Colorado Department of Public Health and Environment

Regulation 85 Discharge Assessment Data Report

City of Boulder, Colorado

January 2015

Contents

1. Introduction 2
2. Objectives of the Data Report 3
   2.1. Regulation 85 Data Report Requirements 4
   2.2. City of Boulder's Approach to the Data Report 4
3. Source of Existing Data to Quantify MS4 Discharge Flows 5
   3.1. Existing Monitoring Data Assessment 5
      3.1.1. Sample Locations and Mapping 5
      3.1.2. Sample Collection, Analysis, and Flow Monitoring 6
   3.2. Predictive Loading Tools 9
      3.2.1. Event Mean Concentrations 10
      3.2.2. Water Quality Model Assessment 13
   3.3. Storm Drain Outfalls and Cumulative Discharge Locations 13
   3.4. Rainfall Data 14
4. Data Gap Analysis, Summary, and Recommendations 14
   4.1. Data Gap Analysis 14
   4.2. Summary 14
   4.3. Recommendations 15

1.Introduction

The following Discharge Assessment Data Report (Data Report) for the City of Boulder's (city) Municipal Separate Storm Sewer System (MS4) was developed to meet the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Commission (CWQCC) Regulation 85 requirements. Per Regulation 85, "The goal of the MS4 data collection requirements is to identify information that exists, and the need for additional monitoring to be conducted in the future, to determine the approximate nitrogen and phosphorus contribution to state waters due to discharges from the MS4." As a result, the intent of this Data Report is to summarize the data available from the city and other sources as well as provide a 'Gap Analysis" required by Regulation 85.

CDPHE Regulation 85 promulgates control regulations on the concentration of total inorganic nitrogen and total phosphorus that can be discharged to state waters from both point and nonpoint sources. Nitrogen and phosphorus are the primary nutrients that, in excessive amounts, accelerate eutrophication of water resources resulting in algal blooms, reduced water transparency, undesirable shifts in algal and fish populations, and fish kills. Phosphorus is typically scarce in surface water under natural conditions and is therefore, in most instances, the limiting nutrient in fresh water bodies. This means that nitrogen is usually in relative abundance and it is phosphorus amounts that control algae growth.

Nutrients enter state waters from both point and non-point sources. Wastewater treatment discharges as well as industrial discharges are primary sources of point source pollution and, due to a piped outfall, are often easier to control. Non-point sources, which are often the more significant source of nutrients, are typically attributed to agricultural and urban activities as summarized in Table 1. Discharge from MS4 outfalls have historically been treated as a non-point source of pollutants.

TABLE 1: Summary of typical non-point sources of nitrogen and phosphorus

	Non-point Urban Sources		Non-point Agricultural Sources
Nitrogen	• Fertilizers • Grass clipping • Animal waste	• Leaves • Polluted rainfall	• Fertilizer • Animal waste • Polluted rainfall
Phosphorus	• Fertilizers • Wastewater • Animal waste • Sediment loss from development • Erosion	• Dust • Pollen • Dead leaves • Detergents • Hydrocarbons/lubricants	• Fertilizer • Animal waste

The city prepared a Stormwater Master Plan (SMP) in 2007 as a guide to address water quality areas of concern associated with existing and future land uses. This SMP is available via the

city's website for reference[1]. As part of the SMP, a water quality model was developed in XPSWMM modeling software to identify areas within the City of Boulder (Boulder) having comparatively high pollutant concentrations and/or loads. The model was used to target locations of BMPs and capital projects throughout Boulder to maximize the system-wide water quality benefit. The 2007 SMP analysis modeled five stormwater quality constituents: total suspended solids (TSS), total phosphorus (TP), lead (Pb), copper (Cu), and zinc (Zn). Regulation 85 requires analysis of both total phosphorus and total nitrogen and of these, only total phosphorus is being analyzed in the SMP model. The SMP model, however, has the capacity to evaluate total nitrogen.

The city collects dry weather nutrient samples along Boulder Creek as part of their standard monthly water quality monitoring program. Nutrient samples are collected at multiple locations from the head waters of Boulder Creek to the confluence with Coal Creek, which includes the urbanized area of Boulder and the area covered under the city's MS4 permit. Sampling procedures and locations are documented in the *Boulder Creek Water Quality Monitoring Program,* 2012 *(Revision #1, June 2014)*. Historic Boulder Creek water quality data is summarized in the report titled *City of Boulder Water Quality Monitoring Report: Baseline and 2011,* August 2012, and the report will be updated every two years. The water quality program is intended to characterize dry weather water quality and evaluate water quality trends with monthly water quality monitoring at long-term stations. The city's Boulder Creek water quality monitoring program is implemented by the city's Public Works Department, Utilities Division, Water Quality and Environmental Services (WQES) Group and supports the three water utilities within the Public Works Department (Wastewater, Water, and Stormwater/Flood).

This Data Report summarizes existing information pertaining to Regulation 85, provides a Gap Analysis for Regulation 85 requirements, and provides recommendations going forward to satisfy these requirements.

2.Objectives of the Data Report

This Data Report provides information on existing data and identifies additional information necessary (Gap Analysis) for future analysis to determine representative estimates that quantify MS4 discharge flows and associated loads of total nitrogen and total phosphorus. This section first states the Regulation 85 requirement and this introduces the city's approach to meeting these requirements.

[1] https://www-static.bouldercolorado.gov/docs/boulder-stormwater-master-plan-june-2007-1-201406101027.pdf

2.1. Regulation 85 Data Report Requirements

As stated in Regulation 85, this Data Report must provide information on existing data that allows for future analysis to determine representative quantitative estimates of MS4 discharge flows and associated concentrations/loads of total nitrogen and total phosphorus. This data includes representative information to define significant nutrient loads from different land uses due to rainfall events, snowmelt events, and/or dry weather flows. Regulation 85 states that this quantification of information can come from one or more of the following sources:

- Monitoring data at MS4 discharges.
- Monitoring data at instream sampling locations along Boulder Creek.
- Land use based water quality model that predicts nutrient concentrations in MS4 discharges.

Per Regulation 85, this Data Report needs to document the following with respect to monitoring data (the first two bullets above):

- Sources of existing data, with monitoring data needing to include a description of the methods used for sample collection, field, and laboratory analysis.
- For receiving water monitoring data, available quantitative or qualitative information that can be used for determining the probable contributions of nitrogen and phosphorus during the monitored events.
- For discharge data that is associated with rainfall or snowmelt events, sources of available data documenting the associated duration and magnitude of the storm event over the contributing watershed.

2.2. City of Boulder's Approach to the Data Report

The city's approach to meeting the above Regulation 85 data requirements, specific to storm water, includes using a combination of its current instream monitoring data along with updating its existing XPSWMM water quality model to assess land use/sector-based contributions of total phosphorus and total nitrogen. This Regulation 85 Data Report reviews and documents the following:

1) The source of existing data to quantify MS4 discharge flows including:
   a) Existing monitoring data assessment
      i) Monitoring data of phosphorus and nitrogen collected by the city along Boulder Creek and availability of data related to nitrogen and phosphorus from MS4 permitted storm drain outfalls within Boulder.
      ii) An assessment of the city's ability to analyze water quality to the standards specified in Regulation 85.
   b) Predictive loading tools.

i) An assessment of the ability to generate land use based nutrient loading using GIS and the XPSWMM water quality model as developed by HDR as a part of the city's SMP.

ii) A literature review and assessment of land use based Event Mean Concentration (EMC) values for phosphorus and nitrogen.

c) Storm Drain Outfalls and Cumulative Discharge Locations

d) Documentation of the rainfall events.

2) A Data Gap analysis assessing the above with respect to Regulation 85.

3. Source of Existing Data to Quantify MS4 Discharge Flows

As stated above, the city implements a water quality monitoring program along Boulder Creek. The city also currently has a robust XPSWMM hydrologic, hydraulic and water quality model of the urban watershed and its natural and man-made stormwater system. This section describes these sources of existing data to quantify MS4 discharge flows.

3.1. Existing Monitoring Data Assessment

The city has a comprehensive water quality monitoring program which includes Boulder Creek. This section examines this program and how it relates to Regulation 85 requirements, and, if necessary, can be adjusted to satisfy those regulatory requirements. Included in this section are the following:

- Mapping of sample locations from the 2012 Boulder Creek Water Quality Monitoring Program and relative proximity to MS4 outfalls.
- Review of phosphorus and nitrogen nutrient instream monitoring data including sampling methodology and testing protocols.
- Summary of sample collection methods, field conditions, available flow data, laboratory testing methods and if data is available for speciation of phosphorus and nitrogen.

3.1.1. Sample Locations and Mapping

Mapping has been prepared that identifies all known MS4 outlets along Boulder Creek. Figure 1 is an overview map with current (2012) sampling locations along Boulder Creek and major watershed basins. Figures 2 through 7 show all known MS4 outfalls, the SMP model network and associated modeled MS4 outfalls, and all known historic and current sampling locations.

A summary of the 2012 Boulder Creek Water Quality Monitoring Program sampling locations along Boulder Creek that are analyzed for total phosphorous and all, or some, of the analytes required to determine total nitrogen is provided in Table 2, with the full list of analytes for each site provided in Appendix A. Except for sample location BC-CU, where TKN is not analyzed, all

sample locations are analyzed for total phosphorus and all analytes required to determine total nitrogen and comply with Regulation 85 requirements.

TABLE 2: Boulder Water Quality Sampling Summary (2012 Monitoring Plan)

Sample Location	Type of Sample	Total Phosphorous	TKN	Nitrite	Nitrate
BC-Can (Boulder Creek at mouth of Boulder Canyon)	Instream	X	X	X	X
BC-CU (Boulder Creek at CU campus)	Instream	X		X	X
BC-61st (Boulder Creek at 61st Street)	Instream	X	X	X	X
BC-aWWTP (Boulder Creek above the 75th Street WWTF)	Instream	X	X	X	X

Historic Boulder Creek MS4 outfall dry weather sampling data exists at the following sites for the years 2000 to 2003: dO-Lib, dO-11, dO-Muni, dO-Bwy, dO-Arp, dO 28, and dFCC-61. Other instream sites were also sampled during the 2000 through 2003 time period including: BC-47, dBR-Conf, dBC-Val, and dSBC-Val. These historic sites were only sampled under dry weather conditions and are also mapped on Figures 2 through 7. The monitoring data is provided in Appendix B.

3.1.2. Sample Collection, Analysis, and Flow Monitoring

Nitrogen and phosphorous samples from the sites listed in Table 2 are grab samples collected, at minimum, on a monthly basis (Appendix A). Sampling is done to monitor the overall stream health and provide an estimate of base nutrient loading. Sampling is not conducted on a storm event basis.

Required analytes per Regulation 85.6 (3) include total nitrogen and total phosphorous. An analytical test is available to directly measure total phosphorous, while total nitrogen is the sum of total Kjeldahl nitrogen (TKN), nitrate (NO_3) and nitrite (NO_2). TKN is the sum of organic nitrogen, ammonia (NH_3) and ammonium (NH_4^+). Analysis methods are to be either specified in or approved pursuant to 40 C.F.R. Part 136. The required Regulation 85 method detection limits (MDLs) are as noted below:

- Total Phosphorous 0.01 mg-P/L
- Nitrate + Nitrite 0.02 mg-N/L
- Total Kjeldahl Nitrogen 0.1 mg-N/L
- Total Nitrogen 0.1 mg-N/L

The city operates two laboratories capable of analyzing nutrients. One is located at the Boulder Reservoir Water Treatment Facility (WTF) and the other, which is larger, is located at the 75th

Street Wastewater Treatment Facility (WWTF). Table 3 summarizes current sampling and analytical methods used by the city and the reported MDLs. The city currently tests for all required Regulation 85 nutrient analytes and all analytes have a MDL that meets Regulation 85 requirements. Note that each method may have an anticipated MDL, but the actual MDL will be determined by each individual laboratory.

The current sampling methods are provided in the 2012 Boulder Creek Water Quality Monitoring Program and are collected, preserved, and managed in accordance with procedures outlined in Standard Methods for the Examination of Water and Wastewater, 20th Edition (section 9060). Sample water is collected using a bailer or bottle on a pole that has been rinsed with sample water. Samples are taken from mid-channel, or the area in the channel that best represents the main flow. Sample bottles, except sterile bacteria bottles, are rinsed with creek water before being filled.

The city of Boulder operates permanent stream flow gages on Boulder Creek in the downtown area between the BC-Can and BC-61 sample sites (Figure 2). In addition, there is a permanent USGS stream gage at 75th Street that correlates with the BC-aWWTP sampling site. These gages can be used to determine flow and nutrient load at the time of the instream samples.

TABLE 3: Boulder Reservoir Water Treatment Facility (WTF) Laboratory and Boulder 75th Street Wastewater Treatment Facility (WWTF) Analytical Methods and Reported MDLs

Parameter	Sample Location	Container Type	Container Volume	Preservation	Holding Time	Method Detection Limit (mg/L)	Method
Ammonia (NH_3)	WTF, WWTF	Plastic	1 L	Sulfuric Acid/ Cool to ≤4C	30 days	0.1	Timberline 001
Nitrite (NO_2)	WWTF	Plastic	500 mL	Cool to ≤4C	48 hours	0.002	Hach Method 10019
Nitrate (NO_3)	WTF	Plastic	100 mL	Cool to ≤4C	48 hours	0.002	IC EPA 300.1
	WWTF	Plastic	100 mL	Cool to ≤4C	48 hours	0.008	300(A) Inorganic Anions by Ion Chromatography
Total Kjeldahl Nitrogen (TKN)	WTF	Plastic	1 L	Sulfuric Acid/ Cool to ≤4C	30 days	0.01	Timberline 001
	WWTF	Plastic	1 L	Sulfuric Acid/ Cool to ≤4C	30 days	0.02	Timberline -001
Ortho phosphate	WTF	Plastic	100 mL	Filtered 0.45 um within 4 hours, Frozen	30 days	0.002	IC EPA 300.1
Phosphorus, dissolved (TDP)	WTF	Plastic	150 mL	Filtered 0.45 um within 4 hours, Frozen	30 days	0.002	Digestion SM4500-P B.5** Analysis SM4500-P E**
Phosphorus, total (TP)	WTF	Plastic	150 mL	Frozen	30 days	0.002	Digestion SM4500-P B.5** Analysis SM4500-P E**
	WWTF	Plastic	200 mL	Cool to ≤4C	48 hours	0.008	4500 - P-E Phosphorus in Water by Colorimetry-Ascorbic Acid Method

3.2. Predictive Loading Tools

There are many different methods and tools available to predict the runoff and loading from a given rainfall event on a given land use. This section focuses on rainfall events because snowmelt is typically not a large contributor of nutrients to surface water. These methods range from spreadsheet calculations to a variety of hydrology models including SWMM, WinSLAMM, WQ-COSM, HydroCAD, and several others. The city SMP developed a water quality model using XPSWMM. Although not currently used for this purpose, XPSWMM can simulate the direct entry of nutrients into storm drain networks (point sources), the buildup and washoff of nutrients (non-point sources) in sub-catchments, transport through collection and conveyance systems, and the treatment of stormwater with retention ponds and Best Management Practices (BMPs). XPSWWM can also be used to simulate design storms or actual rainfall events and replicate both their duration and magnitude.

To meet the Regulation 85 data requirements XPSWMM could be used to model nutrient loading. Water quality modeling in XPSWMM is done by first defining which nutrients require modeling. Nutrients are characterized separately for each land use defined in the watershed. Each modeled nutrient has its own land use dependent buildup (during dry weather) and washoff (rainfall events) characteristics. Buildup is the generation of pollutants on a ground surface during dry weather and is represented by the US EPA time dependent dust and dirt model. Washoff is the mobilization of pollutants from a ground surface during a runoff of event that is defined by the Event Mean Concentration (EMC). Nutrients are generated in each sub-catchment based upon land use characteristics and transported to the hydraulic storm drain system. Once in the pipes, the nutrients are transported through the system using the completely mixed conduit volume.

BMPs can be modeled based either on each land use within a sub-catchment, on the whole sub-catchment in the hydrology layer, or in the storage devices within the hydraulics layer. Street sweeping can also be included. Given the number of BMPs already in place in Boulder, and the consistency in their design, BMPs are currently modeled by calculating the total water quality capture volume (WQCV) contained within the sub-catchment and applying it as additional pervious depressional storage that is abstracted during the modeled rainfall event.

The primary variables that need consideration when modeling nutrients are as follows:

1) Nutrients
   a) Event Mean Concentration.
   b) Daily decay rates.
   c) Amount of the nutrient in dust and dirt <u>or</u> the nutrient buildup over time using the EPA time dependent dust and dirt model.
   d) Concentration in precipitation.
   e) Removal efficiency of street sweeping.
2) BMPs
   a) The location and configuration of BMPs that exist in the watersheds.
      i) The SMP model lumps the WQCV within each sub-catchment into a single depth that is abstracted from the runoff.
   b) Removal efficiency for each BMP for each modeled nutrient.
      i) This would be examined should additional BMPs require simulation in the model.
3) Additional data
   a) Street sweeping schedule.
   b) Curb lengths for each land use within each sub-catchment.
4) Type of rainfall event

3.2.1. Event Mean Concentrations

The city has not evaluated Event Mean Concentration (EMC) values for nutrient concentrations in stormwater runoff for a particular land use in Boulder. However, there is a means to model land use based water quality constituents in XPSWMM. While the city has not developed Boulder specific EMC values, the Urban Drainage and Flood Control District (UDFCD) provides EMC values for various land uses in Table 1-2 of the *Urban Storm Drainage Criteria Manual* (USDCM) Volume 3, *Stormwater Management and Planning* [2]. These EMC values for phosphorus and nitrogen are presented in Table 4.

The city's SMP defines the following land uses for modeling based on the city's GIS data:

- Open Space (OPEN)
- Rural Residential (RR)
- Low Density Residential (LDR)
- Medium Density Residential (MDR)
- High Density Residential (HDR)

[2] (per DRURP and Phase I Stormwater CDPS Permit Application for Denver, Lakewood and Aurora) **(**Source: Aurora et al. 1992. *Stormwater NPDES Part 2 Permit Application Joint Appendix* and DRCOG 1983. *Urban Runoff Quality in the Denver Region.*

- Educational (EDU)
- Commercial (COM)
- Industrial (IND)
- Right-of-Way (TRANS)

It should be noted that with the exception of the IBM and Celestial Seasoning (industrial campuses on the northeast side of Boulder), most industrial land uses are designated as heavy industrial based on their high percent imperviousness. To better simulate the contribution of phosphorus and nitrogen within the XPSWMM model, the IBM and Celestial Seasoning industrial campuses should be split into their open space and building/parking lot components.

To supplement the UDFCD values, data sources for EMC values for other land uses were examined. Two additional studies of nutrient EMC values on a per land use basis include the Rouge River National Wet Weather Demonstration Project[3] and from the United States Army Corps of Engineers (USACE) Wetland Regulatory Assistance Program (WRAP)[4]. WRAP published a review of studied stormwater pollutant export coefficients and EMCs studied throughout the United States and of these studies, the research done in Florida had the most comprehensive number of land use types examined. Table 5 presents EMC values from these two other sources. In addition, there have been several studies performed within the state of Colorado examining nutrient EMC concentrations from various land uses.

TABLE 4: Event Mean Concentrations (EMC) Values from Table 1-2 of the UDFCD USDCM Volume 3, Stormwater Management and Planning[2] and how, where applicable, they can be used with the city's land use GIS file.

Constituent	Land Use			
	Natural Grassland	Commercial (COM)	Residential	Industrial (IND)
Total Phosphorus (TP), (mg-P/L)	0.40	0.42	0.65	0.43
Dissolved or Orthophosphorus (PO_4), (mg-P/L)	0.10	0.10	0.10	0.10
Total Nitrogen (TN), (mg-N/L)	3.4	3.3	3.4	2.7
Total Kjeldahl Nitrogen (TKN), (mg-N/L)	2.9	2.3	2.7	1.8
Ammonia Nitrogen (NH_3), (mg-N/L)	0.1	1.5	0.7	1.2
Nitrate + Nitrite Nitrogen (NO_3/NO_2), (mg-N/L)	0.50	0.50	0.50	0.50

[3] Cave et al, October 12, 1994. Rouge River National Wet Weather Demonstration Project. Technical Memorandum Selection of Stormwater Pollutant Loading Factors. RPO-MOD-TM34.00. Wayne County, Michigan. Table 3-13. Highway reference is from the "Pollutant Loadings and Impact From Highway Stormwater Runoff- Volume II: Analytical Investigation and Research Report", FHWA, 1990, Tables 5 and 8.

[4] Lin, Jeff P. September, 2004. *Review of Published Export Coefficient and Even Mean Concentration (EMC) Data.* Wetlands Regulatory Assistance Program. ERDC TN-WRAP-04-3.

TABLE 5: Event Mean Concentrations (EMC) Values taken from the Rouge River[3] and USACE WRAP[4] Studies and how they can be used with the city's land use GIS file.

Constituent	Date Source	Land Use				
		Highway (TRANS)	Low Density Residential (RR and LDR)	Medium Density Residential (MDR)	High Density Residential (HDR)	Urban Open Space (OPEN)
Total Phosphorus (TP), (mg-P/L	Rouge River[3]	0.43	0.52	0.52	0.24	0.11
Dissolved or Orthophosphorus (PO_4), (mg-P/L)	Rouge River[3]	0.22	0.27	0.27	0.08	0.03
Total Nitrogen (TN), (mg-N/L)	WRAP[4]	2.08	1.77	2.29	2.42	
Total Kjeldahl Nitrogen (TKN), (mg-N/L)	Rouge River[3]	1.72	3.32	3.32	1.17	0.94
Ammonia Nitrogen (NH_3), (mg-N/L)		-	-	-	-	-
Nitrate + Nitrite Nitrogen (NO_3/NO_2), (mg-N/L)	Rouge River[3]	.83	1.83	1.83	2.12	0.80

It should also be noted that there were no EMC related studies that could be identified which specifically addressed educational land use types. These land uses generally contain large buildings and parking spaces as well are large areas of open space used for sporting facilities or playgrounds. Contributing areas for these land use types should also be split accordingly.

Table 6 provides a summary relating the city's GIS land use classifications with studied EMC concentrations. The city believes sufficient information exists to relate existing EMC concentrations to the city's GIS land use classifications for implementation into the water quality model. If new information becomes available that the city feels may be more representative, EMC concentrations can be updated at that time.

TABLE 6: Summary of Event Mean Concentrations (EMC) Values in Relation to the city's land use GIS

Boulder Land Use Categories	Nutrient	EMC Data	
		Status	Potential Source
Open Space (OPEN)	Total Phosphorus	Available	Rouge River[3]
	Total Nitrogen	Available	WRAP[4]
Rural Residential (RR)	Total Phosphorus	Available	Rouge River[3]
	Total Nitrogen	Available	WRAP[4]
Low Density Residential (LDR)	Total Phosphorus	Available	Rouge River[3]
	Total Nitrogen	Available	WRAP[4]
Medium Density Residential (MDR)	Total Phosphorus	Available	Rouge River[3]
	Total Nitrogen	Available	WRAP[4]
High Density Residential (HDR)	Total Phosphorus	Available	Rouge River[3]
	Total Nitrogen	Available	WRAP[4]
Educational (EDU)	Total Phosphorus	Indirectly Available	Rouge River[3], UDFCD[2]
	Total Nitrogen	Indirectly Available	WRAP[4], UDFCD[2]
Commercial (COM)	Total Phosphorus	Available	UDFCD[2]
	Total Nitrogen	Available	UDFCD[2]
Industrial (IND)	Total Phosphorus	Available	UDFCD[2]
	Total Nitrogen	Available	UDFCD[2]
Right-of-Way (TRANS)	Total Phosphorus	Available	Rouge River[3]
	Total Nitrogen	Available	WRAP[4]

3.2.2. Water Quality Model Assessment

Although not currently analyzed by the city, sufficient information exists to populate total phosphorus and total nitrogen water quality modeling parameters into XPSWMM. The SMP model used storm hydrology for 2-year, 5-year and water quality storm events and looked at annual rainfall series to estimate annual loads of Total Suspended Solids (TSS). The existing EMC values from Table 4 and Table 5 for nitrogen and phosphorus can be entered into the model on a land use basis. Should newer EMC values be identified, the city can update the water quality model accordingly. GIS will be used with the model to determine the percentage of each land use that is contained in individual sub-catchments to estimate the corresponding net nutrient concentration for each outfall. Updating the SMP model with the most current land use and more refined EMC data will allow the assessment of nutrient loads at outfalls and locations along Boulder Creek to trace back to contributing land uses based on their estimated EMC loadings.

3.3. Storm Drain Outfalls and Cumulative Discharge Locations

There are numerous MS4 stormwater discharges from Boulder into Boulder Creek and its tributaries. All of these discharges cannot be sampled nor modeled individually. According to Regulation 85, MS4 permittees do not need to determine discharge flows and associated

concentrations for each individual MS4 outfall. Instead, permittees can lump MS4 outfalls into cumulative discharges to a specific receiving water or overall watershed so long as the data is "representative of its discharges." MS4 permittees are also not required to address point source discharges specifically authorized by CDPS permits other than for discharges from an MS4.

As shown in Figures 2 through 7, the majority of outfalls within Boulder are mapped. In addition, the city has GIS files mapping land uses, sub-watersheds, storm drains, and ditches/canals/channels throughout the Boulder MS4 area. If required, the city can provide representative information that accounts for the land uses, imperviousness, watershed hydrology, precipitation data, and other appropriate factors within the permitted area under the MS4 permit. The XPSWMM water quality model can sufficiently estimate the cumulative nutrient discharges from the Boulder MS4 system.

3.4. Rainfall Data

There are several rain gages within Boulder. The UDFCD operates two gages within city limits, the National Weather Service (NWS) operates at least one gage within Boulder, and there is a gage at the municipal airport. In addition, there are several gages within Boulder that are part of the Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS). This rainfall data can be used with the stormwater model for either event based or annual simulations. Both duration and magnitude of rainfall events can be simulated in XPSWMM.

4. Data Gap Analysis, Summary, and Recommendations

4.1. Data Gap Analysis

As shown in this Data Report, the city has all the necessary information to satisfy the Regulation 85 requirements. There are effectively no gaps in the city's stormwater quality phosphorus and nitrogen program because the city currently has a comprehensive water quality sampling program, knows where outfalls are, and has a tool for assessing event based land use contributions of phosphorus and nitrogen, if needed.

4.2. Summary

A summary of the findings from the review and assessment of currently available data are:

- Total phosphorous and the analytes required to determine total nitrogen are analyzed in all five of the Boulder Creek sampling locations and complies with the requirements of Regulation 85. The only exception is that sample site BC-CU does not analyze for TKN.
- Between the city's two laboratories, the city currently tests for all required analytes and have MDLs that comply with the requirements of Regulation 85.

- Storm event-based sampling and flow monitoring at all Boulder Creek sampling sites in Boulder Creek are not currently performed and/or recorded. However, the city has extensive GIS data containing land use, storm drain, and outfall information that is used to support their SMP water quality model.
- The city has a tool for estimating MS4 loading contributions from the Boulder MS4 area as cumulative discharges using the XPSWMM water quality model.
- XPSWMM is a sufficient model for estimating phosphorus and nitrogen loadings to Boulder Creek, and its tributaries, and can be used to assess potential sources and loads based on city GIS land use data.
- Sufficient land use based EMC data is available for incorporation into the XPSWMM water quality model to generate nutrient loads and reporting of cumulative discharge results.

4.3. Recommendations

To maintain compliance with Regulation 85, the following recommendation are made:

- The city should update the GIS information for storm drains and outfalls.
- The city should update and maintain GIS land use data. The land use file should be examined to insure the GIS defined land uses reflect the corresponding land cover. Educational land uses as well as industrial complexes with large amounts of green space such as the IBM and Celestial Seasoning industrial campuses should be segmented based their open space and building/parking lot components.
- The city should update and maintain the SMP and water quality tools, such as the XPSWMM model.
- Sources of EMC data exist for Boulder's land use designations and this data should be implemented into the water quality model. The city can incorporate newer EMC data as it becomes available.
- TKN should be analyzed at sample site BC-CU.

Figures

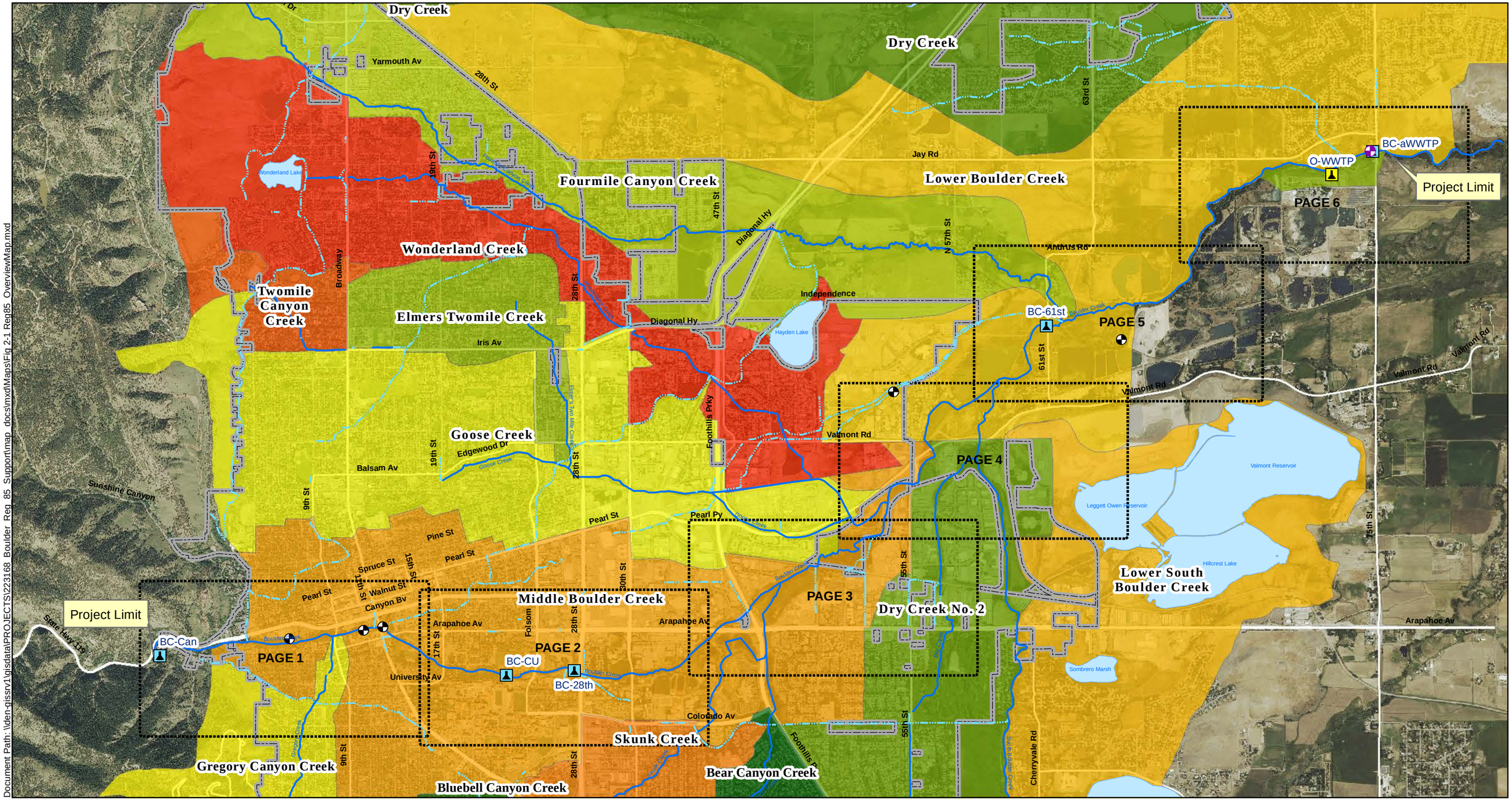
Figure 1 – Overview Map

Figures 2-7 – Discharge Locations Along Boulder Creek

Appendices

Appendix A
Excerpt from Appendix F in the City of Boulder 2012 Monitoring Plan

Appendix B
Legacy Outfall Nutrient and Instream Monitoring Data



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City Of Boulder CDPHE
Reg #85 Nutrients Management
Control Regulation Discharge
Assessment Data Report

- Boulder Creek Water Quality Sampling Site, Instream (2012)
- Boulder Creek Water Quality Sampling Site, WWTF Effluent Channel (2012)
- USGS Flow Gauge
- Other Boulder Flow Gauges
- Canal/ Ditch
- Major drainageway
- Mapbook Pages
- City Limits

Major Basins

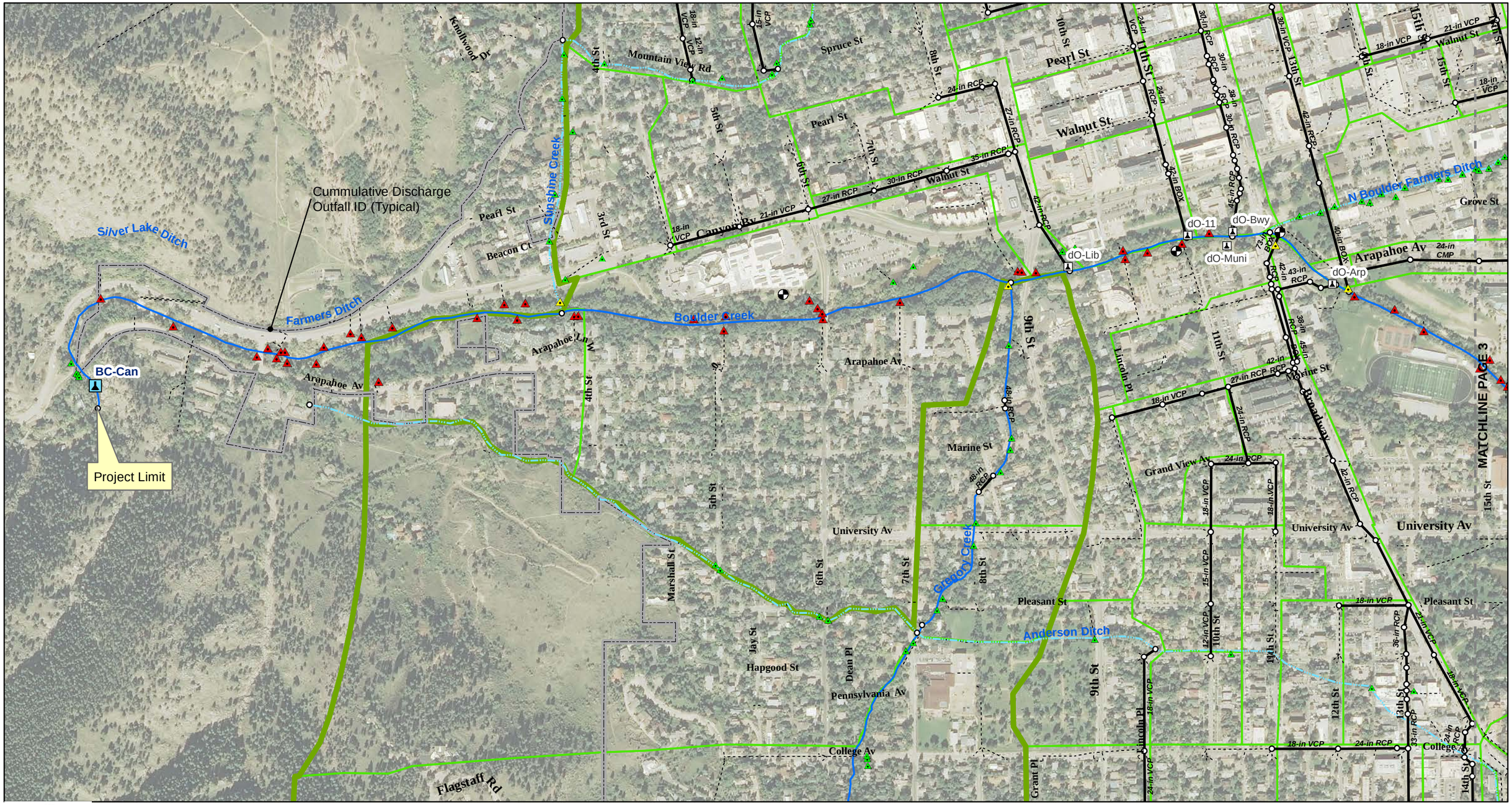
- Bear Canyon Creek
- Bluebell Canyon Creek
- Dry Creek
- Dry Creek No. 2
- Dry Creek-Boulder Creek
- Elmers Twomile Creek
- Fourmile Canyon Creek
- Goose Creek
- Gregory Canyon Creek
- Lower Boulder Creek
- Lower South Boulder Creek
- Middle Boulder Creek
- Skunk Creek
- Twomile Canyon Creek
- Wonderland Creek

0 0.5 1 Miles

N

Overview Map

Figure 1



Model Node
Modeled Storm Drain
Modeled Canal/ Ditch
Modeled Major drainageway
Storm Drain (Not Modeled)

Boulder Creek Water Quality Sampling Site, Instream (2012)
Boulder Creek, Historic Site (MS4 Outfall)

Known Outfalls
Outfall (Boulder Creek, Modeled)
Outfall (Boulder Creek)
Outfall (Other)

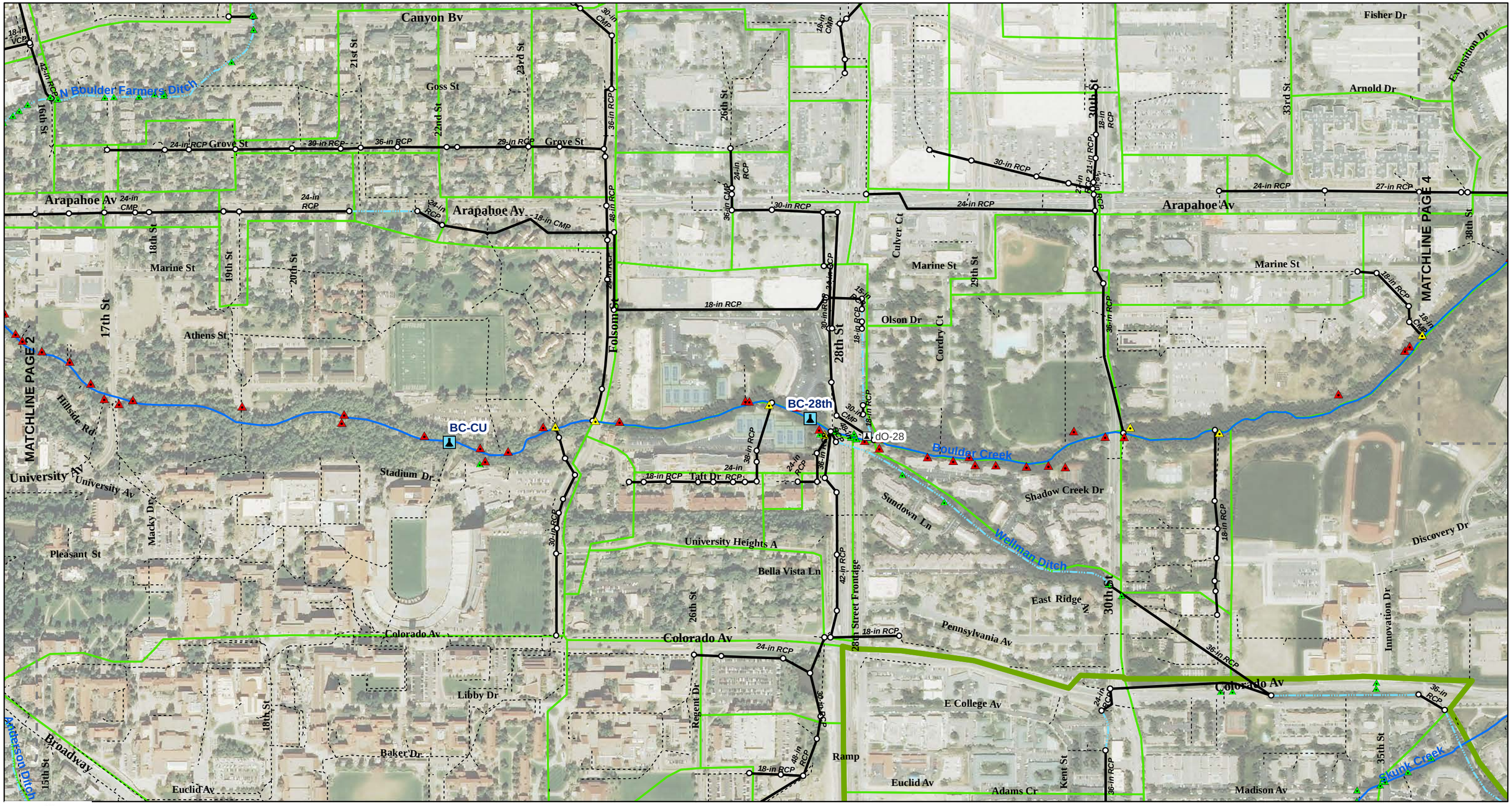
Other Boulder Flow Gauges
CityLimits
Matchline
Subcatchments
Major Basins

N
0 250 500 Feet

City Of Boulder CDPHE Reg #85
Nutrients Management Control Regulation
Discharge Assessment Data Report

Discharge Locations Along Boulder Creek
Figure 2

Document Path: \\den-gissrv1\gisdata\PROJECTS\223168_Boulder_Reg_85_Support\map_docs\mxd\Maps\Fig 2-2 Reg85_Mapbook_6000.mxd



City Of Boulder CDPHE Reg #85
Nutrients Management Control Regulation
Discharge Assessment Data Report

- Model Node
- Modeled Storm Drain
- Modeled Canal/ Ditch
- Modeled Major drainageway
- Storm Drain (Not Modeled)

- Boulder Creek Water Quality Sampling Site, Instream (2012)
- Boulder Creek, Historic Site (MS4 Outfall)

Known Outfalls

- Outfall (Boulder Creek, Modeled)
- Outfall (Boulder Creek)
- Outfall (Other)

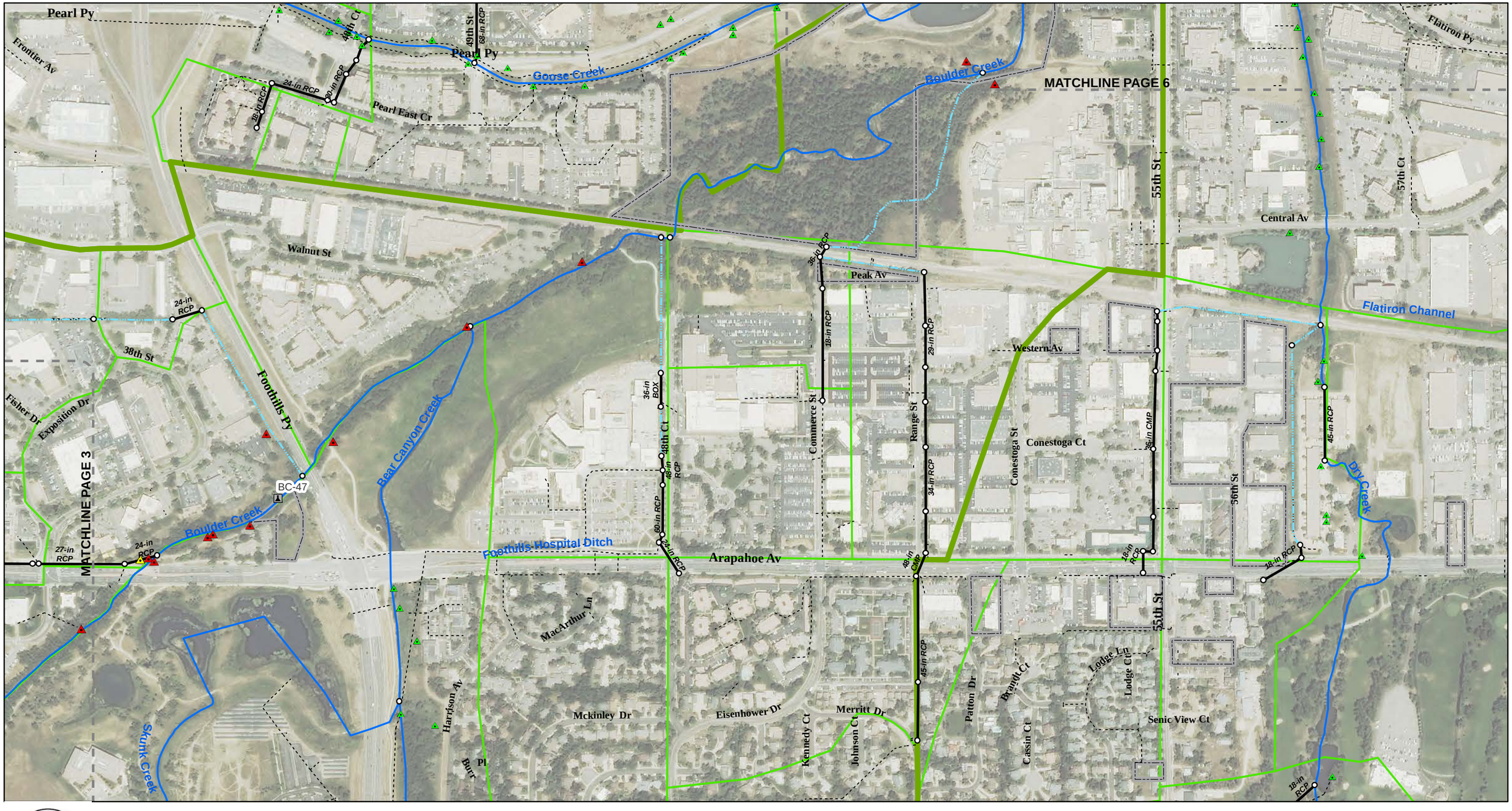
- CityLimits
- Matchline
- Subcatchments
- Major Basins

N

0 250 500 Feet

Discharge Locations Along Boulder Creek

Figure 3



Document Path: \\den-gissrv1\gisdata\PROJECTS\223168_Boulder_Reg_85_Support\map_docs\mxd\Maps\Fig 2-2 Reg85_Mapbook_6000.mxd

City Of Boulder CDPHE Reg #85
Nutrients Management Control Regulation
Discharge Assessment Data Report

- Model Node
- Modeled Storm Drain
- Modeled Canal/ Ditch
- Modeled Major drainageway
- Storm Drain (Not Modeled)
- Boulder Creek, Historic Site (Instream)

Known Outfalls

- Outfall (Boulder Creek, Modeled)
- Outfall (Boulder Creek)
- Outfall (Other)

- CityLimits
- Matchline
- Subcatchments
- Major Basins

N

0 250 500 Feet

Discharge Locations Along Boulder Creek

Figure 4

Document Path: \\den-gissrv1\gisdata\PROJECTS\223168_Boulder_Reg_85_Support\map_docs\mxd\Maps\Fig 2-2 Reg85_Mapbook_6000.mxd

City Of Boulder CDPHE Reg #85
Nutrients Management Control Regulation
Discharge Assessment Data Report

- Model Node
- Modeled Storm Drain
- Modeled Canal/ Ditch
- Modeled Major drainageway
- Storm Drain (Not Modeled)

Boulder Creek Water Quality Sampling Site, Instream (2012)

Known Outfalls

- Outfall (Boulder Creek, Modeled)
- Outfall (Boulder Creek)
- Outfall (Other)

- Other Boulder Flow Gauges
- CityLimits
- Matchline
- Subcatchments
- Major Basins

N

0 250 500 Feet

Discharge Locations Along Boulder Creek

Figure 5

Document Path: \\den-gissrv1\gisdata\PROJECTS\223168_Boulder_Reg_85_Mapbook_6000.mxd

Boulder and Left Hand Ditch
N Boulder Farmers Ditch
Sterling Cr W
Sterling Cr E
Sterling Cr
Minshal Rd
Valmont Rd
Sterling Dr
18-in RCP
29-in RCP
36-in RCP
42-in RCP
54-in RCP
dBC-Val
Boulder Creek
Pearl Pv
dGC-Conf
27-in RCP
Goose Creek
55th St
Flatiron Pv
MATCHLINE PAGE 4
South Boulder Creek
Dry Creek
Central Av
Indian Rd
MATCHLINE PAGE 5
61st St
Butte Mill Ditch
Valmont Rd
Valmont Dr
36-in RCP
Butte Mill Rd
Jones Donnelly Ditch
33-in RCP
63rd St
Stazio Dr
Leggett Owen Reservoir

City Of Boulder CDPHE Reg #85
Nutrients Management Control Regulation
Discharge Assessment Data Report

- Model Node
- Modeled Storm Drain
- Modeled Canal/ Ditch
- Modeled Major drainageway
- Storm Drain (Not Modeled)
- Boulder Creek, Historic Site (Instream)

Known Outfalls

- Outfall (Boulder Creek, Modeled)
- Outfall (Boulder Creek)
- Outfall (Other)
- Other Boulder Flow Gauges
- CityLimits
- Matchline
- Subcatchments
- Major Basins

N

0 250 500 Feet

Discharge Locations Along Boulder Creek

Figure 6

Document Path: \\den-gissrv1\gisdata\PROJECTS\223168_Boulder_Reg_85_Support\map_docs\mxd\Maps\Fig 2-2 Reg85_Mapbook_6000.mxd

City Of Boulder CDPHE Reg #85
Nutrients Management Control Regulation
Discharge Assessment Data Report

- Model Node
- Modeled Storm Drain
- Modeled Canal/ Ditch
- Modeled Major drainageway
- Storm Drain (Not Modeled)
- Boulder Creek Water Quality Sampling Site, Instream (2012)
- Boulder Creek Water Quality Sampling Site, WWTF Effluent Channel

Known Outfalls

- Outfall (Boulder Creek, Modeled)
- Outfall (Boulder Creek)
- Outfall (Other)
- USGS Flow Gauge
- Other Boulder Flow Gauges
- Matchline
- Subcatchments
- Major Basins

N

0 250 500 Feet

Discharge Locations Along Boulder Creek

Figure 7

Appendix A

Excerpt from Appendix F in the City of Boulder 2012 Monitoring Plan

APPENDIX F

MONITORING CONSTITUENTS

				Constituents Analyzed																																
Sample Site Designation[1]	Sample Frequency	Active Site?	Sample Type	Flow	DO	DO % Sat	pH	Water Temp	SpCond	Secchi	Profile	Air Temp	TSS	Turb	TDS	Alk	Hard	SO4	Na	Cl	F	TP	DP	OP	NO2	NO3	TKN	NH3	Dis Fe	Dis Mn	Metals Suite	TOC	UV254	Fecal - E.coli [2]	Tot Coli	COD	Chloro *a*	Phyto
BFC @ Lyons	Special	N	Grab																														X	X	X			
BFC @ Nelson Rd	Special	N	Grab																														X	X	X			
St.VrSupply R Mt	Special	N	Grab																														X	X	X			
Left Hand Creek																																						
LHC @ 49th St	Special	N	Grab (Churn)		X	X	X	X	X				X	X	X	X	X	X	X			X	X			X			X	X		X	X	X	X			
LHC @ BFC	Special	N	Grab (Churn)		X	X	X	X	X				X	X	X	X	X	X	X			X	X			X			X	X		X	X	X	X			
LHVRes Out	Special	N	Grab (Churn)		X	X	X	X	X				X	X	X	X	X	X	X			X	X			X			X	X		X	X	X	X			
Boulder Reservoir																																						
BR SDT	**Monthly or as necessary (March-Dec)**	**Y**	**Vertical comp secchi depth (Van Dorn-churn)**		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	2/yr	X	X	X	X		X	X
BR SDB	**Monthly or as necessary (March-Dec)**	**Y**	**Grab 0.5 m above bottom (Van Dorn-churn)**		X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X		X		X	X	X	2/yr	X	X	X	X			
BR DC In	Monthly	N	Comp (Van Dorn-churn)		X	X	X	X	X	X	X		X	X	X	X	X	X	X			X	X	X		X			X	X	2/yr	X	X	X	X			
BR LDC In	Monthly	N	Comp (Van Dorn-churn)		X	X	X	X	X	X	X		X	X	X	X	X	X	X			X	X	X		X			X	X	2/yr	X	X	X	X			
BR NDT	Monthly	N	Comp (Van Dorn-churn)		X	X	X	X	X	X	X		X	X	X	X	X	X	X			X	X	X		X			X	X	2/yr	X	X	X	X			
BR NDB	Monthly	N	Comp (Van Dorn-churn)		X	X	X	X	X		X		X	X	X	X	X	X	X			X	X	X		X			X	X	2/yr	X	X	X	X			
BRMT	Monthly	N	Comp (Van Dorn-churn)		X	X	X	X	X	X	X		X	X	X	X	X	X	X			X	X	X		X			X	X	2/yr	X	X	X	X			
BRMB	Monthly	N	Comp (Van Dorn-churn)		X	X	X	X	X		X		X	X	X	X	X	X	X			X	X	X		X			X	X	2/yr	X	X	X	X			
BCSC	Monthly	N	Grab (Churn)	X	X	X	X	X	X				X	X	X	X	X	X	X			X	X			X			X	X	2/yr	X	X	X	X			
Boulder Creek																																						
BC-aNBC	Monthly	Y	Grab		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
NBC-Falls	Monthly	Y	Grab		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-Oro	Monthly	Y	Grab		X	X	X	X	X			X	X	X	X	X						X		X	X	X	X	X						X		X		
BC-Can	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-Lib	Monthly	N	Grab		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-CU	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-47th	Monthly	N	Grab		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-61st	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-aWWTP	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
O-WWTP	Monthly	Y	Grab		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
WWTP-Effluent	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-aDC	**Monthly**	**Y**	**Grab**	X	X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-95th	**Monthly**	**N**	**Grab**		X	X	X	X	X			X	X	X	X	X						X		X	X	X	X	X						X		X		
BC-107th	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
BC-Ken	Monthly	N	Grab		X	X	X	X	X			X	X	X	X	X						X		X	X	X	X	X						X		X		
CC-Ken	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X						X		X	X	X	X	X						X		X		
BC-bCC	**Monthly**	**Y**	**Grab**		X	X	X	X	X			X	X	X	X	X	X			X		X		X	X	X	X	X			X			X		X		
SBC 3.5	**Special**	**Y**	**Grab**		X	X	X	X	X			X	X	X		X	X			X		X		X	X	X		X			X	X		X	X	X		
SBC 4	Special	Y	Grab		X	X	X	X	X			X	X	X		X	X			X		X		X	X	X		X			X	X		X	X	X		
Macroinvertebrate Bioassessment																																						
SBC-A ELD	Special	Y	Grab	X	X	X	X	X	X			X																										
SBC-MT	Special	Y	Grab	X	X	X	X	X	X			X																										
SBC-OS	Special	Y	Grab	X	X	X	X	X	X			X																										
BC Canyon	Spring and Fall	Y	Grab	X	X	X	X	X	X			X																										
BC-28th	Spring and Fall	Y	Grab	X	X	X	X	X	X			X																										

Appendix B

Legacy Outfall Nutrient and Instream Monitoring Data

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
BC-Can	02-May-00	9:00:00 AM		0.18	Milligram per Liter	Phosphorus Total as PO4
BC-Can	02-May-00	9:00:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	02-May-00	9:00:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	02-May-00	9:00:00 AM		0.31	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	02-May-00	9:00:00 AM	<	0.1	Milligram per Liter	Nitrogen Kjeldahl as N
BC-Can	02-May-00	9:00:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	02-May-00	9:25:00 AM		1.42	Milligram per Liter	Phosphorus Total as PO4
dO-Lib	02-May-00	9:25:00 AM		1.74	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Lib	02-May-00	9:25:00 AM		1	Milligram per Liter	Nitrogen Nitrate as N
dO-Lib	02-May-00	9:25:00 AM		0.034	Milligram per Liter	Nitrogen Nitrite as N
dO-Lib	02-May-00	9:25:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	02-May-00	9:25:00 AM		1.42	Milligram per Liter	Phosphorus Total as PO4
dO-Lib	02-May-00	9:25:00 AM		5.5	Milligram per Liter	Phosphate Ortho as PO4
dO-Lib	02-May-00	9:25:00 AM		0.01	Cubic Feet per Second	Flow Stream
dO-11	02-May-00	9:40:00 AM		0.06	Cubic Feet per Second	Flow Stream
dO-11	02-May-00	9:40:00 AM		0.25	Milligram per Liter	Phosphorus Total as PO4
dO-11	02-May-00	9:40:00 AM		0.09	Milligram per Liter	Phosphate Ortho as PO4
dO-11	02-May-00	9:40:00 AM		0.005	Milligram per Liter	Nitrogen Nitrite as N
dO-11	02-May-00	9:40:00 AM		2	Milligram per Liter	Nitrogen Nitrate as N
dO-11	02-May-00	9:40:00 AM		0.21	Milligram per Liter	Nitrogen Kjeldahl as N
dO-11	02-May-00	9:40:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Muni	02-May-00	10:00:00 AM		0.089	Milligram per Liter	Nitrogen Nitrite as N
dO-Muni	02-May-00	10:00:00 AM		3.3	Milligram per Liter	Nitrogen Nitrate as N
dO-Muni	02-May-00	10:00:00 AM		0.54	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Muni	02-May-00	10:00:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Muni	02-May-00	10:00:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dO-Muni	02-May-00	10:00:00 AM		0.31	Milligram per Liter	Phosphorus Total as PO4
dO-Muni	02-May-00	10:00:00 AM		0.01	Cubic Feet per Second	Flow Stream
dO-Bwy	02-May-00	10:15:00 AM		0.212	Milligram per Liter	Nitrogen Nitrite as N
dO-Bwy	02-May-00	10:15:00 AM		1.8	Milligram per Liter	Nitrogen Nitrate as N
dO-Bwy	02-May-00	10:15:00 AM		11.84	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Bwy	02-May-00	10:15:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Bwy	02-May-00	10:15:00 AM		4.36	Milligram per Liter	Phosphate Ortho as PO4
dO-Bwy	02-May-00	10:15:00 AM		4.06	Milligram per Liter	Phosphorus Total as PO4
dO-Bwy	02-May-00	10:15:00 AM		0.05	Cubic Feet per Second	Flow Stream
dO-Arp	02-May-00	10:35:00 AM		0.19	Cubic Feet per Second	Flow Stream
dO-Arp	02-May-00	10:35:00 AM		0.22	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Arp	02-May-00	10:35:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Arp	02-May-00	10:35:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dO-Arp	02-May-00	10:35:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-Arp	02-May-00	10:35:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dO-Arp	02-May-00	10:35:00 AM		0.12	Milligram per Liter	Phosphorus Total as PO4
BC-CU	02-May-00	10:55:00 AM		0.19	Milligram per Liter	Phosphorus Total as PO4
BC-CU	02-May-00	10:55:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-CU	02-May-00	10:55:00 AM		0.27	Milligram per Liter	Nitrogen Kjeldahl as N
BC-CU	02-May-00	10:55:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-CU	02-May-00	10:55:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	02-May-00	10:55:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	02-May-00	10:55:00 AM		13.95	Cubic Feet per Second	Flow Stream
dO-28	02-May-00	11:15:00 AM		0.13	Cubic Feet per Second	Flow Stream

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
dO-28	02-May-00	11:15:00 AM		0.13	Milligram per Liter	Phosphorus Total as PO4
dO-28	02-May-00	11:15:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-28	02-May-00	11:15:00 AM		0.32	Milligram per Liter	Nitrogen Kjeldahl as N
dO-28	02-May-00	11:15:00 AM		1.6	Milligram per Liter	Nitrogen Nitrate as N
dO-28	02-May-00	11:15:00 AM		0.002	Milligram per Liter	Nitrogen Nitrite as N
dO-28	02-May-00	11:15:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	02-May-00	12:55:09 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	02-May-00	12:55:09 PM		0.003	Milligram per Liter	Nitrogen Nitrite as N
dFCC-61	02-May-00	12:55:09 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	02-May-00	12:55:09 PM		0.24	Milligram per Liter	Nitrogen Kjeldahl as N
dFCC-61	02-May-00	12:55:09 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dFCC-61	02-May-00	12:55:09 PM		0.18	Milligram per Liter	Phosphorus Total as PO4
BC-47	02-May-00	1:50:00 PM		6.39	Cubic Feet per Second	Flow Stream
BC-47	02-May-00	1:50:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	02-May-00	1:50:00 PM		0.15	Milligram per Liter	Phosphorus Total as PO4
BC-47	02-May-00	1:50:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-47	02-May-00	1:50:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-47	02-May-00	1:50:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-47	02-May-00	1:50:00 PM		0.23	Milligram per Liter	Nitrogen Kjeldahl as N
dBR-Conf	02-May-00	2:25:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBR-Conf	02-May-00	2:25:00 PM		0.63	Milligram per Liter	Nitrogen Kjeldahl as N
dBR-Conf	02-May-00	2:25:00 PM		0.1	Milligram per Liter	Nitrogen Nitrate as N
dBR-Conf	02-May-00	2:25:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBR-Conf	02-May-00	2:25:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBR-Conf	02-May-00	2:25:00 PM		0.44	Cubic Feet per Second	Flow Stream
dBR-Conf	02-May-00	2:25:00 PM		0.2	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	02-May-00	2:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dGC-Conf	02-May-00	2:45:00 PM		0.26	Milligram per Liter	Nitrogen Kjeldahl as N
dGC-Conf	02-May-00	2:45:00 PM		0.006	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	02-May-00	2:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dGC-Conf	02-May-00	2:45:00 PM		0.15	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	02-May-00	2:45:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	02-May-00	2:45:00 PM		0.18	Cubic Feet per Second	Flow Stream
dBC-Val	02-May-00	3:00:00 PM		0.48	Cubic Feet per Second	Flow Stream
dBC-Val	02-May-00	3:00:00 PM		0.08	Milligram per Liter	Phosphorus Total as PO4
dBC-Val	02-May-00	3:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	02-May-00	3:00:00 PM		0.002	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	02-May-00	3:00:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	02-May-00	3:00:00 PM		0.32	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	02-May-00	3:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	02-May-00	3:25:00 PM		0.13	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	02-May-00	3:25:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	02-May-00	3:25:00 PM		0.69	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	02-May-00	3:25:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dSBC-Val	02-May-00	3:25:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dSBC-Val	02-May-00	3:25:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	22-Aug-00	8:55:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	22-Aug-00	8:55:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	22-Aug-00	8:55:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	22-Aug-00	8:55:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
BC-Can	22-Aug-00	8:55:00 AM		0.37	Milligram per Liter	Phosphorus Total as PO4
BC-Can	22-Aug-00	8:55:00 AM		0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	22-Aug-00	9:10:00 AM		0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-Lib	22-Aug-00	9:10:00 AM		1.5	Milligram per Liter	Nitrogen Nitrate as N
dO-Lib	22-Aug-00	9:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	22-Aug-00	9:10:00 AM		0.93	Milligram per Liter	Phosphate Ortho as PO4
dO-Lib	22-Aug-00	9:10:00 AM		0.49	Milligram per Liter	Phosphorus Total as PO4
dO-Lib	22-Aug-00	9:10:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Bwy	22-Aug-00	9:30:00 AM		2.8	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Bwy	22-Aug-00	9:30:00 AM		1.4	Milligram per Liter	Nitrogen Ammonia as N
dO-Bwy	22-Aug-00	9:30:00 AM		1	Milligram per Liter	Nitrogen Nitrate as N
dO-Bwy	22-Aug-00	9:30:00 AM		1.71	Milligram per Liter	Phosphorus Total as PO4
dO-Bwy	22-Aug-00	9:30:00 AM		0.163	Milligram per Liter	Nitrogen Nitrite as N
dO-Bwy	22-Aug-00	9:30:00 AM		1.52	Milligram per Liter	Phosphate Ortho as PO4
dO-Arp	22-Aug-00	9:50:00 AM		0.99	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	22-Aug-00	9:50:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Arp	22-Aug-00	9:50:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Arp	22-Aug-00	9:50:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-Arp	22-Aug-00	9:50:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dO-Arp	22-Aug-00	9:50:00 AM		0.31	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	22-Aug-00	10:15:00 AM		0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-CU	22-Aug-00	10:15:00 AM		0.78	Milligram per Liter	Phosphorus Total as PO4
BC-CU	22-Aug-00	10:15:00 AM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
BC-CU	22-Aug-00	10:15:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-CU	22-Aug-00	10:15:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	22-Aug-00	10:15:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	22-Aug-00	1:00:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-47	22-Aug-00	1:00:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	22-Aug-00	1:00:00 PM		0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-47	22-Aug-00	1:00:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	22-Aug-00	1:00:00 PM		0.14	Milligram per Liter	Phosphorus Total as PO4
BC-47	22-Aug-00	1:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBR-Conf	22-Aug-00	1:10:00 PM		0.1	Milligram per Liter	Phosphate Ortho as PO4
dBR-Conf	22-Aug-00	1:10:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBR-Conf	22-Aug-00	1:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBR-Conf	22-Aug-00	1:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBR-Conf	22-Aug-00	1:10:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dBR-Conf	22-Aug-00	1:10:00 PM		0.08	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	22-Aug-00	1:30:00 PM		0.3	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	22-Aug-00	1:30:00 PM		0	Milligram per Liter	Nitrogen Ammonia as N
dGC-Conf	22-Aug-00	1:30:00 PM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N
dGC-Conf	22-Aug-00	1:30:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	22-Aug-00	1:30:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	22-Aug-00	1:30:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dSBC-Val	22-Aug-00	1:45:00 PM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	22-Aug-00	1:45:00 PM		0	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	22-Aug-00	1:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dSBC-Val	22-Aug-00	1:45:00 PM		0.08	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	22-Aug-00	1:45:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dSBC-Val	22-Aug-00	1:45:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
dBC-Val	22-Aug-00	1:55:00 PM		0.25	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	22-Aug-00	1:55:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	22-Aug-00	1:55:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	22-Aug-00	1:55:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	22-Aug-00	1:55:00 PM		0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	22-Aug-00	1:55:00 PM		0.22	Milligram per Liter	Phosphorus Total as PO4
dFCC-61	22-Aug-00	2:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dFCC-61	22-Aug-00	2:10:00 PM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
dFCC-61	22-Aug-00	2:10:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dFCC-61	22-Aug-00	2:10:00 PM		0.74	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	22-Aug-00	2:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	22-Aug-00	2:10:00 PM		0.06	Milligram per Liter	Phosphorus Total as PO4
BC-Can	25-Apr-01	8:50:00 AM		0.2	Milligram per Liter	Phosphorus Total as PO4
BC-Can	25-Apr-01	8:50:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-Can	25-Apr-01	8:50:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-Can	25-Apr-01	8:50:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	25-Apr-01	8:50:00 AM		0.21	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	25-Apr-01	8:50:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-11	25-Apr-01	9:20:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-11	25-Apr-01	9:20:00 AM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dO-11	25-Apr-01	9:20:00 AM		0.004	Milligram per Liter	Nitrogen Nitrite as N
dO-11	25-Apr-01	9:20:00 AM		0.4	Milligram per Liter	Phosphate Ortho as PO4
dO-11	25-Apr-01	9:20:00 AM		1.6	Milligram per Liter	Nitrogen Nitrate as N
dO-11	25-Apr-01	9:20:00 AM		0.15	Milligram per Liter	Phosphorus Total as PO4
dO-Bwy	25-Apr-01	9:50:00 AM		3	Milligram per Liter	Nitrogen Ammonia as N
dO-Bwy	25-Apr-01	9:50:00 AM		5.9	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Bwy	25-Apr-01	9:50:00 AM		1.7	Milligram per Liter	Nitrogen Nitrate as N
dO-Bwy	25-Apr-01	9:50:00 AM		0.177	Milligram per Liter	Nitrogen Nitrite as N
dO-Bwy	25-Apr-01	9:50:00 AM		1.68	Milligram per Liter	Phosphate Ortho as PO4
dO-Bwy	25-Apr-01	9:50:00 AM		1.99	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	25-Apr-01	10:10:00 AM		0.08	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	25-Apr-01	10:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Arp	25-Apr-01	10:10:00 AM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Arp	25-Apr-01	10:10:00 AM		0.62	Milligram per Liter	Nitrogen Nitrate as N
dO-Arp	25-Apr-01	10:10:00 AM		0.2	Milligram per Liter	Phosphate Ortho as PO4
dO-Arp	25-Apr-01	10:10:00 AM		0.005	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	25-Apr-01	10:35:00 AM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
BC-CU	25-Apr-01	10:35:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-CU	25-Apr-01	10:35:00 AM		0.34	Milligram per Liter	Nitrogen Kjeldahl as N
BC-CU	25-Apr-01	10:35:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	25-Apr-01	10:35:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	25-Apr-01	10:35:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-47	25-Apr-01	11:00:00 AM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
BC-47	25-Apr-01	11:00:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-47	25-Apr-01	11:00:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	25-Apr-01	11:00:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-47	25-Apr-01	11:00:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	25-Apr-01	11:00:00 AM		0.21	Milligram per Liter	Nitrogen Nitrate as N
dBR-Conf	25-Apr-01	1:20:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBR-Conf	25-Apr-01	1:20:00 PM		0.001	Milligram per Liter	Nitrogen Nitrite as N

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
dBR-Conf	25-Apr-01	1:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBR-Conf	25-Apr-01	1:20:00 PM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N
dBR-Conf	25-Apr-01	1:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBR-Conf	25-Apr-01	1:20:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	25-Apr-01	1:50:00 PM		0.13	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	25-Apr-01	1:50:00 PM		0.003	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	25-Apr-01	1:50:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dGC-Conf	25-Apr-01	1:50:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dGC-Conf	25-Apr-01	1:50:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	25-Apr-01	1:50:00 PM		0.46	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	25-Apr-01	2:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	25-Apr-01	2:10:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	25-Apr-01	2:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	25-Apr-01	2:10:00 PM		0.37	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	25-Apr-01	2:10:00 PM		0.001	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	25-Apr-01	2:10:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	25-Apr-01	2:30:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dSBC-Val	25-Apr-01	2:30:00 PM		0.002	Milligram per Liter	Nitrogen Nitrite as N
dSBC-Val	25-Apr-01	2:30:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	25-Apr-01	2:30:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	25-Apr-01	2:30:00 PM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	25-Apr-01	2:30:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	25-Apr-01	2:50:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dFCC-61	25-Apr-01	2:50:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dFCC-61	25-Apr-01	2:50:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	25-Apr-01	2:50:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dFCC-61	25-Apr-01	2:50:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	25-Apr-01	2:50:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-Can	31-Jul-01	9:00:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-Can	31-Jul-01	9:00:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-Can	31-Jul-01	9:00:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	31-Jul-01	9:00:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	31-Jul-01	9:00:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	31-Jul-01	9:00:00 AM		0.22	Milligram per Liter	Phosphorus Total as PO4
dO-Lib	31-Jul-01	9:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	31-Jul-01	9:10:00 AM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Lib	31-Jul-01	9:10:00 AM		1	Milligram per Liter	Nitrogen Nitrate as N
dO-Lib	31-Jul-01	9:10:00 AM		0.003	Milligram per Liter	Nitrogen Nitrite as N
dO-Lib	31-Jul-01	9:10:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dO-Lib	31-Jul-01	9:10:00 AM		0.46	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	31-Jul-01	9:40:00 AM		0.21	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	31-Jul-01	9:40:00 AM		2	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Arp	31-Jul-01	9:40:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Arp	31-Jul-01	9:40:00 AM		0.1	Milligram per Liter	Nitrogen Nitrate as N
dO-Arp	31-Jul-01	9:40:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-Arp	31-Jul-01	9:40:00 AM		0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	31-Jul-01	9:45:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	31-Jul-01	9:45:00 AM			Cubic Feet per Second	Flow Stream
BC-CU	31-Jul-01	9:45:00 AM		0.22	Milligram per Liter	Phosphorus Total as PO4
BC-CU	31-Jul-01	9:45:00 AM		0.2	Milligram per Liter	Nitrogen Nitrate as N

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
BC-CU	31-Jul-01	9:45:00 AM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
BC-CU	31-Jul-01	9:45:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-CU	31-Jul-01	9:45:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	31-Jul-01	10:15:00 AM		0.07	Milligram per Liter	Phosphorus Total as PO4
BC-47	31-Jul-01	10:15:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	31-Jul-01	10:15:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-47	31-Jul-01	10:15:00 AM		0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-47	31-Jul-01	10:15:00 AM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	31-Jul-01	10:15:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBR-Conf	31-Jul-01	12:20:00 PM		0.6	Milligram per Liter	Nitrogen Kjeldahl as N
dBR-Conf	31-Jul-01	12:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBR-Conf	31-Jul-01	12:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBR-Conf	31-Jul-01	12:20:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBR-Conf	31-Jul-01	12:20:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBR-Conf	31-Jul-01	12:20:00 PM		0.4	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	31-Jul-01	12:45:00 PM		0.8	Milligram per Liter	Nitrogen Kjeldahl as N
dGC-Conf	31-Jul-01	12:45:00 PM		0.2	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	31-Jul-01	12:45:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	31-Jul-01	12:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dGC-Conf	31-Jul-01	12:45:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	31-Jul-01	12:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	31-Jul-01	1:00:00 PM		0.26	Milligram per Liter	Phosphorus Total as PO4
dBC-Val	31-Jul-01	1:00:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	31-Jul-01	1:00:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	31-Jul-01	1:00:00 PM		0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	31-Jul-01	1:00:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	31-Jul-01	1:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	31-Jul-01	1:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	31-Jul-01	1:10:00 PM		0.6	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	31-Jul-01	1:10:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dSBC-Val	31-Jul-01	1:10:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dSBC-Val	31-Jul-01	1:10:00 PM		0.36	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	31-Jul-01	1:10:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	31-Jul-01	1:20:00 PM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dFCC-61	31-Jul-01	1:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	31-Jul-01	1:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dFCC-61	31-Jul-01	1:20:00 PM		0.39	Milligram per Liter	Phosphorus Total as PO4
dFCC-61	31-Jul-01	1:20:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	31-Jul-01	1:20:00 PM		0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	23-Apr-02	9:10:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	23-Apr-02	9:10:00 AM		0.4	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	23-Apr-02	9:10:00 AM		0.19	Milligram per Liter	Phosphorus Total as PO4
BC-Can	23-Apr-02	9:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-Can	23-Apr-02	9:10:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-Can	23-Apr-02	9:10:00 AM		0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-11	23-Apr-02	9:20:00 AM		0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-11	23-Apr-02	9:20:00 AM		1.6	Milligram per Liter	Nitrogen Nitrate as N
dO-11	23-Apr-02	9:20:00 AM		0.004	Milligram per Liter	Nitrogen Nitrite as N
dO-11	23-Apr-02	9:20:00 AM		0.28	Milligram per Liter	Phosphate Ortho as PO4
dO-11	23-Apr-02	9:20:00 AM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
dO-11	23-Apr-02	9:20:00 AM		0.17	Milligram per Liter	Phosphorus Total as PO4
BC-CU	23-Apr-02	9:50:00 AM		0.08	Milligram per Liter	Phosphorus Total as PO4
BC-CU	23-Apr-02	9:50:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	23-Apr-02	9:50:00 AM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
BC-CU	23-Apr-02	9:50:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-CU	23-Apr-02	9:50:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	23-Apr-02	9:50:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-47	23-Apr-02	10:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-47	23-Apr-02	10:10:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	23-Apr-02	10:10:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-47	23-Apr-02	10:10:00 AM		0.13	Milligram per Liter	Phosphate Ortho as PO4
BC-47	23-Apr-02	10:10:00 AM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
BC-47	23-Apr-02	10:10:00 AM		0.2	Milligram per Liter	Nitrogen Nitrate as N
dGC-Conf	23-Apr-02	12:25:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	23-Apr-02	12:25:00 PM		0.08	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	23-Apr-02	12:25:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	23-Apr-02	12:25:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dGC-Conf	23-Apr-02	12:25:00 PM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N
dGC-Conf	23-Apr-02	12:25:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	23-Apr-02	12:40:00 PM		0.07	Milligram per Liter	Phosphorus Total as PO4
dBC-Val	23-Apr-02	12:40:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	23-Apr-02	12:40:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	23-Apr-02	12:40:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	23-Apr-02	12:40:00 PM		0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	23-Apr-02	12:40:00 PM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	23-Apr-02	12:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	23-Apr-02	12:45:00 PM		0.5	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	23-Apr-02	12:45:00 PM		0.1	Milligram per Liter	Nitrogen Nitrate as N
dSBC-Val	23-Apr-02	12:45:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dSBC-Val	23-Apr-02	12:45:00 PM		0.35	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	23-Apr-02	12:45:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	23-Apr-02	1:00:00 PM		0.14	Milligram per Liter	Phosphorus Total as PO4
dFCC-61	23-Apr-02	1:00:00 PM		0.28	Milligram per Liter	Phosphate Ortho as PO4
dFCC-61	23-Apr-02	1:00:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dFCC-61	23-Apr-02	1:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dFCC-61	23-Apr-02	1:00:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dFCC-61	23-Apr-02	1:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-Can	22-Oct-02	8:55:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-Can	22-Oct-02	8:55:00 AM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
BC-Can	22-Oct-02	8:55:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	22-Oct-02	8:55:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	22-Oct-02	8:55:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	22-Oct-02	8:55:00 AM		0.11	Milligram per Liter	Phosphorus Total as PO4
dO-Lib	22-Oct-02	9:20:00 AM		0.11	Milligram per Liter	Phosphate Ortho as PO4
dO-Lib	22-Oct-02	9:20:00 AM		0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	22-Oct-02	9:20:00 AM		0.6	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Lib	22-Oct-02	9:20:00 AM		0.1	Milligram per Liter	Nitrogen Nitrate as N
dO-Lib	22-Oct-02	9:20:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dO-Lib	22-Oct-02	9:20:00 AM		0.81	Milligram per Liter	Phosphorus Total as PO4
dO-11	22-Oct-02	9:40:00 AM		0.6	Milligram per Liter	Phosphorus Total as PO4

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
dO-11	22-Oct-02	9:40:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-11	22-Oct-02	9:40:00 AM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dO-11	22-Oct-02	9:40:00 AM		0.7	Milligram per Liter	Nitrogen Nitrate as N
dO-11	22-Oct-02	9:40:00 AM		0.005	Milligram per Liter	Nitrogen Nitrite as N
dO-11	22-Oct-02	9:40:00 AM		0.36	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	22-Oct-02	10:25:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-CU	22-Oct-02	10:25:00 AM		0.11	Milligram per Liter	Phosphorus Total as PO4
BC-CU	22-Oct-02	10:25:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-CU	22-Oct-02	10:25:00 AM		0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	22-Oct-02	10:25:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-CU	22-Oct-02	10:25:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	22-Oct-02	10:45:00 AM		0.27	Milligram per Liter	Phosphorus Total as PO4
BC-47	22-Oct-02	10:45:00 AM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
BC-47	22-Oct-02	10:45:00 AM		0.002	Milligram per Liter	Nitrogen Nitrite as N
BC-47	22-Oct-02	10:45:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-47	22-Oct-02	10:45:00 AM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	22-Oct-02	10:45:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dGC-Conf	22-Oct-02	1:00:00 PM		0.001	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	22-Oct-02	1:00:00 PM		0.71	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	22-Oct-02	1:00:00 PM		0.45	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	22-Oct-02	1:00:00 PM		0.4	Milligram per Liter	Nitrogen Kjeldahl as N
dGC-Conf	22-Oct-02	1:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dGC-Conf	22-Oct-02	1:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	22-Oct-02	1:20:00 PM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	22-Oct-02	1:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	22-Oct-02	1:20:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	22-Oct-02	1:20:00 PM		0.001	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	22-Oct-02	1:20:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	22-Oct-02	1:20:00 PM		0.31	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	22-Oct-02	1:35:00 PM		0.8	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	22-Oct-02	1:35:00 PM		0.17	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	22-Oct-02	1:35:00 PM	<	0.1	Milligram per Liter	Phosphate Ortho as PO4
dSBC-Val	22-Oct-02	1:35:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dSBC-Val	22-Oct-02	1:35:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	22-Oct-02	1:35:00 PM		0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	28-Jan-03	9:55:00 AM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-Can	28-Jan-03	9:55:00 AM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
BC-Can	28-Jan-03	9:55:00 AM		0.16	Milligram per Liter	Phosphate Ortho as PO4
BC-Can	28-Jan-03	9:55:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-Can	28-Jan-03	9:55:00 AM		0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-Can	28-Jan-03	9:55:00 AM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Lib	28-Jan-03	10:15:00 AM		1.1	Milligram per Liter	Nitrogen Nitrate as N
dO-Lib	28-Jan-03	10:15:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Lib	28-Jan-03	10:15:00 AM		6.9	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Lib	28-Jan-03	10:15:00 AM		0.033	Milligram per Liter	Nitrogen Nitrite as N
dO-Lib	28-Jan-03	10:15:00 AM		0.68	Milligram per Liter	Phosphate Ortho as PO4
dO-Lib	28-Jan-03	10:15:00 AM		0.69	Milligram per Liter	Phosphorus Total as PO4
dO-11	28-Jan-03	10:25:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-11	28-Jan-03	10:25:00 AM		0.6	Milligram per Liter	Nitrogen Kjeldahl as N
dO-11	28-Jan-03	10:25:00 AM		0.6	Milligram per Liter	Nitrogen Nitrate as N

Dry Weather Nutrient Data for Selected Outfalls

Location.NAME	SAMPLEDATE	SAMPLETIME	Sign	RESULT	Units.NAME	ANALYTE
dO-11	28-Jan-03	10:25:00 AM		0.014	Milligram per Liter	Nitrogen Nitrite as N
dO-11	28-Jan-03	10:25:00 AM		0.34	Milligram per Liter	Phosphate Ortho as PO4
dO-11	28-Jan-03	10:25:00 AM		0.28	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	28-Jan-03	10:45:00 AM		0.1	Milligram per Liter	Nitrogen Ammonia as N
dO-Arp	28-Jan-03	10:45:00 AM		0.3	Milligram per Liter	Nitrogen Kjeldahl as N
dO-Arp	28-Jan-03	10:45:00 AM		0.9	Milligram per Liter	Nitrogen Nitrate as N
dO-Arp	28-Jan-03	10:45:00 AM		1.17	Milligram per Liter	Phosphate Ortho as PO4
dO-Arp	28-Jan-03	10:45:00 AM		1.03	Milligram per Liter	Phosphorus Total as PO4
dO-Arp	28-Jan-03	10:45:00 AM		0.002	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	28-Jan-03	11:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-CU	28-Jan-03	11:10:00 AM		0.1	Milligram per Liter	Nitrogen Kjeldahl as N
BC-CU	28-Jan-03	11:10:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-CU	28-Jan-03	11:10:00 AM		0.001	Milligram per Liter	Nitrogen Nitrite as N
BC-CU	28-Jan-03	11:10:00 AM		0.08	Milligram per Liter	Phosphorus Total as PO4
BC-CU	28-Jan-03	11:10:00 AM		2.49	Milligram per Liter	Phosphate Ortho as PO4
BC-47	28-Jan-03	11:45:00 AM		0.002	Milligram per Liter	Nitrogen Nitrite as N
BC-47	28-Jan-03	11:45:00 AM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
BC-47	28-Jan-03	11:45:00 AM		0.2	Milligram per Liter	Nitrogen Kjeldahl as N
BC-47	28-Jan-03	11:45:00 AM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
BC-47	28-Jan-03	11:45:00 AM		0.37	Milligram per Liter	Phosphate Ortho as PO4
BC-47	28-Jan-03	11:45:00 AM		0.09	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	28-Jan-03	1:30:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dGC-Conf	28-Jan-03	1:30:00 PM		2.05	Milligram per Liter	Phosphate Ortho as PO4
dGC-Conf	28-Jan-03	1:30:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dGC-Conf	28-Jan-03	1:30:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dGC-Conf	28-Jan-03	1:30:00 PM		0.6	Milligram per Liter	Nitrogen Kjeldahl as N
dGC-Conf	28-Jan-03	1:30:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	28-Jan-03	1:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dBC-Val	28-Jan-03	1:45:00 PM		0.1	Milligram per Liter	Nitrogen Kjeldahl as N
dBC-Val	28-Jan-03	1:45:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dBC-Val	28-Jan-03	1:45:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dBC-Val	28-Jan-03	1:45:00 PM		1.42	Milligram per Liter	Phosphate Ortho as PO4
dBC-Val	28-Jan-03	1:45:00 PM	<	0.05	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	28-Jan-03	2:00:00 PM	<	0.001	Milligram per Liter	Nitrogen Nitrite as N
dSBC-Val	28-Jan-03	2:00:00 PM		0.77	Milligram per Liter	Phosphorus Total as PO4
dSBC-Val	28-Jan-03	2:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Nitrate as N
dSBC-Val	28-Jan-03	2:00:00 PM		0.8	Milligram per Liter	Nitrogen Kjeldahl as N
dSBC-Val	28-Jan-03	2:00:00 PM	<	0.1	Milligram per Liter	Nitrogen Ammonia as N
dSBC-Val	28-Jan-03	2:00:00 PM		0.56	Milligram per Liter	Phosphate Ortho as PO4