021	6.21										
5/2/2021	6.69							0.22	7.65	7.58	7.87
5/3/2021	9.47				6.8	47.2		0.06	7.27	7.11	7.33
5/4/2021	9.37		4.60				J	0.03	6.83	6.67	6.86
5/5/2021	7.69						J	0.02	7.63	7.40	7.65
5/6/2021	7.58						J	0.04	8.36	8.03	8.40
5/7/2021	7.50										
5/8/2021	7.21										
5/9/2021	7.42							0.07	7.43	7.17	7.50
5/10/2021	7.13						J	0.03	7.20	7.03	7.23
5/11/2021	7.40		5.99				J	0.02	7.51	7.30	7.53
5/12/2021	6.96		5.29				J	0.02	7.98	7.85	8.00
5/13/2021	7.43				5.8	19.5		0.06	8.10	7.98	8.16
5/14/2021	6.79										
5/15/2021	6.98										
5/16/2021	7.12				12.6			0.12	7.18	7.04	7.30
5/17/2021	6.95					13.1		0.05	6.75	6.76	6.80
5/18/2021	7.73		5.24					0.07	6.54	6.43	6.61
5/19/2021	7.41		5.10					0.11	7.23	7.05	7.34
5/20/2021	6.99							0.11	7.18	7.20	7.29
5/21/2021	6.92										
5/22/2021	6.57										
5/23/2021	7.43							0.23	7.28	7.32	7.51
5/24/2021	6.78				7.6	12.1		0.12	6.56	6.52	6.68
5/25/2021	6.18		5.70					0.08	6.81	6.76	6.89
5/26/2021	6.34		5.03					0.08	7.36	7.24	7.44
5/27/2021	5.59							0.14	7.32	7.50	7.46
5/28/2021	5.55										
5/29/2021	5.59										
5/30/2021	6.43							0.36	6.89	7.40	7.25
5/31/2021	6.97					5.2		0.46	6.20	6.66	6.66
6/1/2021	6.13		5.80		7.0			0.10	5.85	6.02	5.95
6/2/2021	6.39		6.12					0.09	6.12	6.07	6.21
6/3/2021	5.50							0.07	6.32	6.32	6.39
6/4/2021	6.15										
6/5/2021	6.39										
6/6/2021	6.72							0.15	6.43	6.55	6.58
6/7/2021	5.32							0.06	6.15	5.97	6.21

Date	E004 Eff Flow MG	<	E004 Eff BOD mg/L	<	E004 Eff TSS mg/L	E004 Eff E. coli #/100ml	<	E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}$ +$NO5_{Lachat}$
Frequency	Daily		Weekly		Weekly	Weekly		2x/Month	5x/Week	5x/Week	
6/8/2021	5.60		3.22					0.05	6.04	6.16	6.09
6/9/2021	5.28		2.54					0.08	6.35	6.54	6.43
6/10/2021	3.94				3.8	4.1		0.08	6.26	6.46	6.34
6/11/2021	4.48										
6/12/2021	3.63										
6/13/2021	4.72				3.8			0.11	5.85	6.01	5.96
6/14/2021	4.17					8.5		0.06	5.49	5.52	5.55
6/15/2021	3.51		3.29					0.07	5.38	5.42	5.45
6/16/2021	2.73		3.23					0.08	5.85	5.93	5.93
6/17/2021	2.68							0.09	5.96	5.83	6.05
6/18/2021	3.06										
6/19/2021	2.79										
6/20/2021	3.48							0.21	6.51	6.65	6.72
6/21/2021	4.04				4.4	10.9		0.08	5.93	5.79	6.01
6/22/2021	4.05		3.84					0.08	6.34	6.20	6.42
6/23/2021	3.49							0.08	6.58	6.41	6.66
6/24/2021	3.34							0.08	7.67	7.40	7.75
6/25/2021	2.75										
6/26/2021	4.71										
6/27/2021	5.33							0.08	7.34	6.95	7.42
6/28/2021	5.03							0.06	6.80	6.36	6.86
6/29/2021	4.42				3.4			0.07	7.11	6.95	7.18
6/30/2021	4.43					7.3		0.07	7.34	7.05	7.41
7/1/2021	4.62							0.07	6.96	6.76	7.03
7/2/2021	4.85										
7/3/2021	4.33										
7/4/2021	4.43				3.4			0.06	6.52	6.54	6.58
7/5/2021	4.02					10.9		0.07	6.66	6.46	6.73
7/6/2021	3.77		2.83					0.06	6.07	5.89	6.13
7/7/2021	3.33		3.00					0.07	6.56	6.37	6.63
7/8/2021	3.65		2.54					0.06	8.35	7.11	8.41
7/9/2021	2.75										
7/10/2021	3.38										
7/11/2021	3.95							0.06	7.42	7.69	7.48
7/12/2021	2.82							0.07	7.56	7.98	7.63
7/13/2021	3.23		3.81					0.06	7.99	7.97	8.05
7/14/2021	3.96		3.69					0.06	8.24	8.00	8.30
7/15/2021	3.15		4.07		2.8	3.0		0.04	8.29	9.13	8.33
7/16/2021	3.20										
7/17/2021	3.12										
7/18/2021	3.03							0.05	7.47	7.80	7.52
7/19/2021	3.38				4.0	2.0		0.05	7.16	7.46	7.21
7/20/2021	2.71		3.23					0.06	7.61	7.62	7.67
7/21/2021	2.67		3.22					0.07	8.35	8.53	8.42
7/22/2021	2.76							0.08	8.49	8.14	8.57
7/23/2021	2.12										
7/24/2021	1.91										
7/25/2021	3.60							0.09	7.56	7.60	7.65
7/26/2021	3.10				5.8	5.2		0.09	7.12	7.03	7.21
7/27/2021	2.45		5.37					0.11	7.13	7.00	7.24
7/28/2021	2.40							0.10	7.60	7.30	7.70
7/29/2021	1.84							0.10	7.23	7.13	7.33
7/30/2021	1.55										
7/31/2021	4.06										
8/1/2021	4.33							0.06	6.42	6.15	6.48

Date	E004 Eff Flow MG	<	E004 Eff BOD mg/L	<	E004 Eff TSS mg/L	E004 Eff E. coli #/100ml	<	E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}+NO5_{Lachat}$
Frequency	Daily		Weekly		Weekly	Weekly		2x/Month	5x/Week	5x/Week	
8/2/2021	3.97				4.4	4.1		0.06	6.04	5.85	6.10
8/3/2021	3.25		5.59					0.07	6.58	6.49	6.65
8/4/2021	3.38		5.16					0.06	6.46	6.72	6.52
8/5/2021	2.28							0.05	7.40	8.13	7.45
8/6/2021	3.02										
8/7/2021	2.31										
8/8/2021	2.29							0.05	8.45	8.34	8.50
8/9/2021	2.72							0.04	7.23	7.15	7.27
8/10/2021	1.89		6.29					0.06	8.28	8.55	8.34
8/11/2021	2.91		5.53					0.06	7.80	7.82	7.86
8/12/2021	2.64				4.0	9.5		0.08	8.36	8.40	8.44
8/13/2021	2.50										
8/14/2021	2.68										
8/15/2021	3.08				5.0			0.09	7.83	8.09	7.92
8/16/2021	3.37					9.7		0.08	7.15	7.42	7.23
8/17/2021	3.18		2.92					0.10	7.49	7.69	7.59
8/18/2021	2.71		2.75					0.08	7.58	7.69	7.66
8/19/2021	2.78							0.07	7.94	7.94	8.01
8/20/2021	3.13										
8/21/2021	4.07										
8/22/2021	4.21							0.07	8.20	8.33	8.27
8/23/2021	3.46				3.7	14.8		0.07	7.21	7.44	7.28
8/24/2021	2.94		4.96					0.07	7.46	7.52	7.53
8/25/2021	2.64		4.72					0.09	8.44	8.29	8.53
8/26/2021	3.13							0.07	8.04	8.30	8.11
8/27/2021	2.03										
8/28/2021	2.18										
8/29/2021	3.23							0.06	8.26	8.22	8.32
8/30/2021	2.77				3.6	13.4		0.06	6.71	6.93	6.77
8/31/2021	2.58		4.18					0.06	7.15	7.45	7.21
9/1/2021	2.85		3.54					0.09	8.17	8.12	8.26
9/2/2021	3.05							0.06	8.81	9.17	8.87
9/3/2021	3.22										
9/4/2021	2.80										
9/5/2021	2.35							0.07	8.49	8.57	8.56
9/6/2021	2.59				5.3	13.5		0.09	7.72	8.09	7.81
9/7/2021	2.50		3.44					0.06	5.62	5.81	5.68
9/8/2021	2.56		3.93					0.09	6.21	6.42	6.30
9/9/2021	2.90							0.07	7.31	7.59	7.38
9/10/2021	2.20										
9/11/2021	2.91										
9/12/2021	2.68		6.78					0.11	8.33	8.78	8.44
9/13/2021	2.32							0.05	7.79	7.71	7.84
9/14/2021	2.96		4.01					0.06	7.79	7.95	7.85
9/15/2021	3.07							0.08	8.53	9.13	8.61
9/16/2021	2.57				3.8	6.3		0.08	8.13	8.15	8.21
9/17/2021	2.99										
9/18/2021	2.91										
9/19/2021	3.21				4.0			0.06	6.94	6.66	7.00
9/20/2021	2.96							0.06	6.17	6.09	6.23
9/21/2021	2.25		4.08					0.04	7.83	7.98	7.87
9/22/2021	4.49		3.66			10.8		0.03	8.19	8.22	8.22
9/23/2021	4.51							0.04	8.70	8.85	8.74
9/24/2021	3.02										
9/25/2021	2.31										

Date	E004 Eff Flow MG		E004 Eff BOD mg/L		E004 Eff TSS mg/L	E004 Eff E. coli #/100ml		E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}$ +$NO5_{Lachat}$
Frequency	Daily	<	Weekly	<	Weekly	Weekly	<	2x/Month	5x/Week	5x/Week	
9/26/2021	2.95										
9/27/2021	2.74				9.6	15.8		0.13	7.18	7.10	7.31
9/28/2021	3.02		5.31					0.17	7.88	8.42	8.05
9/29/2021	3.76		4.58					0.16	8.44	8.57	8.60
9/30/2021	3.37							0.09	8.83	8.58	8.92
10/1/2021	2.88							0.13	9.59	9.48	9.72
10/2/2021	3.95										
10/3/2021	4.29		5.55					0.43	8.33	8.82	8.76
10/4/2021	3.57							0.15	7.55	7.41	7.70
10/5/2021	3.20		4.56					0.07	7.83	7.90	7.90
10/6/2021	3.34							0.14	8.37	8.43	8.51
10/7/2021	3.65				6.0	9.6		0.14	8.92	9.27	9.06
10/8/2021	4.19										
10/9/2021	4.05										
10/10/2021	4.25				8.0			0.52	7.39	7.77	7.91
10/11/2021	3.83							0.20	6.74	7.12	6.94
10/12/2021	3.66		4.76			6.3		0.11	6.06	6.20	6.17
10/13/2021	5.67		4.70					0.23	7.09	7.52	7.32
10/14/2021	6.14							0.20	8.13	8.24	8.33
10/15/2021	4.80										
10/16/2021	4.31										
10/17/2021	4.81							0.85	7.42	8.44	8.27
10/18/2021	4.84				15.2	16.0		0.35	6.99	7.54	7.34
10/19/2021	5.38		5.84					0.14	7.33	7.53	7.47
10/20/2021	4.51		6.96					0.14	7.99	8.08	8.13
10/21/2021	4.34							0.21	8.53	8.77	8.74
10/22/2021	5.33										
10/23/2021	5.75										
10/24/2021	6.07							0.98	7.02	7.97	8.00
10/25/2021	5.72				7.6	3.1		0.49	6.61	7.36	7.10
10/26/2021	5.65		5.65					0.17	7.09	7.33	7.26
10/27/2021	6.03		4.66					0.30	7.44	7.79	7.74
10/28/2021	5.54							0.39	8.05	8.15	8.44
10/29/2021	5.34										
10/30/2021	5.51										
10/31/2021	6.32							1.37	6.37	8.39	7.74
11/1/2021	5.98				11.6	9.7		0.91	7.47	7.93	8.38
11/2/2021	5.94		6.22					0.45	7.61	7.88	8.06
11/3/2021	5.21		5.78					0.40	8.29	8.56	8.69
11/4/2021	6.00							0.48	8.37	8.84	8.85
11/5/2021	6.06										
11/6/2021	6.29										
11/7/2021	5.26							1.57	7.59	9.35	9.16
11/8/2021	6.14				12.0	6.3		1.01	7.53	8.40	8.54
11/9/2021	5.20		7.72					0.67	8.33	8.95	9.00
11/10/2021	6.07		6.47					0.66	8.93	9.29	9.59
11/11/2021	5.37							0.70	9.41	9.75	10.11
11/12/2021	5.90										
11/13/2021	6.29										
11/14/2021	6.50							1.43	8.72	10.11	10.15
11/15/2021	6.17							0.80	8.23	8.70	9.03
11/16/2021	6.09		6.56					0.54	8.44	8.84	8.98
11/17/2021	5.77		6.10					0.89	8.60	9.48	9.49
11/18/2021	5.86				8.8	17.3		1.05	8.72	9.56	9.77
11/19/2021	5.98										

Date	E004 Eff Flow MG		E004 Eff BOD mg/L		E004 Eff TSS mg/L	E004 Eff E. coli #/100ml		E004 Eff NH3 mg/L Timberline	E004 Eff NO2+NO3 mg/L Lachat	E004 Eff TIN mg/L Timberline (ATP)	E004 Eff TIN calculated $NH3_{Timberline}$ +$NO5_{Lachat}$
Frequency	Daily	<	Weekly	<	Weekly	Weekly	<	2x/Month	5x/Week	5x/Week	
11/20/2021	6.19										
11/21/2021	6.22				7.4			2.21	8.03	10.04	10.24
11/22/2021	5.88		3.96			11.9		1.91	7.78	9.38	9.69
11/23/2021	6.00		3.77					1.72	8.10	10.02	9.82
11/24/2021	5.99							1.59	8.01	9.69	9.60
11/25/2021	6.07							1.97	6.80	8.58	8.77
11/26/2021	5.85										
11/27/2021	6.10										
11/28/2021	6.37							1.93	7.03	8.79	8.96
11/29/2021	6.08				5.4	15.6		1.24	6.40	7.66	7.64
11/30/2021	5.82		4.83					0.66	6.33	6.74	6.99
12/1/2021	5.94		5.08					1.03	7.39	8.03	8.42
12/2/2021	6.55							1.26	7.49	9.26	8.75
12/3/2021	5.87										
12/4/2021	6.06										
12/5/2021	6.74							0.80	6.00	7.02	6.80
12/6/2021	5.63							0.34	5.84	6.48	6.18
12/7/2021	5.76		6.79					0.33	6.26	7.04	6.59
12/8/2021	5.95		6.06					0.26	6.57	6.95	6.83
12/9/2021	6.15				7.8	6.3		0.40	6.67	7.52	7.07
12/10/2021	5.91										
12/11/2021	6.44										
12/12/2021	6.55				9.0			1.27	6.64	8.30	7.91
12/13/2021	5.88							0.70	6.55	7.81	7.25
12/14/2021	5.81		8.96					0.22	6.76	7.20	6.98
12/15/2021	5.97		6.56			9.7		0.24	7.28	7.70	7.52
12/16/2021	5.75							0.44	7.92	8.50	8.36
12/17/2021	5.79										
12/18/2021	5.83										
12/19/2021	6.18							1.65	8.33	9.80	9.98
12/20/2021	5.92				10.4	5.2		0.89	7.83	8.53	8.72
12/21/2021	5.96		7.35					0.51	8.26	8.57	8.77
12/22/2021	6.05		4.32					0.41	8.50	8.84	8.91
12/23/2021	6.05							0.37	7.93	8.33	8.30
12/24/2021	6.06										
12/25/2021	5.43										
12/26/2021	5.87							0.39	6.50	6.71	6.89
12/27/2021	5.76				7.4			0.15	5.88	5.92	6.03
12/28/2021	5.62		7.02						5.36		
12/29/2021	5.56					4.1					
12/30/2021	5.78										
12/31/2021	5.70										

City of Westn							Colorado Analytical		Colorado Analytical
Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
12/27/2020									
12/28/2020				0.012					
12/29/2020									
12/30/2020		0.31							
12/31/2020									
1/1/2021									
1/2/2021									
1/3/2021									
1/4/2021		0.32		0.008		451			
1/5/2021							140.31		
1/6/2021								<	5.0
1/7/2021									
1/8/2021									
1/9/2021									
1/10/2021									
1/11/2021				0.010	449	484			
1/12/2021									
1/13/2021									
1/14/2021	10.05	0.61							
1/15/2021									
1/16/2021									
1/17/2021		0.76							
1/18/2021				0.011		476			
1/19/2021									
1/20/2021									
1/21/2021									
1/22/2021									
1/23/2021									
1/24/2021									
1/25/2021		0.28		0.005					
1/26/2021									
1/27/2021									
1/28/2021									
1/29/2021									
1/30/2021									
1/31/2021									
2/1/2021				0.008					
2/2/2021		0.29							
2/3/2021									
2/4/2021									
2/5/2021									
2/6/2021									
2/7/2021				0.005	464	475			
2/8/2021									
2/9/2021							135.97	<	4.8
2/10/2021									
2/11/2021	8.24	0.33							
2/12/2021									
2/13/2021									
2/14/2021		0.39		0.008		466			
2/15/2021									
2/16/2021									
2/17/2021									

Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
2/18/2021									
2/19/2021									
2/20/2021									
2/21/2021									
2/22/2021		0.33		0.009		510			
2/23/2021									
2/24/2021									
2/25/2021									
2/26/2021									
2/27/2021									
2/28/2021									
3/1/2021		0.35		0.010		497			
3/2/2021							143.65	<	4.7
3/3/2021									
3/4/2021									
3/5/2021									
3/6/2021									
3/7/2021									
3/8/2021				0.007	478	508			
3/9/2021									
3/10/2021									
3/11/2021	9.37	0.30							
3/12/2021									
3/13/2021									
3/14/2021		0.40							
3/15/2021				0.006		521			
3/16/2021									
3/17/2021									
3/18/2021									
3/19/2021									
3/20/2021									
3/21/2021									
3/22/2021		0.34		0.006		607			
3/23/2021									
3/24/2021									
3/25/2021									
3/26/2021									
3/27/2021									
3/28/2021									
3/29/2021			<	0.005		600			
3/30/2021		0.55							
3/31/2021									
4/1/2021									
4/2/2021									
4/3/2021									
4/4/2021						572			
4/5/2021				0.007					
4/6/2021							189.25		
4/7/2021					556			<	4.8
4/8/2021	9.60	0.53							
4/9/2021									
4/10/2021									
4/11/2021		0.73	<	0.005		553			
4/12/2021									
4/13/2021									

Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
4/14/2021									
4/15/2021									
4/16/2021									
4/17/2021									
4/18/2021									
4/19/2021		0.59		0.005		585			
4/20/2021									
4/21/2021									
4/22/2021									
4/23/2021									
4/24/2021									
4/25/2021									
4/26/2021				0.006		599			
4/27/2021		0.83							
4/28/2021									
4/29/2021									
4/30/2021									
5/1/2021									
5/2/2021									
5/3/2021		0.76		0.008					
5/4/2021							230.83		
5/5/2021								<	4.8
5/6/2021									
5/7/2021									
5/8/2021									
5/9/2021									
5/10/2021				0.005	617	687			
5/11/2021									
5/12/2021									
5/13/2021	9.92	1.24							
5/14/2021									
5/15/2021									
5/16/2021		1.18							
5/17/2021				0.007		673			
5/18/2021									
5/19/2021									
5/20/2021									
5/21/2021									
5/22/2021									
5/23/2021						698			
5/24/2021				0.005					
5/25/2021		0.80							
5/26/2021									
5/27/2021									
5/28/2021									
5/29/2021									
5/30/2021									
5/31/2021		0.92		0.005					
6/1/2021							233.36		
6/2/2021								<	4.9
6/3/2021									
6/4/2021									
6/5/2021									
6/6/2021									
6/7/2021				0.007	652	680			

Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
6/8/2021									
6/9/2021									
6/10/2021	7.60	0.68							
6/11/2021									
6/12/2021									
6/13/2021		0.55							
6/14/2021				0.005					
6/15/2021									
6/16/2021									
6/17/2021									
6/18/2021									
6/19/2021									
6/20/2021									
6/21/2021			<	0.005					
6/22/2021		0.28							
6/23/2021									
6/24/2021									
6/25/2021									
6/26/2021									
6/27/2021									
6/28/2021		0.32		0.006					
6/29/2021									
6/30/2021									
7/1/2021									
7/2/2021									
7/3/2021									
7/4/2021									
7/5/2021		0.30		0.005					
7/6/2021							198.07		
7/7/2021								<	5.1
7/8/2021									
7/9/2021									
7/10/2021									
7/11/2021									
7/12/2021				0.006	572	617			
7/13/2021									
7/14/2021									
7/15/2021	9.93	0.71							
7/16/2021									
7/17/2021									
7/18/2021		0.73		0.008					
7/19/2021									
7/20/2021									
7/21/2021									
7/22/2021									
7/23/2021									
7/24/2021									
7/25/2021				0.030					
7/26/2021									
7/27/2021		0.44							
7/28/2021									
7/29/2021									
7/30/2021									
7/31/2021									
8/1/2021			<	0.005					

Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
8/2/2021									
8/3/2021		0.24					196.09		
8/4/2021								<	5.1
8/5/2021									
8/6/2021									
8/7/2021									
8/8/2021				0.006					
8/9/2021					537	580			
8/10/2021									
8/11/2021									
8/12/2021	9.63	0.50							
8/13/2021									
8/14/2021									
8/15/2021		0.48	<	0.005					
8/16/2021									
8/17/2021									
8/18/2021									
8/19/2021									
8/20/2021									
8/21/2021									
8/22/2021				0.005					
8/23/2021		0.37							
8/24/2021									
8/25/2021									
8/26/2021									
8/27/2021									
8/28/2021									
8/29/2021				0.005					
8/30/2021									
8/31/2021									
9/1/2021		0.24							
9/2/2021									
9/3/2021									
9/4/2021									
9/5/2021				0.007					
9/6/2021					479	543			
9/7/2021		0.28					156.52		
9/8/2021									
9/9/2021									
9/10/2021									
9/11/2021									
9/12/2021				0.005					
9/13/2021									
9/14/2021							150.10		
9/15/2021								<	4.9
9/16/2021	9.46	0.40							
9/17/2021									
9/18/2021									
9/19/2021		0.36	<	0.005					
9/20/2021									
9/21/2021									
9/22/2021									
9/23/2021									
9/24/2021									
9/25/2021									

Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
9/26/2021									
9/27/2021		0.54		0.013					
9/28/2021									
9/29/2021									
9/30/2021									
10/1/2021									
10/2/2021									
10/3/2021				0.005					
10/4/2021									
10/5/2021							155.14		
10/6/2021								<	4.9
10/7/2021	10.38	0.40							
10/8/2021									
10/9/2021									
10/10/2021		0.36		0.008					
10/11/2021					500	506			
10/12/2021									
10/13/2021							154.41		
10/14/2021									
10/15/2021									
10/16/2021									
10/17/2021				0.024					
10/18/2021		0.49							
10/19/2021									
10/20/2021									
10/21/2021									
10/22/2021									
10/23/2021									
10/24/2021				0.013					
10/25/2021									
10/26/2021		0.41							
10/27/2021									
10/28/2021									
10/29/2021									
10/30/2021									
10/31/2021				0.011					
11/1/2021									
11/2/2021		0.43					151.95		
11/3/2021								<	4.9
11/4/2021									
11/5/2021									
11/6/2021									
11/7/2021				0.014					
11/8/2021		0.50			469	493			
11/9/2021							150.50		
11/10/2021									
11/11/2021									
11/12/2021									
11/13/2021									
11/14/2021				0.013					
11/15/2021									
11/16/2021									
11/17/2021									
11/18/2021	9.90	0.45							
11/19/2021									

Date	E004 Eff TN (Timberline) mg/L	E004 Eff T-P (Lachat) mg/L	<	BDC Eff sulfide mg/L	BDC Eff TDS mg/L	BDC Eff Salinity mg/L	BDC Eff sulfate mg/L	<	E004 Eff Nonylphenol ug/L
Frequency		Monthly		Weekly			Monthly		Monthly
11/20/2021									
11/21/2021		0.35		0.009					
11/22/2021									
11/23/2021									
11/24/2021									
11/25/2021									
11/26/2021									
11/27/2021									
11/28/2021		0.29		0.008					
11/29/2021									
11/30/2021									
12/1/2021									
12/2/2021									
12/3/2021									
12/4/2021									
12/5/2021				0.014					
12/6/2021									
12/7/2021							141.57		
12/8/2021								<	5.1
12/9/2021	8.81	0.33							
12/10/2021									
12/11/2021									
12/12/2021		0.33		0.007					
12/13/2021					427	470			
12/14/2021							141.58		
12/15/2021									
12/16/2021									
12/17/2021									
12/18/2021									
12/19/2021				0.013					
12/20/2021									
12/21/2021		0.46							
12/22/2021									
12/23/2021									
12/24/2021									
12/25/2021									
12/26/2021									
12/27/2021									
12/28/2021				0.013					
12/29/2021									
12/30/2021									
12/31/2021									

City of Westminster - Big Dry Creek Wastewater Treatment Facility - 2021

	E004		E004		E004		E004		E004		E004		E004		E004		E004		E004		E004	
	ARSENIC (TOTAL)		BERYLLIUM **(TR)**		CADMIUM (TOTAL)		CHROMIUM (TOTAL)		COPPER (TOTAL)		IRON **(TR)**		LEAD (TOTAL)		MERCURY (TOTAL)		MOLYBDENUM (TOTAL)		NICKEL (TOTAL)		SELENIUM (TOTAL)		SILVER (TOTAL)	
Method Number	200.8		200.8		200.8		200.8		200.8		200.7		200.8		1631c		200.8		200.8		200.8		200.8	
Units	(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)		(ng/L)		(ug/L)		(ug/L)		(ug/L)		(ug/L)	
Frequency	Quarterly		Quarterly		Quarterly		Quarterly		Quarterly		2x/Month		Quarterly		Quarterly		Quarterly		Quarterly		Quarterly		Quarterly	
Sample Date																								
1/5/2021											38													
1/12/2021											41													
2/2/2021											30													
2/9/2021	<	0.6	<	0.1	<	0.1	<	1.5		4.1	31		0.2				2.8		1.5		1.5		<	0.5
2/10/2021																								
3/2/2021											37													
3/9/2021											35				1.39									
4/6/2021	<	0.6	<	0.1	<	0.1	<	1.5		4.0	35		0.3				2.9		1.6		2.3		<	0.5
4/7/2021																								
4/13/2021											35													
5/4/2021											41													
5/11/2021											49													
5/18/2021															1.26									
6/1/2021											54													
6/8/2021											43													
7/6/2021											38													
7/13/2021											31													
8/3/2021											50													
8/10/2021											46													
9/7/2021											38													
9/14/2021	<	0.6	<	0.1	<	0.1	<	1.5		4.7	34		0.1		2.25		3.2		1.5		2.2		<	0.5
9/15/2021																								
10/5/2021	<	0.6	<	0.1	<	0.1	<	1.5		4.7	38		0.10		0.93		2.6		1.4		2.3		<	0.5
10/6/2021																								
10/13/2021											49													
10/21/2021																								
10/28/2021																								
11/2/2021											35													

11/9/2021											47													
11/16/2021																								
12/7/2021											36													
12/14/2021											47													
Average											39.92													
Maximum	<	0.6	<	0.10	<	0.10	<	1.5		4.7	54		0.30		2.25		3.2		1.6	<	2.3	<	0.50	
Minimum	<	0.6	<	0.1	<	0.1	<	1.5		4.0	30		0.10		0.93		2.6		1.4	<	1.5	<	0.5	

NOTE: If some values for a parameter were <(X), (X) was used in calculating the average.

City of Westminster - Big Dry Creek Wastewater Treatment Facility - 2021

	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004	E004
	ARSENIC (TOTAL)	BERYLLIUM (TR)	CADMIUM (TOTAL)	CHROMIUM (TOTAL)	COPPER (TOTAL)	IRON (TR)	LEAD (TOTAL)	MERCURY (TOTAL)	MOLYBDENUM (TOTAL)	NICKEL (TOTAL)	SELENIUM (TOTAL)	SILVER (TOTAL)	ZINC (TOTAL)	BORON (TOTAL)	CYANIDE (TOTAL)	PHENOLS (TOTAL)
Method Number	200.8	200.8	200.8	200.8	200.8	200.7	200.8	1631c	200.8	200.8	200.8	200.8	200.8	SM4500 B B	SM4500 CN E	420.2
Units	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ng/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(mg/L)	(ug/L)	(ug/L)
Frequency	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	2x/Month	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly
Sample Date																
1/5/2021						38										
1/12/2021						41										
2/2/2021						30										
2/9/2021	< 0.6	< 0.1	< 0.1	< 1.5	4.1	31	0.2		2.8	1.5	1.5	< 0.5	66	0.28		< 15
2/10/2021															< 5	
3/2/2021						37										
3/9/2021						35		1.39								
4/6/2021	< 0.6	< 0.1	< 0.1	< 1.5	4.0	35	0.3		2.9	1.6	2.3	< 0.5	52	0.20		< 15
4/7/2021															< 5	
4/13/2021						35										
5/4/2021						41										
5/11/2021						49										
5/18/2021								1.26								
6/1/2021						54										
6/8/2021						43										
7/6/2021						38										
7/13/2021						31										
8/3/2021						50										
8/10/2021						46										
9/7/2021						38										
9/14/2021	< 0.6	< 0.1	< 0.1	< 1.5	4.7	34	0.1	2.25	3.2	1.5	2.2	< 0.5	52	0.27		< 15
9/15/2021															< 5	
10/5/2021	< 0.6	< 0.1	< 0.1	< 1.5	4.7	38	0.10	0.93	2.6	1.4	2.3	< 0.5	56	0.22		< 15
10/6/2021															< 5	
10/13/2021						49										
10/21/2021																
10/28/2021																
11/2/2021						35										
11/9/2021						47										
11/16/2021																
12/7/2021						36										
12/14/2021						47										
Average						39.92										
Maximum	< 0.6	< 0.10	< 0.10	< 1.5	4.7	54	0.30	2.25	3.2	1.6	< 2.3	< 0.50	66	0.28	< 5	< 15
Minimum	< 0.6	< 0.1	< 0.1	< 1.5	4.0	30	0.10	0.93	2.6	1.4	< 1.5	< 0.5	52	0.20	< 5	< 15

NOTE: If some values for a parameter were <(X), (X) was used in calculating the average.

	E004	E004	E004	E004
	COPPER (PD)	IRON (Dissolved)	MANGANESE (PD)	SELENIUM (PD)
Method Number	200.7	200.7	200.8	200.8
Units	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Frequency	Quarterly	2x/Month	2x/Month	Monthly
Sample Date				
1/5/2021			57.8	1.5
1/12/2021			47.1	
2/2/2021			79.4	
2/9/2021	4.0		79.1	1.5
2/10/2021				
3/2/2021			108.6	1.6
3/9/2021			70.7	
4/6/2021	3.2		41.7	2.3
4/7/2021				
4/13/2021			35.1	
5/4/2021			37.4	4.3
5/11/2021			36.0	
5/18/2021				
6/1/2021			68.4	4.0
6/8/2021			69.8	
7/6/2021			120.9	2.6
7/13/2021			108.2	
8/3/2021			17.3	2.1
8/10/2021			33.0	
9/7/2021		28	11.9	
9/14/2021	4.7	27	10.9	2.0
9/15/2021				
10/5/2021	4.6	30	22.9	1.5
10/6/2021				
10/13/2021		35	20.0	
10/21/2021		19		
10/28/2021		15		
11/2/2021			22.8	2.3
11/9/2021		20	27.9	
11/16/2021		19		
12/7/2021		24	45.5	1.9
12/14/2021		28	43.7	
Average			50.7	< 2.30
Maximum	4.7	35.0	120.9	4.3
Minimum	3.2	15.0	10.9	< 1.5

NOTE: If some values for a parameter were <(X), (X) was used in calculating the average.

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
Sunday, December 27, 2020	1.8	7.09		1.34	1.16	4.26	6.76		
28-Dec	1.80	6.92	2	1.01	1.07	4.42	6.50		
29-Dec	1.80	7.10							
30-Dec	1.80	7.07		0.72	0.93	3.57	5.22		
31-Dec	1.80	7.07							
1-Jan	1.80	7.03							
2-Jan	1.80	7.11							
Sunday, January 3, 2021	1.80	7.07		0.91	0.98	5.03	6.92		
4-Jan	1.80	6.90	13.4	0.88	0.88	4.17	5.93	<5	0.28
5-Jan	1.80	6.85	7.5	0.43	0.69	4.07	5.19		
6-Jan	1.80	6.84							
7-Jan	1.80	6.88							
8-Jan	1.80	6.95							
9-Jan	1.80	7.14							
Sunday, January 10, 2021	1.80	6.97		0.16	0.49	5.62	6.27		
11-Jan	1.80	6.90	7.50	0.74	0.65	5.45	6.84		
12-Jan	1.80	6.99							
13-Jan	1.83	7.08							
14-Jan	1.80	7.06		0.10	0.22	5.91	6.23		
15-Jan	1.80	7.15							
16-Jan	1.80	7.18							
Sunday, January 17, 2021	1.80	7.20							
18-Jan	1.80	6.99		0.16	0.25	6.37	6.78		
19-Jan	1.80	7.26		0.74	0.23	6.18	7.15		
20-Jan	1.80	7.03	7.4	0.10	0.21	5.02	5.33	<5	0.26
21-Jan	1.80	7.02							
22-Jan	1.80	6.98							
23-Jan	1.80	7.22							
Sunday, January 24, 2021	1.80	7.14		0.25	0.37	5.96	6.58		
25-Jan	1.80	6.94	18.5	0.56	0.45	5.83	6.84		
26-Jan	1.80	7.02		0.40	0.36	5.55	6.31		
27-Jan	1.80	6.88							
28-Jan	1.80	6.92							
29-Jan	1.80	6.88							
30-Jan	1.80	6.87							
Sunday, January 31, 2021	1.81	6.82		2.550	0.389	4.200	7.139		
1-Feb	1.82	6.86	14.6						
2-Feb	1.88	7.06	10.8	1.670	0.401	4.250	6.321		
3-Feb	2.00	6.97							
4-Feb	1.81	7.02		0.420	0.264	5.400	6.084	<5	0.14
5-Feb	1.80	6.97							
6-Feb	1.80	6.95							
Sunday, February 7, 2021	1.88	7.02		0.520	0.270	5.750	6.540		
8-Feb	1.80	6.82		1.010	0.278	4.880	6.168		
9-Feb	1.80	6.90	44.1						
10-Feb	1.80	6.84							
11-Feb	2.08	6.94		1.370	0.326	6.050	7.746		
12-Feb	1.80	6.87							

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
13-Feb	1.80	6.89							
Sunday, February 14, 2021	1.80	6.84							
15-Feb	1.80	6.86		2.140	0.360	6.240	8.740		
16-Feb	1.88	6.92		2.250	0.323	5.170	7.743		
17-Feb	1.03	6.81	5.2	2.150	0.324	4.550	7.024	<5	0.35
18-Feb									
19-Feb	1.80	7.14							
20-Feb	2.34	6.99							
Sunday, February 21, 2021	2.00	6.59		2.650	0.255	5.090	7.995		
22-Feb	1.81	6.78	6.3	2.700	0.292	5.100	8.092		
23-Feb	1.18	7.17							
24-Feb									
25-Feb	1.55	6.90							
26-Feb	2.51	6.87		1.750	0.489	3.060	5.299		
27-Feb	2.73	6.98							
Sunday, February 28, 2021	2.85	6.96		2.790	0.391	3.900	7.081		
1-Mar	2.08	6.96	41.40	2.750	0.430	5.890	9.040	<5	0.28
2-Mar	2.07	6.90	6.30						
3-Mar	2.17	6.72		1.520	0.290	5.820	7.630		
4-Mar	2.15	6.80							
5-Mar	2.16	6.95							
6-Mar	2.16	6.86							
Sunday, March 7, 2021	2.16	7.02		1.600	0.222	4.690	6.512		
8-Mar	2.16	6.95	0	2.010	0.230	4.700	6.940		
9-Mar	2.16	6.91							
10-Mar	2.15	6.91							
11-Mar	2.15	6.93		1.700	0.205	5.450	7.355		
12-Mar	2.15	6.85							
13-Mar	2.15	6.86							
Sunday, March 14, 2021	2.15	6.83							
15-Mar	2.15	6.80							
16-Mar	2.46	6.83		0.570	0.108	4.700	5.378		
17-Mar	3.14	6.89	1	3.320	0.264	5.250	8.834	<5	0.21
18-Mar	3.09	6.91		2.72	0.226	5.74	8.686		
19-Mar	3.38	6.89							
20-Mar	3.55	7.02							
Sunday, March 21, 2021	3.32	7.20		5.550	0.092	5.750	11.392		
22-Mar	3.42	7.08	3	8.610	0.090	4.190	12.890		
23-Mar	3.38	6.89							
24-Mar	2.15	7.02		9.280	0.121	2.380	11.781		
25-Mar	2.16	7.03		9.400	0.125	1.460	10.985		
26-Mar	2.15	6.95							
27-Mar	2.16	7.03							
Sunday, March 28, 2021	2.17	6.90		3.820	0.131	4.360	8.311		
29-Mar	2.16	7.14		4.040	0.166	3.380	7.586		
30-Mar	2.15	6.97		1.870	0.143	4.710	6.723		
31-Mar	2.15	6.85							
1-Apr	2.16	6.87	13.5						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
2-Apr	2.16	7.00							
3-Apr	2.16	6.90							
Sunday, April 4, 2021	2.16	6.90		1.840	0.184	4.940	6.964	<5	0.36
5-Apr	2.16	6.88	2	1.520	0.415	4.620	6.555		
6-Apr	2.15	6.87	3						
7-Apr	2.16	6.84							
8-Apr	2.16	6.87		0.630	0.161	4.570	5.361		
9-Apr	2.15	6.94							
10-Apr	2.16	7.19							
Sunday, April 11, 2021	2.15	6.74		1.490	0.240	5.100	6.830		
12-Apr	2.15	6.65	14.60	1.200	0.272	5.240	6.712		
13-Apr	2.15	7.87		0.850	0.239	5.690	6.779		
14-Apr	2.15	7.82							
15-Apr	2.30	7.30						<5	0.32
16-Apr	2.60	7.36							
17-Apr	2.60	7.20							
Sunday, April 18, 2021	2.62	7.20		0.700	0.211	5.600	6.511		
19-Apr	2.60	7.15	5.2	0.450	0.221	5.520	6.191		
20-Apr	2.60	7.26		0.460	0.222	5.340	6.022		
21-Apr	2.60	7.20							
22-Apr	2.62	7.07							
23-Apr	2.61	7.32							
24-Apr	2.62	7.12							
Sunday, April 25, 2021	2.61	6.79		0.260	0.192	5.960	6.412		
26-Apr	2.62	6.86	9.70	0.170	0.205	5.430	5.805		
27-Apr	2.62	6.89							
28-Apr	2.62	7.31		0.220	0.220	5.360	5.800		
29-Apr	2.62	7.11							
30-Apr	2.79	7.12							
1-May	1.05	7.27							
Sunday, May 2, 2021	1.00	6.99		0.130	0.109	5.490	5.729		
3-May	1.07	7.02	13.1	0.140	0.227	5.000	5.367		
4-May	2.60	7.58	18.3	0.210	0.118	5.560	5.888		
5-May	0.39	7.08						5.000	0.26
6-May									
7-May									
8-May									
Sunday, May 9, 2021									
10-May									
11-May									
12-May									
13-May									
14-May									
15-May									
Sunday, May 16, 2021									
17-May									
18-May									
19-May									

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
20-May									
21-May									
22-May									
Sunday, May 23, 2021									
24-May									
25-May									
26-May	0.62	7.47	16	0.130	0.161	4.910	5.201	5.000	0.35
27-May									
28-May									
29-May									
Sunday, May 30, 2021									
31-May									
1-Jun									
2-Jun									
3-Jun									
4-Jun									
5-Jun									
Sunday, June 6, 2021									
7-Jun			71.70						
8-Jun	0.33	7.18	57.30	0.330	0.239	3.060	3.629	<5.0	0.44
9-Jun	0.38	7.16		0.150	0.184	3.900	4.234		
10-Jun	0.46	7.51		0.16	0.183	4.25	4.593		
11-Jun	0.46	7.39							
12-Jun									
Sunday, June 13, 2021									
14-Jun	0.47	7.30	9.80	0.21	0.27	3.61	4.09		
15-Jun									
16-Jun									
17-Jun	1.12	7.36		0.38	0.55	8.19	9.12		
18-Jun	0.97	7.20		0.18	0.23	6.61	7.02	<5.0	0.3
19-Jun	1.09	7.17							
Sunday, June 20, 2021	0.96	7.06		0.20	0.25	6.22	6.67		
21-Jun	0.96	7.01	16.9	0.21	0.29	5.77	6.27		
22-Jun	1.30	7.10		0.17	0.32	5.80	6.29		
23-Jun	1.30	7.14							
24-Jun	1.30	7.20							
25-Jun	1.30	7.38							
26-Jun	1.30	7.57							
Sunday, June 27, 2021	1.30	7.08							
28-Jun	2.58	7.39		0.63	0.54	5.99	7.16		
29-Jun	2.59	7.37	9.6	0.43	0.70	6.53	7.66		
30-Jun	2.58	7.30		0.43	0.78	7.50	8.71		
1-Jul									
2-Jul									
3-Jul									
Sunday, July 4, 2021									
5-Jul									
6-Jul									

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
7-Jul									
8-Jul									
9-Jul									
10-Jul									
Sunday, July 11, 2021									
12-Jul									
13-Jul									
14-Jul									
15-Jul									
16-Jul									
17-Jul									
Sunday, July 18, 2021									
19-Jul									
20-Jul									
21-Jul									
22-Jul									
23-Jul									
24-Jul									
Sunday, July 25, 2021									
26-Jul									
27-Jul									
28-Jul									
29-Jul									
30-Jul									
31-Jul									
Sunday, August 1, 2021									
2-Aug									
3-Aug	2.45	7.13	344.8	0.26	0.31	5.37	5.94		
4-Aug	3.56	7.33	2	0.16	0.28	7.68	8.12	<5	0.29
5-Aug	2.11	7.14	2	0.15	0.23	6.68	7.06		
6-Aug	2.30	7.59							
7-Aug	2.31	7.36							
Sunday, August 8, 2021	2.58	7.15		0.14	0.26	5.26	5.66		
9-Aug	2.81	7.23	0	0.12	0.33	5.47	5.92		
10-Aug	2.82	7.20							
11-Aug	2.81	7.18							
12-Aug	2.81	7.23		0.12	0.265	6.23	6.62		
13-Aug	2.81	7.26							
14-Aug	2.81	6.80							
Sunday, August 15, 2021	2.81	6.77		0.27	0.32	5.85	6.44		
16-Aug	2.82	6.88		0.21	0.34	6.06	6.61	<5	0.33
17-Aug	2.81	6.87	6.3	0.17	0.26	5.68	6.11		
18-Aug	2.81	6.93							
19-Aug	2.81	7.76							
20-Aug	2.81	7.46							
21-Aug	2.81	7.77							
Sunday, August 22, 2021	2.81	7.30		0.00	0.22	6.58	6.80		
23-Aug	2.81	7.47	2	0.00	0.29	6.53	6.82		

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
24-Aug	2.26	7.61		0.00	0.10	6.23	6.33		
25-Aug	2.26	7.22							
26-Aug	2.26	7.13							
27-Aug	2.27	7.17							
28-Aug	2.26	7.27							
Sunday, August 29, 2021	2.26	7.24		0.15	0.20	5.60	5.95		
30-Aug	2.26	7.30	8.4	0.26	0.28	5.75	6.29		
31-Aug	2.26	7.32							
1-Sep	2.26	7.29		0.10	0.17	6.34	6.61	<5	0.31
2-Sep	2.26	6.97							
3-Sep	1.95	6.97							
4-Sep	1.95	7.02							
Sunday, September 5, 2021	1.98	6.90							
6-Sep	1.95	6.71							
7-Sep	2.10	7.21							
8-Sep	1.95	7.03		0.16	0.30	5.67	6.13		
9-Sep	2.45	7.16	1	0.11	0.21	6.75	7.07		
10-Sep	2.45	6.94	4.1	0.20	0.311	8.00	8.51		
11-Sep	2.45	7.03							
Sunday, September 12, 2021	2.45	6.88		0.55	0.42	7.32	8.29		
13-Sep	2.45	6.77	6.3	1.32	0.73	5.86	7.91	<5	0.29
14-Sep	2.45	6.75		0.75	0.78	5.60	7.13		
15-Sep	1.64	6.74							
16-Sep	1.61	7.00							
17-Sep	1.61	6.99							
18-Sep	1.61	7.32							
Sunday, September 19, 2021	1.61	7.03		1.63	1.09	4.13	6.85		
20-Sep	1.61	6.78	27.2	2.86	1.96	2.43	7.25		
21-Sep	1.61	6.98		1.04	1.37	3.00	5.41		
22-Sep	2.00	7.03							
23-Sep	2.00	6.73							
24-Sep	2.00	6.62							
25-Sep	2.00	7.47							
Sunday, September 26, 2021	2.00	7.27		0.95	1.10	3.99	6.04		
27-Sep	2.00	7.17	13.5	1.27	1.14	4.43	6.84		
28-Sep	2.00	7.27		0.35	0.87	3.72	4.94		
29-Sep	2.00	6.89							
30-Sep	2.00	6.83							
1-Oct	2.00	7.50							
2-Oct	2.00	6.99							
Sunday, October 3, 2021	2.00	7.06		0.17	4.83	0.52	5.52		
4-Oct	2.00	6.68	6.3	0.12	3.88	0.28	4.28		
5-Oct	2.00	6.73	5.1						
6-Oct	2.00	6.70							
7-Oct	2.00	6.68		0.10	4.73	0.12	4.95		
8-Oct	2.00	7.17							0.26
9-Oct	2.00	6.85						<5.00	
Sunday, October 10, 2021	2.00	7.06		0.11	3.78	0.13	4.02		

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
11-Oct	2.00	6.68	5.2	0.16	3.25	0.25	3.66		
12-Oct	2.00	6.82		0.13	3.19	0.17	3.49		
13-Oct	2.00	6.71							
14-Oct	2.00	7.34							
15-Oct	2.00	6.74							
16-Oct	2.00	6.75							
Sunday, October 17, 2021	2.00	6.68		0.15	4.33	0.37	4.85		
18-Oct	2.00	6.96	4.1	0.11	3.53	0.22	3.86		0.27
19-Oct	2.00	6.97		0.10	3.93	0.14	4.17	<5.00	
20-Oct	2.00	6.98							
21-Oct	2.00	7.15							
22-Oct	2.00	7.20							
23-Oct	2.00	7.01							
Sunday, October 24, 2021	2.00	6.75		0.12	8.44	0.45	9.01		
25-Oct	2.00	6.82	7.5	<0.10	7.11	0.18	7.29		
26-Oct	2.00	6.72		0.11	7.47	0.24	7.82		
27-Oct	2.00	6.62							
28-Oct	2.00	6.74							
29-Oct	2.00	6.73							
30-Oct	2.00	6.79							
Sunday, October 31, 2021	2.00	6.81		0.86	7.59	0.54	8.99		
1-Nov	2.00	6.62	4.1	0.26	0.37	7.54	8.17		
2-Nov	2.00	6.81		4.94	0.93	6.36	12.23	<5.0	0.3
3-Nov	2.00	7.01							
4-Nov	2.00	6.78							
5-Nov	1.61	6.58							
6-Nov	1.61	6.98							
Sunday, November 7, 2021	1.61	7.06		0.65	0.47	7.67	8.79		
8-Nov	1.61	7.14	22.6	0.23	0.37	6.94	7.54		
9-Nov	1.61	7.22	18.3	0.23	0.35	6.68	7.26		
10-Nov	1.61	7.17							
11-Nov	1.61	7.28							
12-Nov	1.61	7.39							
13-Nov	1.61	7.24							
Sunday, November 14, 2021	1.61	6.61		1.43	0.34	6.65	8.42		
15-Nov	1.61	6.78	19.9						
16-Nov	1.61	6.92							
17-Nov	1.61	6.79		0.30	0.22	7.32	7.84		
18-Nov	1.61	6.85		0.44	0.304	7.56	8.30		
19-Nov	1.61	7.03						<5.0	0.46
20-Nov	1.61	6.96							
Sunday, November 21, 2021	1.61	6.65		1.00	0.28	6.68	7.96		
22-Nov	1.61	6.67	2	0.65	0.30	5.88	6.83		
23-Nov	1.61	6.61		0.27	0.24	5.59	6.10		
24-Nov	1.62	6.71							
25-Nov	1.61	6.66							
26-Nov	1.61	6.80							
27-Nov	1.61	7.04							

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
		Daily	Weekly	Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
Sunday, November 28, 2021	1.61	7.22		1.73	0.37	5.67	7.77		
29-Nov	1.61	6.61	8.6	0.77	0.38	5.15	6.30		
30-Nov	1.61	6.85		0.85	0.39	3.72	4.96		
1-Dec	1.61	6.78							
2-Dec	1.61	6.79							
3-Dec	1.61	6.75							
4-Dec	1.61	6.80							
Sunday, December 5, 2021	1.61	6.77							
6-Dec	2.56	6.69							
7-Dec	2.58	6.69		0.84	0.54	3.03	4.406		0.45
8-Dec	2.58	7.59	3	1.00	0.54	3.58	5.117	<5	
9-Dec	2.58	7.18		0.83	0.46	4.17	5.461		
10-Dec	2.58	7.25							
11-Dec	2.58	7.92							
Sunday, December 12, 2021	2.58	7.33		6.52	0.56	4.18	11.259		
13-Dec	2.59	6.88	4.10	8.70	0.63	2.77	12.102		
14-Dec	2.58	7.64		6.46	0.69	3.47	10.615		
15-Dec	2.58	7.25							
16-Dec	2.58	7.10						<5	0.2
17-Dec	2.58	6.60							
18-Dec	2.58	7.17							
Sunday, December 19, 2021	2.58	6.65		3.52	0.46	4.37	8.351		
20-Dec	2.58	6.65	3.1	3.54	0.48	4.41	8.431		
21-Dec	2.58	6.91		2.87	0.48	4.59	7.938		
22-Dec	2.58	7.42							
23-Dec	2.58	6.91							
24-Dec	2.58	6.80							
25-Dec	2.58	7.26							
Sunday, December 26, 2021	2.58	6.65		1.49	0.38	4.47	6.344		
27-Dec	2.58	6.78	45.5	2.74	0.39	4.99	8.124		
28-Dec	2.41	6.73		1.73	0.36	4.64	6.730		
29-Dec	2.58	6.66							
30-Dec	2.58	6.72							
31-Dec	2.58	6.74							
1-Jan									

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
Sunday, December 27, 2020						
28-Dec						0.348
29-Dec						
30-Dec						
31-Dec						
1-Jan						
2-Jan						
Sunday, January 3, 2021						
4-Jan	27	93.4	0	205.16		
5-Jan						
6-Jan						
7-Jan						
8-Jan						
9-Jan						
Sunday, January 10, 2021						
11-Jan						
12-Jan						
13-Jan						
14-Jan						0.222
15-Jan						
16-Jan						
Sunday, January 17, 2021						
18-Jan						
19-Jan						
20-Jan	28	97.4	0.03	207.46	<4.7	
21-Jan						
22-Jan						
23-Jan						
Sunday, January 24, 2021						
25-Jan						
26-Jan						
27-Jan						
28-Jan						
29-Jan						
30-Jan						
Sunday, January 31, 2021						
1-Feb						
2-Feb						
3-Feb						
4-Feb	41	101	0	202.64		
5-Feb						
6-Feb						
Sunday, February 7, 2021						
8-Feb						
9-Feb						
10-Feb						
11-Feb						0.215
12-Feb						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
13-Feb						
Sunday, February 14, 2021						
15-Feb						
16-Feb					<4.7	
17-Feb	38	90.9	0	201.88		
18-Feb						
19-Feb						
20-Feb						
Sunday, February 21, 2021						
22-Feb						
23-Feb						
24-Feb						
25-Feb						
26-Feb						
27-Feb						
Sunday, February 28, 2021						
1-Mar	43	106.4	<0.1	196.28		
2-Mar						
3-Mar						
4-Mar						
5-Mar						
6-Mar						
Sunday, March 7, 2021						
8-Mar						
9-Mar						
10-Mar						
11-Mar						0.243
12-Mar						
13-Mar						
Sunday, March 14, 2021						
15-Mar						
16-Mar						
17-Mar	29	101.3	<0.1	247.65	<4.7	
18-Mar						
19-Mar						
20-Mar						
Sunday, March 21, 2021						
22-Mar						
23-Mar						
24-Mar						
25-Mar						
26-Mar						
27-Mar						
Sunday, March 28, 2021						
29-Mar						
30-Mar						
31-Mar						
1-Apr						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
2-Apr						
3-Apr						
Sunday, April 4, 2021	31	112.9	<0.1	297.53		
5-Apr						
6-Apr						
7-Apr						
8-Apr						0.276
9-Apr						
10-Apr						
Sunday, April 11, 2021						
12-Apr						
13-Apr						
14-Apr						
15-Apr	32	126	<0.1	278.1		
16-Apr						
17-Apr						
Sunday, April 18, 2021						
19-Apr	28			298.4		
20-Apr						
21-Apr						
22-Apr						
23-Apr						
24-Apr						
Sunday, April 25, 2021						
26-Apr						
27-Apr						
28-Apr	32			332.82		
29-Apr						
30-Apr						
1-May						
Sunday, May 2, 2021						
3-May						
4-May						
5-May	18	68	0.1	375.64		
6-May						
7-May						
8-May						
Sunday, May 9, 2021						
10-May						
11-May						
12-May						
13-May						
14-May						
15-May						
Sunday, May 16, 2021						
17-May						
18-May						
19-May						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
20-May						
21-May						
22-May						
Sunday, May 23, 2021						
24-May						
25-May						
26-May	33	50.2	0.1	393.36		0.633
27-May						
28-May						
29-May						
Sunday, May 30, 2021						
31-May						
1-Jun						
2-Jun						
3-Jun						
4-Jun						
5-Jun						
Sunday, June 6, 2021						
7-Jun						
8-Jun	24	249.4	<0.1	366.64		
9-Jun						
10-Jun						0.295
11-Jun						
12-Jun						
Sunday, June 13, 2021						
14-Jun						
15-Jun						
16-Jun						
17-Jun						
18-Jun	13	168.2	<0.1	325.41		
19-Jun						
Sunday, June 20, 2021						
21-Jun						
22-Jun					<4.7	
23-Jun						
24-Jun						
25-Jun						
26-Jun						
Sunday, June 27, 2021						
28-Jun						
29-Jun						
30-Jun						
1-Jul						
2-Jul						
3-Jul						
Sunday, July 4, 2021						
5-Jul						
6-Jul						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
7-Jul						
8-Jul						
9-Jul						
10-Jul						
Sunday, July 11, 2021						
12-Jul						
13-Jul						
14-Jul						
15-Jul						
16-Jul						
17-Jul						
Sunday, July 18, 2021						
19-Jul						
20-Jul						
21-Jul						
22-Jul						
23-Jul						
24-Jul						
Sunday, July 25, 2021						
26-Jul						
27-Jul						
28-Jul						
29-Jul						
30-Jul						
31-Jul						
Sunday, August 1, 2021						
2-Aug						
3-Aug						
4-Aug	16	520	<0.1	273.17		
5-Aug						
6-Aug					<4.7	
7-Aug						
Sunday, August 8, 2021						
9-Aug						
10-Aug						
11-Aug						
12-Aug						0.476
13-Aug						
14-Aug						
Sunday, August 15, 2021						
16-Aug	26	111.3	<0.1	221.29		
17-Aug						
18-Aug		82.8				
19-Aug		87.7				
20-Aug						
21-Aug						
Sunday, August 22, 2021						
23-Aug						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
24-Aug						
25-Aug						
26-Aug						
27-Aug						
28-Aug						
Sunday, August 29, 2021						
30-Aug						
31-Aug						
1-Sep	27	240.5	<0.1	214.67		
2-Sep						
3-Sep						
4-Sep						
Sunday, September 5, 2021						
6-Sep						
7-Sep						
8-Sep						
9-Sep						
10-Sep						
11-Sep						
Sunday, September 12, 2021						
13-Sep	13	333	<0.1	196.77	<4.7	
14-Sep						
15-Sep						
16-Sep						0.188
17-Sep						
18-Sep						
Sunday, September 19, 2021						
20-Sep						
21-Sep						
22-Sep						
23-Sep						
24-Sep						
25-Sep						
Sunday, September 26, 2021						
27-Sep						
28-Sep						
29-Sep						
30-Sep						
1-Oct						
2-Oct						
Sunday, October 3, 2021						
4-Oct						
5-Oct						
6-Oct						
7-Oct						
8-Oct	19	69	<0.1	207.04		0.117
9-Oct						
Sunday, October 10, 2021						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
11-Oct						
12-Oct						
13-Oct						
14-Oct						
15-Oct						
16-Oct						
Sunday, October 17, 2021						
18-Oct	22	56	<0.1	215.44		
19-Oct						
20-Oct						
21-Oct						
22-Oct						
23-Oct						
Sunday, October 24, 2021						
25-Oct						
26-Oct						
27-Oct						
28-Oct						
29-Oct						
30-Oct						
Sunday, October 31, 2021						
1-Nov						
2-Nov	29	124.7	<0.1	199.85		
3-Nov						
4-Nov						
5-Nov						
6-Nov						
Sunday, November 7, 2021						
8-Nov						
9-Nov						
10-Nov						
11-Nov					<9.3	
12-Nov						
13-Nov						
Sunday, November 14, 2021						
15-Nov						
16-Nov						
17-Nov						
18-Nov						0.834
19-Nov	28	96.5	<0.1	189.66		
20-Nov						
Sunday, November 21, 2021						
22-Nov						
23-Nov						
24-Nov						
25-Nov						
26-Nov						
27-Nov						

	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC	007 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
Sunday, November 28, 2021						
29-Nov						0.2
30-Nov						
1-Dec						
2-Dec						
3-Dec						
4-Dec						
Sunday, December 5, 2021						
6-Dec						
7-Dec	78	141.2	<0.1	187.43		
8-Dec						
9-Dec						0.221
10-Dec						
11-Dec						
Sunday, December 12, 2021						
13-Dec						
14-Dec						
15-Dec						
16-Dec	55	119.7	<0.1	192.97	<4.7	
17-Dec						
18-Dec						
Sunday, December 19, 2021						
20-Dec						
21-Dec						
22-Dec						
23-Dec						
24-Dec						
25-Dec						
Sunday, December 26, 2021						
27-Dec						
28-Dec						
29-Dec						
30-Dec						
31-Dec						
1-Jan						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
Sunday, December 27, 2020									
28-Dec									
29-Dec									
30-Dec									
31-Dec									
1-Jan									
2-Jan									
Sunday, January 3, 2021									
4-Jan									
5-Jan									
6-Jan									
7-Jan									
8-Jan									
9-Jan									
Sunday, January 10, 2021									
11-Jan									
12-Jan									
13-Jan									
14-Jan									
15-Jan									
16-Jan									
Sunday, January 17, 2021									
18-Jan									
19-Jan									
20-Jan									
21-Jan									
22-Jan									
23-Jan									
Sunday, January 24, 2021									
25-Jan									
26-Jan									
27-Jan									
28-Jan									
29-Jan									
30-Jan									
Sunday, January 31, 2021									
1-Feb									
2-Feb									
3-Feb									
4-Feb									
5-Feb									
6-Feb									
Sunday, February 7, 2021									
8-Feb									
9-Feb									
10-Feb									
11-Feb									
12-Feb									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
13-Feb									
Sunday, February 14, 2021									
15-Feb									
16-Feb									
17-Feb									
18-Feb									
19-Feb									
20-Feb									
Sunday, February 21, 2021									
22-Feb									
23-Feb									
24-Feb									
25-Feb									
26-Feb									
27-Feb									
Sunday, February 28, 2021									
1-Mar									
2-Mar									
3-Mar									
4-Mar									
5-Mar									
6-Mar									
Sunday, March 7, 2021									
8-Mar									
9-Mar									
10-Mar									
11-Mar									
12-Mar									
13-Mar									
Sunday, March 14, 2021									
15-Mar									
16-Mar									
17-Mar									
18-Mar									
19-Mar									
20-Mar									
Sunday, March 21, 2021									
22-Mar									
23-Mar									
24-Mar									
25-Mar									
26-Mar									
27-Mar									
Sunday, March 28, 2021									
29-Mar									
30-Mar									
31-Mar									
1-Apr									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
2-Apr									
3-Apr									
Sunday, April 4, 2021									
5-Apr									
6-Apr									
7-Apr									
8-Apr									
9-Apr									
10-Apr									
Sunday, April 11, 2021									
12-Apr									
13-Apr									
14-Apr									
15-Apr									
16-Apr									
17-Apr									
Sunday, April 18, 2021									
19-Apr									
20-Apr									
21-Apr									
22-Apr									
23-Apr									
24-Apr									
Sunday, April 25, 2021									
26-Apr									
27-Apr									
28-Apr									
29-Apr									
30-Apr									
1-May									
Sunday, May 2, 2021									
3-May									
4-May									
5-May									
6-May									
7-May									
8-May									
Sunday, May 9, 2021									
10-May									
11-May									
12-May									
13-May									
14-May									
15-May									
Sunday, May 16, 2021									
17-May									
18-May									
19-May									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
20-May									
21-May									
22-May									
Sunday, May 23, 2021									
24-May									
25-May									
26-May									
27-May									
28-May									
29-May									
Sunday, May 30, 2021									
31-May									
1-Jun									
2-Jun									
3-Jun									
4-Jun									
5-Jun									
Sunday, June 6, 2021									
7-Jun									
8-Jun									
9-Jun									
10-Jun									
11-Jun									
12-Jun									
Sunday, June 13, 2021									
14-Jun									
15-Jun									
16-Jun									
17-Jun									
18-Jun									
19-Jun									
Sunday, June 20, 2021									
21-Jun									
22-Jun									
23-Jun									
24-Jun									
25-Jun									
26-Jun									
Sunday, June 27, 2021									
28-Jun									
29-Jun									
30-Jun									
1-Jul									
2-Jul									
3-Jul									
Sunday, July 4, 2021									
5-Jul									
6-Jul									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
7-Jul			2						
8-Jul	1.03	7.84	6.3	1.510	0.1	0.755	2.41		
9-Jul	1.34	7.59		1.440	0.2	0.887	2.50	<5	0.28
10-Jul	1.14	8.16		1.470	0.2	0.794	2.43		
Sunday, July 11, 2021	1.01	8.12		1.46	0.2	0.800	2.43		
12-Jul	1.01	7.93	0.00	1.46	0.2	0.750	2.39		
13-Jul	1.02	8.15							
14-Jul	1.51	8.00							
15-Jul	3.33	7.99		1.20	0.2	0.774	2.20		
16-Jul	4.29	8.00							
17-Jul	4.13	8.01							
Sunday, July 18, 2021	4.14	7.94							
19-Jul	4.67	8.03		1.240	0.4	0.868	2.46		
20-Jul	5.52	7.89		0.900	0.4	0.883	2.23	<5	0.42
21-Jul	5.46	8.25							
22-Jul	5.40	8.10							
23-Jul	5.48	8.14	2	1.010	0.3	0.976	2.33		
24-Jul	5.73	8.22							
Sunday, July 25, 2021	5.65	8.26		0.81	0.3	0.942	2.03		
26-Jul	5.52	8.37	8.2	0.51	0.4	0.856	1.72		
27-Jul	5.45	8.16							
28-Jul	5.26	8.26							
29-Jul	5.40	8.28		0.85	0.3	0.925	2.03		
30-Jul	5.32	8.60							
31-Jul	5.41	8.40							
Sunday, August 1, 2021	5.22	8.49		0.16	0.17	0.820	1.15		
2-Aug	3.58	8.20	27.9	0.000	0.15	0.870	1.02	<5	0.38
3-Aug	1.34	8.66		0.130	0.13	0.841	1.10		
4-Aug	1.33	8.45							
5-Aug	1.48	8.57							
6-Aug	1.64	8.78							
7-Aug	1.25	8.58							
Sunday, August 8, 2021									
9-Aug									
10-Aug									
11-Aug									
12-Aug									
13-Aug									
14-Aug									
Sunday, August 15, 2021									
16-Aug									
17-Aug									
18-Aug									
19-Aug									
20-Aug									
21-Aug									
Sunday, August 22, 2021									
23-Aug									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
24-Aug									
25-Aug									
26-Aug									
27-Aug									
28-Aug									
Sunday, August 29, 2021									
30-Aug									
31-Aug									
1-Sep									
2-Sep									
3-Sep									
4-Sep									
Sunday, September 5, 2021									
6-Sep									
7-Sep									
8-Sep									
9-Sep									
10-Sep									
11-Sep									
Sunday, September 12, 2021									
13-Sep									
14-Sep									
15-Sep									
16-Sep									
17-Sep									
18-Sep									
Sunday, September 19, 2021									
20-Sep									
21-Sep									
22-Sep									
23-Sep									
24-Sep									
25-Sep									
Sunday, September 26, 2021									
27-Sep									
28-Sep									
29-Sep									
30-Sep									
1-Oct									
2-Oct									
Sunday, October 3, 2021									
4-Oct									
5-Oct									
6-Oct									
7-Oct									
8-Oct									
9-Oct									
Sunday, October 10, 2021									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
11-Oct									
12-Oct									
13-Oct									
14-Oct									
15-Oct									
16-Oct									
Sunday, October 17, 2021									
18-Oct									
19-Oct									
20-Oct									
21-Oct									
22-Oct									
23-Oct									
Sunday, October 24, 2021									
25-Oct									
26-Oct									
27-Oct									
28-Oct									
29-Oct									
30-Oct									
Sunday, October 31, 2021									
1-Nov									
2-Nov									
3-Nov									
4-Nov									
5-Nov									
6-Nov									
Sunday, November 7, 2021									
8-Nov									
9-Nov									
10-Nov									
11-Nov									
12-Nov									
13-Nov									
Sunday, November 14, 2021									
15-Nov									
16-Nov									
17-Nov									
18-Nov									
19-Nov									
20-Nov									
Sunday, November 21, 2021									
22-Nov									
23-Nov									
24-Nov									
25-Nov									
26-Nov									
27-Nov									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Flow	**pH**	**E. coli**	**Ammonia**	**NO2**	**NO3**	**TIN**	**WAD - CN**	**Boron (T)**
	MGD	SU	MPN/100 mL	mg/L as N	mg/L as N	mg/L as N	mg/L as N	ug/l	mg/l
		Grab	Grab	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Comp. 3xWeek	Grab	Composite
				Method TMA-001	Method TMA-001	Method TMA-001	Method TMA-001	2x Monthly	2x Monthly
Sunday, November 28, 2021									
29-Nov									
30-Nov									
1-Dec									
2-Dec									
3-Dec									
4-Dec									
Sunday, December 5, 2021									
6-Dec									
7-Dec									
8-Dec									
9-Dec									
10-Dec									
11-Dec									
Sunday, December 12, 2021									
13-Dec									
14-Dec									
15-Dec									
16-Dec									
17-Dec									
18-Dec									
Sunday, December 19, 2021									
20-Dec									
21-Dec									
22-Dec									
23-Dec									
24-Dec									
25-Dec									
Sunday, December 26, 2021									
27-Dec									
28-Dec									
29-Dec									
30-Dec									
31-Dec									
1-Jan									

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
Sunday, December 27, 2020						
28-Dec						
29-Dec						
30-Dec						
31-Dec						
1-Jan						
2-Jan						
Sunday, January 3, 2021						
4-Jan						
5-Jan						
6-Jan						
7-Jan						
8-Jan						
9-Jan						
Sunday, January 10, 2021						
11-Jan						
12-Jan						
13-Jan						
14-Jan						
15-Jan						
16-Jan						
Sunday, January 17, 2021						
18-Jan						
19-Jan						
20-Jan						
21-Jan						
22-Jan						
23-Jan						
Sunday, January 24, 2021						
25-Jan						
26-Jan						
27-Jan						
28-Jan						
29-Jan						
30-Jan						
Sunday, January 31, 2021						
1-Feb						
2-Feb						
3-Feb						
4-Feb						
5-Feb						
6-Feb						
Sunday, February 7, 2021						
8-Feb						
9-Feb						
10-Feb						
11-Feb						
12-Feb						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
13-Feb						
Sunday, February 14, 2021						
15-Feb						
16-Feb						
17-Feb						
18-Feb						
19-Feb						
20-Feb						
Sunday, February 21, 2021						
22-Feb						
23-Feb						
24-Feb						
25-Feb						
26-Feb						
27-Feb						
Sunday, February 28, 2021						
1-Mar						
2-Mar						
3-Mar						
4-Mar						
5-Mar						
6-Mar						
Sunday, March 7, 2021						
8-Mar						
9-Mar						
10-Mar						
11-Mar						
12-Mar						
13-Mar						
Sunday, March 14, 2021						
15-Mar						
16-Mar						
17-Mar						
18-Mar						
19-Mar						
20-Mar						
Sunday, March 21, 2021						
22-Mar						
23-Mar						
24-Mar						
25-Mar						
26-Mar						
27-Mar						
Sunday, March 28, 2021						
29-Mar						
30-Mar						
31-Mar						
1-Apr						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
2-Apr						
3-Apr						
Sunday, April 4, 2021						
5-Apr						
6-Apr						
7-Apr						
8-Apr						
9-Apr						
10-Apr						
Sunday, April 11, 2021						
12-Apr						
13-Apr						
14-Apr						
15-Apr						
16-Apr						
17-Apr						
Sunday, April 18, 2021						
19-Apr						
20-Apr						
21-Apr						
22-Apr						
23-Apr						
24-Apr						
Sunday, April 25, 2021						
26-Apr						
27-Apr						
28-Apr						
29-Apr						
30-Apr						
1-May						
Sunday, May 2, 2021						
3-May						
4-May						
5-May						
6-May						
7-May						
8-May						
Sunday, May 9, 2021						
10-May						
11-May						
12-May						
13-May						
14-May						
15-May						
Sunday, May 16, 2021						
17-May						
18-May						
19-May						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
20-May						
21-May						
22-May						
Sunday, May 23, 2021						
24-May						
25-May						
26-May						
27-May						
28-May						
29-May						
Sunday, May 30, 2021						
31-May						
1-Jun						
2-Jun						
3-Jun						
4-Jun						
5-Jun						
Sunday, June 6, 2021						
7-Jun						
8-Jun						
9-Jun						
10-Jun						
11-Jun						
12-Jun						
Sunday, June 13, 2021						
14-Jun						
15-Jun						
16-Jun						
17-Jun						
18-Jun						
19-Jun						
Sunday, June 20, 2021						
21-Jun						
22-Jun						
23-Jun						
24-Jun						
25-Jun						
26-Jun						
Sunday, June 27, 2021						
28-Jun						
29-Jun						
30-Jun						
1-Jul						
2-Jul						
3-Jul						
Sunday, July 4, 2021						
5-Jul						
6-Jul						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
7-Jul						
8-Jul						
9-Jul	25	201.2	<0.1	300	<4.7	
10-Jul						
Sunday, July 11, 2021						
12-Jul						
13-Jul						
14-Jul						
15-Jul						0.5
16-Jul						
17-Jul						
Sunday, July 18, 2021						
19-Jul						
20-Jul	6	130.2	<0.1	311.27		
21-Jul						
22-Jul						
23-Jul						
24-Jul						
Sunday, July 25, 2021						
26-Jul						
27-Jul						
28-Jul						
29-Jul						
30-Jul						
31-Jul						
Sunday, August 1, 2021						
2-Aug	13	188.3	<.1	342.37		
3-Aug						
4-Aug						
5-Aug						
6-Aug					<4.6	
7-Aug						0.54
Sunday, August 8, 2021						
9-Aug						
10-Aug						
11-Aug						
12-Aug						
13-Aug						
14-Aug						
Sunday, August 15, 2021						
16-Aug						
17-Aug						
18-Aug						
19-Aug						
20-Aug						
21-Aug						
Sunday, August 22, 2021						
23-Aug						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
24-Aug						
25-Aug						
26-Aug						
27-Aug						
28-Aug						
Sunday, August 29, 2021						
30-Aug						
31-Aug						
1-Sep						
2-Sep						
3-Sep						
4-Sep						
Sunday, September 5, 2021						
6-Sep						
7-Sep						
8-Sep						
9-Sep						
10-Sep						
11-Sep						
Sunday, September 12, 2021						
13-Sep						
14-Sep						
15-Sep						
16-Sep						
17-Sep						
18-Sep						
Sunday, September 19, 2021						
20-Sep						
21-Sep						
22-Sep						
23-Sep						
24-Sep						
25-Sep						
Sunday, September 26, 2021						
27-Sep						
28-Sep						
29-Sep						
30-Sep						
1-Oct						
2-Oct						
Sunday, October 3, 2021						
4-Oct						
5-Oct						
6-Oct						
7-Oct						
8-Oct						
9-Oct						
Sunday, October 10, 2021						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
11-Oct						
12-Oct						
13-Oct						
14-Oct						
15-Oct						
16-Oct						
Sunday, October 17, 2021						
18-Oct						
19-Oct						
20-Oct						
21-Oct						
22-Oct						
23-Oct						
Sunday, October 24, 2021						
25-Oct						
26-Oct						
27-Oct						
28-Oct						
29-Oct						
30-Oct						
Sunday, October 31, 2021						
1-Nov						
2-Nov						
3-Nov						
4-Nov						
5-Nov						
6-Nov						
Sunday, November 7, 2021						
8-Nov						
9-Nov						
10-Nov						
11-Nov						
12-Nov						
13-Nov						
Sunday, November 14, 2021						
15-Nov						
16-Nov						
17-Nov						
18-Nov						
19-Nov						
20-Nov						
Sunday, November 21, 2021						
22-Nov						
23-Nov						
24-Nov						
25-Nov						
26-Nov						
27-Nov						

	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC	004 BDC
	Fe (Dis)	**Mn (Dis)**	**Sulfide as H2S**	**Sulfate**	**Nonylphenol**	**Total Phosphorus**
	ug/l	ug/l	mg/l	mg/l	ug/l	mg/l
	Composite	Composite	Composite	Composite	Grab	Composite
	2x Monthly	2x Monthly	2x Monthly	2x Monthly	Monthly	Monthly
Sunday, November 28, 2021						
29-Nov						
30-Nov						
1-Dec						
2-Dec						
3-Dec						
4-Dec						
Sunday, December 5, 2021						
6-Dec						
7-Dec						
8-Dec						
9-Dec						
10-Dec						
11-Dec						
Sunday, December 12, 2021						
13-Dec						
14-Dec						
15-Dec						
16-Dec						
17-Dec						
18-Dec						
Sunday, December 19, 2021						
20-Dec						
21-Dec						
22-Dec						
23-Dec						
24-Dec						
25-Dec						
Sunday, December 26, 2021						
27-Dec						
28-Dec						
29-Dec						
30-Dec						
31-Dec						
1-Jan						

Appendix E. Metro Wastewater 2021 Sampling on Lower Big Dry Creek

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Appendix E. Metro Wastewater Total Recoverable Iron Sampling on Big Dry Creek

	Total Recoverable Iron (mg/L)	
Date	BDC	BDC8
1/4/2012	1.60	1.50
1/18/2012	2.40	1.70
2/1/2012	1.00	1.10
2/15/2012	2.50	2.50
3/7/2012	1.00	0.80
3/21/2012	0.70	0.80
4/4/2012	8.80	7.10
4/18/2012	3.20	0.80
5/2/2012	1.30	1.20
5/16/2012	2.30	0.80
6/6/2012	0.60	0.60
6/20/2012	1.00	0.30
7/3/2012	1.00	0.70
7/18/2012	2.30	3.10
8/1/2012	1.10	0.40
8/15/2012	1.20	0.50
9/5/2012	1.30	1.40
9/19/2012	1.60	2.20
10/3/2012	0.40	0.20
10/17/2012	0.50	1.40
11/7/2012	1.20	0.70
11/21/2012	1.30	1.40
12/6/2012	1.00	1.10
12/19/2012	1.00	1.30
1/2/2013	0.90	1.30
1/16/2013	0.70	1.00
2/6/2013	0.90	0.85
2/20/2013	0.70	0.80
3/6/2013	1.20	1.40
3/20/2013	1.40	1.20
4/3/2013	2.20	2.80
4/17/2013		6.40
5/1/2013	1.60	2.10
5/15/2013	4.00	1.90
6/5/2013	2.00	1.60
6/19/2013	2.10	0.40
7/3/2013	2.60	2.80
7/17/2013	1.50	1.20
8/7/2013	2.60	3.20
8/21/2013	2.90	0.90
9/4/2013	1.90	1.60

Appendix E. Metro Wastewater Total Recoverable Iron Sampling on Big Dry Creek

	Total Recoverable Iron (mg/L)	
Date	BDC	BDC8
9/18/2013		7.20
10/2/2013	3.80	2.60
10/16/2013	1.70	1.90
11/6/2013	0.80	1.10
11/20/2013	0.30	0.50
12/4/2013	0.60	0.80
12/19/2013	0.30	0.50
1/8/2014	0.70	0.30
1/15/2014	1.20	1.30
2/5/2014	1.80	1.40
2/18/2014	1.40	1.20
3/5/2014	0.80	1.10
3/19/2014	0.60	0.70
4/2/2014	0.80	0.30
4/16/2014	1.00	1.30
5/7/2014	1.20	0.80
5/21/2014	2.90	2.30
6/4/2014	3.50	2.80
6/18/2014	2.50	0.80
7/2/2014	2.50	0.38
7/16/2014	5.63	5.80
8/6/2014	4.67	3.19
8/20/2014	1.41	0.42
9/3/2014	1.83	1.85
9/17/2014	1.84	1.83
10/1/2014	4.67	4.98
10/15/2014	2.22	2.29
11/5/2014	0.78	0.48
11/19/2014	0.90	1.33
12/3/2014	0.64	0.42
12/18/2014	0.40	0.58
1/7/2015	1.63	3.36
1/21/2015	0.52	0.58
2/4/2015	1.18	0.88
2/18/2015	1.49	1.51
3/4/2015	1.36	1.40
3/18/2015	0.82	0.98
4/1/2015	0.64	0.35
4/15/2015	1.66	1.70
5/6/2015	5.94	11.40
5/20/2015	10.10	10.40

Appendix E. Metro Wastewater Total Recoverable Iron Sampling on Big Dry Creek

	Total Recoverable Iron (mg/L)	
Date	BDC	BDC8
6/3/2015	2.80	2.79
6/17/2015	4.23	3.72
7/1/2015	1.71	0.66
7/15/2015	2.99	3.56
8/5/2015		0.82
8/19/2015	3.04	3.30
9/2/2015	1.93	1.24
9/16/2015		0.60
10/7/2015	1.06	1.17
10/21/2015		
11/4/2015	1.59	1.32
11/18/2015	4.04	3.33
12/2/2015	1.04	1.02
12/17/2015	1.20	0.77
1/6/2016	0.63	0.58
1/20/2016	0.78	0.66
2/3/2016	0.94	0.87
2/17/2016	0.47	0.41
3/2/2016	0.49	0.53
4/6/2016	1.56	1.91
4/20/2016	7.16	
5/4/2016	2.05	1.89
5/18/2016	3.02	2.43
6/1/2016	3.30	9.51
6/15/2016	2.06	0.96
7/6/2016	1.22	1.54
7/20/2016	3.14	2.76
8/3/2016	2.10	1.20
9/7/2016	1.71	1.87
10/5/2016	0.55	0.63
11/2/2016	1.73	0.97
11/16/2016	0.41	0.22
12/7/2016	1.64	1.36
12/21/2016	4.10	6.27
1/4/2017	1.05	2.04
1/18/2017	3.23	2.90
2/1/2017	0.85	0.84
3/1/2017	0.47	0.59
3/15/2017	0.38	0.31
4/5/2017	12.80	12.30
4/19/2017	1.13	1.64

Appendix E. Metro Wastewater Total Recoverable Iron Sampling on Big Dry Creek

	Total Recoverable Iron (mg/L)	
Date	BDC	BDC8
5/3/2017	1.45	1.45
6/7/2017	11.90	12.50
9/6/2017	0.98	0.55
9/20/2017	0.70	1.05
10/4/2017	3.99	4.21
11/1/2017	1.87	0.67
12/13/2017	0.41	0.37
1/3/2018	0.43	0.66
1/17/2018	0.700	1.45
2/7/2018	1.04	0.90
2/21/2018	1.65	1.37
3/7/2018	0.71	0.42
3/21/2018	3.04	2.59
4/4/2018	1.39	1.35
4/18/2018	2.07	1.95
5/2/2018	1.53	1.06
5/16/2018	2.28	1.80
6/6/2018	1.24	0.72
6/20/2018	2.39	1.85
7/10/2018	1.13	0.85
8/1/2018	3.80	2.16
8/15/2018	2.03	1.81
9/5/2018	1.60	2.55
9/19/2018	1.37	1.60
10/3/2018	0.95	0.25
10/17/2018	0.94	0.73
11/7/2018	1.14	0.98
11/20/2018	0.79	1.01
12/5/2018	0.70	0.96
12/18/2018	0.60	0.83
1/2/2019	0.36	0.39
1/16/2019	0.88	0.74
2/6/2019	0.43	0.33
2/20/2019	0.70	0.92
3/6/2019	0.77	0.62
3/20/2019	1.01	0.99
4/3/2019	0.46	0.31
4/17/2019	0.94	0.17
5/1/2019	1.28	2.42
5/15/2019	1.47	0.94
6/5/2019	2.41	1.64

Appendix E. Metro Wastewater Total Recoverable Iron Sampling on Big Dry Creek

	Total Recoverable Iron (mg/L)	
Date	BDC	BDC8
6/19/2019	3.70	2.43
7/3/2019	3.55	3.60
7/17/2019	1.84	1.66
8/7/2019	1.32	0.86
8/21/2019	1.16	0.45
9/4/2019	1.29	1.33
9/18/2019	0.94	
10/2/2019	0.96	0.92
10/16/2019	0.48	0.60
11/6/2019	0.76	0.58
11/20/2019	0.34	0.22
12/3/2019	1.18	1.01
12/18/2019	1.03	0.71
1/8/2020	0.44	0.38
1/15/2020	0.57	0.47
2/5/2020	0.68	0.53
2/19/2020	0.41	0.32
3/4/2020	0.25	0.18
5/6/2020	1.17	0.65
5/20/2020	1.10	0.43
6/3/2020	1.76	0.91
6/17/2020	1.69	1.44
7/1/2020	1.45	0.97
7/15/2020	1.83	1.18
8/5/2020	1.68	1.93
8/19/2020	1.92	2.35
9/2/2020	2.15	3.27
9/16/2020	1.04	0.78
10/7/2020	0.28	0.29
10/21/2020	0.96	0.75
11/4/2020	0.54	0.24
11/18/2020	0.79	0.52
12/2/2020	0.80	0.68
1/6/2021	0.66	0.56
2/3/2021	0.44	0.52
2/17/2021	0.43	0.66
3/3/2021	0.49	0.62
3/17/2021		4.42
4/7/2021	1.00	
4/21/2021	0.55	
5/5/2021	9.79	8.23

Appendix E. Metro Wastewater Total Recoverable Iron Sampling on Big Dry Creek

	Total Recoverable Iron (mg/L)	
Date	**BDC**	**BDC8**
5/19/2021	5.58	4.62
6/2/2021	3.53	2.86
6/16/2021	2.82	2.28
7/7/2021	2.58	1.95
7/21/2021	2.25	1.40
8/4/2021	3.45	2.68
8/18/2021	0.81	0.76
9/1/2021	0.88	0.91
9/15/2021	0.83	0.77
10/6/2021	0.70	0.72
10/20/2021	0.59	0.80
11/3/2021	1.40	0.46
11/17/2021	0.85	0.49
12/1/2021	0.43	0.29
12/16/2021	0.59	0.39
Median 2017-2021	**1.03**	**0.90**
Median 2017-2021	**0.96**	