Appendix A:
Summary of the Bear Creek Segment 1a Supplemental Monitoring Program
For June 1-September 30, 2004

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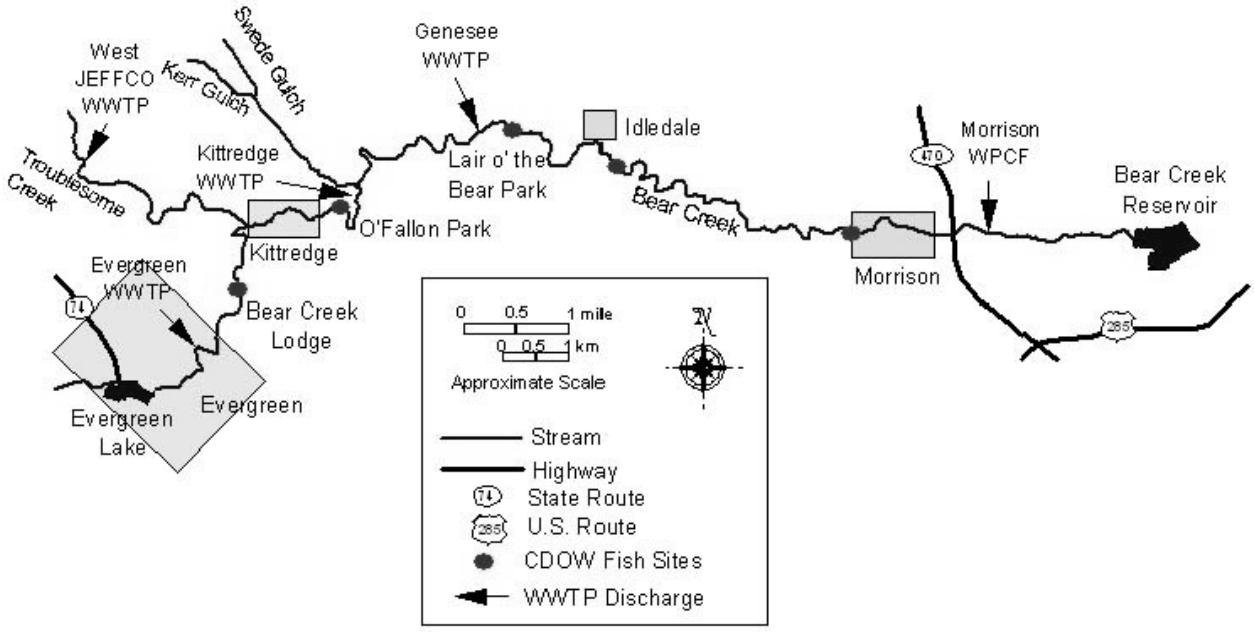
PURPOSE

The Bear Creek Watershed Association (Association) conducted a special stream monitoring program for Bear Creek Segment 1a during the summer of 2004. The segment listed on the State of Colorado's Monitoring and Evaluation List Regulation #94 is Bear Creek Segment COSPBE01a from below Evergreen Lake to the Harriman Diversion. Temperature data obtained from five in-stream locations, monitoring data from nine in-stream locations and data from four wastewater treatment plant (WWTP) effluents will be presented in this report.



The Program included data gathering locations outside of the identified Segment. Those locations include above Evergreen Lake, in Evergreen Lake (at the dam), and below the Harriman Diversion. The Morrison wastewater treatment plant (WWTP) discharge is also below the Harriman Diversion. The complete 2004 water quality data set is an electronic attachment to this data summary report.

The Program was a cooperative effort between the Association and the five larger wastewater treatment plant dischargers into Bear Creek Segment 1a. The entities include Evergreen Metropolitan District (EMD), West Jefferson County Metropolitan District (WJCMD), Kittredge Sanitation and Water District (KSWD), Genesee Water and Sanitation District (GWSD) and the town of Morrison. This supplemental monitoring program began June 1, 2004 and completed on September 30, 2004. (A limited sampling and monitoring program continues through the spring of 2005.) The in-stream monitoring program provides more detailed water quality information specifically for temperature, pH, dissolved oxygen, specific conductance and ammonia in Bear Creek Segment 1a. The monitoring program design specially addresses the listing parameters of aquatic life, temperature and ammonia as included in the 2004 Colorado Monitoring and Evaluation List.

BACKGROUND

- The 2004 Colorado Monitoring and Evaluation List identified Bear Creek Segment 1a as potentially impaired due to temperature and ammonia, and conditions affecting aquatic life. The Association needed to obtain detailed water quality data throughout Segment 1a to determine if temperature and ammonia were a water quality problem.

- The routine water quality monitoring program maintained by the Bear Creek Watershed Association (for Bear Creek Reservoir) had not demonstrated a temperature or ammonia toxicity problem; consequently the supplemental monitoring effort was designed to assess gaps in the routine monitoring program by expanding the temporal and spatial data gathering efforts on the stream. Once the more detailed stream data was analyzed, the Association would determine the best location and sampling protocol to characterize Segment 1a.

- The Association wanted to obtain water quality data that could be used in future stream modeling and prediction. Additional evaluation and modeling of the temperature information was necessary to determine a management strategy for the stream.

- The listing for aquatic life required a more detailed stream characterization to assess how the trout populations are responding to both natural and human induced alterations. The supplemental data set allowed the Association to determine if chemical effects were part of the problem.

- The Association wanted to evaluate the cause and effect response to stream chemistry and recommend a management strategy to the Water Quality Control Commission.

SPECIAL STRAM MONITORING PROGRAM COMPONENTS

The Program consisted of several components in an effort to assemble as much pertinent scientific data and information about Bear Creek Segment 1a as possible. Components included:

Temperature dataloggers

Programmable temperature dataloggers measured and recorded hourly stream and WWTP effluent temperatures. The loggers used in the Program were Onset Computer Corporation brand, HOBO model H8 programmable dataloggers. The dataloggers were placed into watertight cases and secured to weights before placed underwater. The Program also used Onset computer software specifically designed for these dataloggers, which enables launch and readout (start and stop) and viewing of downloaded data. The software automatically presents the downloaded data in graph and table formats and allows data export into a spreadsheet format.

Dataloggers placed at 5 locations in Segment 1a and in all five WWTP effluents. Additionally, two dataloggers recorded measurements in Evergreen Lake (at the dam), one datalogger in Bear Creek above Evergreen Lake and one in Bear Creek below the Harriman

Diversion. As mentioned above, these four dataloggers (along with the Morrison WWTP effluent datalogger) were not within the scope of this report, but utilized for supplementary data collection and historical record. Their data will be included as an electronic attachment to this report. The datalogger identification codes and locations are shown n Table 1.

Table 1 Datalogger Identification and Location

Datalogger ID	Datalogger Location
EMD1	Above Evergreen Lake, at the USGS gaging station
EMD2	In Evergreen Lake, at the dam face, on the surface
EMD3	In Evergreen Lake, at the dam face, 10 feet below the surface
EMD4	Bear Creek Segment 1a, above EMD WWTP effluent
EMD5	EMD WWTP effluent
WJ6	WJCMD WWTP effluent
KSWD7	Bear Creek Segment 1a, above KSWD WWTP effluent
KSWD8	KSWD WWTP effluent
GWSD9	Bear Creek Segment 1a, above GWSD WWTP effluent
GWSD9A	GWSD WWTP effluent
EMD5A	Bear Creek Segment 1a, below Idledale (east end of town)
MORR10	Bear Creek Segment 1a, above Morrison (west end of town)
MORR11	Bear Creek Segment 1a, above Morrison WWTP effluent
MORR12	Morrison WWTP effluent

The dataloggers were programmed for hourly measurements at an office computer equipped with the Onset software. At this frequency, the memory capacity is approximately 75 days. However, because of the Onset program design, the units begin recording temperatures immediately, once launched. (Newer models have delayed-start capabilities.) Logsheets were utilized to record the exact time of deployment and retrieval of all units, so that erroneous measurements (measurements recorded out of water) could be omitted during the data evaluation process.

A typical retrieval/deployment procedure is as follows: The loggers are removed from their locations, beginning in Evergreen and proceeding downstream toward Morrison. The date and time of each retrieval are noted on a log sheet. After retrieving the last logger in Morrison, the loggers are transported to the computer with the Onset software at the EMD Administration office. The loggers are then removed from their watertight cases. The loggers are connected to the computer via a download cable, data collection is stopped and data on the loggers is individually downloaded into separate program files. A desiccant packet in the watertight case is removed and dried. The cases are prepared for the re-immersion by coating the o-ring with silicone sealant. The loggers are then individually connected to the computer and launched (started). The logger with a desiccant packet is placed into the case and closed, hand tight. Beginning in Evergreen, the dataloggers are returned to their respective locations, moving downstream to Morrison, noting the date and time of deployment on the log sheet.

Precautions were taken during the Program to avoid lost temperature data. In previous years, dataloggers have been stolen from their location and all data for that recording period lost. In an effort to minimize lost data, dataloggers located in Segment 1a were retrieved and downloaded on a monthly schedule. The dataloggers located in the WWTP effluents were retrieved and downloaded every two months, because of the secure environment. Summary results from the temperature dataloggers presented in the table format.

Weekly Measurements

Monitoring for pH, dissolved oxygen, temperature and specific conductance was performed weekly at ten locations in Segment 1a. Some of the locations were coincident with temperature dataloggers. (Monitoring was performed in Evergreen Lake at two locations near the dam face and one location in the "middle" of the Lake. In addition, measurements were taken at Kerr Gulch, a spring-fed drainage into Bear Creek, just below the KSWD WWTP discharge. Measurements were obtained at a location above Morrison's WWTP discharge. These data presented as an electronic attachment to this report. The monitoring ID's and locations shown in Table 2 and parameters sampled shown in Table 3.

Table 2 Monitoring Identification and Location

Monitoring ID	Location
EMD4	Bear Creek Segment 1a, above EMD WWTP effluent
BCC	Bear Creek Segment 1a, vehicle bridge below Bear Creek Cabins
WELCHBR	Bear Creek Segment 1a, vehicle bridge at Welch Avenue in Kittredge
OFPWEST	Bear Creek Segment 1a, west end of O'Fallon Park in Kittredge
KSWD7	Bear Creek Segment 1a, above KSWD WWTP effluent
KERR	Kerr Gulch, above the confluence of Bear Creek Segment 1a
GWSD9	Bear Creek Segment 1a, above GWSD WWTP effluent
IDLEWEST	Bear Creek Segment 1a, west end of Idledale, west of Little Park
EMD5A	Bear Creek Segment 1a, below Idledale (east end of town)
MORR10	Bear Creek Segment 1a, above Morrison (west end of town)
MORR11	Bear Creek Segment 1a, above Morrison WWTP effluent

Table 3 The weekly sampling and monitoring events

Sampling/ Monitoring ID	Parameters
EMD4	pH, Temperature (Temp.), Dissolved Oxygen (DO), Specific Conductance (SpCd); Total Ammonia; Temp. Datalogger
BCC	pH, Temp., DO, SpCd; Total Ammonia
WELCHBR	pH, Temp., DO, SpCd; Total Ammonia
OFPWEST	pH, Temp., DO, SpCd; Total Ammonia
KSWD7	pH, Temp., DO, SpCd; Total Ammonia; Temp Datalogger
KERR	pH, Temp., DO, SpCd; Total Ammonia
GWSD9	pH, Temp., DO, SpCd; Total Ammonia; Temp Datalogger
IDLEWEST	pH, Temp., DO, SpCd; Total Ammonia
EMD5A	pH, Temp., DO, SpCd; Total Ammonia; Temp Datalogger
MORR10	pH, Temp., DO, SpCd; Total Ammonia; Temp Datalogger
MORR11	pH, Temp., DO, SpCd; Total Ammonia; Temp Datalogger

Weekly measurements performed alternately in scheduled morning and afternoon events. Morning events began at approximately 8:00 in Evergreen Lake, while afternoon events began about noon. The purpose for alternating morning and afternoon events was to determine if any significant changes observed are temporally related. Morning and afternoon datasets presented separately in report tables.

Measurements recorded with a Yellow Springs Instruments, Inc. (YSI) Model 556 MPS hand-held meter. The meter utilizes a multi-probe sensor, capable of measuring pH, temperature, dissolved oxygen and specific conductance simultaneously. The measurements are logged and retained in the on-board computer until manually or electronically downloaded. (Typically, the logged data was manually downloaded by viewing each file and transcribing data onto weekly Logsheets. At the completion of the Program, the memory was downloaded to a computer for use as a quality control check.) Prior to the Program, the meter was calibrated by certified technicians at Geotech Environmental Equipment in Denver. Prior to each monitoring event, the meter calibrated for each parameter, using a purchased calibration solution for specific conductance and technician-mixed pH buffers (two-point calibration, 7.00 and 10.01). All calibrations were documented on a Logsheets.

Fresh batteries were installed in the meter at the start of the Program and batteries were replaced when the observed battery charge reached 50%. The YSI multimeter utilizes a YSI software program to download and present collected data. Ecowatch software presents the data in graphic and tabular formats and data can be exported into a spreadsheet program.

Total Ammonia Weekly Sampling

Weekly sampling for total ammonia performed at ten locations in Segment 1a. In addition, the locations above Evergreen Lake, Kerr Gulch and above Morrison's WWTP discharge were sampled. As stated above, this data will be included as an electronic attachment to this report.

Sampling performed concurrently with weekly monitoring. The temperature and pH values measured at the time of sampling used in the unionized ammonia calculation. The weekly sampling and monitoring was also coordinated with permit sampling performed by the WWTP's discharging into Bear Creek. The reason for this coordinated effort was to attempt to provide a water quality "snapshot" of Bear Creek at that point in time.

WWTP effluents analyzed by onsite laboratories: EMD, WJCMD and KSWD plant effluents were analyzed by EMD personnel, as typically done for CPDES permit reporting. EMD personnel utilize the EPA-approved Method 4500-NH3 D., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition.* Similarly, GWSD WWTP personnel analyzed plant effluent per approved methods: Method 4500-NH3 D., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition.*

Samples taken in the field were documented on Logsheets and EMD Chain of Custody forms. Samples were taken in polyethylene bottles, unpreserved, and immediately iced. Morning sampling events resulted in same-day transport to the University of Colorado Limnology Laboratory. Afternoon sampling events resulted in next morning transport to the University of Colorado Limnology Laboratory. Samples were iced overnight. The CU Lab uses a low level, spectrophotometric method: Method 4500-NH3 F., *Standard Methods for the Analysis of Water and Wastewater, 20th Edition.* Summary results of the ammonia sampling are presented in this summary report.

24-hour Profiling At Two Locations

In addition to weekly sampling and monitoring, the Association decided to purchase a programmable, sonde-type, recording, multi-sensor probe to profile selected sites for pH, temperature, dissolved oxygen and specific conductance over a 24-hour period. Two locations were selected: Bear Creek Segment 1a, above KSWD WWTP effluent and Lair o' the Bear Park, near Idledale.

The location above KSWD WWTP effluent is at the east end of O'Fallon Park. This Denver Mountain Park is a high-use park popular with day users from the Denver area. The Park has been identified as a problem area for water quality in past years. The Lair o' the Bear Open Space Park site was chosen for its proximity to the midpoint of the Segment. Both sites were chosen for their accessibility and cover from the public. The reason for 24-hour profiling was to document naturally occurring, diurnal parameter fluctuations. In prior years, high parameter fluctuations (pH) were documented but attributed to low flows. This is an effort to begin historical data collection to compare normal and low flow years.

The probe selected for the Program was a YSI 600XLM. Calibrations were performed and documented prior to each use. A two-point calibration was used for pH (7.00 and 10.01) and the specific conductance calibration was performed with a purchased solution. The probe was programmed for a delayed start and programmed to measure parameters hourly. The probe was weighted, disguised and deployed at each location six times during the Program. The YSI Ecowatch software downloads data and presents it in graphic and tabular formats. Data can be exported into a spreadsheet program.

Data Management

Large quantities of varied data were collected during the Program. As mentioned above, weekly stream monitoring and sampling (separated into morning and afternoon events), laboratory results, hourly temperature measurements from dataloggers, wastewater treatment plant effluent process control and permit monitoring data (from four treatment plants), weather statistics and stream flows comprise raw data. All data was stored on an office computer, using Microsoft Office 2000 software. The majority of the data resides in and analyses occurred in Excel spreadsheet format. The PC is connected to a LAN, which provides nightly backup to a server. Other software programs that contain raw data include Onset Computer Corporation Boxcar software and YSI Ecowatch software. Both of these programs reside on the same PC mentioned above. Laboratory results consisted of low-level total ammonia results from the Limnology Laboratory at CU Boulder. These results, coupled with pH and temperature values taken simultaneously were used to calculate the unionized ammonia fraction.

Weekly stream monitoring and sampling data

Weekly stream monitoring and sampling data was tabulated and separated into morning and afternoon datasets. Data was retrieved from the YSI memory shortly after each monitoring event. Data was transcribed onto the weekly Logsheets and subsequently entered onto Excel spreadsheets. Each monitoring site has an individual folder, with files of data. Additionally, individual parameter files created to evaluate separately. Minimum, maximum, average and standard deviation analyses were performed on this (and mostly all) data.

Temperature datalogger data

Hourly datalogger temperature measurements were exported from the Onset Computer software into Excel spreadsheets. Each download of temperature data is treated as a file in the Onset software. Once the Onset file formats had been saved as separate Excel files, the Excel files for each location were combined into one Excel file with multiple worksheets. Therefore, each Excel file contains multiple worksheets, one for each separate download of data, and a summary worksheet. The summary worksheet contains the combined individual data files and statistical analysis.

The date and time recorded on the Launch/Retrieval logsheet were used to eliminate erroneous temperature measurements prior to data analysis. Once in a spreadsheet format, the data was analyzed for Daily Maximum Temperature, Seven-day Average Maximum Temperature and Δ°C/4 hours. Temperature data was analyzed against the 20°C maximum stream standard and the Δ3°C/4 hours limits. Additionally, any values found to exceed the Δ3°C/4 hours were analyzed to determine whether the exceedence occurred above or below 20°C. Percentages of compliance were calculated.

Wastewater Treatment Plant Data

Since there are five "major" wastewater treatment facilities that discharge into Bear Creek Segment 1a, an effort was undertaken to analyze effluent parameters that would be consequential to the receiving waters (Table 4). (The Morrison WWTP is not included in this report, because its discharge enters Bear Creek below the identified Segment 1a.) Effluent flow, temperature, dissolved oxygen, pH and total ammonia data has been collected and reviewed. Only data that typically comprises daily Process Control and permit-mandated monitoring was reviewed. In prior years, the same data was collected and combined with monitoring and measurements taken in Bear Creek. This combined data was introduced to separate temperature, dissolved oxygen models to document existing effects, and predict possible outcomes of specific scenarios.

Table 4 Wastewater Treatment Plants And Parameters

WWTP	Parameters
EMD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
WJCMD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
KSWD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
GWSD	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger
Morrison	Flow, pH, Temperature, Dissolved Oxygen, Total Ammonia; Temp Datalogger

The sampling and monitoring portion of the Program was coordinated with the permit required effluent sampling. This occurred on Thursdays during the Program.

Weather (local)

A National Weather Service reporting station is maintained at the EMD WWTP. Daily high and low air temperatures and precipitation are recorded and transmitted monthly to the

National Weather Service. Weather data is tabulated and correlated with Bear Creek stream flows for the Program.

Stream flows

A USGS stream gage (USGS 06710385) is maintained at the temperature datalogger location ID EMD1, which is located above Evergreen Lake. The gage location is adjacent to the Denver Mountain Parks golf course and restaurant (Keys on the Green) parking lot. A second gaging station is located at the temperature datalogger location ID MORR10, above the town of Morrison, just west of the Highway 8 bridge over Bear Creek. This station (BCMORCO) is maintained by the US Army Corps of Engineers and the Colorado Division of Water Resources. Weekly stream flow graphs were printed from both stations and filed for record. Monthly average daily flows from the USGS station have been exported to a spreadsheet for comparison with historical data.

Problems

Relatively few problems encountered during the Program. The datalogger located just above the EMD WWTP effluent outfall (EMD4) malfunctioned shortly after its return to service on 8/2/04. The malfunction occurred on 8/6/04 at 04:05; however, it was not realized until the datalogger was retrieved on 9/11/04. The unit experienced a thermistor problem and no data collected for essentially the month of August. A replacement datalogger put into service with the subsequent launching. There were no other equipment problems during the Program. An attempt made to use temporary staff gages placed in the creek at four different locations for relative measurements. The heavy rains in July toppled the gages and sometimes swept them away, resulting in repositioning and inconsistent readings. Readings halted approximately midway through the Program.

OTHER SUPPORTING STREAM STUDY EFFORTS

Macroinvertebrate Assessment

The macroinvertebrate integrity of Bear Creek segment 1a was assessed by collecting macroinvertebrate at four sites along Bear Creek on June 11, 2005: Bear Creek Park, Lair o' the Bear Park, O' Fallow Park, and Upstream Evergreen wastewater treatment plant effluent outfall. Association members used a Surber Stream-bottom sampler (After Brewer and McCann, 1982) and standard sampling protocol. A discrete section of randomly selected steam substrate was stirred in fixed quarter-meter framed area with a trowel for 2 minutes and 4 – 6 inches deep. Floating organisms captured in the net. Large rocks removed and hand picked on shore. 58 different species were collected at these sites.

CDOW Fish Count

The Colorado Division of Wildlife (CDOW) performed an electro-fishing fish count in Segment 1a on September 14-15, 2004. Five locations were surveyed (moving upstream to downstream): Bear Creek Cabins, O'Fallon Park, Lair o' the Bear Park, below Idledale and at the west end of Morrison. Chadwick Ecological Consultants (CEC) requested the raw data for analysis. BCWA did not retain CEC to perform a detailed analysis of the data, but received a verbal summary of the data. CDOW contacted for the same: a verbal analysis of

the data, with a comparison to prior years. BCWA took this approach (verbal summaries) to maximize the return on monitoring dollars. The BCWA includes the fish count data summaries as an indicator of the overall water quality in Segment 1a.

Fishing Survey

A fishing survey was created by EMD personnel and handed to anglers along Bear Creek during the Program. The purpose was to collect additional non-scientific data regarding water quality through the personal input of recreational users. Five return-addressed, stamped surveys were distributed and one was returned.

DATA SHEETS AND STUDY FORMS

Several forms were generated by EMD personnel to document measurements and actions during the Program. Logsheets used in the Program include:

- Datalogger Launch/Retrieve
- Bear Creek Study Staff Gage Readings
- Calibration Record-YSI 556
- Calibration Record-YSI Sonde
- Bear Creek Weekly Checks Log
- EMD Chain of Custody form

Data Sheets-Launch/Retrieve Record

This form was used during the Program to document the precise time and date when the dataloggers were removed from and immersed in Bear Creek. This was an important to document because no delayed start was used with the dataloggers. Temperature measurement began as soon as the logger was launched at the computer, so documenting exactly when the logger was immersed allows for the exclusion of erroneous readings. Date, time and initials recorded.

Data Sheets-Staff Gage Readings

This form used during the Program to document relative stream height on non-permanent staff gages. Date, time, height in feet and initials recorded. Readings were taken whenever personnel were performing Program tasks. Because the staff gages were non-permanent, high flows from rain events caused toppling. Staff gages were up righted and readings taken, usually from a new location. Because of this frequent occurrence, the readings became more meaningless and the procedure abandoned midway through the Program.

Data Sheets-Calibrations

The two-calibration log sheets used during Program documented the instrument calibrations performed before each measuring activity. Date, time, equipment warm-up time, pH (7.00 and 10.01), dissolved oxygen, temperature, specific conductance and initials were recorded. Both the YSI 556 and the YSI 600 XLM Sonde instruments were calibrated prior to each use. Any unusual conditions (unit will not calibrate) or service activities (changing batteries) were also noted.

Data Sheets-Weekly Log

The weekly log sheets used during the Program summarized sampling and monitoring event results. Date, pH, temperature, dissolved oxygen, specific conductance, sampling time and initials were documented. Parameter results and monitoring time were transcribed from the YSI 556 meter memory. A note was also made regarding the presence (or absence) of the datalogger. Weather observations were noted.

Data Sheets-EMD Chain of Custody

The Chain of Custody form was used during the Program to document the secure handling of stream samples obtained. Date, time, sample location, sample type (composite/grab), number of containers, analysis, sampler signature, remarks, relinquished by and received by signature was recorded. The form is a carbonless copy, and the copy remained with the samples in the Limnology Laboratory at CU Boulder and the original was retained on file by EMD. Datasets that are much more detailed include all locations from individual events, graphed representation of such data and all recorded temperature data (exported to spreadsheet format) from the dataloggers. This data is available as an attachment to the report. Total ammonia results were combined with pH and temperature measurements recorded at the time of sampling to calculate the unionized fraction.

BEAR CREEK IN-STREAM DATA TABLES

Table 5 Above EMD WWTP effluent

[Monitoring station/Datalogger ID: EMD4 GPS Coordinates: 39.6376°N, 105.3150°W; The location of the sampling/monitoring site is in Bear Creek, behind the EMD WWTP UV building, upstream of the plant effluent outfall.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.95	10.50	7.97	0.053	8.2	0
Max	7.84	17.89	11.34	0.078	34.4	0
Avg	7.39	13.53	8.85	0.063	18.8	0
Std. Dev.	0.23	1.92	0.95	0.007	9.6	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.82	9.94	8.37	0.057	8.9	0
Max	7.87	16.93	9.19	0.078	39.6	1
Avg	7.44	13.95	8.65	0.066	18.5	0
Std. Dev.	0.26	1.81	0.27	0.007	9.2	0

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	∆°C/4 hr Moving Averages
Min	9	10.2	10.6	0.0
Max	19	19.0	18.1	2.7
Avg	13.6	14.7	14.9	0.6
Std. Dev.	1.9	1.9	1.6	0.4
# of measurements	2113	89	77	2101
# of 20°C exceed	0	0	0	
% Compliance	100	100	100	
∆3°C/ 4 hr exceedances				0
% Compliance				100
∆3°C/ 4 hr exceedances > 20°C				0
% Compliance				100

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 6 Bear Creek Cabins

[Monitoring station/Datalogger ID: BCC GPS Coordinates: 39.6437°N, 105.3074°W The location of the sampling/monitoring site is in Bear Creek, below the Bear Creek Cabins WWTP, on the upstream side of the vehicle bridge at Old Gulch Road. There was no temperature datalogger at this location.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.29	10.53	8.31	0.056	7.4	0
Max	8.50	18.23	11.38	0.086	137.2	1
Avg	7.73	13.88	9.03	0.069	28.3	0
Std. Dev.	0.38	1.96	0.88	0.009	39.1	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.01	10.40	8.33	0.056	9.0	0
Max	8.18	17.30	9.27	0.093	35.5	0
Avg	7.66	14.67	8.72	0.075	15.6	0
Std. Dev.	0.35	2.03	0.30	0.011	8.2	0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 7 Welch Avenue Bridge

[Monitoring station/Datalogger ID: WELCHBR GPS Coordinates: 39.6548°N, 105.3028°W The location of the sampling/monitoring site is in Bear Creek, on the upstream side of the bridge at Welch Avenue in Kittredge, near the Kittredge Community Park. There was no temperature datalogger at this location.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.22	9.97	8.30	0.063	7.3	0
Max	8.41	18.10	11.61	0.102	191.1	1
Avg	7.68	13.71	9.02	0.081	32.8	0
Std. Dev.	0.39	2.01	0.96	0.013	56.3	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.22	10.94	7.96	0.071	8.1	0
Max	8.36	18.40	9.00	0.120	19.2	1
Avg	7.77	15.41	8.52	0.086	13.2	0
Std. Dev.	0.38	2.29	0.28	0.014	3.4	0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 8 O'Fallon Park West

[Monitoring station/Datalogger ID: OFPWEST GPS Coordinates: 39.6560°N, 105.2920°W The location of the sampling/monitoring site is in Bear Creek, at the west end of O'Fallon Park in Kittredge, just downstream of the Bear Creek Tavern restaurant.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.34	9.99	8.61	0.064	5.8	0
Max	8.64	18.47	11.51	0.105	249.7	1
Avg	7.98	13.88	9.25	0.083	37.7	0
Std. Dev.	0.43	2.09	0.89	0.013	75.1	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.53	11.28	7.94	0.071	7.2	0
Max	8.54	19.13	9.19	0.123	18.2	1
Avg	7.98	15.75	8.58	0.089	13.0	0
Std. Dev.	0.40	2.35	0.36	0.015	3.3	0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 9 Above KSWD WWTP effluent

[Monitoring station/Datalogger ID: KSWD7 GPS Coordinates: 39.6585°N, 105.2863°W The location of the sampling/monitoring site is in Bear Creek, at the east end of O'Fallon Park in Kittredge, just upstream of the Kittredge WWTP effluent outfall.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.48	9.86	8.12	0.066	7.3	0
Max	8.60	19.00	11.59	0.108	184.2	1
Avg	8.05	14.22	8.92	0.082	31.1	0
Std. Dev.	0.38	2.26	0.99	0.012	54.4	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.50	11.49	7.58	0.073	8.7	0
Max	8.42	19.58	8.91	0.125	19.0	1
Avg	7.99	16.06	8.29	0.091	13.1	0
Std. Dev.	0.35	2.41	0.34	0.015	3.2	0

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	Δ°C/4 hr Moving Averages
Min	8.6	11.3	12.7	0.0
Max	22.1	22.1	20.3	4.6
Avg	14	16.4	16.5	1.0
Std. Dev.	2.2	2.2	1.6	0.9
# of measurements	2912	122.0	116.0	2900
# of 20°C exceed	28	9.0	3.0	
% Compliance	99	93	97	
Δ3°C/ 4 hr exceedances				108
% Compliance				96
Δ3°C/ 4 hr exceedances > 20°C				14
% Compliance				87

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 10 Above GWSD WWTP effluent

[Monitoring station/Datalogger ID: GWSD9 GPS Coordinates: 39.6668°N, 105.2657°W The location of the sampling/monitoring site is in Bear Creek, at the west end of Lair o' the Bear Park near Idledale, just upstream of the Genesee WWTP effluent outfall.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.71	9.19	7.98	0.069	8.3	0
Max	8.64	18.88	11.87	0.102	67.8	2
Avg	8.03	14.09	8.87	0.084	20.1	0
Std. Dev.	0.28	2.40	1.09	0.011	18.3	1
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.56	11.47	7.54	0.075	1.1	0
Max	8.19	19.38	8.82	0.134	28.8	1
Avg	7.91	16.11	8.23	0.098	13.0	0
Std. Dev.	0.25	2.31	0.34	0.018	7.5	0

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	∆°C/4 hr Moving Averages
Min	7.8	11.3	12.4	0.0
Max	22.4	22.4	20.4	5.3
Avg	13.9	16.5	16.4	1.1
Std. Dev.	2.4	2.2	1.8	0.9
# of measurements	2913	122.0	116.0	2901
# of 20°C exceed	31	6.0	4.0	
% Compliance	99	95	97	
∆3°C/ 4 hr exceedances				111
% Compliance				96
∆3°C/ 4 hr exceedances > 20°C				13
% Compliance				88

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic; 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 11 Idledale West

[Monitoring station/Datalogger ID: IDLEWEST GPS Coordinates: 39.6624°N, 105.2546°W The location of the sampling/monitoring site is in Bear Creek, at the west end Idledale, west of Little Park. There was no temperature datalogger at this location.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.68	9.91	7.35	0.070	8.1	0
Max	8.31	19.72	11.92	0.107	56.7	1
Avg	7.91	14.74	8.76	0.089	18.7	0
Std. Dev.	0.21	2.47	1.19	0.013	15.5	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.55	11.65	7.53	0.075	7.8	0
Max	8.47	19.81	8.75	0.139	33.3	1
Avg	7.97	16.37	8.17	0.101	14.2	0
Std. Dev.	0.28	2.27	0.33	0.019	8.0	0

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 12 Below Idledale

[Monitoring station/Datalogger ID: EMD5A GPS Coordinates: 39.6614°N, 105.2354°W The location of the sampling/monitoring site is in Bear Creek, at the east end of Idledale, at the upstream side of the residential bridge at 21020 Highway 74.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.62	9.74	7.53	0.069	7.7	0
Max	8.01	19.72	12.05	0.108	48.1	1
Avg	7.77	14.76	8.78	0.089	18.0	0
Std. Dev.	0.13	2.52	1.21	0.013	13.4	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.54	11.61	7.44	0.077	6.9	0
Max	8.16	19.87	8.83	0.137	35.0	1
Avg	7.85	16.34	8.19	0.100	12.5	0
Std. Dev.	0.19	2.27	0.37	0.018	8.4	0

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	∆°C/4 hr Moving Averages
Min	7.0	11.3	2.3	0.0
Max	22.8	22.8	20.8	4.7
Avg	14.0	16.6	15.4	1.2
Std. Dev.	2.5	2.2	3.8	0.9
# of measurements	2913	122.0	116.0	2901
# of 20°C exceed	49	9.0	6.0	
% Compliance	98	93	95	
∆3°C/ 4 hr exceedances				114
% Compliance				96
∆3°C/ 4 hr exceedances > 20°C				9
% Compliance				92

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 13 West end of Morrison

[Monitoring station/Datalogger ID: MORR10 GPS Coordinates: 39.6528°N, 105.1878°W The location of the sampling/monitoring site is in Bear Creek, at the west end of Morrison, just upstream of the gaging station west of Highway 8.]

9 weekly morning sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.56	9.43	7.62	0.077	6.9	0
Max	7.91	19.68	12.38	0.166	50.8	1
Avg	7.73	14.80	8.92	0.119	16.3	0
Std. Dev.	0.11	2.63	1.28	0.030	14.0	0
9 weekly afternoon sampling/monitoring events June 1-Sept 30, 2004						
Weekly Parameter results	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Sp. Cond., mS/cm	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	7.61	11.53	7.55	0.077	4.8	0
Max	8.11	20.20	8.95	0.135	31.1	1
Avg	7.89	16.27	8.37	0.099	11.0	0
Std. Dev.	0.16	2.31	0.41	0.019	7.5	0

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	∆°C/4 hr Moving Averages
Min	7.0	11.7	2.3	0.0
Max	22.4	22.4	20.7	4.9
Avg	14.5	16.7	15.6	1.1
Std. Dev.	2.5	2.2	3.7	0.8
# of measurements	2913	122.0	116.0	2901
# of 20°C exceed	49	10.0	7.0	
% Compliance	98	92	94	
∆3°C/ 4 hr exceedances				57
% Compliance				98
∆3°C/ 4 hr exceedances > 20°C				5
% Compliance				91

Existing stream standards: 0.02 mg/L (20.0 ug/L) Unionized Ammonia (NH3-N), chronic;
20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

DATA SHEETS-WWTP EFFLUENT

The following data sheets summarize the wastewater plant effluent quality for dischargers into Bear Creek Segment 1a. Data obtained from plant daily process control sheets and laboratory results that are utilized to complete CDPES Discharge Monitoring Reports (DMR). Since daily plant operations and reporting requirements differ, only available data was used. There no additional requirements requested of plant operators for the Program. Datalogger temperature measurements of plant effluent were obtained at the identical frequency of the instream dataloggers. Datasets that are much more detailed include all locations from individual events, graphed representation of such data and all recorded temperature data (exported to spreadsheet format) from the dataloggers. This data is available as an attachment to this report. Total ammonia results were combined with effluent pH and temperature to calculate the unionized fraction. The datasheets will be listed in a downstream direction, as the effluents enter Bear Creek, from the EMD WWTP to the Morrison WWTP.

Table 14 Wastewater Plant Effluent Data EMD5

[Datalogger ID: EMD5 GPS Coordinates: 39.6376°N, 105.3150°W The location of the sampling/monitoring site is the EMD WWTP effluent. The datalogger was originally located in the end of the chlorine contact chamber. Plant improvements during the study changed the disinfection process from chlorine to ultraviolet radiation (UV). The datalogger relocated to the UV channel, just upstream of the outfall. Effluent flows directly from the UV building to Bear Creek.]

EMD WWTP Effluent June 1-Sept 30, 2004						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.56	15.00	3.27	0.3587	30.0	0
Max	6.97	18.90	6.58	0.8209	7,020.0	14
Avg	6.75	17.46	4.98	0.5738	502.7	1
Std. Dev.	0.07	0.85	0.69	0.0717	1,584.9	3
# of Measurements	85	80	83	122	18	18

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	Δ°C/4 hr Moving Averages
Min	14.1	16.3	16.6	0.0
Max	20.2	20.2	19.3	3.3
Avg	17.0	18.0	18.0	0.4
Std. Dev.	0.9	1.0	0.8	0.4
# of measurements	2922	122.0	116.0	2916
# of 20°C exceed	2	2.0	0.0	
% Compliance	99	98	100	
Δ3°C/ 4 hr exceedances				2
% Compliance				99
Δ3°C/ 4 hr exceedances > 20°C				0
% Compliance				100

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows- June-8,200 July-8,000 August-6,400 September-5,200; pH 6.5-9.0

Table 15 Wastewater Plant Effluent Data WJ6

[Datalogger ID: WJ6 GPS Coordinates: 39.6621°N, 105.3351°W The location of the sampling/monitoring site is the WJCMD WWTP effluent. The datalogger was located in the end of the chlorine contact chamber. The effluent flows into a ditch and joins Troublesome Gulch just outside the plant boundary. Troublesome Gulch flows to Kittredge and combines with Bear Creek at the west end of Kittredge.]

WJCMD WWTP Effluent June 1-Sept 30, 2004						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.63	14.40	3.01	0.2425	30.0	0
Max	7.05	19.80	5.51	0.6354	1,180.0	2
Avg	6.81	18.60	3.61	0.4312	138.2	0
Std. Dev.	0.10	1.06	0.33	0.0695	286.5	1
# of Measurements	85	78	79	122	18	18

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	Δ°C/4 hr Moving Averages
Min	14.4	15.9	16.4	0.0
Max	21.3	21.3	20.5	3.8
Avg	17.0	18.3	18.3	0.4
Std. Dev.	0.9	1.3	1.0	0.6
# of measurements	2922	122.0	116.0	2916
# of 20°C exceed	17	12.0	7.0	
% Compliance	99	90	94	
Δ3°C/ 4 hr exceedances				31
% Compliance				98.9
Δ3°C/ 4 hr exceedances > 20°C				14
% Compliance				45.2

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows-
June-12,600 July-13,000 August-10,700 September-8,400; pH 6.5-9.0

Table 16 Wastewater Plant Effluent Data KSWD8

[Datalogger ID: KSWD8 GPS Coordinates: 39.6585°N, 105.2868°W The location of the sampling/monitoring site is the KSWD WWTP effluent. The datalogger was located near the flow-measuring flume, just upstream of the outfall. Effluent flows from the datalogger location under Highway 74 to the outfall in Bear Creek.]

KSWD WWTP Effluent June 1-Sept 30, 2004						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.55	15.25	4.51	0.0000	87.9	0
Max	7.34	19.99	8.00	0.0704	1,920.0	5
Avg	6.88	18.74	5.61	0.0490	590.6	1
Std. Dev.	0.19	0.98	0.61	0.0142	545.4	1
# of Measurements	78	70	70	117	17	14

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	∆°C/4 hr Moving Averages
Min	10.9	13.3	16.4	0.0
Max	20.2	20.2	19.9	5.3
Avg	18.3	18.6	18.7	0.2
Std. Dev.	1.4	1.3	1.0	0.4
# of measurements	2922	122.0	116.0	2916
# of 20°C exceed	1	1.0	0.0	
% Compliance	99	99	100	
∆3°C/ 4 hr exceedances				6
% Compliance				99
∆3°C/ 4 hr exceedances > 20°C				0
% Compliance				100

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows-
June-5,200 July-7,700 August-5,500 September-3,300; pH 6.5-9.0

Table 17 Wastewater Plant Effluent Data GWSD9A

[Datalogger ID: GWSD9A GPS Coordinates: 39.6732°N, 105.2712°W The location of the sampling/monitoring site is the GWSD WWTP effluent. The datalogger was located in a wet well, just upstream of the outfall at the plant. Effluent flows from the datalogger location into a drainage, down to and under Highway 74 at the west end of Lair o' the Bear Park, and into Bear Creek.]

GWSD WWTP Effluent June 1-Sept 30, 2004						
Process Control and Permit Sampling and Monitoring						
Parameter	pH, SU	Temp, °C	Dissolved Oxygen, mg/L	Flow, MGD	Total NH3-N, ug/L	Unionized NH3-N, ug/L
Min	6.78	15.00	6.70	0.0560	20.0	0
Max	7.50	18.50	7.80	0.3150	256.0	1
Avg	7.09	17.22	7.23	0.2450	114.4	0
Std. Dev.	0.13	0.81	0.24	0.0314	64.3	0
# of Measurements	117	117	115	118	18	18

Datalogger Temperature Data				
All Temperatures in °C	Hourly Temp.	Daily Max Temp.	7-Day Avg. Max Temp.	∆°C/4 hr Moving Averages
Min	14.8	15.2	15.5	0.0
Max	18.6	18.6	18.5	0.4
Avg	17.4	17.5	17.6	0.1
Std. Dev.	0.9	0.9	0.9	0.2
# of measurements	2922	122.0	116.0	2916
# of 20°C exceed	0	0.0	0.0	
% Compliance	100	100	100	
∆3°C/ 4 hr exceedances				0
% Compliance				100
∆3°C/ 4 hr exceedances > 20°C				0
% Compliance				100

Notes: Discharge permit limits for Total Ammonia (NH3-N), in ug/L are as follows-
June-12,600 July-13,000 August-10,700 September-8,400; pH 6.5-9.0

24-HOUR PROFILE DATASHEETS

A recording, multi-sensor probe collected 24-hour data from two specific sites in Bear Creek during the Program. Parameters measured were pH, temperature, dissolved oxygen and specific conductance. Sensors calibrated prior to each deployment and data downloaded following each retrieval. The purpose was to evaluate multiple parameters over a 24-hour period. Two locations selected for their accessibility and ability to conceal the probe. The O'Fallon Park East (BCOFPEA) location was just upstream of the KSWD WWTP effluent discharge. The Lair o' the Bear (BCLAIR) location was within Lair o' the Bear Open Space Park, almost a half-mile downstream of the GWSD WWTP effluent discharge.

Six profiles collected for each of the two sites. Data collection began 6/24/2004 and completed on 9/23/2004. Frequency of data collection originally scheduled to be weekly, but the schedule was modified as necessary, because of weather and stream conditions.

Table 18 O'Fallon Park East June 24, 2004

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
6/24/2004	11:00	15.69	0.109	8.27	8.15
	12:00	17.03	0.115	8.09	8.26
	13:00	18.36	0.116	7.89	8.34
	14:00	19.56	0.120	7.69	8.42
	15:00	18.67	0.118	7.59	8.30
	16:00	17.85	0.117	7.72	8.15
	17:00	17.06	0.116	7.84	8.09
	18:00	16.06	0.116	8.04	8.04
	19:00	15.54	0.115	8.08	7.98
	20:00	15.23	0.115	7.99	7.87
	21:00	14.91	0.114	7.96	7.78
	22:00	14.64	0.112	7.99	7.73
	23:00	14.38	0.114	8.04	7.71
	0:00	14.09	0.114	8.10	7.69
	1:00	13.87	0.114	8.13	7.69
	2:00	13.75	0.115	8.15	7.68
	3:00	13.68	0.113	8.16	7.67
	4:00	13.55	0.109	8.19	7.66
	5:00	13.40	0.105	8.22	7.65
	6:00	13.29	0.104	8.27	7.65
	7:00	13.25	0.103	8.33	7.68
	8:00	13.45	0.102	8.37	7.72
	9:00	14.02	0.100	8.39	7.82
	10:00	14.42	0.100	8.40	7.89
	MIN	13.25	0.100	7.59	7.65
	MAX	19.56	0.120	8.40	8.42
	AVG	15.24	0.112	8.08	7.90
	StdDev	1.86	0.006	0.22	0.25
# >20° C		0			
# > 3° C/ 4 hrs		1			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 19 O'Fallon Park East July 8, 2004

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
7/8/2004	15:00	19.60	0.087	7.74	8.60
	16:00	18.58	0.086	7.79	8.51
	17:00	17.97	0.087	7.86	8.43
	18:00	17.07	0.086	7.89	8.16
	19:00	16.78	0.085	7.92	8.05
	20:00	16.83	0.082	7.80	7.90
	21:00	16.50	0.081	7.75	7.73
	22:00	16.24	0.081	7.79	7.68
	23:00	16.03	0.080	7.84	7.66
	0:00	15.80	0.082	7.87	7.65
	1:00	15.60	0.082	7.91	7.64
	2:00	15.38	0.082	7.95	7.63
	3:00	15.15	0.082	8.01	7.62
	4:00	14.96	0.082	8.03	7.62
	5:00	14.77	0.081	8.09	7.62
	6:00	14.59	0.082	8.12	7.62
	7:00	14.43	0.082	8.22	7.65
	8:00	14.51	0.082	8.29	7.72
	9:00	15.10	0.082	8.33	7.85
	10:00	15.94	0.083	8.28	8.05
	11:00	16.97	0.085	8.19	8.27
	12:00	18.15	0.086	8.07	8.46
	13:00	18.81	0.085	7.84	8.58
	14:00	17.95	0.087	7.55	8.04
	MIN	14.43	0.080	7.55	7.62
	MAX	19.60	0.087	8.33	8.60
	AVG	16.40	0.083	7.96	7.95
	StdDev	1.46	0.002	0.20	0.35
# >20° C		0			
# > 3° C/ 4 hrs		1			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 20 O'Fallon Park East August 4, 2004

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
8/4/2004	15:00	16.59	0.077	8.06	8.19
	16:00	15.86	0.076	8.19	8.17
	17:00	15.11	0.074	8.26	8.08
	18:00	14.78	0.074	8.29	7.98
	19:00	14.85	0.074	8.20	7.90
	20:00	15.31	0.074	8.05	7.79
	21:00	15.65	0.074	7.92	7.72
	22:00	15.74	0.075	7.89	7.70
	23:00	15.38	0.075	7.99	7.69
	0:00	15.21	0.075	8.01	7.68
	1:00	15.00	0.075	8.06	7.68
	2:00	14.97	0.075	8.07	7.68
	3:00	14.97	0.074	8.06	7.69
	4:00	14.82	0.073	8.09	7.69
	5:00	14.67	0.072	8.12	7.67
	6:00	14.55	0.071	8.14	7.69
	7:00	14.43	0.070	8.21	7.69
	8:00	14.53	0.070	8.30	7.79
	9:00	14.70	0.069	8.35	7.87
	10:00	15.02	0.071	8.36	8.06
	11:00	15.64	0.072	8.31	8.20
	12:00	15.90	0.075	8.26	8.31
	13:00	16.38	0.075	8.14	8.38
	14:00	16.42	0.075	8.00	8.29
	MIN	14.43	0.069	7.89	7.67
	MAX	16.59	0.077	8.36	8.38
	AVG	15.27	0.074	8.14	7.90
	StdDev	0.61	0.002	0.13	0.24
# >20° C		0			
# > 3° C/ 4 hrs		0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 21 O'Fallon Park East August 17, 2004

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
8/17/2004	12:00	17.08	0.083	9.00	9.04
	13:00	17.15	0.084	8.69	9.10
	14:00	17.94	0.082	8.61	9.23
	15:00	17.32	0.082	8.41	9.11
	16:00	16.85	0.080	8.59	9.04
	17:00	16.99	0.079	8.38	8.94
	18:00	16.98	0.080	8.05	8.47
	19:00	16.65	0.083	8.01	8.01
	20:00	16.04	0.082	8.09	7.87
	21:00	15.73	0.081	8.13	7.81
	22:00	15.60	0.081	8.19	7.78
	23:00	15.45	0.082	8.16	7.77
	0:00	15.28	0.083	8.24	7.76
	1:00	15.11	0.084	8.24	7.76
	2:00	14.87	0.082	8.29	7.75
	3:00	14.65	0.080	8.36	7.74
	4:00	14.49	0.077	8.39	7.73
	5:00	14.30	0.075	8.41	7.73
	6:00	14.06	0.073	8.48	7.72
	7:00	13.91	0.072	8.56	7.74
	8:00	13.95	0.072	8.71	7.87
	9:00	14.17	0.072	8.87	8.10
	10:00	14.58	0.073	9.06	8.48
	11:00	15.05	0.077	8.98	8.83
	MIN	13.91	0.072	8.01	7.72
	MAX	17.94	0.084	9.06	9.23
	AVG	15.59	0.079	8.45	8.22
	StdDev	1.22	0.004	0.30	0.56
# >20° C		0			
# > 3° C/ 4 hrs		0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 22 O'Fallon Park East September 1, 2004

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
9/1/2004	15:00	17.17	0.097	8.43	9.03
	16:00	17.09	0.096	8.21	8.94
	17:00	16.46	0.097	8.23	8.88
	18:00	15.56	0.097	8.32	8.71
	19:00	14.58	0.099	8.38	8.25
	20:00	13.68	0.100	8.49	7.98
	21:00	13.23	0.099	8.56	7.88
	22:00	13.07	0.100	8.57	7.83
	23:00	12.88	0.100	8.62	7.80
	0:00	12.82	0.101	8.62	7.79
	1:00	12.80	0.101	8.61	7.80
	2:00	12.64	0.102	8.64	7.79
	3:00	12.42	0.101	8.68	7.78
	4:00	12.30	0.099	8.71	7.80
	5:00	12.14	0.097	8.74	7.78
	6:00	11.96	0.096	8.77	7.75
	7:00	11.82	0.096	8.84	7.77
	8:00	11.84	0.095	8.98	7.83
	9:00	12.19	0.095	8.95	7.90
	10:00	13.10	0.096	8.96	8.14
	11:00	13.71	0.100	8.86	8.32
	12:00	14.30	0.105	8.66	8.38
	13:00	14.78	0.106	8.56	8.38
	14:00	15.24	0.105	8.62	8.33
	MIN	11.82	0.095	8.21	7.75
	MAX	17.17	0.106	8.98	9.03
	AVG	13.66	0.099	8.63	8.12
	StdDev	1.61	0.003	0.21	0.41
# >20° C		0			
# > 3° C/ 4 hrs		0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 23 O'Fallon Park East September 15, 2004

GPS Coordinates: 39.6585°N, 105.2863°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
9/15/2004	15:00	15.73	0.099	8.70	8.85
	16:00	16.14	0.096	8.45	8.94
	17:00	16.00	0.096	8.23	8.88
	18:00	15.42	0.095	8.21	8.67
	19:00	14.50	0.097	8.32	8.22
	20:00	13.39	0.099	8.48	7.95
	21:00	12.52	0.098	8.66	7.87
	22:00	11.97	0.098	8.79	7.84
	23:00	11.58	0.098	8.88	7.82
	0:00	11.31	0.098	8.96	7.81
	1:00	11.10	0.098	9.00	7.80
	2:00	10.90	0.099	9.01	7.80
	3:00	10.69	0.100	9.07	7.80
	4:00	10.49	0.097	9.10	7.80
	5:00	10.27	0.093	9.16	7.79
	6:00	10.05	0.090	9.21	7.78
	7:00	9.89	0.089	9.25	7.77
	8:00	9.77	0.089	9.35	7.79
	9:00	9.84	0.090	9.41	7.83
	10:00	10.45	0.089	9.48	7.93
	11:00	11.73	0.091	9.34	8.09
	12:00	13.13	0.097	9.22	8.36
	13:00	14.32	0.109	8.92	8.55
	14:00	15.04	0.106	8.72	8.59
	MIN	9.77	0.089	8.21	7.77
	MAX	16.14	0.109	9.48	8.94
	AVG	12.34	0.096	8.91	8.11
	StdDev	2.14	0.005	0.37	0.40
	# >20° C	0			
	# > 3° C/ 4 hrs	3			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 24 Lair o' the Bear Park July 7, 2004

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
7/7/2004	11:00	15.41	0.090	9.70	8.01
	12:00	16.66	0.090	9.46	8.07
	13:00	17.80	0.090	9.20	8.10
	14:00	18.66	0.092	8.92	8.10
	15:00	18.90	0.093	8.89	8.11
	16:00	19.09	0.091	8.74	8.05
	17:00	19.34	0.090	8.65	8.01
	18:00	19.05	0.088	8.64	7.88
	19:00	18.65	0.090	8.74	7.88
	20:00	18.07	0.090	8.79	7.80
	21:00	17.50	0.090	8.88	7.75
	22:00	16.86	0.090	9.03	7.77
	23:00	16.11	0.090	9.20	7.74
	0:00	15.61	0.090	9.30	7.73
	1:00	15.32	0.091	9.37	7.74
	2:00	15.09	0.091	9.42	7.74
	3:00	14.83	0.090	9.47	7.73
	4:00	14.53	0.090	9.54	7.74
	5:00	14.20	0.090	9.62	7.74
	6:00	13.87	0.089	9.71	7.74
	7:00	13.62	0.087	9.84	7.77
	8:00	13.63	0.086	9.92	7.83
	9:00	14.04	0.088	9.91	7.91
	10:00	14.83	0.089	9.79	7.99
	MIN	13.62	0.09	8.64	7.73
	MAX	19.34	0.09	9.92	8.11
	AVG	16.32	0.09	9.28	7.87
	StdDev	1.94	0.00	0.42	0.14
	# >20° C	0			
	# > 3° C/ 4 hrs	1			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 25 Lair o' the Bear Park July 14, 2004

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
7/14/2004	14:00	21.32	0.091	7.81	8.40
	15:00	21.73	0.091	7.87	8.56
	16:00	21.62	0.089	7.62	8.39
	17:00	21.18	0.090	7.60	8.02
	18:00	20.83	0.089	7.65	7.89
	19:00	19.89	0.092	7.91	7.91
	20:00	18.95	0.091	8.04	7.87
	21:00	18.26	0.090	8.13	7.84
	22:00	17.81	0.090	8.22	7.83
	23:00	17.65	0.091	8.26	7.82
	0:00	17.65	0.091	8.25	7.81
	1:00	17.50	0.092	8.27	7.80
	2:00	17.27	0.091	8.32	7.80
	3:00	16.98	0.089	8.38	7.80
	4:00	16.72	0.090	8.44	7.80
	5:00	16.46	0.088	8.50	7.79
	6:00	16.22	0.086	8.57	7.79
	7:00	16.02	0.086	8.67	7.82
	8:00	15.92	0.084	8.79	7.88
	9:00	16.24	0.083	8.83	7.96
	10:00	16.98	0.086	8.75	8.07
	11:00	18.03	0.086	8.59	8.17
	12:00	19.27	0.085	8.40	8.28
	13:00	20.29	0.089	8.08	8.39
	MIN	15.92	0.08	7.60	7.79
	MAX	21.73	0.09	8.83	8.56
	AVG	18.37	0.09	8.25	7.99
	StdDev	1.89	0.00	0.36	0.24
	# >20° C	6			
	# > 3° C/ 4 hrs	2			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 26 Lair o' the Bear Park August 12, 2004

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
8/12/2004	13:00	16.82	0.082	8.78	8.44
	14:00	17.62	0.084	8.55	8.56
	15:00	18.20	0.085	8.38	8.64
	16:00	18.58	0.085	8.24	8.67
	17:00	18.47	0.084	8.19	8.63
	18:00	17.91	0.083	8.25	8.49
	19:00	17.11	0.083	8.26	8.18
	20:00	16.28	0.079	8.37	7.97
	21:00	15.48	0.084	8.54	7.87
	22:00	14.91	0.083	8.67	7.85
	23:00	14.60	0.083	8.74	7.83
	0:00	14.35	0.083	8.79	7.81
	1:00	14.11	0.083	8.84	7.81
	2:00	13.95	0.083	8.86	7.80
	3:00	13.79	0.082	8.89	7.79
	4:00	13.56	0.081	8.93	7.79
	5:00	13.32	0.080	8.98	7.78
	6:00	13.09	0.080	9.04	7.77
	7:00	12.89	0.078	9.13	7.79
	8:00	12.85	0.077	9.22	7.83
	9:00	13.11	0.077	9.27	7.91
	10:00	13.69	0.080	9.23	8.01
	11:00	14.61	0.082	9.09	8.10
	12:00	15.70	0.084	8.21	8.21
	MIN	12.85	0.077	8.19	7.77
	MAX	18.58	0.085	9.27	8.67
	AVG	15.21	0.082	8.73	8.06
	StdDev	1.90	0.002	0.35	0.32
	# >20° C	0			
	# > 3° C/ 4 hrs	0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 27 Lair o' the Bear Park August 26, 2004

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
8/26/2004	13:00	14.69	0.115	9.05	8.18
	14:00	15.83	0.117	8.51	7.84
	15:00	16.60	0.117	8.43	8.09
	16:00	16.87	0.114	8.29	8.04
	17:00	16.55	0.114	8.30	7.97
	18:00	15.97	0.113	8.39	7.93
	19:00	15.20	0.114	8.52	7.87
	20:00	14.39	0.113	8.68	7.86
	21:00	13.82	0.114	8.82	7.85
	22:00	13.43	0.114	8.91	7.83
	23:00	13.36	0.115	8.94	7.83
	0:00	13.33	0.116	8.93	7.83
	1:00	13.18	0.118	8.97	7.81
	2:00	13.02	0.117	9.00	7.82
	3:00	12.98	0.121	9.01	7.82
	4:00	12.94	0.120	9.02	7.83
	5:00	12.87	0.116	9.03	7.81
	6:00	12.77	0.113	9.06	7.81
	7:00	12.67	0.112	9.10	7.78
	8:00	12.61	0.110	9.14	7.80
	9:00	12.57	0.111	9.17	7.81
	10:00	12.60	0.113	9.25	7.82
	11:00	12.69	0.115	9.17	7.86
	12:00	12.58	0.120	9.17	7.82
	MIN	12.57	0.110	8.29	7.78
	MAX	16.87	0.121	9.25	8.18
	AVG	13.90	0.115	8.87	7.87
	StdDev	1.44	0.003	0.30	0.10
	# >20° C	0			
	# > 3° C/ 4 hrs	0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 28 Lair o' the Bear Park September 9, 2004

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
9/9/2004	13:00	14.21	0.097	9.58	8.49
	14:00	14.89	0.100	9.28	8.57
	15:00	15.44	0.110	9.27	8.64
	16:00	15.68	0.110	8.98	8.57
	17:00	16.15	0.105	8.86	8.62
	18:00	16.20	0.102	8.56	8.35
	19:00	15.88	0.102	8.59	8.10
	20:00	15.56	0.101	8.58	7.95
	21:00	15.17	0.103	8.66	7.89
	22:00	14.63	0.105	8.80	7.90
	23:00	14.18	0.106	8.88	7.90
	0:00	13.75	0.105	8.97	7.89
	1:00	13.25	0.103	9.09	7.89
	2:00	12.85	0.103	9.17	7.89
	3:00	12.48	0.102	9.26	7.89
	4:00	12.16	0.103	9.33	7.89
	5:00	11.85	0.104	9.41	7.89
	6:00	11.64	0.102	9.46	7.89
	7:00	11.52	0.102	9.51	7.89
	8:00	11.50	0.098	9.62	7.93
	9:00	11.55	0.097	9.61	7.96
	10:00	11.77	0.101	9.69	8.02
	11:00	12.00	0.102	9.54	7.99
	12:00	12.43	0.101	9.79	8.20
	MIN	11.50	0.097	8.56	7.89
	MAX	16.20	0.110	9.79	8.64
	AVG	13.61	0.103	9.19	8.09
	StdDev	1.67	0.003	0.38	0.27
# >20° C		0			
# > 3° C/ 4 hrs		0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

Table 29 Lair o' the Bear Park September 22, 2004

GPS Coordinates: 39.6672°N, 105.2587°W

Date	Time	Temp °C	Specific Conductance, mS/cm	Dissolved Oxygen, mg/L	pH, S. U.
9/22/2004	12:00	11.62	0.103	9.66	8.22
	13:00	12.05	0.105	9.40	8.17
	14:00	12.40	0.104	9.31	8.18
	15:00	12.34	0.110	9.03	8.07
	16:00	11.88	0.110	9.22	8.04
	17:00	12.15	0.111	9.14	8.08
	18:00	12.05	0.107	9.17	8.06
	19:00	11.66	0.110	9.15	8.00
	20:00	11.24	0.109	9.20	7.93
	21:00	10.67	0.111	9.33	7.90
	22:00	10.21	0.108	9.43	7.88
	23:00	9.78	0.110	9.54	7.87
	0:00	9.38	0.109	9.63	7.86
	1:00	9.05	0.107	9.71	7.85
	2:00	8.78	0.107	9.78	7.85
	3:00	8.50	0.105	9.85	7.85
	4:00	8.32	0.105	9.90	7.85
	5:00	8.17	0.103	9.94	7.84
	6:00	8.01	0.100	9.97	7.84
	7:00	7.88	0.097	10.05	7.83
	8:00	7.83	0.094	10.11	7.84
	9:00	8.03	0.093	10.12	7.85
	10:00	8.58	0.098	10.11	7.90
	11:00	9.36	0.098	9.99	7.95
	MIN	7.83	0.093	9.03	7.83
	MAX	12.40	0.111	10.12	8.22
	AVG	10.00	0.105	9.61	7.95
	StdDev	1.66	0.005	0.36	0.12
# >20° C		0			
# > 3° C/ 4 hrs		0			

Existing stream standards: 20°C Maximum, 3°C increase per 4 hours; pH 6.5-9.0; DO 6.0 mg/L

STREAM FLOW AND WEATHER DATA

During the Program, stream flows for Bear Creek were tracked using two gaging stations. The stations are the USGS station above Evergreen Lake and the DWR/U.S. Army COE station above Morrison. Weekly downloads and printing of flow graphs was performed to document flows. Downloads were obtained at http://www.dwr.state.co.us/Hydrology/flow_search.asp.

The Program utilizes the USGS station flows and presents monthly summary tables comparing 2004 flow data with 20 years of historical data. Local weather statistics summarized, comparing 2004 air temperatures and precipitation to 30- year historical data.

Table 30 2004 June Bear Creek Flow vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6330°N, 105.3371°W

Date	Daily Mean Flow (cfs) June 2004	Historic Daily Mean Flow (cfs) 20 Years for June	Deviation from Historic Flow (cfs)
1	34	111	-77
2	34	106	-72
3	37	105	-68
4	36	104	-68
5	35	105	-70
6	34	105	-71
7	34	111	-77
8	36	107	-71
9	59	115	-56
10	46	113	-67
11	36	106	-70
12	32	104	-72
13	30	105	-75
14	29	104	-75
15	29	104	-75
16	30	105	-75
17	41	105	-64
18	48	108	-60
19	46	99.2	-53.2
20	37	97.3	-60.3
21	40	94.7	-54.7
22	46	93.9	-47.9
23	36	90	-54
34	32	85.9	-53.9
25	38	82.9	-44.9
26	48	83.1	-35.1
27	56	79.6	-23.6
28	78	78.6	-0.6
29	64	79.3	-15.3
30	71	75.3	-4.3
MAX	78	115	-0.6
MIN	29	75.3	-77
AVG	41.7	98.8	-57.0

Historic flows calculated on 20 years of data obtained at the USGS gaging station above Evergreen Lake.

Table 31 2004 July Bear Creek Flow vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6330°N, 105.3371°W

Date	Daily Mean Flow (cfs) July 2004	Historic Daily Mean Flow (cfs) 20 Years for July	Deviation from Historic Flow (cfs)
1	93	69.8	23.2
2	73	65.9	7.1
3	67	63.8	3.2
4	64	62.7	1.3
5	62	62.2	-0.2
6	60	61.1	-1.1
7	58	62.3	-4.3
8	55	63.2	-8.2
9	54	67.3	-13.3
10	58	64.8	-6.8
11	54	62.7	-8.7
12	50	60.7	-10.7
13	48	61.5	-13.5
14	46	58.5	-12.5
15	53	54.7	-1.7
16	86	52.8	33.2
17	124	57.2	66.8
18	105	53.5	51.5
19	92	54.3	37.7
20	99	53.2	45.8
21	98	51.9	46.1
22	99	49.2	49.8
23	121	53.3	67.7
34	149	51.4	97.6
25	127	50.1	76.9
26	119	51	68
27	116	47.7	68.3
28	---	48.2	
29	122	51	71
30	108	52.2	55.8
31	104	52.4	51.6
MAX	149	69.8	97.6
MIN	46	47.7	-13.5
AVG	85.5	57.1	28.1

Historic flows calculated on 20 years of data obtained at the USGS gaging station above Evergreen Lake.

Table 32 2004 August Bear Creek Flow vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6330°N, 105.3371°W

Date	Daily Mean Flow (cfs) August 2004	Historic Daily Mean Flow (cfs) 20 Years for August	Deviation from Historic Flow (cfs)
1	100	58.8	41.2
2	99	59	40
3	98	58.1	39.9
4	91	61.4	29.6
5	98	65.3	32.7
6	91	65.7	25.3
7	85	61.9	23.1
8	82	59.5	22.5
9	77	58	19
10	72	59.4	12.6
11	69	57.9	11.1
12	68	55.5	12.5
13	64	56.4	7.6
14	60	53.2	6.8
15	57	52	5
16	55	50.7	4.3
17	54	50.8	3.2
18	61	55.1	5.9
19	104	55.3	48.7
20	82	53.4	28.6
21	71	57.3	13.7
22	65	58.3	6.7
23	64	59.3	4.7
34	56	61.7	-5.7
25	54	58.5	-4.5
26	51	59.4	-8.4
27	56	54.6	1.4
28	58	53	5
29	50	51.5	-1.5
30	46	50.1	-4.1
31	45	47.4	-2.4
MAX	104	65.7	48.7
MIN	45	47.4	-8.4
AVG	70.4	56.7	13.7

Historic flows calculated on 20 years of data obtained at the USGS gaging station above Evergreen Lake.

Table 33 2004 September Bear Creek Flow vs. Historic Bear Creek Flow

USGS 06710385 GPS Coordinates: 39.6330°N, 105.3371°W

Date	Daily Mean Flow (cfs) September 2004	Historic Daily Mean Flow (cfs) 20 Years for September	Deviation from Historic Flow (cfs)
1	43	48.3	-5.3
2	41	46.6	-5.6
3	39	44.7	-5.7
4	37	43.4	-6.4
5	41	41.5	-0.5
6	37	40.4	-3.4
7	36	40.2	-4.2
8	34	40.7	-6.7
9	33	39.5	-6.5
10	32	41	-9
11	33	41.1	-8.1
12	31	40.6	-9.6
13	30	38.5	-8.5
14	28	37	-9
15	27	36.3	-9.3
16	27	34.2	-7.2
17	26	33.9	-7.9
18	25	32.5	-7.5
19	25	32.8	-7.8
20	26	33	-7
21	32	33	-1
22	36	32.5	3.5
23	33	31.5	1.5
34	35	31.3	3.7
25	34	30.7	3.3
26	35	30.8	4.2
27	32	29.8	2.2
28	34	30	4
29	37	29.6	7.4
30	41	29.6	11.4
MAX	43	48.3	11.4
MIN	25	29.6	-9.6
AVG	33.3	36.5	-3.2

Historic flows calculated on 20 years of data obtained at the USGS gaging station above Evergreen Lake.

Weather Data

Local weather data documented at the Evergreen Metropolitan District's WWTP. The plant has been operating the National Weather Service reporting station since EMD assumed operations of the plant in 1974. Recording maximum and minimum thermometers along with a rain gauge are present and read each morning. Daily readings logged on a monthly datasheet and entered into a NWS software program. Monthly maximum temperature and precipitation data compared to 30 years (1971-2000) of historical weather data.

Table 34 Stream Flow and Weather Data June-September Summary

Average Daily Flow (cfs)	June 2004	July 2004	August 2004	September 2004
Average Daily Min	29	46	45	30
Average Daily Max	78	149	104	43
Average Daily Mean	42	85	70	25
Weather				
Air Temp Low Max (°C)	11.1	12.2	15	4.44
Air Temp High Max (°C)	32.8	32.8	31.1	28.3
Air Temp Avg Max (°C)	22.2	25.5	24.4	22.8
Total Precip (in.)	2.99	2.79	2.64	1.07

The average daily flow data was downloaded from the website:
www.dwr.state.co.us/Hydrology/flow_search.asp

Local weather data was collected at the National Weather Service reporting station located at the Evergreen Metropolitan District WWTP. Historical weather data was obtained from the NWS.

Table 35 2004 Weather Data vs. Historical Weather Data (30 years 1971-2000)

	June 2004	June Hist	% Dev.	July 2004	July Hist	% Dev.	Aug 2004	Aug Hist	% Dev.	Sept 2004	Sept Hist	% Dev.
Avg Daily Min (°C)	5	5.17	-3.3	8.33	8.05	+3.5	6.66	7.44	-10.5	3.33	2.94	+13.3
Avg Daily Max (°C)	22.2	24.4	-9.0	25.6	27.4	-6.6	24.4	26.6	-8.3	22.8	22.4	+1.8
Avg Monthly Mean (°C)	13.6	14.8	-8.1	16.8	17.8	-5.6	15.5	17	-8.8	12.8	12.7	+0.8
Precip (in.)	2.99	2.05	+45.8	2.79	2.29	+17.2	2.64	2.38	+10.9	1.07	1.45	-26.2

DATA SUMMARIES

Summary Of In-Stream Temperature Datalogger Results

A total of 13,764 temperature data points were obtained for the five-datalogger locations within Segment 1a. The in-stream temperature limit is 20°C maximum, with an increase of 3°C/ 4 hr. 151 data points were greater than 20°C. This results in 99% of the values in compliance. In evaluating the Δ°C/ 4 hr, 13,704 4-hour blocks were used. Including any 4-hour block of time that resulted in a greater than a 3°C change (increase and decrease), 390 exceedances were recorded. This results in 97% compliance regarding the Δ3°C/ 4 hr requirement during the monitoring period at the same five Segment 1a locations.

Summary Of In-Stream Weekly Monitoring Parameter Results

Weekly spot measurements obtained from nine locations in Segment 1a over 18 weeks. 162 total measurements of temperature were obtained at a total of nine locations within Segment 1a. The in-stream temperature limit is 20°C maximum. One temperature value exceeded 20°C. This results in 94.4% of the values in compliance at that particular site (west end of Morrison, at the DWR gage station) and 100% of the values in compliance for each of the remaining sites. The complete dataset for temperature in the Segment 1a study results in 99% of the values in compliance. 162 total measurements of pH were obtained at a total of nine locations within Segment 1a. The in-stream pH range is 6.5 – 9.0. 100% of values were in compliance. 162 total measurements of dissolved oxygen were obtained at a total of nine locations within Segment 1a. The in-stream dissolved oxygen limit is 6.0 mg/L. 100% of the weekly monitored parameter measurements were in compliance.

Summary Of In-Stream Ammonia Results

Weekly grab samples taken at nine locations in Segment 1a over 18 weeks. The in-stream unionized ammonia limit is 0.02 mg/L. 100% of the ammonia results were in compliance.

Summary Of WWTP Effluent Temperature Datalogger Results

A total of 11,688 temperature data points were obtained from the four dataloggers located in the WWTP effluents that discharge into Segment 1a. The in-stream temperature limit is 20°C maximum, with an increase of 3°C/ 4 hr. This in-stream limit was utilized to evaluate the WWTP effluents. 20 data points were greater than 20°C. This results in 99% of the values in compliance. In evaluating the Δ°C/ 4 hr, 11,664 4-hour blocks were used. Including any 4-hour block of time that resulted in a greater than a 3°C change (increase and decrease), 39 exceedances were recorded. These results in 99% compliance regarding the Δ3°C/ 4 hr requirement during the Program at the four WWTP effluents that discharges into Segment 1a.

Summary Of WWTP Effluent Sampling And Monitoring Parameter Results

WWTP effluent measurements and samples were taken as necessary according to discharge permit requirements. Process control measurements were taken during the normal course of plant operations. 345 total measurements of temperature were obtained at the four WWTP effluents during the Program. The in-stream temperature limit is 20°C maximum. This in-stream limit was utilized to evaluate the WWTP effluents. All temperature values recorded were less than 20°C, resulting in 100% compliance. 365 total measurements of pH were obtained at the four WWTP effluents that discharge into Segment 1a. The discharge permit pH range is 6.5 – 9.0. 100% of values were in compliance. 347 total measurements of dissolved oxygen were obtained at the four WWTP effluents that discharge into Segment 1a. None of the four WWTP discharge permits has limits for dissolved oxygen. 68 unionized ammonia sample results were calculated from total ammonia results. Although there were three additional total ammonia results, corresponding pH and temperature values were not available for the unionized calculation. The in-stream unionized ammonia limit is 0.02 mg/L. 100% of the effluent analysis results were in compliance.

Summary Of 24-Hour Profiling Results (2 Sites)

At the O'Fallon Park East location, 144 measurements were obtained for each of the four parameters: pH, Temperature, Dissolved Oxygen and Specific Conductance.

- There were 5 exceedances of the 9.0 pH limit. There results in 96.5% compliance.
- There was 100% compliance with the Dissolved Oxygen standard.
- There was 100% compliance with the 20°C-temperature standard.
- There were five exceedances of the Δ3°C/4 hours temperature standard. This results in 96.5% compliance.

At the Lair o' the Bear Park location, 144 measurements were obtained for each of the four parameters: pH, Temperature, Dissolved Oxygen and Specific Conductance.

- There was 100% compliance with the pH standard.
- There was 100% compliance with the Dissolved Oxygen standard.
- There were 6 measurements exceeding the 20°C temperature standard. This results in 95.8% compliance.
- There were 3 exceedances of the Δ3°C/4 hours temperature standard. This results in 97.9% compliance.

Summary of Macroinvertebrate Data

The Association analyzed relative macroinvertebrate information from four sites along segment 1a. The Water Quality Control Division also sampled for macroinvertebrate speciation in Bear Creek. The Association added a copy of the state data to the Association database. The Association results listed in Table 36.

Table 36 Summary of Bear Creek Segment 1a Macroinvertebrate Data

	Site BC01	Site BC02	Site BC03	Site BC04
	Bear Creek Park	Lair o' the Bear Park	O' Fallow Park	Upstream Evergreen WWTP
Organism	**Individuals**	**Individuals**	**Individuals**	**Individuals**
Acentrella insignificans	91	98	12	3
Antocha sp.		3		
Atherix pachypus			1	
Baetis flavistriga	4	1		
Baetis tricaudatus	24	17		11
Brachycentrus americanus	1			
Caecidotea sp.	4			28
Ceratopogonidae	1			1
Ceratopogonidae pupae	1			
Cheumatopsyche sp.	1	2		21
Cheumatopsyche sp. pupae				2
Corynoneura sp.			1	
Cricotopus/Orthocladius sp.			14	25
Crangonyx sp.	5	1		
Cryptochironomus sp.			4	1
Cryptochironomus sp. pupae			1	
Diamesa sp.		8		
Dugesia sp.	4			
Empididae pupae				1
Ephemerella sp.		4	2	4
Erpobdellidae		1	1	
Eukiefferiella sp.	4	7		6
Eukiefferiella sp. pupae	1			
Hemerodromia sp.				1
Hydrobaenus sp.				1
Hydropsyche sp.	2	6	8	74
Hydropsyche sp. pupae	2	16	2	39
Hydroptila sp.				1
Isoperla sp.	3			
Lepidostoma sp.		2		1
Limnophyes sp.			1	
Lumbricidae	1	1		3
Nais spp.				3
Nanocladius sp.				3
Oecetis sp.		1		
Oecetis sp. pupae			1	1
Odontomesa sp.			2	1
Ophidonais serpentina				11
Optioservus sp. adults		13		4
Optioservus sp. larvae		7		17
Pagastia sp.		6	1	28
Paraleptophlebia sp.			2	1
Parametriocnemus sp.				2
Physidae				2
Petrophila sp.		6		

	Site BC01	Site BC02	Site BC03	Site BC04
	Bear Creek Park	Lair o' the Bear Park	O' Fallow Park	Upstream Evergreen WWTP
Organism	**Individuals**	**Individuals**	**Individuals**	**Individuals**
Polypedilum sp.		2	1	7
Potthastia longimana group				1
Rheocricotopus sp.				1
Rheocricotopus sp. pupae				1
Simulium sp.		15		1
Stenochironomus sp.			1	
Synorthocladius sp.				2
Thienemannimyia group				15
Thienemannimyia group pupae				1
Tipula sp.		1		
Tricorythodes minutus	13	1		
Tubificidae with hair chaetae	20			
Tubificidae w/o hair chaetae			2	3
Species Richness	18	23	18	38
Geometric Mean	4	4	2	3
Total CTS	182	219	57	328
Area Sampled (sq meter)	0.75	0.5	1.25	0.5
Species density/m2	243	438	46	656

Summary of CDOW fish count

The 2004 Fish Count in Segment 1a was completed on September 15th. Raw data was from CDOW transmitted to Chadwick Ecological Consultants (CEC) for evaluation. The BCWA did not formally contract with CEC to analyze the data, but CEC provided an overall assessment, which was summarized and included here. Additionally, CDOW was contacted to provide another opinion of the same data. The Fish Count will be evaluated site-by-site beginning upstream. The first evaluation is a summary of comments from CEC.

The Bear Creek Cabins site produced good year classes in browns and rainbows, indicating some reproduction. The numbers were up slightly from 2003, and close to pre-2002 numbers. The O'Fallon Park site was down in numbers all around. There were some larger fish present, but recent stream improvement restoration work most likely drove the smaller fish away. The Lair o' the Bear site data must be qualified because muddy water from in-stream activities upstream interfered with a second pass. Despite this, good young of the year numbers were present. The Idledale site produced numbers up slightly from 2003. All size classes were present in good numbers. The Morrison site produced good young of the year classes, indicating a good reproduction year. There were good numbers of medium sized fish. The Segment continues to improve with stronger numbers than 2003.

It is important to note that CDOW focused primarily on brown trout, because it is the naturally reproducing population. CDOW provided the following comments: The Bear Creek Cabins site yielded good biomass for the size of stream and raw data showed 12-15" sizes. The length frequency showed good multiple size classes. The O'Fallon Park site was not representative because of the habitat restoration work being done in the Park. The lower numbers were to be expected. The Lair o' the Bear site biomass numbers was good, considering the count did not successfully complete one pass. The numbers are probably

higher, but the pounds/acre of fish was still good. The Idledale site biomass numbers and length frequency were good. Raw data shows a 17" brown trout and a wide range of sizes. The Morrison site yielded an abundance of 'young of the year', but not as many adult fish. Size classes were in a wide range, from 8-14". The Segment 1a continues to improve from 2002, in both biomass and numbers.

Summary of Stream Flow Data and Weather

The stream flows recorded during the Program, on average, were lower than the historic average in June and September, and higher than the historic average in July and August. This data is correlated to the measured precipitation. Measurable precipitation was recorded 11 of the last 14 days in June, and continued with 13 days of measurable precipitation in July. August followed with 10 days, but September had only 6 days of measurable precipitation. Precipitation was above historical average, with the exception of September (-0.38").

The Average Daily Minimum temperatures were within a degree or so of the historical data for the Program period. The Average Daily Maximum temperatures were below historical averages, with the exception of September (within one degree). The Average Monthly temperatures were slightly below historical averages, with the exception of September (at average).

Summary of Fishing Surveys

Five Fishing Surveys were handed out from August 26 through September 9, 2004. The Surveys were return-addressed and stamped. Only one survey was returned. The angler was inexperienced, but commented that he had caught brown and rainbow trout in the 6" to 11" range. The survey response was a disappointing, but the survey will be used in future studies.

COMPLIANCE RESULTS

The hourly temperature datalogger measurements recorded in Bear Creek from just above the EMD WWTP discharge to the west end of Morrison do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of the 20°C stream standard, utilizing the 85th%-tile qualifier. 99% of the temperature values were in compliance.

Analysis of the hourly temperature datalogger measurements recorded in Bear Creek from just above the EMD WWTP discharge to the west end of Morrison do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of the Δ3°C/ 4 hour stream standard, utilizing the 85th%-tile qualifier. This analysis included every four-hour block of time (in a rolling average format) that resulted in a greater than 3°C change of temperature. 97% of the temperature values were in compliance.

Weekly in-stream monitoring measurements recorded in Bear Creek at nine locations from just above the EMD WWTP discharge to the west end of Morrison, do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for pH, Temperature, and Dissolved Oxygen, utilizing the 85th%-tile qualifier.

Analysis of all (18 weeks, nine locations) in-stream measurements (162 per parameter) results in 100% compliance for pH, 99% compliance for Temperature and 100% compliance for Dissolved Oxygen. It is important to note that nine weekly monitoring events occurred in the morning and nine in the afternoon.

Weekly in-stream sampling results and calculations obtained in Bear Creek at nine locations from just above the EMD WWTP discharge to the west end of Morrison, do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for Ammonia, utilizing the 85th%-tile qualifier. pH and Temperature values recorded at the time of sampling were combined with Total Ammonia results to produce calculated Unionized Ammonia results. 100% of the calculated values were in compliance. It is important to note that nine weekly sampling events occurred in the morning and nine in the afternoon.

The hourly temperature datalogger measurements recorded in the four WWTP effluents that discharge into Bear Creek in Segment 1a, do not indicate that a problem exists in the temperature of any WWTP effluent that results in the non-compliance of any temperature stream standard, utilizing the 85th%-tile qualifier. Since there are no temperature effluent limits for the four-wastewater plants, the existing stream standards of 20°C Max, with an increase of >3°CΔ/ 4 hours were applied. 99% of the effluent temperature values were in compliance with the 20°C Max stream standard and 99% of the effluent temperature values were in compliance with the >3°CΔ/ 4 hours.

The daily WWTP Process Control measurements recorded in the four WWTP effluents that discharge into Bear Creek in Segment 1a, do not indicate that a problem exists in any WWTP effluent that results in the non-compliance of any pH, Temperature, Dissolved Oxygen or Unionized Ammonia stream standard, utilizing the 85th%-tile qualifier. It is important to note that there were no permit violations for any WWTP with respect to pH or Ammonia.

The results of the 24-hour profiling at the two selected locations in Bear Creek Segment 1a do not indicate that a problem exists, either man-induced or natural, that results in the non-compliance of stream standards for pH, Temperature, and Dissolved Oxygen, utilizing the 85th%-tile qualifier. A total of 144 measurements per parameter were recorded at each location. 96.5% or higher compliance was achieved for the pH, Temperature and Dissolved Oxygen stream standards at the O'Fallon Park location. 95.8% or higher compliance was achieved for the pH, Temperature and Dissolved Oxygen stream standards at the Lair o' the Bear Park location.

The fish count data shows that Segment 1a continues to improve since 2002. The water quality of Bear Creek is a major factor contributing to its improvement. Without detailed data analyze by the Association, it appears that both Chadwick and CDOW agree that Segment 1a continues to improve. The numbers, biomass and size classes continue to improve since the 2002 summer season.

Weather records and stream gage readings indicate that the cooler, wetter season contributed to the more typical water quality conditions seen in Bear Creek. Stream gage measurements recorded at the USGS station above Evergreen Lake showed lower than historic averages for June and September, but the beginning of a return to regular summer

precipitation pattern produced higher than historical average flows in July and August. The precipitation in July and August was slightly above historical average. Average daily maximum air temperatures were slightly lower than historical average, with the exception of September (near normal).

No Water Quality Impairment In 2004

The 2004 special stream monitoring program in Bear Creek segment 1a showed no evidence of impairment. Compliance with temperature and ammonia stream standards, the two main parameters of concern, was never in question during the Program period. A comprehensive temperature data collection effort, summarized in 13,764 hourly measurements in five in-stream locations throughout the Segment, showed no evidence of thermal impairment. Eighteen ammonia-sampling events at nine locations throughout the Segment, showed no evidence of ammonia toxicity or impairment.

A major contributing factor in the 2004 Program were the regular precipitation events that produced and sustained above average stream flows during the typically warmest period of the summer. The snow pack runoff proved non-existent for May and June. This is evident in the less than average flows for May and June, as compared to 20-year historical data. Monthly average stream flow for May 2004 was 51.6 cfs, as compared to the historical 93.9 cfs. Monthly average stream flow for June 2004 was 39.1 cfs, as compared to the historical 98.8 cfs. Once July and August precipitation events occurred, stream flows were increased and sustained. Monthly average stream flows were above historical averages.

A comprehensive temperature data collection effort, summarized in 11,688 hourly measurements in four wastewater treatment plant effluents that discharge into Bear Creek Segment 1a, showed no evidence of thermal pollution. Similarly, there was no evidence of ammonia, dissolved oxygen or pH exceedances during the typical operation of these plants. All four plants met discharge limits stated in their Colorado Discharge Pollutant Elimination System (CDPES) permit for parameters of concern regarding this report during the Program period.

There were no observed impairment issues in the Segment or any permit violations in wastewater plant effluents during the Program. There were no observed temperature or ammonia issues with the Segment. Wastewater treatment plant effluents had no detrimental effect on the water quality of Segment 1a. Increased flows from typical summer precipitation events produced above average stream flows for most of the Program period, which resulted in near normal water quality conditions. Bioassessment and fish count data indicate that the fishery continues to recover from the drastic conditions encountered in the most severe drought year of 2002.

EXAMPLE DATA FORMS

EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
303-674-4112
Fax 303-674-7267

BEAR CREEK STUDY—SUMMER 2004 DATALOGGER LAUNCH/RETRIEVE

LOGGER #	LOGGERLOCATION	DATE OUT	TIME OUT	DATE IN	TIME IN	INITIALS
EMD1	Above Evergreen Lake, at gaging station					
EMD2	In Evergreen Lake, near dam, at surface					
EMD3	In Evergreen Lake, near dam, 10' down					
EMD4	Above EMD WWTP effluent					
EMD5	EMD WWTP effluent					
EMD5A	Below Idledale, at McGoldrick bridge					
WJ6	WJCMD WWTP effluent					
KSWD7	Above KSWD WWTP effluent, east end of O'Fallon					
KSWD8	KSWD WWTP effluent					
GWSD9	Above GWSD WWTP effluent, west end of Lair o' the Bear					
GWSD9A	GWSD WWTP effluent					
Morr10	Morrison gaging station, west end of town above Harriman Diversion					
Morr11	Above Morrison WWTP effluent, start of Bear Creek segment 1b					
Morr12	Morrison WWTP effluent					

COMMENTS:____

EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
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Fax 303-674-7267

Bear Creek Study 2004 Staff Gage Readings

Date	Time	Location	Feet
		Keys on the Green gaging station	
		O'Fallon Park at pedestrian bridge	
		Corwina Park	
		Lair o' the Bear Park south of parking lot	
		Keys on the Green gaging station	
		O'Fallon Park at pedestrian bridge	
		Corwina Park	
		Lair o' the Bear Park south of parking lot	
		Keys on the Green gaging station	
		O'Fallon Park at pedestrian bridge	
		Corwina Park	
		Lair o' the Bear Park south of parking lot	
		Keys on the Green gaging station	
		O'Fallon Park at pedestrian bridge	
		Corwina Park	
		Lair o' the Bear Park south of parking lot	

Notes

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EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
303-674-4112
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BEAR CREEK STUDY—SUMMER 2004
pH/Temp/DO/COND METER CALIBRATION RECORD

MAKE __YSI_____MODEL___556 MPS____S/N____02E1048AA_____

Comments:_____

DATE	20 Min Warm up	DO Calib. OK?	pH 7 Calib OK?	PH 10 Calib OK?	Temp ºC	COND 1.413 mS/cm OK?	Probe Maint?	Init

EVERGREEN METROPOLITAN DISTRICT
Water and Wastewater
P.O. Box 3819
Evergreen, Colorado 80437-3819
303-674-4112
Fax 303-674-7267

BEAR CREEK STUDY—SUMMER 2004
pH/Temp/DO/COND SONDE CALIBRATION RECORD

MAKE __YSI Sonde___MODEL___600 XLM____S/N____03C0209_____

Comments:_____

DATE	20 Min Warm up	DO Calib. OK?	pH 7 Calib OK?	PH 10 Calib OK?	Temp ºC	COND 1.413mS @ 25˚C OK?	Probe Maint?	Init

BEAR CREEK STUDY—SUMMER 2004
WEEKLY CHECKS

DATE:_____

LOGGER or YSI ID	LOCATION	PH (SU)	TEMP ˚C	DO (mg/L)	COND (mS)	Monitoring Time	Logger Intact? Y/N	Location Sampled? Y/N	Sampling Time
KSWD7	Above KSWD WWTP effluent, east end of O'Fallon Park								
KERR	Kerr Gulch, at Hwy 74 bridge						N/A		
GWSD9	Above GWSD WWTP effluent, west end of Lair o' the Bear Park								
IDLEWEST	Above Idledale, west end of town						N/A		
EMD5A	Below Idledale, at McGoldrick bridge								
Morr10	At Morrison gaging station, above Harriman Diversion								
Morr11	Above Morrison WWTP effluent, at start of Bear Creek segment 1b								

WEATHER:_____
START TIME:_____ END
TIME:_____INITIALS:_____

LOGGER or YSI ID	LOCATION	PH (SU)	TEMP ˚C	DO mg/L	COND (mS)	Monitoring Time	Logger Intact? Y/N	Location Sampled? Y/N	Sampling Time
EMD1	Above Evergreen Lake, at gaging station								
EMD2	In Evergreen Lake, near dam, at surface							N	N/A
EMD3	In Evergreen Lake, near dam, 10' down							N	N/A
EVLKMID	In Evergreen Lake, middle						N/A	N	N/A
EMD4	Above EMD WWTP effluent								
BCC	Below Bear Creek cabins, at bridge						N/A		
WELCHBR	Below Troublesome Gulch, at Welch Ave. bridge						N/A		
OFPWEST	O'Fallon Park, west end						N/A		

COMMENTS: Data retrieved from YSI memory
_____
BEAR CREEK STUDY—SUMMER 2004

COMMENTS: Data retrieved from YSI memory
_____
_____

Evergreen Metropolitan District Sampler (Signature)					# of Containers	Matrix (Water, Soil, Sludge)	List analyses requested here					
Sample Number	Date	Time	Comp/ Grab	Sample Location								Remarks

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time

Notes: 1.) Label all samples.

2.) Transport all samples in coolers with ice or freeze packs. Store at 4°C.