

RECLAMATION

Managing Water in the West

Annual Operating Plan

Sixty-seventh Annual Report
Colorado – Big Thompson Project
And Western Division Systems Power
Operations

Water Year 2018
Summary of Actual Operations

and

Water Year 2019
Annual Operating Plans

Early Winter Water Year 2018 Pole Hill Powerplant Switchyard Work



U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region

Preface

The purpose of the Annual Report for the Colorado-Big Thompson Project (C-BT) is to inform interested parties of the coordinated operation of the project. The report has two main parts. The first describes the actual operation of the project during current water year and the plan of operation for the next. The second presents the hydropower operations for current water year and the forecast for the next.

This report in part fulfills requirements included within decree stipulations. These include the Stipulation dated October 5, 1955, as amended October 12, 1955, and filed with the United States District Court for the District of Colorado in Civil Action Nos. 2782, 5016, and 5017 for an annual report of the Green Mountain Reservoir Operations and the Agreements in the Stipulation and Agreement of the Orchard Mesa Check Case (Colo. Water Div. 5, 91CW247) dated September 6, 1996, to produce a Historic Users Pool (HUP) Annual Operating Plan (AOP).

Executive Summary

Collection System and East Slope Reservoirs started Water Year 2018 (WY 2018) with greater storages than average and ended WY 2018 with reduced storages but still generally higher than average. Snowpack was generally less than average for the water year and runoff mirrored snowpack. Average air temperatures were generally slightly higher than average throughout the water year. Precipitation was also marginally below average for the water year.

Colorado – Big Thompson (C-BT) Project diversions totaled 236,578 acre-feet (AF) through Adams Tunnel for water year 2018. Deliveries of C-BT water totaled 234,675 AF. Green Mountain Reservoir delivered a total of 123,342 AF from storage in WY 2018.

The natural inflow to Lake Estes reached its WY 2018 peak flow with a daily average flow of 560 cubic feet per second (cfs) on May 28. The maximum mean daily release from Olympus Dam was 499 cfs, occurring on May 24.

Green Mountain Reservoir did not achieve a physical fill in WY 2018. Granby Reservoir did not achieve a fill in WY 2018 and Horsetooth Reservoir did not achieve a fill in WY 2018. Carter Lake achieved a single fill in WY 2018. Sufficient storage in Horsetooth Reservoir and Carter Lake existed to satisfy demands for WY 2018.

Grand Lake clarity goals were met for the 2018 clarity season.

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General Description of the Colorado-Big Thompson Project

The Colorado-Big Thompson Project (C-BT) is one of the largest and most complex natural resource developments undertaken by the Bureau of Reclamation. It consists of over 100 structures integrated into a transmountain water diversion and delivery system which provides water and power benefits across the state of Colorado from the Nebraska to the Utah state lines. The project was authorized for construction in the 1930's and completed in the 1950's.

C-BT project facilities spread over approximately 100 miles within north-central Colorado. The project stores, regulates, and diverts water from the Colorado River west of the Continental Divide to provide supplemental irrigation water for 720,000 acres of land east of the Rocky Mountains. It supplements municipal and industrial water supply while providing water-oriented recreation for a growing population of approximately 600,000. While delivering the water, the 3,000 feet of elevation drop allows for hydroelectric generation of the electricity required for project pumping and produces enough surplus electricity for nearly 50,000 households. Additionally, the project provides water storage within the upper Colorado River basin for agricultural, municipal, industrial, recreation, and environmental uses. Major features of the C-BT include; dams, dikes, reservoirs, powerplants, pumping plants, pipelines, tunnels, transmission lines, substations, and other associated structures.

Historically, the C-BT diverts approximately 230,000 acre-feet (AF) of water, annually, (310,000 AF maximum) from the Colorado River headwaters on the western slope to the South Platte River basin on the eastern slope, for distribution to project lands and communities. The Northern Colorado Water Conservancy District (Northern Water) apportions the water used for irrigation to more than 120 ditches and 60 reservoirs. Twenty-nine communities receive municipal and industrial water from the C-BT. The Western Area Power Administration (WAPA) markets and transmits the electric power produced at the six powerplants associated with the project.

Collection System and East Slope Colorado-Big Thompson Project

Overview

The C-BT is often grouped by which side of the Continental Divide a sub-system is located. Facilities within the Colorado River Basin are on the west slope which include a replacement and compensatory storage reservoir and a water collection and diversion system. East slope facilities are located within the South Platte River Basin and include a power and delivery system and a water distribution system.

Green Mountain Reservoir is the replacement and compensatory storage reservoir on the west slope. Green Mountain Reservoir is located on the Blue River, a tributary of the Colorado River

approximately 30 miles south west of the collection system. This reservoir allows for year-round diversion at the collection system by providing replacement water during periods when senior downstream water users would otherwise require the collection system to bypass inflow. Green Mountain Reservoir also provides water storage for the benefit of water users within the Colorado River basin. Green Mountain Dam includes a powerplant for hydropower generation. The Blue River confluence is downstream of the Colorado River Collection System.

The Colorado River collection and diversion system captures snowmelt runoff from the high mountains and diverts water to the eastern slope. The system stores, regulates, and conveys Colorado River water through Grand Lake to a trans-mountain diversion tunnel for delivery to the east slope. This system includes three reservoirs, two pumping stations, conveyance canals and the trans-mountain diversion tunnel.

Authorization of the project included improvements and operational requirements to mitigate anticipated lower flows downstream of the collection system. The project included installation of pumping systems for existing irrigators upstream of the Blue River confluence. The project also required maintaining a release schedule downstream of the collection system in order to maintain the Colorado River fishery downstream of Granby Dam.



A summer release through the spillway at Green Mountain Dam and Reservoir. Green Mountain Powerplant, located just below the dam, also generating power.

The three Colorado River Collection System reservoirs on the west slope are Lake Granby, Willow Creek and Shadow Mountain Reservoirs. Lake Granby Reservoir is located on the Colorado River and is the largest reservoir within the C-BT. Lake Granby provides multiyear storage of Colorado River water. The Farr Pumping Plant lifts water from Lake Granby to Shadow Mountain Reservoir. Shadow Mountain Reservoir impounds the Colorado River upstream of Lake Granby and allows for gravity conveyance of Colorado River water through Grand Lake to the Adams Tunnel. Grand Lake is the largest natural lake in Colorado, is hydraulically connected to Shadow Mountain Reservoir. The two are operated as a single regulatory reservoir. Willow Creek Reservoir is used

to regulate and divert water from Willow Creek, a tributary of the Colorado River, and its Pumping Plant lifts water to Lake Granby.

Completed in 1950, Granby Dam is located on the upper Colorado River. The dam has a river outlet with a capacity of 430 cfs. The dam spillway is controlled by two radial gates with a combined total release capacity of 11,500 cfs. The reservoir stores the flow of the Colorado River and water pumped from Willow Creek Reservoir. The reservoir has a total storage capacity of 539,800 AF.

Farr Pump Plant lifts water from Lake Granby to Granby Pump Canal for conveyance to Shadow Mountain Reservoir. The Farr Pump Plant has three 6,000 horsepower units with a combined installed capacity of 600 cfs when lifting the maximum head of 186 feet. The lifting head depends upon the storage level in Lake Granby and ranges between 88 feet to 186 feet. The combined lifting capacity for the 88 feet head differential is 1,200 cfs. The canal conveys the water 1.8 miles to Shadow Mountain Reservoir with a maximum capacity of 1,100 cfs.

Completed in 1953, Willow Creek Dam located on Willow Creek, a tributary to the Colorado River below Lake Granby, stores and diverts water to Lake Granby Reservoir. The dam has a river outlet with a capacity of 2,080 cfs, a diversion outlet capacity of 400 cfs and an uncontrolled spillway located on the left abutment with a maximum flow capacity of 3,200 cfs. The reservoir has a total storage capacity of 10,600 AF. The Willow Creek Pumping Plant has two 5,000 horsepower units that lift water 175 feet with a combined capacity of 400 cfs.

Completed in 1946, Shadow Mountain Dam impounds the Colorado River upstream of Lake Granby. The dam has an outlet with 50 cfs capacity and a radial gate controlled spillway with a capacity of 10,000 cfs. The reservoir provides regulatory storage and the hydraulic head necessary for gravity conveyance to the Adams Tunnel. The reservoir has a total storage capacity 18,400 AF which includes 1 foot of regulatory storage in Grand Lake. The dam maintains the reservoir water surface elevation within the historic water surface elevation of Grand Lake as required under the project authorization.

Completed in 1947, the Adams Tunnel was constructed to divert water from the Colorado River to the Big Thompson River. The 13.4 mile, 9.75 foot diameter tunnel is concrete lined with a capacity of 550 cfs. Tunnel flow is control by a radial gate inlet at a diversion structure called Adams Tunnel West Portal on the east end of Grand Lake. The tunnel passes under the Continental Divide and Rocky Mountain National Park and daylights at East Portal Reservoir approximately 4.5 miles south-west of Estes Park.

The east slope power and delivery system includes four regulatory reservoirs, five powerplants, one pumping station, multiple conveyance and diversions structures and two terminal storage reservoirs. The system is typically divided into three components including an Upper Power Arm above Olympus Dam, a Lower Power Arm above Flatiron Dam and the terminal storage reservoirs. Water delivery may occur at multiple delivery points between Adams Tunnel and the two terminal storage reservoirs. Primary delivery to the terminal reservoirs occurs through the power arm.

The Upper Power Arm begins at the Adams Tunnel East Portal and ends at Olympus Dam. East Portal Dam is constructed on Wind River. It directs natural and C-BT water exiting Adams Tunnel into a siphon under Aspen Creek and a tunnel under Rams Horn Mountain. Below Rams Horn Tunnel a penstock conducts pressurized flow to Marys Lake Powerplant and Marys Lake.

Marys Lake Powerplant and Marys Lake is the first powerplant and regulatory reservoir on the Upper Power Arm. The powerplant has a single generator with a nameplate capacity of 8.1 megawatts with 210 feet of head. The powerplant is a “run-of-the-river” type generator that follows flow diverted at East Portal Dam between 200 cfs and 550 cfs. All flow bypasses the powerplant over a flip-bucket spillway when flows are below generation capacity or when generation is not available. Marys Lake is a natural lake that was enhanced by construction of dikes. Marys Lake has a storage of 927 AF and regulatory capacity of 593 AF. The outlet has a capacity of 1,300 cfs and no spillway. The reservoir serves as the afterbay for Marys Lake Powerplant and the forebay for Estes Park Powerplant. Prospect Mountain Conduit and Tunnel convey water from Marys Lake to Estes Park Powerplant.

Estes Park Powerplant and Lake Estes is the second powerplant and regulatory reservoir on the Upper Power Arm. The powerplant has three generators with a combined nameplate capacity of 45 megawatts with 572 feet of head. The powerplant is a “peaking plant” which allows load demand following by balancing storage contents between Marys Lake and Lake Estes. Olympus Dam impounds the Big Thompson River east of the town of Estes Park to form Lake Estes. Olympus Dam includes a gated river outlet, a gated diversion outlet and radial-gated spillway. Lake Estes has a total capacity of 3,100 AF and a regulatory capacity of 740 AF. The reservoir regulates discharge from Estes Park Powerplant and natural runoff from the Big Thompson River and Fish Creek. Olympus Dam diverts up to 550 cfs to the Lower Power Arm via Olympus Tunnel and controls release to the Big Thompson River.



Olympus Dam and Lake Estes, along with the Big Thompson River gage below Olympus Dam. The Town of Estes Park and Rocky Mountain National Park can be seen in the background.

The Lower Power Arm begins at Olympus Dam and ends at Flatiron Reservoir. Water from Lake Estes and the Big Thompson River is conveyed by Olympus Siphon and Tunnel to Pole Hill Tunnel and Canal to the Pole Hill Powerplant forebay.

The Pole Hill Powerplant is the first powerplant in the Lower Power Arm. The powerplant is a single unit with a net head of 815 feet. The unit nameplate generation is 33.25 megawatts. The powerplant discharges into a small afterbay that diverts water through Rattlesnake Siphon and Tunnel to Pinewood Reservoir. The powerplant forebay has no storage, and generation follows release from Olympus Dam to Olympus Tunnel. When required, flow from the Pole Hill forebay can bypass the powerplant by falling into Little Hell Creek where it flows until it is re-diverted to the Pole Hill Afterbay.

Pinewood Reservoir provides regulatory storage for Flatiron Powerplant. Rattlesnake Dam impounds water diverted from Olympus Dam through the Olympus Siphon and Tunnel. The reservoir has a storage capacity of 2,180 AF with regulatory capacity of 1,422 AF. Rattlesnake Dam has an outlet for releasing native flow to Cottonwood Creek and an uncontrolled spillway. The Bald Mountain Pressure Tunnel inlet supplies water to the Flatiron Penstocks and Powerplant. Flatiron Powerplant is the second powerplant on the Lower Power Arm. The powerplant includes three units. Two units have nameplates of 31.5 Megawatts with a maximum head of 1,118 feet. They receive water from Pinewood Reservoir. The two turbines discharge into Flatiron Reservoir. Flatiron Powerplant Unit 1 and 2 are operated as load-following generators. The third unit is a pump-generator connected to Carter Lake Reservoir. Unit 3 has a 13 KHp motor with a maximum lift of 297 feet. When generating, the unit is rated at 8.5 megawatts.

Flatiron Reservoir is a regulatory reservoir that regulates flow to the Charles Hansen Feeder Canal and maintains head as an afterbay for Flatiron Powerplant Generation and a forebay for Unit 3 pumping to Carter Lake Reservoir. Flatiron Dam impounds Chimney Hollow and the ephemeral tributary of Dry Creek. The reservoir stores 760 AF of water with 399 AF of regulatory storage. The dam has an uncontrolled spillway with 23,600 cfs capacity and a Charles Hansen Feeder Canal outlet design capacity of 930 cfs.

The terminal storage and delivery component of the C-BT conveys water for user delivery and provides water storage for high demand periods. The two terminal reservoirs that have not been transferred to Northern Colorado Water Conservancy District are Carter Lake Reservoir and Horsetooth Reservoir. They receive water from Flatiron Reservoir. Carter Lake Reservoir supplies water to the project service area south of the Big Thompson River. Horsetooth Reservoir supplies water to the Cache La Poudre River project service area. The Charles Hansen Feeder Canal conveys water to Horsetooth Reservoir and delivers water to the Big Thompson River and water users along the canal.

The Dille Diversion Dam and Tunnel, located one mile upstream from the Big Thompson Canyon mouth, is a redundant feature for rediverting project water from the Big Thompson River when the Lower Power Arm is unavailable. Additionally, non-project water from the Big Thompson River can be diverted into the tunnel. Tunnel water is conveyed to the Charles Hansen Feeder Canal, and used for power generation at Big Thompson Powerplant or conveyed by the Charles Hansen Feeder Canal toward Horsetooth Reservoir.

Carter Lake Reservoir is impounded by three dams on ephemeral streams. Carter Lake Reservoir has a storage capacity of 112,200 AF with an active capacity of 108,900 AF. Carter Lake Reservoir receives water either from Flatiron Powerplant Unit 3 or a bypass gravity conduit. Deliveries are made through outlet works located in Dam number 1 to the Saint Vrain Supply Canal or to Flatiron Reservoir through the Flatiron Powerplant.

The Charles Hansen Feeder Canal (CHFC) transports water from Flatiron Reservoir to the Big Thompson River and Horsetooth Reservoir. CHFC has a nominal capacity of 930 cfs from Flatiron Reservoir to the Big Thompson River. The CHFC can make water deliveries at the Big Thompson River and several turnouts along the canal. Deliveries from the canal to the river are made through a controlled wasteway or the Big Thompson Powerplant. The CHFC has a nominal capacity of 550 cfs from the Big Thompson River to Horsetooth Reservoir.

Big Thompson Powerplant is the last federal powerplant in the CBT system. The powerplant is used to make deliveries from the CHFC or to return non-project Big Thompson River water used for skim power operations to the river. The powerplant's nameplate is 4.5 megawatts with an operational head of 183 feet. The powerplant has a maximum flow rate around 400 cfs. The CHFC wasteway makes river deliveries when demand exceeds 400 cfs or when the powerplant is unavailable. It is also used to deliver water to users between the wasteway and powerplant. Big Thompson Powerplant is typically only operated during the snowmelt runoff and delivery season. Horsetooth Reservoir is located west of Fort Collins, Colorado. The reservoir includes four dams and a dike with a storage capacity of 151,800 AF and an active capacity of 143,500 AF. Outlet works are located in two of the dams, Horsetooth Dam and Soldier Canyon Dam. Dixon and Spring Canyon dams and Satanka Dike do not have outlet works. The reservoir has no spillway. The Soldier Canyon Dam outlet supplies water to the city of Fort Collins, three rural water districts, Colorado State University, and the Dixon Feeder Canal for irrigation. Horsetooth Dam outlet discharges to the Charles Hansen Supply Canal for water delivery to the Cache La Poudre River and water users north of the Cache la Poudre River.

Additional water delivery and power transmission features were constructed under the project authorization. These features include supply canals, diversion structures, transmission lines and substations. All water delivery features below Horsetooth Reservoir and Carter Lake Reservoir were transferred to Northern Water Conservancy District upon repayment. Northern Water maintains and operates these features. Power transmission features are maintained and operated by Western Area Power Administration (WAPA). These features are not further described in this document.

Planning and Control

The C-BT is operated for the purpose for which it was authorized and constructed: to provide supplemental municipal and industrial water supply, irrigation water supply, and hydroelectric power production.

The integrated operation of the C-BT is planned and coordinated by the Water Resources Group at Eastern Colorado Area Office (ECAO) in Loveland, Colorado. Staff collects and analyzes information daily and makes the decisions necessary for successful operation of the C-BT. This continuous water management function involves coordination between the Colorado Division of

Water Resources, Northern Colorado Water Conservancy District (Northern Water), WAPA, Upper Colorado and Reclamation's Upper Colorado and Great Plains Regions, other Reclamation groups, and many other local, state, and Federal agencies.

Experience has proven that proper use of the available water resource in a multi-purpose project, such as the C-BT, can be achieved only through careful budgeting and management of the anticipated water supply. One product of this budgeting and management process is an Annual Operating Plan (AOP).

The C-BT water operations are routinely planned on a 12 month basis. The first AOP of the new water year (WY) is prepared in early October and it covers the October 1 to September 30 period. AOPs are prepared for reasonable maximum, most probable and reasonable minimum runoff conditions of water supply and associated requirements. The C-BT is operated to optimize the most probable water supply, without jeopardizing the operational position should either the reasonable maximum or the reasonable minimum water supply conditions occur. The plan is reviewed and revised monthly, or as needed during the year as new information becomes available or conditions change. Computer programs and models are used by ECAO to develop the AOPs and water supply forecasts. Tables B-5, B-6 and B-7 include the first AOP for the upcoming WY for the most probable, minimum reasonable and maximum reasonable plans, respectively. Appendix B-8 also provides a view of the planned C-BT operations for the upcoming WY.

Irrigation Requirements

The amount of water made available to the C-BT for irrigation is determined by Northern Water. This determination is subject to change by agreement throughout the remainder of the irrigation season. Changes may occur as a result of substantial changes in the prevailing climatic demand or operational conditions. Irrigation requirements for the three runoff conditions, most probable, reasonable maximum and reasonable minimum, are estimated by analyzing actual use under a variety of actual runoff conditions.

Estimated supplemental irrigation deliveries from Green Mountain Reservoir to irrigators in the Colorado River Basin are included in the release from Green Mountain Reservoir, according to the "Operating Criteria for Green Mountain Reservoir."



Big Thompson Siphon Connecting Charles Hansen Feeder Canal 930 and 550 Sections.

East Slope Diversion Operations

Olympus Dam, East Portal Dam and the Dille Diversion Dam can divert Big Thompson River water for beneficial use. These operations include carriage contracts for decreed water, diversion and storage of decreed east slope project water and non-consumptive diversion for power generation. Carriage contracts allow for the project to divert and deliver decreed water for water users when unused capacity is available. The C-BT will divert and store Big Thompson water rights when those rights are in priority as long as doing so does not adversely impact attainment of the project’s objectives. The project also diverts Big Thompson River water that is obligated

downstream of the Big Thompson Powerplant for non-consumptive power generation. This diversion operation is referred to as a “Skim” operation. Big Thompson River water availability for diversion depends on the flow in the Big Thompson River and its tributaries above Lake Estes, C-BT water imported through the Adams Tunnel, and its power arm capacity. Skim operations and determination of unused system capacity is managed according to the AOP and as prescribed by the ECAO Water Resources staff.

Flow Requirements Below Project Facilities

Many of the CBT dams include downstream flow recommendations or requirements. Release of water from project dams for maintaining downstream river flow was one of the primary purposes included within the project authorization operations and a stipulation of the project’s water rights. This obligation for instream flow requirements preceded recognition of instream flow as a beneficial use within the State of Colorado. Granby Dam, Green Mountain Dam, Willow Creek Dam, Shadow Mountain Dam, East Portal Dam and Olympus Dam operations include some guidance or actual obligations for meeting stream flow targets.

The Secretary of the Department of Interior issued a release schedule for Granby and Willow Creek dams to define monthly flows for the time of the year, location and hydrology. This schedule, titled “Principles to Govern the Release of Water at Granby Dam to Provide Fishery Flows immediately Downstream in the Colorado River,” was signed on January 19, 1961 by the Secretary of the Department of the Interior as directed by the project authorization. During the irrigation season, Colorado River Flow is maintained downstream of senior irrigation diversions downstream of Granby Dam. During the remainder of year, flow is maintained immediately below Granby Dam. Scheduled flows for the Colorado River range between 20 cfs and 75 cfs. Willow Creek Dam only releases water for this purpose during the non-irrigation season, between October and April. Willow Creek Dam release is limited to the lesser of 7 cfs or reservoir inflow. The schedule also allows for flow adjustments based on revised forecasts and consideration of actual flows during May through July. A copy of the document is included in the Standard Operating Procedures (SOP) for Granby Dams and Reservoir, Appendix A, Exhibit 4.

In accordance with the SOP for Shadow Mountain Reservoir, Chapter 4 Section D, minimum releases from Shadow Mountain Lake are to be whichever is less between inflow and the following seasonal flows: September through October -- 35 cfs; November through December -- 45 cfs; January through May -- 20 cfs; June through July -- 50 cfs; and August -- 40 cfs. The purpose of these flows is to maintain the fishery within the Colorado River above Lake Granby. The minimum release required out of Green Mountain Reservoir is determined by senior adjudicated water rights downstream from the reservoir. Inflow to Green Mountain Reservoir is released, as required, to meet these downstream rights. Releases are maintained at all times to be adequate for the preservation of fish habitat.

The United States Fish and Wildlife Service and the State of Colorado Department of Natural Resources, Parks and Wildlife Division have recommended the following minimum release schedule for Lake Estes, shown in the table below. Although no official decision record (i.e. contract, memorandum of understanding, intergovernmental agreement) is available, Reclamation has cooperatively adopted the recommendations when inflow meets or exceeds these values. Releases in excess of inflows are not required. This schedule meets the flow requirements of native

fish along the Big Thompson River. When the minimum release objective conflicts with service of Carriage Contracts, recent practice has prioritized meeting the minimum release flows over diverting water into Olympus Tunnel in service of the contracts. Likewise, diversion of flows from the Big Thompson River at Olympus Dam for power production (skim operation) is of lower priority than meeting the recommended minimum flows.

Minimum Releases (cfs)	Period
25	November 1 - April 15
50	April 16 - April 30
100	May 1 - May 15
125	May 16 - August 15
100	August 16 - August 31
75	September 1 - September 15
50	September 16 - October 31

Minimum release schedule for Lake Estes. Recommended by the U.S. Fish and Wildlife Service and the Colorado Department of Natural Resources, Parks and Wildlife Division.

Annual Operating Plan

Beginning each WY, the C-BT Most Probable Annual Operating Plan is developed considering the effects of historical average runoff values, the expected demands and depletions of Northern Water and Denver Water, the project’s initial states (e.g. pool levels), other average values, special operations such as previously planned system outages and maintenance schedules, and an assumed Northern Water quota for their water users of 70 percent.

The operations at Granby Reservoir are highly dependent on the runoff conditions on both sides of the Continental Divide. The conditions on the east slope have a direct effect on the diversions through the Adams Tunnel. The diversions through the Adams Tunnel affect the pumping operations at the Farr Pump Plant, and consequently the reservoir levels at Granby Reservoir.

The Green Mountain Reservoir operational plan was developed considering the effects of upstream operations at Dillon Reservoir, forecasted depletions provided by Denver Water, average runoff values, anticipated system outages and planned special operations.

Green Mountain Reservoir

Green Mountain Reservoir Operation

Paragraph 6 of the October 5, 1955 Stipulation in the decree for the Consolidated Cases Nos. 2782, 5016, and 5017 in the United States District Court for the District of Colorado (Blue River Decree), calls for periodic plans for the operation of Green Mountain Reservoir to be developed. This plan addresses this requirement.

Provisions guiding the operations of Green Mountain Reservoir are contained in the following documents. Operations will be consistent with the applicable provisions in the following documents:

Manner of Operation of Project Facilities and Auxiliary Features, Senate Document No. 80,
75th Congress, 1st Session
Consolidated Cases Nos. 2782, 5016, and 5017
October 12, 1955, Stipulation and Decree
April 16, 1964, Stipulation and Decree
Operating Policy for Green Mountain Reservoir, C-BT, published in the Federal Register, Vol.
48, No. 247, December 22, 1983,
September 4, 1996, Stipulation and Agreement in Colorado Water Div. 5, Case No. 91CW247
(Orchard Mesa Check Case), and attached Historic Users Pool (HUP) Operating Criteria.

The General Operations Guided by These Provisions are Given Below:

1. Winter Operation (November-March)

- a. Bypass inflow to supply downstream vested senior rights.
- b. Make releases to replace water diverted or stored out of priority by the C-BT collection system, as required.
- c. Make releases for west slope irrigation and domestic uses per Green Mountain Operating Policy and the HUP Operating Criteria.
- d. Make releases for water service contracts pursuant to the Operating Policy.
- e. Maximize power generation, while maintaining:
 - i. Adequate storage to meet the anticipated needs under the guiding documents.
 - ii. A minimum power head consistent with the integrated system power operations.

2. Operation during Snowmelt Period (April-July)

- a. Bypass inflow to supply downstream vested senior rights.
- b. Make releases to replace water diverted or stored out of priority by the C-BT collection system, as required.
- c. Make releases for west slope irrigation and domestic uses per Green Mountain Operating Policy and the HUP Operating Criteria.
- d. Make releases for water service contracts pursuant to the Operating Policy.
- e. Participate in the Coordinated Reservoir Operations (CROS) effort to enhance peak flows for the Colorado River Endangered Fishes. Reduce releases from traditional levels before and after the peak flow period on the Colorado River in the Grand Junction area. During peak flow period, release the lesser of inflows or turbine capacity for approximately a 10-day period.
- f. Fill without spilling to maximize power generation by using the storage and power rights concurrently.
- g. On or before June 30 each year, meet with Managing Entities established under the settlement of the Orchard Mesa Check Case to assess availability of surplus water in the HUP.
- h. Confer with Managing Entities on a regular basis through the irrigation season to assess availability of surplus water in the HUP.
- i. If a surplus condition is declared, make releases up to the amount of surplus, under agreements, to:
 - i. the Grand Valley Powerplant up to its need or capacity; then to
 - ii. the Grand Valley under the Municipal Recreation contract in excess of that needed by the powerplant

- j. Maximize power operation consistent with 1.e.
- k. Make releases as outlined in the above referenced documents¹.

3. Operation After Snowmelt Period (August-October)

- a. Bypass inflow to supply downstream vested senior rights.
- b. Make releases to replace water diverted or stored out of priority by the C-BT collection system, as required.
- c. Make releases for west slope irrigation and domestic uses per Green Mountain Operating Policy and the HUP Operating Criteria.
- d. Make releases for water service contracts pursuant to the Operating Policy.
- e. Confer with Managing Entities on a regular basis through the irrigation season to assess availability of surplus water in the HUP.
- f. If a surplus condition is declared, make releases up to the amount of surplus, under agreements, to:
 - i. the Grand Valley Powerplant up to its need or capacity; then to
 - ii. the Grand Valley under the Municipal Recreation contract in excess of that needed by the powerplant.
- g. Maximize power operation consistent with 1.e.
- h. Make releases as outlined in the above referenced documents.²

Green Mountain Historic Users Pool (HUP) and the Orchard Mesa Check Case Settlement

Background and Authority

The Orchard Mesa Check (Check) is a structure below the common afterbay of the Orchard Mesa Irrigation District (OMID) Pumping Plant and the federal Grand Valley Powerplant in the Grand Valley of Colorado. The purpose of the Check is to raise the water level in the common afterbay, allowing water to flow through the bypass channel to support hydropower operations and return to the Colorado River upstream of the Grand Valley Irrigation Company (GVIC) diversion dam.

Operation of the Check was determined to constitute an 'exchange' of water whereby water destined for the senior GVIC irrigation water right is borrowed for pumping and hydroelectric power generation purposes and returned to GVIC for irrigation use. Operation of the Check influences the operation of the following: Grand Valley irrigation systems; Grand Valley Powerplant; Green Mountain Reservoir releases; and the 15-Mile Reach of the Colorado River. The 15-Mile Reach is the section of the Colorado River from the GVIC diversion dam to the confluence of the Gunnison River and has been designated critical habitat by the Upper Colorado River Endangered Fish Recovery Program.

The Check has been operated on an informal basis without a decreed right since approximately 1926 to manage flows in the Colorado River for the benefit of the United States, Grand Valley Water Users Association, and OMID. In the late 1980s, a hydropower development was proposed

¹ By the use of these criteria for current operating purposes, the United States does not intend to imply any definition of rights and obligations. The order in which these criteria are listed does not reflect any intended priority.

² By the use of these provisions for current operating purposes, the United States does not intend to imply any definition of rights and obligations. The order in which these criteria are listed does not reflect any intended priority.

in a reach of the Colorado River between the Grand Valley Diversion Dam, the point where the exchange water is diverted, and the GVIC diversion dam where the exchange water is returned. The OMID was concerned that a water right awarded for this development could interfere with the exchange of water. In response, the OMID filed an application in State Water Court on December 30, 1991 for approval of an exchange of water. This case (Water Division 5, Case No. 91CW247) was informally known as the Orchard Mesa Check Case. Resolution of the case resulted in a negotiated Stipulation and Agreement entered into the District Court, Water Division No. 5, State of Colorado, on September 4, 1996.

Overview of the Stipulated Settlement

The settlement contains two major components: the Stipulation and Agreement and the Green Mountain Reservoir HUP Operating Criteria (Operating Criteria). The Operating Criteria further defines operation of the Green Mountain Reservoir HUP consistent with Senate Document 80 and the 1984 Operating Policy. The parts of the Stipulation and Agreement pertinent to the operation of the HUP are summarized below.

As part of the Stipulation and Agreement the OMID and GVIC agree not to exercise their irrigation rights against any upstream HUP beneficiary provided that the Check is physically operable; there is at least 66,000 AF of water in storage in the Green Mountain Reservoir HUP, or approved substitute storage reservoir, when Green Mountain Reservoir storage rights cease to be in priority; and the water rights for the Shoshone Powerplant continue to be exercised in a manner consistent with their historical operation. (Section 3.b. of the Stipulation and Agreement).

The Stipulation and Agreement also provides that Reclamation will declare surplus water which is in excess of the needs of HUP beneficiaries for a given WY. Water declared surplus might be delivered through agreements for beneficial uses in western Colorado. This is to be done in accordance with the provisions of the HUP Operating Criteria, which are summarized below.

Management of the HUP under the Operating Criteria

The management of the HUP is accomplished through the process defined in Sections 3.d and 3.e of the Operating Criteria. This process requires the development of this Annual HUP Operating Plan on or before June 30 of each year.

The Annual HUP Operating Plan is developed by Reclamation in consultation with the Grand Valley Water Users Association, the Orchard Mesa Irrigation District, the Grand Valley Irrigation Company, the State of Colorado Division 5 State Engineer, the Colorado Water Conservation Board, and Fish and Wildlife Service (Managing Entities). The Managing Entities agree to make a good faith effort to develop an Annual HUP Operating Plan that is unanimously supported. However, Reclamation reserves the right to establish a release schedule should unanimous consent prove unattainable.

The Annual HUP Operating Plan is based upon actual HUP storage conditions, projected runoff forecasts, operational and climatological conditions, projected irrigation demands, and 15-Mile Reach flow needs. It is expressly recognized that, in some years, release of the entire HUP by the end of the irrigation season will not be necessary or possible.

On or before June 30 of each year Reclamation assembles initial information on storage in the HUP and comparative runoff years. Based upon the information assembled a meeting is held with the other Managing Entities. During this meeting a review of the forecasts is analyzed and initial determinations are made of the level of “checking” required to preserve water in the HUP, and of water surplus available for HUP beneficiaries.

The HUP operations are reviewed and modified by the Managing Entities as necessary to respond to changing conditions. Subsequent meetings or conference calls are held as needed to reconsider prevailing conditions including HUP storage conditions, runoff forecasts, climatological conditions, irrigation demands, 15-Mile Reach flow needs, and other operational conditions. The Managing Entities adjust the checking as warranted by the examination of prevailing conditions, and determine the water surplus and release schedule for HUP beneficiaries. During periods of below average river flows the Managing Entities may meet as frequently as every week.

This mechanism provides a way to integrate management of releases from the HUP with operation of the Check to accomplish the purposes of the Operating Criteria. The mechanism is also used to integrate releases from the HUP with other reservoir releases for the endangered fish.

Operational Summary: Water Year 2018

Summary of System-wide Conditions

Last water year’s AOP was summarized in the previous Annual Report of the Colorado-Big Thompson project³. The following four sub-sections summarize *actual* operational results for WY 2018.

Weather and Inflow Hydrology

Snow accumulation during the fall of WY 2018 was about normal until December 2017 at which point accumulation fell behind and remained below average for the remainder of the season. The Big Thompson River drainage snow pack was significantly below average, the Granby Reservoir drainage was mildly below average and the Green Mountain Reservoir drainage returned to near average in mid-January then fell to well below average snow accumulation for the remainder of the season. The area surrounding the C-BT project generally followed the same pattern of snow accumulation, except for those areas well south of the project which were substantially below average for the entire season. Generally, snow pack was significantly below the median snow pack for much of the area.

Broadly speaking, the months of January through March were slightly colder than normal but the rest of the WY was near normal to slightly warmer than normal. Specifically, the early part of February was slightly warmer than normal. The coldest temperatures were recorded in mid to late February and continued colder-than-normal temperatures occurred through early March. By the

3 Available online at https://www.usbr.gov/gp/aop/cbt/17cbt_18forecast.pdf (accessed January 16, 2019)

first week of April area temperatures began to rise slowly, and snow at lower elevations began to melt. The Northern Mountains of Colorado showed signs that runoff had, once again, started a bit earlier than normal. Most locations began to experience slowly rising inflows by early to middle of April. By early May 2018, the snowpack at higher elevations began to melt. Willow Creek Reservoir reached peak runoff just before the middle of May and inflows to Lake Estes, Granby and Green Mountain all peaked in late May to the first day of June 2018. All those peaks were lower and earlier than average.

Precipitation was slightly above average over the mountains in October and November 2017, normal for January through April 2018, then mostly well below normal for the remainder of the WY. The monsoonal season in the Northern Colorado Mountains near Granby was slightly above normal but below normal for the east slope. The monsoonal season for areas near Green Mountain were also below normal for 2018.

Table 1 provides an overview of the snowpack condition on April 1, 2018, at some of the contributing watersheds within the C-BT system. The first column in Table 1 is the average snow water equivalent (SWE) of the SNOTEL sites contributing to each reservoir on April 1, 2018. For a historical comparison to the average of the April 1, 2018 condition SWE of the same SNOTEL sites for the 1985-2017 period was calculated. The runoff forecast for April 1, 2018, was below the typical condition over the last 33 years for most locations within the C-BT region, some were significantly so. Table 2 provides the resulting runoff forecasts for several C-BT facilities across a range of exceedance probabilities of occurrence.

Most Northern Colorado reservoirs throughout the spring season had relatively high storage contents. With demands for water relatively low through early July, most reservoirs remained generally full starting into summer. The dry and hot weather from mid-July through mid-September put pressure on those reserves reducing storages to near 50 percent of capacity. Most reservoirs in the area ended WY 2018 lower than they did in previous years. The exception was Horsetooth Reservoir which ended the water year slightly higher than the previous year, though 2017 Horsetooth storage was purposefully lowered for maintenance on the Soldier Dam outlet works.

Table 1: Snow-Water Content for April 1, 2018

Watershed	Snow-Water Content		
	2018 (In.)	Avg. (In.)	Percent of Avg.
Green Mountain Reservoir	11.8	14.1	84
Willow Creek	9.8	9.7	101
Lake Granby	11.8	13.4	88
Lake Estes	10.6	14.3	76

**Table 2: Reclamation’s Runoff Forecast for Several Locations within the C-BT Area
April 1, 2018 Forecast of Apr-Jul Volume**

Forecast Point	Chance of Exceeding					50 percent Most Probable percent of avg
	90 percent Reasonable Min 1/	70 percent	50 percent Most Probable	30 percent	10 percent Reasonable Max 1/	
Green Mtn. Res	170	206	231	256	293	82
Willow Crk. Res	25.6	36	43.1	50.3	60.6	92
Lake Granby	144	178	201	225	259	91
Big Thompson River Above Lake Estes	39.8	52.8	61.8	70.8	83.8	89
Big Thompson River at Canyon Mouth	46.2	70.1	86.4	103	127	96

1/ The probability is estimated to be 8 chances in 10 that the actual volume will fall between the reasonable minimum and reasonable maximum.

System Demands and Deliveries

Northern Water declared a quota of 50 percent in November 2017. At the April 2018 Board meeting the quota was increased by 30 percent to 80 percent for the rest of WY 2018. The quota used for the monthly updates to the 2018 AOP were slightly different. These began at 70 percent in October and then increased to 80 percent in May, which matched the Northern declared quota by that time.

An accounting summary of the C-BT west slope collection system in WY 2018 shows there were 236,543 AF available for diversion to the east slope. Adams Tunnel diversions were 236,578 AF, a difference of -0.01 percent when comparing available collection system diversions versus reported diversions. That percent difference was well within the errors associated with the various measurements for the data used to create the accounting terms summarized in Table 3. The formula for determining the collection system volume available for diversion to the east slope is shown below:

West Slope Collection Available for Diversion

= *Natural Inflow (Granby, Shadow Mountain and Grand Lake) + Windy Gap Pumping*
 + *Willow Creek Pumping – Change in Storage (Granby, Shadow Mountain, Grand Lake)*
 – *Granby Spill – Granby Scheduled Release*
 – *Net Evaporation (Granby, Shadow Mountain, Grand Lake) – Granby Seepage*

Table 3: C-BT West Slope Collection Water Balance. Volume Available for Diversion from West Slope Collection System v. Reported Diversions through Adams Tunnel for WY 2018 (units in AF)

	WY 2018 (AF)
Combined 3 Lakes Natural Inflow	191,016
Willow Creek Pumping	25,664
Windy Gap Pumping	26,235
Combined 3 Lakes Change in Storage	-54,761
Granby Spill	0
Granby Scheduled Release	33,775
Combined 3 Lakes Net Evaporation	21,538
Granby Seepage	5,821
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Volume Available for Diversion	236,543
Reported Adams Tunnel Diversion	236,578
Percent Difference	-0.01%

On the east slope, total supplies were compared to total deliveries for WY 2018. Total supplies were calculated to be 244,036 acre-feet and total deliveries were calculated to be 234,675 AF. The percent difference was 3.8 percent which can be explained by delivery system transit losses and measurement error of the terms that went into the calculations. The formula for determining total east slope supplies is shown below:

East Slope Supplies

= *West Slope Diversions through Adams Tunnel + Priority Water*
 – *Net Evaporation (Carter and Horsetooth Reservoir)*
 – *End of WY East Slope Reservoirs' Change in Storage*
 – *Tridistrict Excess Capacity Account Change in Storage at Horsetooth*
 – *Predetermined/Accounted CBT Delivery Losses*

The Predetermined/Accounted C-BT Delivery Losses term in the supplies equation includes any assigned delivery losses in the east slope system. For WY 2018, a 2 percent delivery loss was established for Big Thompson River deliveries from Lake Estes to demands on the river or to Dille Diversion Dam during the Maitland Siphon outage period at the start of the WY and the annual outage toward the end of the WY. Supply releases had to be greater than the requested deliveries to offset the loss and that known difference was subtracted from the supply term in Table 4.

The formula for determining total deliveries is as follows:

$$\text{Total Deliveries} = \text{Total CBT Deliveries} + \text{Total Windy Gap Deliveries}$$

The results of the supplies versus east-slope deliveries are shown in Table 4 below.

Table 4: C-BT East Slope Water Balance, Volume Available for Supply v. Reported East Slope Deliveries for WY 2018 (units are AF)

	WY 2018
Supply	(AF)
Adams Tunnel Diversion	236,578
East Slope Priority Water	2,836
Carter + Horsetooth Net Evap	7,056
Total East Slope Reservoir Change in Storage	-11,853
Tridistrict Excess Capacity Change In Storage	-76.7
Predetermined C-BT Delivery Loss	97.4
Total Supply	244,036
Delivery	
Total C-BT Deliveries	219,370
Total Windy Gap Deliveries	15,125
Eureka Replacement Delivery	180
Total Deliveries	234,675
% Difference (of Total Supply)	3.8%

Maintenance and System Outages

Three improvements to the C-BT project required significant outages during WY 2018. 1) The Maitland siphon outage on the Charles Hansen Feeder Canal 930 Section (CHFC930) was an unusual and significant event that impacted the start WY2018. The outage to repair the canal siphon began on August 1 and ended on November 8, 2017, thirty-nine days into WY 2018. Stop logs were placed in the CHFC930 section just upstream of the Dille diversion confluence, allowing the Dille Diversion from the Big Thompson River to be used during the outage. The rest of the CHFC930 section was unavailable during the period. 2) A WAPA outage for switchyard work at Pole Hill Powerplant ran from July 31, 2017 through January 31, 2018, the timing of which took advantage of a portion of the Maitland Siphon outage. 3) Flatiron Powerplant Unit #3 outage started on October 10, 2017 and extended into January 2018.

The combination of those three outages reduced the generation potential of the Lower Power Arm of the C-BT project from October 2017 through January 2018.

Taking advantage of scheduled outages, numerous inspections took place at different facilities from late October through early December 2017. Water diversions from the west slope were suspended for just under 4 weeks, from mid-November 2018 to mid-December, in order to accommodate all the inspections and maintenance activities.

In addition to that work, the Estes Powerplant crew conducted the annual maintenance for Lake Estes Powerplant units #1, #2 and #3 in succession from early January through the mid-May 2018. Two units were always available for generation.

The Flatiron crew completed the annual maintenance of the Flatiron Powerplant unit #3 by mid-November 2017, but the unit was returned to service toward the end of January 2018. The annual maintenance of units #1 and #2 occurred starting in late February 2018 and ended in late May 2018. These outages had an impact on peaking power generation at the powerplant and resulted in lost skim power operations in early Spring as diversion volumes from the west slope were behind schedule and spill was still a significant possibility. The Charles Hansen Feeder Canal trifurcation was winterized in mid-November 2017. The annual maintenance of the Charles Hansen Feeder Canal 550 section for WY 2018 took place during the middle part of October 2017 and the annual maintenance of the 930 section took place during the middle of April 2018.

The Adams Tunnel diversions were slowed for a couple of days in mid-April 2017 so that the Hansen Feeder Canal 930 section could be lowered to facilitate annual maintenance and de-winterizing activities at the Big Thompson Powerplant and Trifurcation. The pumping operation to Carter Reservoir was not affected by the Adams Tunnel reduction. The annual maintenance for the Big Thompson Powerplant occurred in the off-season between January and early February 2018. Therefore its outage had zero impact on operations.

The WY 2018 fall outage work did not prevent meeting all C-BT water demands during WY 2018. To meet demands on the lower Charles Hansen Feeder Canal, imports were released to the Big Thompson River from Olympus dam, sent through the canyon and picked up at Dille Diversion Dam. Water stored within the east slope reservoirs and imports delivered via the Big Thompson River canyon were sufficient to satisfy the demands during the fall outage.

Operations and Outcomes

Typically starting around the middle of December after fall annual outages are lifted, the project begins to divert water through Adams Tunnel at full capacity to refill Carter Lake and Horsetooth Reservoir. This timing is prior to when skim and priority water usually are available (mid-to-late April into late July and mid-to-late May into late June, respectively). Such scheduling usually maximizes utility of available skim and priority water. Two outages combined to delay AOP-anticipated diversions at full capacity by approximately 1.5 months. Flatiron Powerplant Unit #3 was not available until January 17, 2018, a consequence of the WAPA switchyard work at Pole Hill Powerplant not being complete until mid-January 2018. This meant that generation at Pole Hill Powerplant was not available until the last day of January 2018.

Although Adams Tunnel clearance ended on December 11, 2017, only 250 cfs was diverted from the west slope until January 17, 2018. This below-capacity flow was enough to produce hydropower at Marys, Estes and Flatiron powerplants while delivering water to Horsetooth to avoid getting too far behind on west-to-east movement of water. Higher flows were not scheduled because of opportunity costs resulting from moving water around Pole Hill without generating power there.

Pumping to Carter Reservoir commenced on January 17, 2018 as the clearance on Flartiron Unit #3 was lifted, corresponding to finishing the WAPA switchyard work. Adams Tunnel imports increased to about 500 cfs for the remainder of the month. Pole Hill Powerplant was still being bypassed because the functional tests at Pole Hill still needed to be completed. Pole Hill Powerplant came online January 31, 2018 with the completion of functional testing there. Adams Tunnel diversion increased to 550 cfs on February 1. The combination of those two outages extended the refill of Carter Lake and Horsetooth Reservoir into the time of year when the project typically takes advantage of the skim water operations. Therefore, the system did not optimize the water available for C-BT skim during WY2018 for power production. Hydropower objectives were continually considered within the context of system constraints.

Relatively high carryover storage at Granby Reservoir presented a risk for west slope spill through winter and early spring. By May, the potential for a spill at Granby Reservoir was rapidly declining. With Carter Reservoir's first fill of the WY complete, west slope diversions were reduced beginning May 24 for skim operations in the Lower Power Arm. Pumping to Carter Reservoir resumed on June 13 to partially refill it by June 26, 2018. In anticipation of that Carter pumping, the Adams Tunnel diversions were increased to 550 cfs on June 10, 2018. However, within a couple of days the diversions were reduced as the likelihood of a spill at Granby dropped to zero. Skim operations in the Lower Power Arm of the C-BT system resumed at full intensity.

On June 25 a clarity operation for Grand Lake Adaptive Management began which reduced Adams Tunnel diversion to slightly less than the natural inflow to Grand Lake. Those inflows were so low, due to the lack of any remaining runoff from melting snow by that time, that it necessitated the shutdown of the Carter pump. Carter Lake only filled once in WY 2018 and Horsetooth never achieved a fill. However, sufficient storage in both reservoirs existed to satisfy demands for WY 2018.

C-BT operations and the skimming of water from the Big Thompson River through Olympus Tunnel kept daily mean releases from Olympus Dam at or below 500 cfs during runoff. The peak instantaneous release from Olympus Dam was 566 cfs and occurred at 1:15 am on May 27, 2018.

C-BT Operations by Facility

Collection System

Willow Creek Reservoir

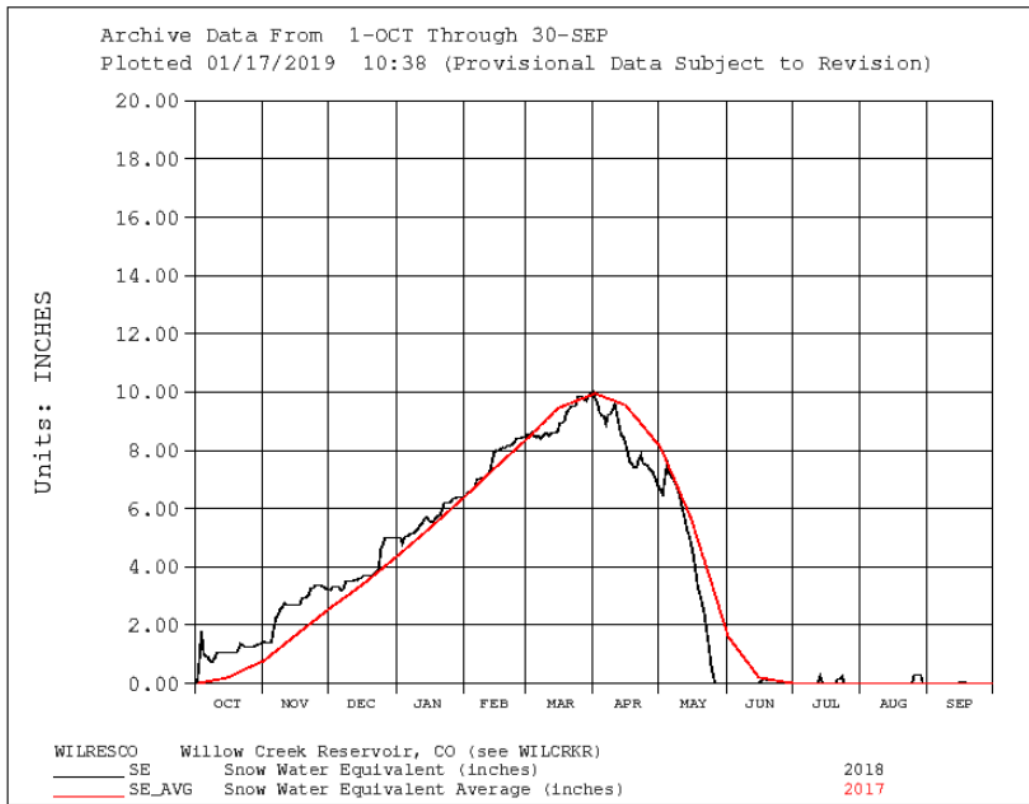
October through March: Snow accumulation in the Willow Creek basin started with a below average fall and then surpassed the average condition by mid-winter. The snowpack remained near normal throughout the rest of the winter and during most of the spring.

April, May: The first signs of runoff in the Willow Creek watershed began in late March 2018. Pumping to Granby began in mid-April 2018, with one pump. At the beginning of May the Water Scheduling Group at ECAO was informed the second pump at Willow Creek was non-functional and would not be returned to service until after the 2018 runoff period.

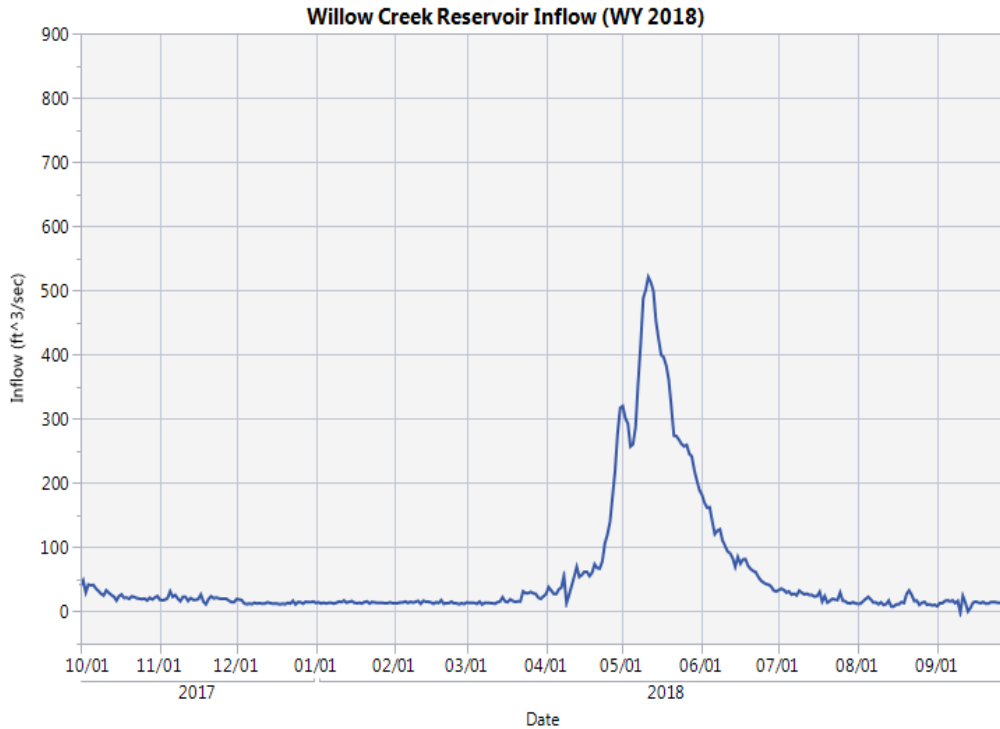
May: The WY 2018 peak inflow of 521 cfs was reached on May 11, 2018. This was about 35 percent lower than the peak inflow for WY 2017. Due to mechanical issues, only one pump was available at Willow Creek between May 11 and May 21, 2018. As a result, just less than 3,500 AF of water was released downstream instead of it being pumped to Granby Reservoir. The highest release from Willow Creek Reservoir to Willow Creek was 261 cfs, occurring on May 11, 2018.

June: Willow Creek pumping ceased for WY 2018 on June 14, 2018.

May through September: Diversion operations at Willow Creek Reservoir were less than normal due to lower than expected runoff and the availability of only one pump during the runoff period.



WY 2018 and 30-year average snow-water equivalent for the Willow Creek Reservoir drainage area.



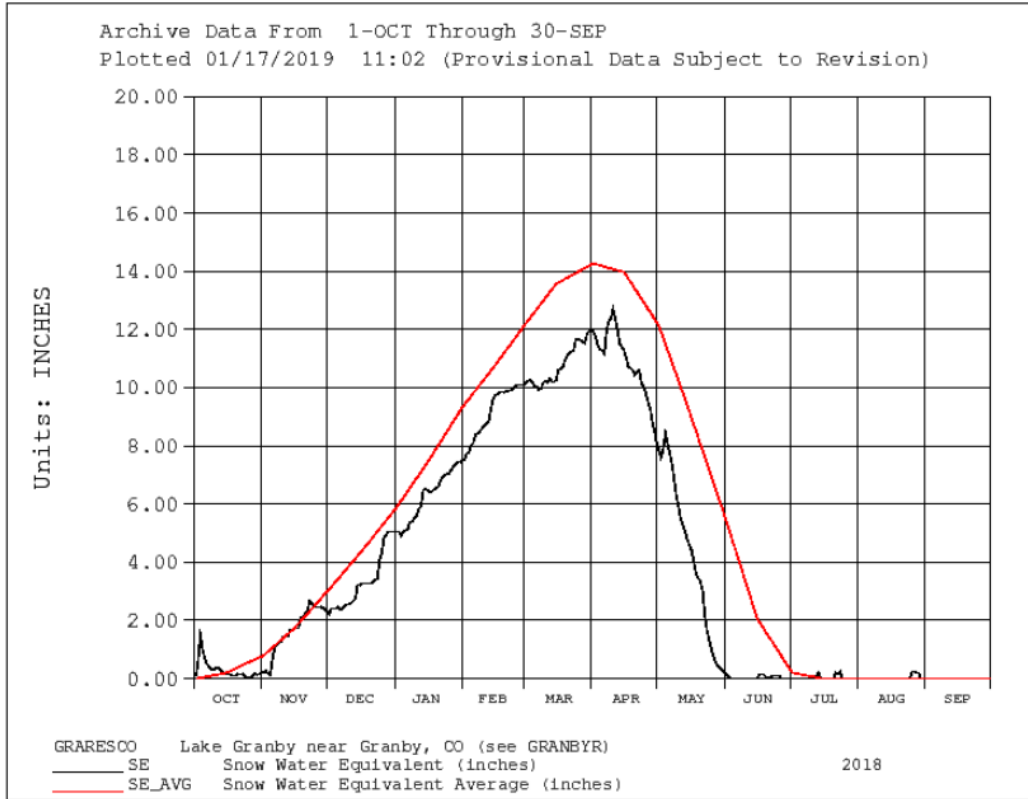
Inflow to Willow Creek Reservoir during WY 2018.

Granby Reservoir and Shadow Mountain Reservoir/Grade Lake

Shadow Mountain Reservoir and Grand Lake are hydraulically connected which makes them function operationally much like a single body of water. Elevations are maintained between 8,366 and 8,367 feet. Thus, their combined storage changes very little. Farr Pump Plant is used to move water from Granby Reservoir to Shadow Mountain Reservoir to maintain the prescribed elevations. Grand Lake functions as forebay storage for Adams Tunnel. Unless otherwise noted, the balance of this section will emphasize Granby Reservoir operations which are considerably more variable and notable than Shadow Mountain and Grand Lake.

October through January: The carryover content from WY 2017 for Granby Reservoir was 518,682 AF, 124 percent of the 30 year average (416,750 AF). At full capacity Granby Reservoir is 539,758 AF. The reservoir content remained above 500,000 AF until January 23, 2018.

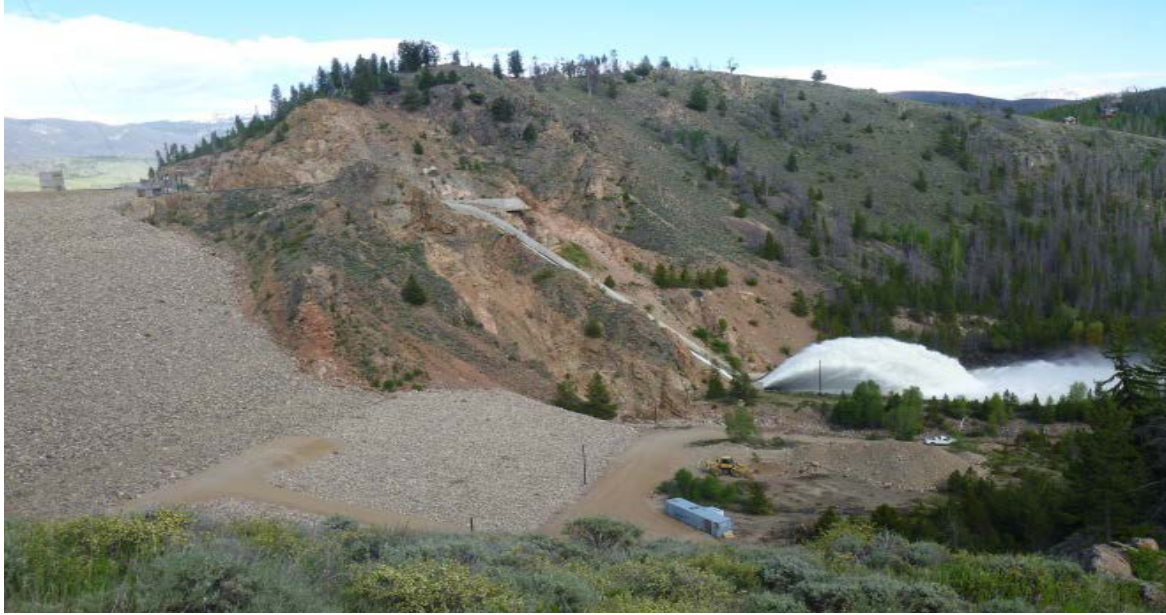
January through May: Granby snow accumulation was lower than average essentially the entire season. As diversions through the Adams Tunnel resumed in the second half of January 2018, Granby Reservoir content began to fall steadily. The reservoir content dropped to 416,267 AF on April 23, 2018 before it began a steady rise. With the exception of the Charles Hansen Feeder Canal 930 Section outage in late April 2018, Adams Tunnel diversions remained at full capacity from the end of January to Carter Reservoir’s first fill of the WY in late May 2018.



WY 2018 versus 30-year average snow-water equivalent for the Granby Reservoir drainage area.

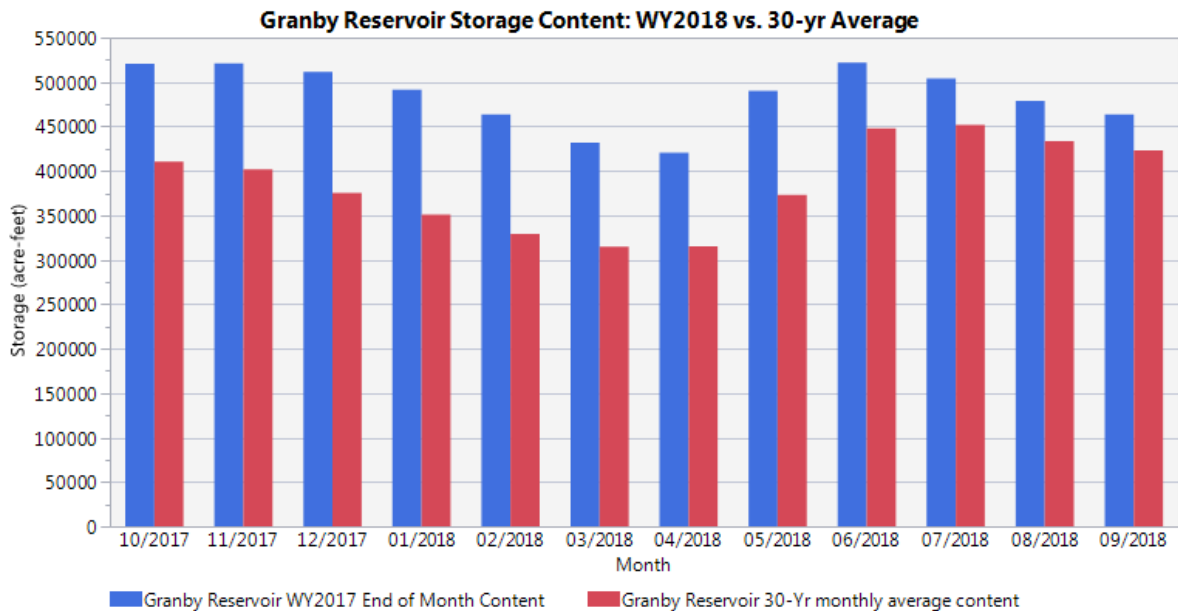
April/May through June: Hydrologic conditions for both the west and east slope indicated that the potential for a spill at Granby was rapidly declining. On June 1, Granby, Horsetooth and Carter Lake Reservoirs' combined storage was 732 thousand acre-feet (KAF) at the 94 percentile of combined storage for the preceding 50 years. The below average runoff forecast for April through July on both the west and east slopes was becoming a reality. Adams Tunnel diversion dropped below capacity late May and continued most of June 2018 as the need to protect against a west slope spill at Granby declined. Reduced diversions allowed for skim operations on the east slope. Full Adams Tunnel diversions were not resumed throughout the remainder of the WY.

At the end of April, the likelihood of Granby Reservoir spill was low enough to risk pumping from the Windy Gap Reservoir into Granby Reservoir. By April 25, 2018 the pumping operation from Windy Gap Reservoir into Granby Reservoir had commenced. It continued until late May, when a 6 day hiatus occurred. Then, as the risk of spill from Granby decreased further, the Windy Gap Municipal Subdistrict increased the number of their pumping days. Windy Gap pumping ceased on June 14, 2018. Some the Windy Gap water pumped into Granby Reservoir during WY 2018 was supplied from the spill at Willow Creek.



Granby Reservoir spill; approximately 2,400 cfs, June 13 through June 21, 2015.

July through September: Although the official Grand Lake Clarity season is defined as July 1 through September 11, Farr Plant pumping operations contributed to the effort beginning June 25 by entering a no-pump period wherein efforts to maintain a positive flow from Grand Lake to Shadow Mountain allowed for settling of particles in both water bodies. By July 2, the Clarity operation required pumping to support the 440 cfs daily average diversion through Adams Tunnel on weekdays and 220 cfs on weekends. No deviation from that plan was needed as the water quality goals were met for the season.



Granby Reservoir storage content during WY 2018 versus the 30-year average.

A full description of the planned clarity operations and actual clarity operations for the WY 2018 clarity period can be found in the 2018 Grand Lake Clarity Adaptive Management Final Report.

September: After the clarity season ended on September 11, diversions through the Adams Tunnel remained at 220 cfs until September 21 when diversions were reduced to meet the demands on the Big Thompson River for the remaining few days in the WY. Granby Reservoir finished WY 2018 with 463,560 AF of water in storage.

East Slope

Adams Tunnel, Marys Lake and Lake Estes

November: Similar to previous years, the month of November 2017 brought multiple inspections and maintenance projects for the C-BT. Marys Lake and Lake Estes were lowered in early December to do tunnel inspections and annual maintenance. The Lake Estes water surface was lowered down to the spillway crest level in early December to inspect the Olympus Tunnel intake facility and to test and recalibrate all the radial gates at Olympus Dam.

December 11: Water began to flow through the Adams Tunnel once again after the drawdown of Marys and Lake Estes.

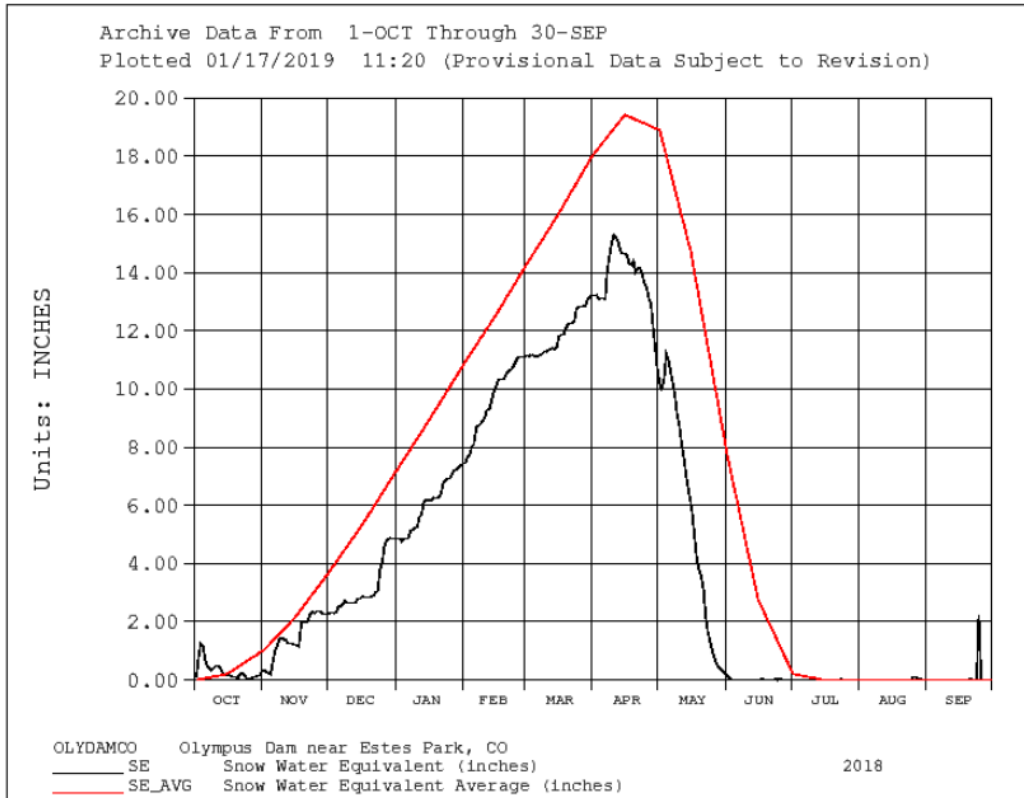
December 12: The level at Marys lake and Lake Estes reached normal operational pool.

January 31: The C-BT maintenance season came to an end as the Adams Tunnel flow reached 550 cfs one and a half months later than projected by the C-BT AOP for WY 2018. Diversions through the Adams Tunnel continued at or near capacity, with minor interruptions for Flatiron switch yard troubleshooting on February 13 and a single week in late April for a Charles Hansen Feeder Canal 930 Section outage, until May 23, 2018.

February: The snowpack above Olympus Dam remained below the 30-year average during the winter and spring.

April: A relatively mild warming trend in April 2018 began to melt some of the snow at the lower elevations. The inflow to Lake Estes gradually increased throughout the month.

May: The month of May was relatively warm over the east slope. With the exception of a mild cooling trend during the first week of the month and another the third week of the month, the natural inflow to Lake Estes gradually increased. The inflow to Lake Estes reached a daily average peak flow of 560 cfs on May 28 and that was the peak for the runoff season in WY 2018. The maximum mean daily release from Olympus Dam was 499 cfs and occurred on May 24.



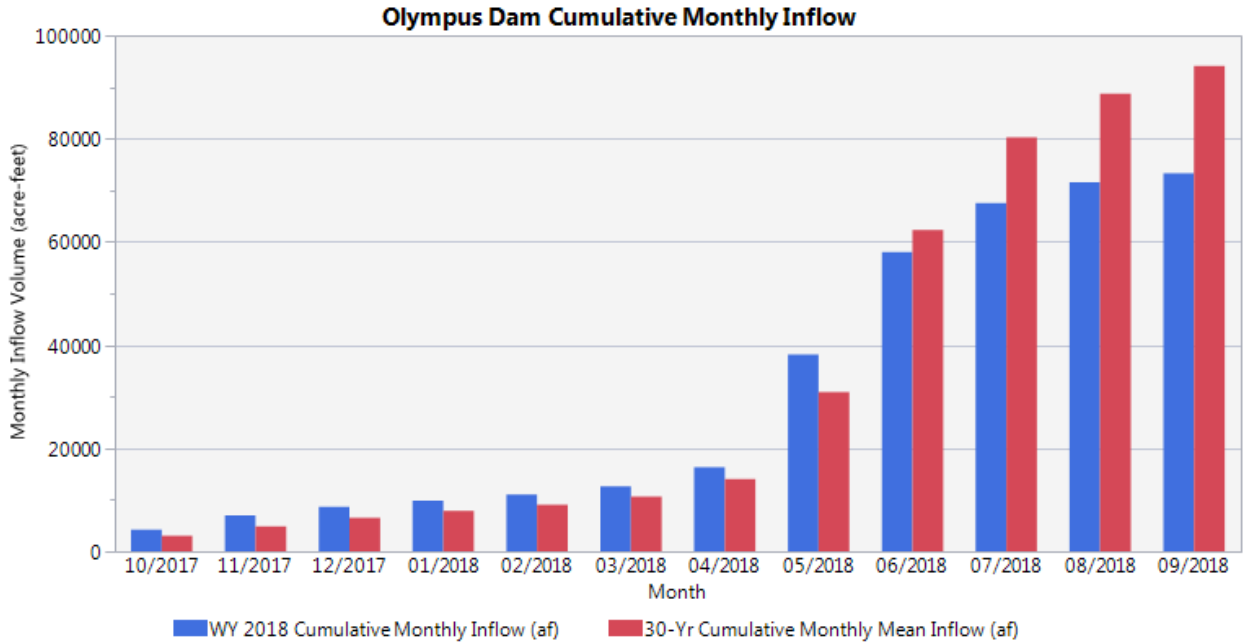
WY 2018 and 30-year average snow-water for the Olympus Dam drainage area.

May 24: C-BT skim operations started on May 24, generating power at Pole Hill and Flatiron Powerplants. Total skim volumes were low for May 2018, only 677 AF, and started later than previous years due to the late start to full-capacity refill of eastern reservoirs.

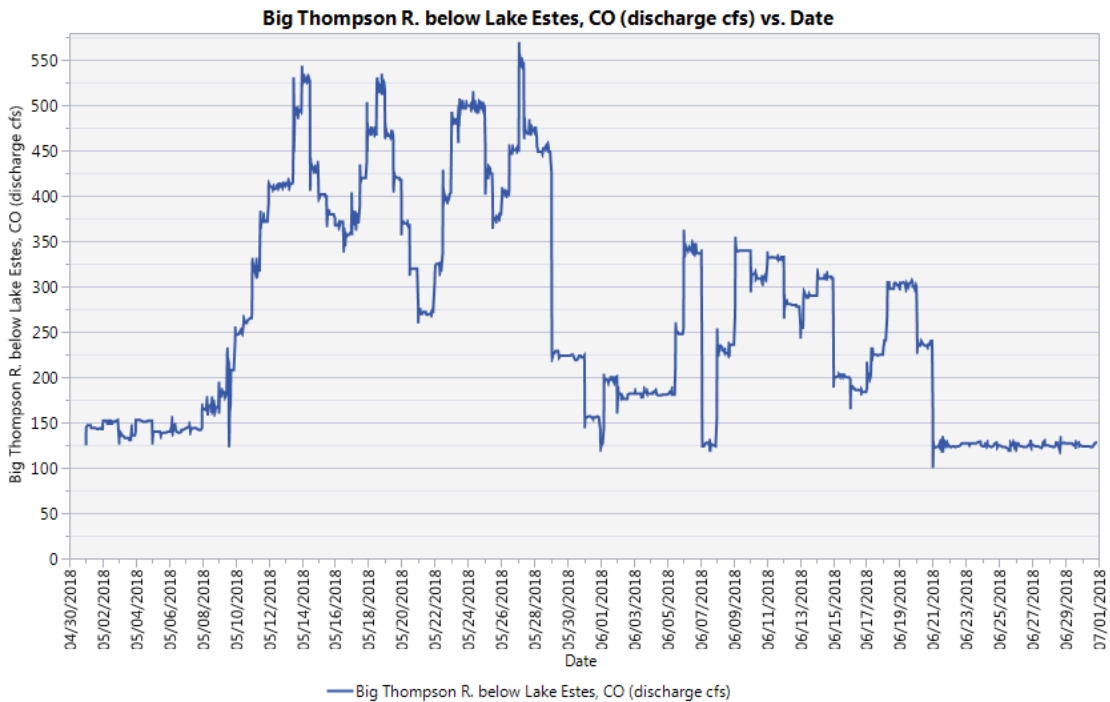
May 26: Carter Reservoir reached its maximum storage capacity on May 26, 2018. Pumping to Carter Reservoir was suspended temporarily and Adams Tunnel imports were directed fully to filling Horsetooth Reservoir.

May 27: The first east slope priority water for the WY became available. Carter had just been filled so all east slope priority was sent to Horsetooth Reservoir. The peak instantaneous release from Olympus Dam was 566 cfs and occurred on May 27.

June: Temperatures over the Front Range were higher than normal during June 2018, especially for the first half of the month, but precipitation was just shy of normal for the month keeping C-BT demands near the projected value. Because the peak of the runoff season was in late May, the June climatic conditions contributed very little to extending runoff. Sufficient space remained in Horsetooth Reservoir to capture all of the east slope priority water available to the project in WY 2018. The project moved out of priority for east slope water on June 7, 2018. A total of 2,831 AF of east slope priority was available, taken and stored in Horsetooth Reservoir in late May and early June.



Computed cumulative native inflow for Lake Estes during WY 2018 versus its 30-year average.



Releases from Olympus Dam to the Big Thompson River from May – June 2018.

June 12: Pumping to Carter Reservoir resumed on June 12, 2018 and continued until June 25 in an attempt to refill Carter once more before the Grand Lake clarity operations were scheduled to commence. A second fill of Carter Reservoir was not achieved in WY 2018.

June-September: Beginning June 25, 2018, with initiation of Grand Lake clarity operations, Adams Tunnel imports were reduced as operations were made to maintain a positive flow from Grand Lake to Shadow Mountain Reservoir considering only the natural inflows to Shadow Mountain and Grand Lake. This settling operation was intended to begin with the clarity period, July 1, but was begun earlier when hydrology clearly indicated there would be insufficient natural inflow to Grand Lake to support it for very long. With some minimum positive flow, any remaining natural inflows to Grand Lake were diverted through Adams Tunnel. By July 3 the natural inflows to Shadow Mountain Reservoir and Grand Lake had declined to the point that east slope demands exceeded the available natural inflow supply to Grand Lake and the Farr Pump was restarted to provide clarity operation flows for the season.

Lower Power Arm, Carter Lake and Horsetooth Reservoir

October - November: The Maitland Siphon repair effort that started in WY 2017 was working toward completion in October and early November 2017. Annual outages covered most of November into early December. No water was diverted through Olympus Tunnel in October and November 2017. Pinewood and Flatiron Reservoirs began the month of October relatively full. The water stored in Flatiron Reservoir was used to meet CHFC demands after the completion of the Maitland Siphon work in early November 2017. Once storage was sufficiently low at Flatiron Reservoir, annual gate inspection and maintenance were performed. From mid-November to the end of the month, water in storage at Pinewood Reservoir was used to refill Flatiron Reservoir for continued satisfaction of the CHFC demands. This lowered Pinewood storage enough for the Bald Mountain Tunnel inspection in the third week of November.

December: The Pole Hill Powerplant annual maintenance began on November 5, 2017 and continued until the middle of December 2017. A portion of Lake Estes storage was moved through Olympus Tunnel bypassing Pole Hill Powerplant to partially refill Pinewood and Flatiron Reservoir the first four days of December. The storage in Flatiron was then used to continue to meet CHFC demands until the annual maintenance season was completed and Adams Tunnel imports commenced on December 11. Lower storages in Pinewood and Flatiron Reservoirs were returned to operational levels by December 15, 2017.

December 11-31: Imports resumed on December 11, 2017, as the Adams Tunnel diversions were increased to 425 cfs to refill east slope storage used during the Adams Tunnel outage, then imports were lowered to 250 cfs throughout the remainder of the month. Both the WAPA switchyard work at Pole Hill Powerplant and Flatiron Unit #3 work were extended through the end of the month. Limiting imports during the month of December to 250 cfs allowed generation at Marys, Estes and Flatiron powerplants and was a tradeoff made to reduce power losses (bypasses around out-of-commission Pole Hill Powerplant) and still provide some water to refill east slope reservoirs. In addition, the diversion provided some protection against potential project yield loss if west slope runoff projections grew over the next five months.

January: Both the Pole Hill Powerplant WAPA switchyard and the Flatiron Unit #3 outages were extended into the middle of the month. Imports remained at 250 cfs the first half of January, then increased to about 500 cfs once Unit number 3 began pumping on January 18. The WAPA switchyard work at Pole Hill was also completed in mid-January but the powerplant could not start generation until after functional testing was complete.

January 18: Pumping to Carter Lake began on January 18 for WY 2018, approximately one month later than intended and modeled within the WY 2018 AOP.

February 1: Adams Tunnel diversions were increased to 550 cfs, the day after functional testing was completed at Pole Hill Powerplant.

February through May: Diversions from the west slope continued uninterrupted at full capacity through May 24, 2018 with two exceptions. From February 12-14 diversions were reduced so that some control circuitry issues at Flatiron Powerplant could be corrected and from April 20-26 for annual maintenance on CHFC930 Section. The impact of those outages on the refill efforts of Carter and Horsetooth Reservoirs was not large.

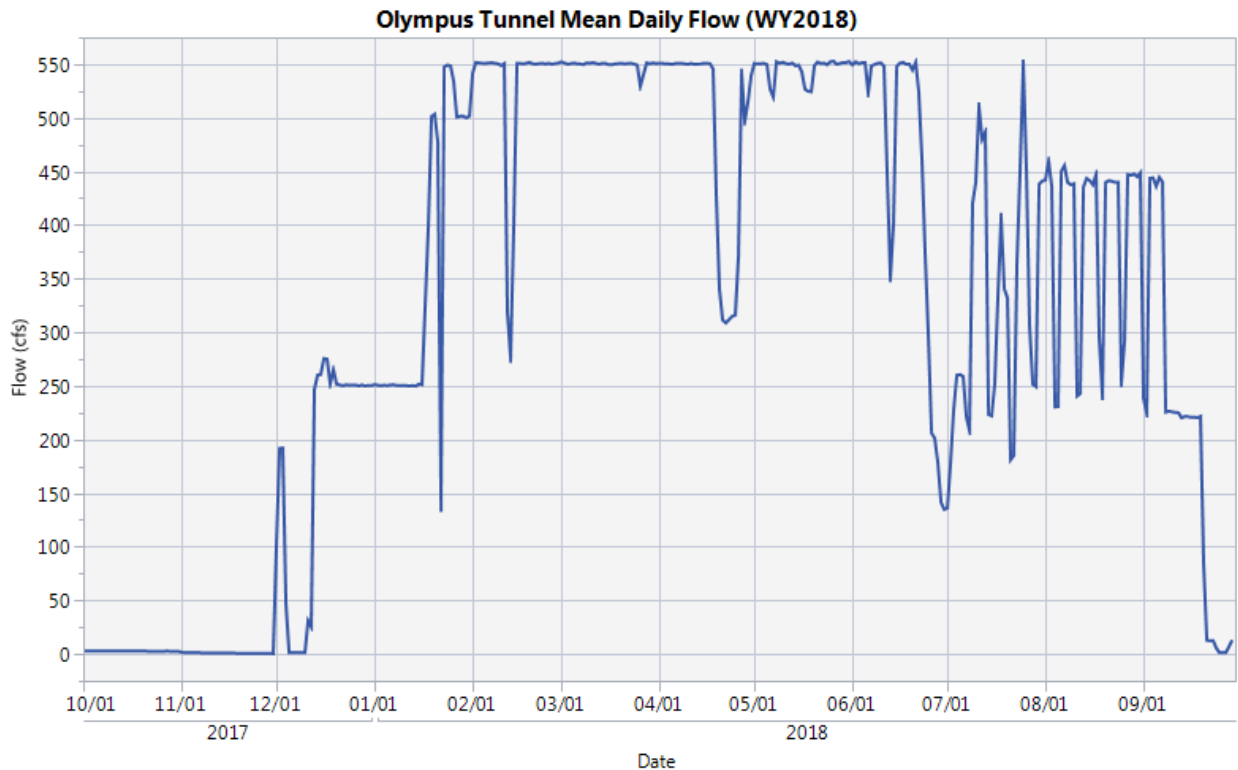
March 22: Skim water became available to the project, but could not be used due to the late start of pumping to Carter and Horsetooth refill efforts and threat of Granby spill.

April 20: The annual maintenance for the CHFC began on April 20, 2018 and continued until April 27, 2018. Pumping to Carter Reservoir continued during this period and by April 27, Olympus Tunnel flows were returned to 550 cfs.

May 24: Adams Tunnel diversion were reduced to approximately 450 cfs as the first Carter Lake fill approached. This created space in Olympus Tunnel for the first skim operation of the season.

May 26: Pumping to Carter Reservoir ceased on May 26, 2018, as the reservoir reached its full capacity. The Adams Tunnel diversions were maintained at about 450 cfs through May 28 with the water flowing north towards Horsetooth Reservoir. Skim operations also continued during the period.

May 27: Priority water first became available, maintaining full generation in the Lower Power Arm with water the project could keep. For WY 2018, all priority water was sent to Horsetooth Reservoir. Carter pumping was off during the period when priority water was available (May 27 through June 6).



Olympus Tunnel 24-hour average flow during WY 2018.

June: For the first part of June, Adams Tunnel imports were adjusted daily to take full advantage of priority water that was available in the system and to fully use Olympus Tunnel capacity. Olympus Tunnel remained at full capacity through June 11 taking advantage of available skim water. Dille diversions began after the first week of June and the first generation at Big Thompson Powerplant also began for the season. Although water was available for diversion at Dille and generation at the Big Thompson Powerplant prior to June, the suspended sediment concentration in the Big Thompson River was high, due to effects of the 2013 flood and the restoration efforts in the canyon. It was determined the water available for skim at Dille was not usable until the suspended sediment concentration was lower. By the second week in June, diversions at Dille began for the season. By mid-June, the risk of spill at Granby Reservoir was minimal so efforts to completely refill Horsetooth Reservoir were reduced. This allowed the project to take full advantage of remaining skim water in the system through the remainder of the month.

June 6: A total of 2,836 AF of priority water for WY 2018 was diverted to Horsetooth Reservoir, ending on June 6.

June 7: Big Thompson Powerplant generation began for the season.

June 8: Dille diversion on the Big Thompson River began for the season.

June 12: Pumping to Carter Reservoir resumed on June 12. Only a partial refill of Carter was achieved by the time pumping ceased on June 25. Insufficient water was available to support the Carter pump beyond June 25 due to clarity operational plans and the precipitous drop in natural

inflow to Grand Lake that occurred in late June 2018. The maximum storage volume at Horsetooth Reservoir was also achieved on June 12; 138,778 AF.

July: The clarity settling operation ended in early July and other clarity operations began. The WY 2018 clarity settling operation was to hold off pumping from Granby Reservoir into Shadow Mountain Reservoir as long as possible by using the natural inflows at Grand Lake to support Adams Tunnel diversion while maintaining a positive flow from Grand Lake into Shadow Mountain Reservoir. Those natural inflows were so low that pumping from Granby had to begin on July 2. Throughout the rest of the clarity period, pumping from Granby was limited to the volume necessary to support Adams Tunnel diversions of 220 cfs during the weekends and 440 cfs during weekdays. CHFC 930 and 550 Sections were under clearance for a week in July for a repair at the Trifurcation. Carter pumping resumed for that week to increase the projected minimum Fall storage there.

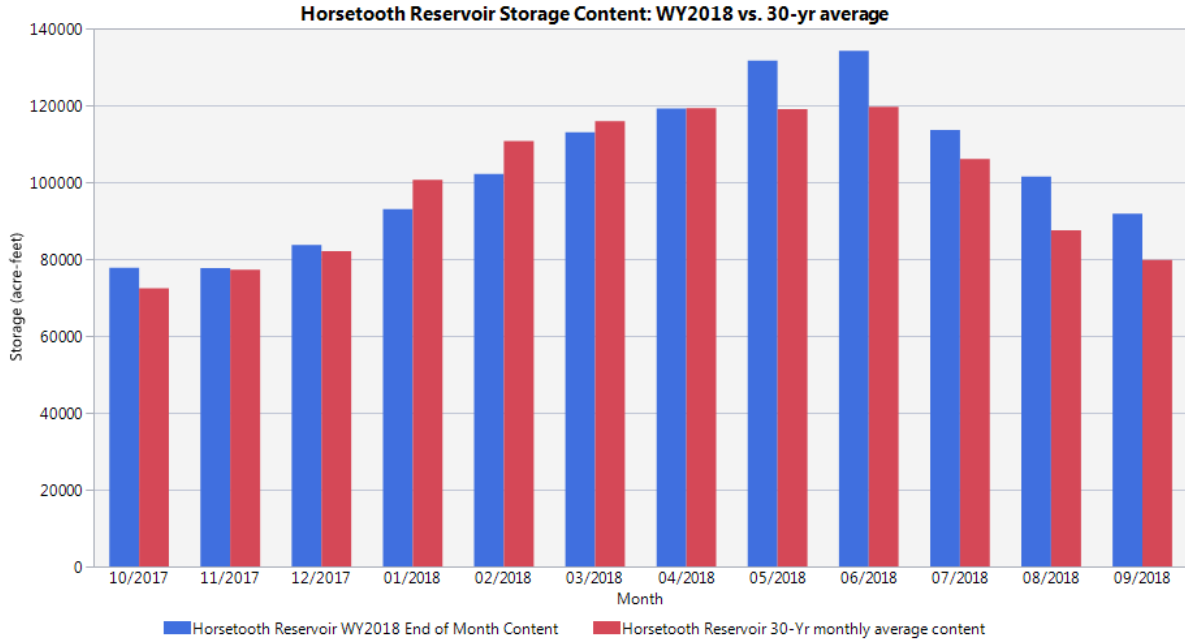
July 17: Carter Lake pumping resumed while CHFC 930 and 550 sections were under clearance.

July 23: Carter Lake pumping ceased for the WY as the clearance was lifted on the CHFC.

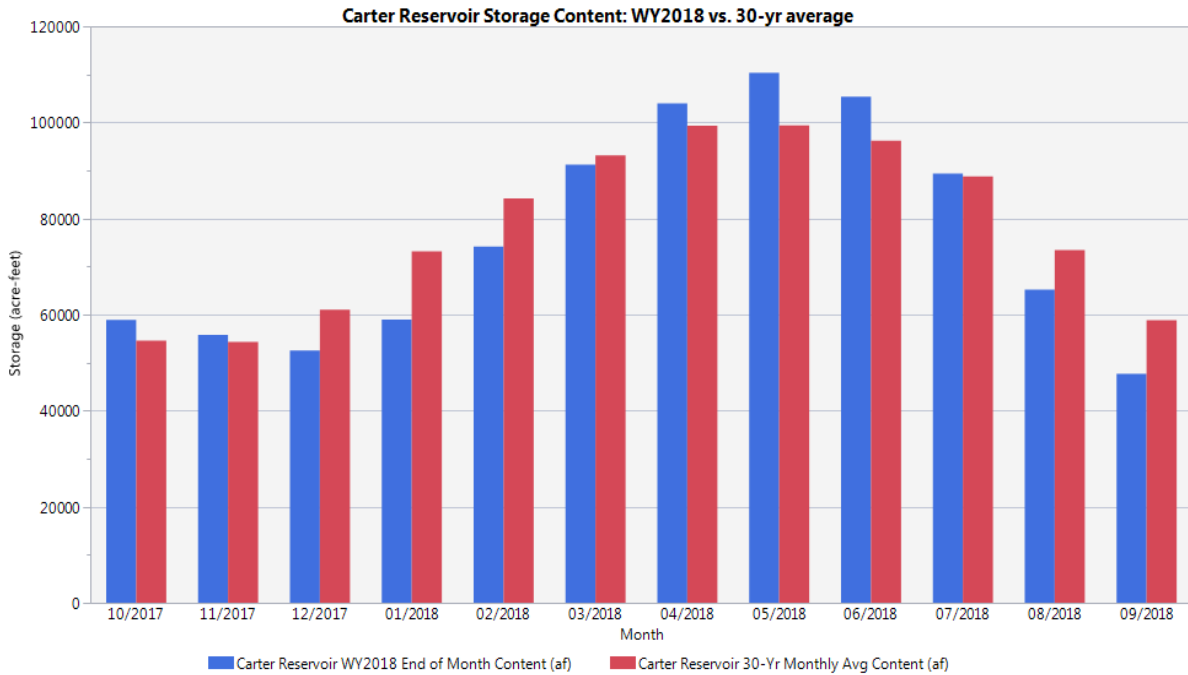
July 30: The natural inflow to Lake Estes dropped below the minimum release schedule so Olympus Tunnel skim operations ended for the WY.

August - September: Adams Tunnel diversions continued as prescribed by the clarity plan for the season. Natural flow gains between the Big Thompson below Olympus Dam and the Dille diversion were poor throughout the late summer. Although all available skim water was diverted at Dille, the Dille skim volume for the late summer was very low. Annual maintenance of the CHFC 550 section started at the end of September. C-BT deliveries to the Big Thompson River were made from Olympus dam during the annual maintenance.

Throughout WY 2018: Although Adams Tunnel full diversions began nearly one and a half months days later than the WY2018 AOP, Carter and Horsetooth Reservoir elevations remained above the elevations necessary to support all boat ramps during the recreation season and sufficient supplies were available to meet all water supply deliveries for the WY.



Horsetooth Reservoir storage content during WY 2018 versus its 30-year average.

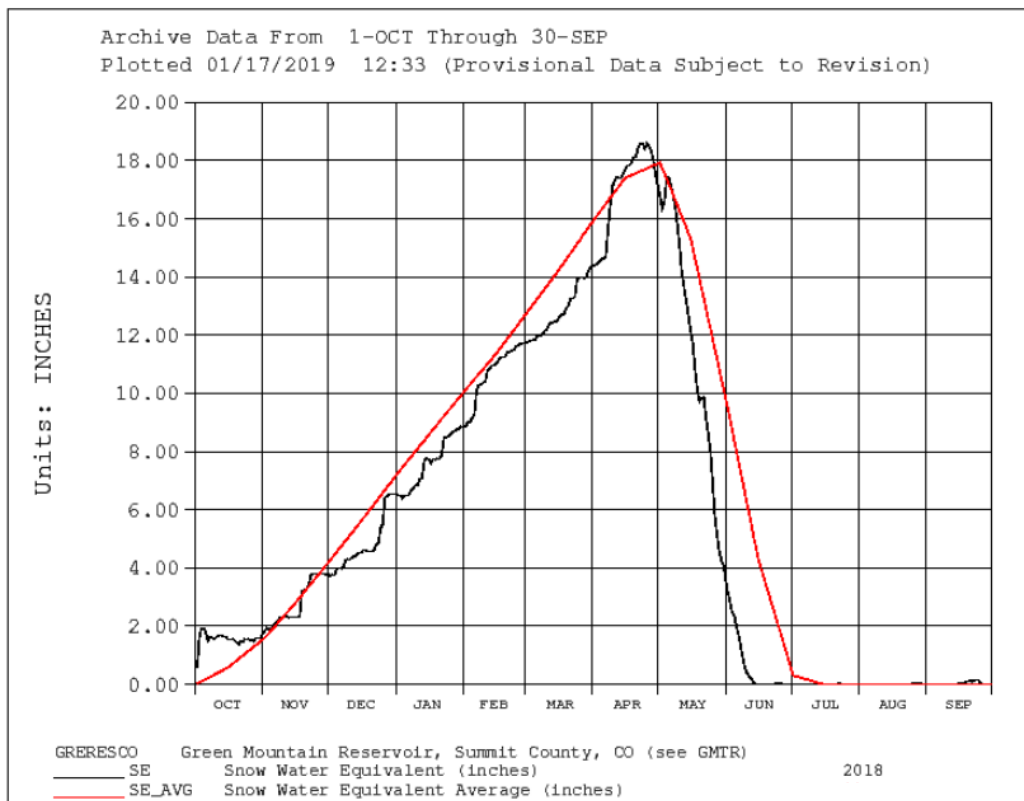


Carter Reservoir storage content during WY 2018 versus its 30-year average.

Green Mountain Reservoir

Fall, winter and spring hydrology WY 2018: Green Mountain Reservoir operations were challenged by slightly below average snowpack followed by early runoff, well below average spring precipitation and warmer than average temperatures. Early season snow was followed by

slightly below average precipitation throughout most of the winter. A large localized precipitation event in early April added 2 inches of SWE and boosted snow water equivalent above normal just before runoff. Peak snow accumulation occurred on April 22, 2017, near the median historic peak accumulation. The April 1 runoff forecast projected an undepleted runoff volume of 231 KAF, approximately 88% of normal.



WY 2018 and 30-year average snow-water equivalent for the Green Mountain Reservoir drainage area.

Above normal temperatures and well below normal precipitation followed the near normal snow accumulation season. Both factors contributed to a rapid and early runoff and substantially less runoff volume. Peak reservoir average daily inflow of 1,450 cfs occurred on June 1, 2018. The total observed April-July runoff was 197 KAF. This represented 33 KAF or 15 percent less than the April 1 forecast for the most probable plan. Total runoff volume was 76 percent of the median runoff volume.

The below normal runoff coupled with early Dillon Reservoir fill and higher than average upstream trans-mountain diversion by Denver and Colorado Springs Utilities greatly impacted reservoir operations during the fill season. On April 1, Denver Water Board's South Platte and Blue River storage was well above normal for this time of the year. Dillon Reservoir had less than 20 KAF of remaining available storage to store the anticipated runoff. However, even with above average snow accumulation in the South Platte Basin, Denver Water and Colorado Spring Utilities east slope diversion April-July total was 61 KAF, 160 percent of normal. Green Mountain Reservoir inflow represented 69 percent of the basin runoff. Reservoir inflow remained below maximum powerplant capacity during runoff.

The dry and warm weather condition kept mainstem Colorado River flow well below average during snowmelt runoff. With minimal lower elevation snow, an early runoff and practically no rain in May and June, the Shoshone Powerplant Water Right Call was placed on June 28, 2018, nearly a month earlier than typical and before Green Mountain Reservoir completed fill.

October through April WY2018 Delivery Operations: Green Mountain Reservoir operation was normal during the fall and winter delivery season. The C-BT project was the swing right for a few days in October but was unable to store water under a refill right. The project was out-of-priority for the rest of the delivery period. The Shoshone Powerplant Senior Water Right was in effect from October 1, 2017, until administration was relaxed on April 10, 2018. During this period Green Mountain Reservoir delivered 20,831 AF of C-BT collection system replacement water, 18,891 AF to fulfill HUP obligations, 2,371 AF for contract deliveries, 0 AF for the Silt Project replacement and 493 AF for Green Mountain Reservoir evaporative losses. The Shoshone Outage Protocol was not exercised during this period.

The HUP managing entities declared a surplus in the HUP of 66,000 AF allocation in August 9, 2017. Green Mountain Reservoir released 17,702 AF of HUP surplus water during October 2017 to support the Colorado River Endangered Fish Recovery Program. This water was delivered to the 15-Mile Reach downstream of the Grand Valley Irrigation Company's Colorado River diversion.

HUP managing entities decided to delivery additional storage from the remaining HUP allocation to the 15 mile reach to offset low Colorado River flow at the Grand Valley diversions. HUP remaining allocation was 7,127 AF on April 13, 2018. The HUP managing entities had declared Surplus the previous fill season. Between April 13 and April 21 Green Mountain Reservoir released 2,356 AF of HUP surplus to the 15 mile reach. Release rate ranged between 48 cfs to 198 cfs.

Green Mountain Reservoir reached the year's minimum storage of 60,422 AF on April 21, 2018, with a water surface level of 7,890.96 feet. Then the reservoir commenced storing water using the refill storage right with the relaxation of water rights administration on the Colorado River. Green Mountain Reservoir was not impacted by any operating restrictions during the delivery period. (The only existing operating restriction applies below 7,865 feet (36,957 AF) where drawdown rate cannot exceed 0.5 feet per day. This restriction is always in place to address landslide concerns.) End of the month storage contents for the reservoir during WY 2018 compared to the 30-year average are provided below.



Comparison between the Green Mountain Reservoir monthly content during WY 2017 and its 30-year average content.

March 27, 2018: The HUP managing entities held the 2017 HUP Operations Wrap Up meeting. The agenda included reports on total HUP deliveries, Green Mountain Reservoir Operations. Reclamation informed the entities that Green Mountain Reservoir was forecast to fill and that the HUP allocation was expected to refill the full 66,000 AF. The status of the Heeny Slide operation restriction was also discussed including the expectation that it would not apply during the WY 2018 irrigation season.

April through July Fill Operations: Green Mountain Reservoir exercised refill storage rights from April 22, 2018, until May 07, 2018. During this period Green Mountain Reservoir stored 5,435 AF. Reservoir storage was 65,857 AF on May 7, 2018 for declaration of Start-of-Fill, about 96 percent of the historical average for this day.

Reclamation forecasted that Green Mountain Reservoir would physically fill in WY 2018. The good carryover storage conditions and slightly below average May 1, 2018 streamflow projections indicated a physical fill for 95 percent of possible hydrologic scenarios. The Denver Water Board and Colorado Springs Utilities were permitted to divert out of priority since all forecasts projected a substantial amount of runoff available for power generation.

The Colorado State Engineer office administered Green Mountain Reservoir operations under the Green Mountain Administrative Protocol (Protocol) for WY 2018. Green Mountain Reservoir maintained the Direct Flow Power Water Right call with a priority of June 23, 1946 until reducing release below powerplant minimum flow on May 31, 2018.

May 7: The start of fill for Green Mountain Senior Refill Right was declared for WY 2018. Re-allocation of the carry over storage replenished the 52,000 AF collection system replacement pool and partially refilled the 5,000 AF Silt Project allocation.

May 31: Green Mountain release to the Blue River was reduced to minimum required release. This action responded to the acceptance of a conservative operation offer from the Cities as per the Protocol and a reduction in the anticipated runoff. Minimum release was maintained until river administration required additional HUP and contract releases. Reclamation revised the forecasted fill schedule based upon substantially less forecasted runoff. Reclamation announced that Green Mountain Reservoir would not have surplus water and could not participate in the Colorado River Endangered Fish Recovery Program Coordinated Reservoir Operations (CROS) for 2018. CROS operations did not occur during runoff in WY 2018.

June 27: The HUP Managing Entities held their initial meeting in Grand Junction to consider conditions and plan for WY 2018 operations. A total of 30 meetings and conference calls were held between June 27 and October 24, 2018 to manage releases from Green Mountain, Ruedi, Granby, Wolford Mountain, and Williams Fork Reservoirs; coordinate irrigation diversions in the Grand Valley; and attempt to maintain the mean monthly target flows in the 15-Mile Reach. The U.S. Fish and Wildlife Service proposed an average year target flow of 810 cfs due to low runoff forecast.

June 28: Green Mountain Dam resumed power generation with an increase in release due to change in river administration. Flows in the Colorado River at the Shoshone Powerplant dropped below administrative level and Green Mountain Reservoir commenced releasing augmentation contract and HUP replacement water from storable inflow.

July 4: Green Mountain Reservoir achieved this year's maximum physical fill level of 148,535 AF.

July 21: The C-BT was fully called out due to Colorado River flow dropping below 1,250 cfs at the Shoshone Powerplant.

July 27: Reclamation declared End of Fill for the Green Mountain Reservoir Senior Storage Right per II.A.3.b. of the Protocol. Reclamation determined a substitution year with a total storage of 151,674 AF accounted toward the senior storage right. Reclamation also calculated that the Cities had no replacement requirement due in part to discretionary power release at the start of fill season and the additional volume stored under the Conservative Operations-Power Loss Replacement Offer made by the Cities per IV.A.4.b of the Protocol. While this outcome was a very low risk possibility when early decisions were made, schedulers learned from this experience and will approach a similar decision somewhat differently in the future.

July-September: The C-BT project remained out of priority for all of August through the end of the water year. During irrigation season Green Mountain Reservoir delivered the full 65,500 AF of HUP allocation available for the irrigation season on October 1, 2018. No HUP surplus existed. Additional water was made available to augment storage delivery to the Grand Valley irrigation entities including Grand County Windy Gap water and Ruedi contract water.

WY 2018: Green Mountain Reservoir operations did not require any operating restrictions during delivery and filling.

Green Mountain Reservoir delivered a total of 123,342 AF from storage in WY 2018, some attributed to the 2017 fill and delivery year and some attributed to the 2018 fill and delivery year. These deliveries included 86,599 AF for HUP allocation, 29,193 AF for C-BT collection system replacement, 6,384 AF for contract obligations and 2,911 AF for Silt Project replacement. Green Mountain Reservoir released 20,051 AF of HUP Surplus releases for the benefit of the Colorado Endangered Fish Recovery Program. All HUP Surplus release was from the 2017 fill and delivery year. The Shoshone Outage Protocol was not exercised in WY 2018.

2019 Annual Operation Plan

Collection System and East Slope Colorado-Big Thompson Project

The 2019 C-BT Most-Probable Annual Operating Plan is developed considering the effects of historical average runoff values, the expected demands and depletions of the Northern Water and Denver Water (including an assumed Northern Water quota of 70 percent), the project's initial states (e.g. pool levels), other average values, special operations such as previously planned system outages and maintenance schedules.

The 2019 AOP projected a total inflow to the west slope collection system of 250,700 AF during WY 2019. It simulated 35,800 AF of water pumped from Willow Creek and no spill at Granby. Windy Gap was expected to pump 40,100 AF to Granby Reservoir.

The 2019 AOP projected a total of 259,600 AF of diversions through the Adams Tunnel during WY 2019. Just over half of that water was planned to be diverted between January 2018 and May 2018, while leaving sufficient capacity within the system to convey Big Thompson River skim water used for power generation and Big Thompson River priority water. The skim operation is an estimated 19,100 AF of water through the Olympus Tunnel. The Dille Tunnel diversion was simulated as available by late April 2018, skimming an estimated volume of 26,200 AF. Total priority water for the 2019 AOP was simulated as 2,900 AF.

The 2019 AOP projected a fill of Carter Reservoir but not for Horsetooth Reservoir. Carter was expected to fill by mid-April 2019 and demands were projected to exceed supply in early July, causing reservoir draft. Horsetooth maximum content was expected in early July 2019 with subsequent storage draft. Total 2019 AOP deliveries from Carter were simulated as 103,200 AF. Total deliveries from Horsetooth were simulated as 119,600 AF. Initial content of Carter Reservoir is 48,000 AF and simulated ending content is 52,800 AF. Horsetooth's initial content is 92,000 AF and simulated ending content is 93,300 AF.

Green Mountain Reservoir

The 2019 AOP for Green Mountain Reservoir inflow used was 315,100 AF. Green Mountain is not projected fill due to low carry over storage at the start of fill season date. Green Mountain is anticipated to achieve 2019's maximum content in the first half of July. Total Green Mountain Reservoir releases are simulated as 154,600 AF, all through the powerplant. The reservoir is forecast to obtain a physical fill with a substitution obligation for Denver and Colorado Springs. Green Mountain Reservoir forecast simulation indicates that all allocations will refill for delivery during the 2019 delivery season. The 2019 minimum reservoir water surface elevation was projected to reach 7,883.7 feet before refilling begins, well above the Heeney Slide operational restriction of 7,865.0 feet.

Green Mountain Reservoir filling projections assumed that Denver and Colorado Springs would deplete a total of 123,000 AF. Per the Blue River decree, the cities would be required to replace the fill shortage in Green Mountain Reservoir.

APPENDIX A - DAILY RECORDS FOR WY2018

Appendix A (1 of 38)

Green Mountain Reservoir, CO

Location. --Lat 39°52'42", long 106°19'42", Summit County, Hydrologic Unit 14010002, on Green Mountain Dam, 13 miles southeast of Kremmling, Colorado, on the Blue River.

Gage. --Water level recorder with satellite telemetry. Elevation of gage is 7960 from topographic map.

Remarks. -- Inflow computed daily based on change in content from midnight to midnight, and on the 24-hour average releases from Green Mountain Reservoir. Recorders were operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and fair. This record consists of operational data which could be subject to future revisions and changes.

Inflow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	302	165	211	190	159	200	247	442	1450	528	222	118
2	295	214	227	145	166	188	225	356	1326	527	224	139
3	243	154	197	128	163	197	233	409	1278	507	252	131
4	248	218	204	153	173	196	219	354	1218	475	246	125
5	262	238	202	167	162	193	233	361	1285	445	248	174
6	260	234	172	183	174	186	248	396	1300	447	229	133
7	278	224	159	210	133	187	244	416	1239	460	190	129
8	214	211	177	177	164	173	338	487	1227	463	200	123
9	241	129	163	181	156	183	300	634	1185	462	173	118
10	222	228	130	197	171	170	234	609	1133	482	182	129
11	222	203	142	185	170	175	254	705	1074	467	173	111
12	214	227	158	151	165	171	269	790	994	386	156	105
13	212	158	175	175	179	184	245	741	987	348	166	95
14	199	226	161	181	187	184	226	682	1007	318	163	116
15	208	238	150	181	180	133	213	618	1009	275	174	73
16	218	233	159	157	188	192	231	706	996	265	143	102
17	226	215	157	158	163	164	222	814	1049	280	166	100
18	209	258	153	170	180	185	251	833	1170	261	144	89
19	220	179	147	162	179	182	234	691	957	241	124	95
20	222	220	155	152	171	184	218	616	819	231	140	86
21	224	233	161	170	171	176	220	654	734	230	163	88
22	199	233	164	164	130	203	202	683	714	237	152	104
23	199	233	167	159	176	219	216	717	596	238	153	88
24	247	183	168	152	186	235	296	749	588	216	147	111
25	219	228	167	158	182	218	288	811	539	225	145	101
26	219	241	168	179	171	206	279	1054	573	233	159	108
27	181	212	205	161	177	175	435	979	535	237	146	77
28	229	200	209	145	191	206	349	1012	583	217	108	99
29	217	214	193	167		238	403	910	566	205	129	103
30	204	189	192	175		225	443	935	558	230	134	87
31	222		187	157		235		1214		208	126	
Min	181	129	130	128	130	133	202	354	535	205	108	73
Max	302	258	227	210	191	238	443	1214	1450	528	252	174
Mean	228	211	174	167	170	192	267	690	956	334	170	109
ac-ft	14012	12548	10650	10273	9436	11806	15869	42332	56805	20482	10445	6450



Appendix A (2 of 38)

Elliot Creek Canal near Green Mountain Reservoir, CO

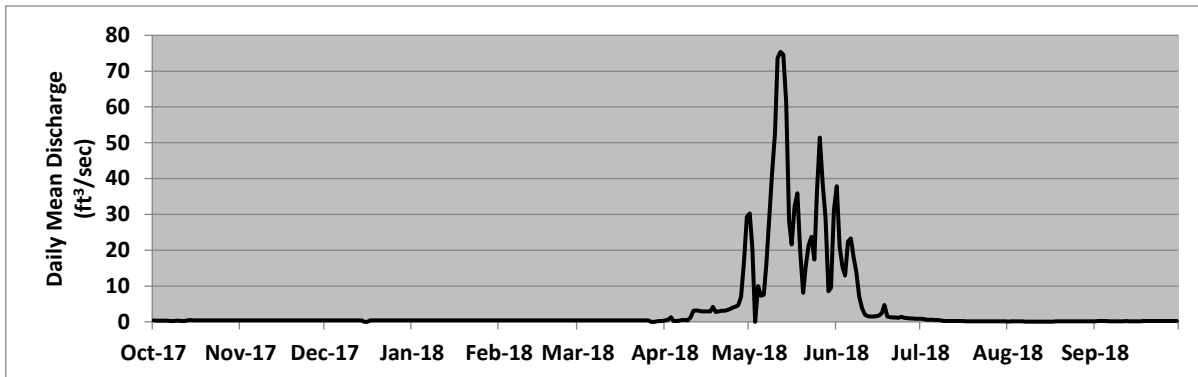
Location. --Lat 39°52'25", long 106°19'49", Summit County, Hydrologic Unit 14010002 , on left bank at concrete flume structure, and 1.1 mi west of Heeney.

Gage.--Water-stage recorder with satellite telemetry. Elevation of gage is 8050 ft from topographic map.

Remarks.—This is a diversion from Elliot Creek in the Blue River Basin to Green Mountain Reservoir. Recorders were operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable while recorder is operated. This record contains operational data which could be subject to future revisions and changes. Official data is published by the United States Geological Survey.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	30	38	1	0	0
2	0	0	0	0	0	0	1	21	21	1	0	0
3	0	0	0	0	0	0	1	0	15	1	0	0
4	0	0	0	0	0	0	0	10	13	1	0	0
5	0	0	0	0	0	0	0	7	22	1	0	0
6	0	0	0	0	0	0	0	8	23	1	0	0
7	0	0	0	0	0	0	0	16	18	1	0	0
8	0	0	0	0	0	0	0	29	14	0	0	0
9	0	0	0	0	0	0	0	42	7	0	0	0
10	0	0	0	0	0	0	1	53	4	0	0	0
11	0	0	0	0	0	0	3	74	2	0	0	0
12	0	0	0	0	0	0	3	75	2	0	0	0
13	0	0	0	0	0	0	3	75	1	0	0	0
14	1	0	0	0	0	0	3	61	1	0	0	0
15	0	0	0	0	0	0	3	28	2	0	0	0
16	0	0	0	0	0	0	3	22	2	0	0	0
17	0	0	0	0	0	0	3	32	2	0	0	0
18	0	0	0	0	0	0	4	36	5	0	0	0
19	0	0	0	0	0	0	3	19	1	0	0	0
20	0	0	0	0	0	0	3	8	1	0	0	0
21	0	0	0	0	0	0	3	16	1	0	0	0
22	0	0	0	0	0	0	3	21	1	0	0	0
23	0	0	0	0	0	0	3	24	1	0	0	0
24	0	0	0	0	0	0	4	17	1	0	0	0
25	0	0	0	0	0	0	4	36	1	0	0	0
26	0	0	0	0	0	0	4	51	1	0	0	0
27	0	0	0	0	0	0	5	39	1	0	0	0
28	0	0	0	0	0	0	7	29	1	0	0	0
29	0	0	0	0	0	0	17	9	1	0	0	0
30	0	0	0	0	0	0	29	10	1	0	0	0
31	0	0	0	0	0	0	0	31	0	0	0	0
Min	0	0	0	0	0	0	0	0	1	0	0	0
Max	1	0	0	0	0	0	29	75	38	1	0	0
Mean	0	0	0	0	0	0	4	30	7	0	0	0
ac-ft	24	26	25	26	24	24	229	1837	408	18	8	12



Appendix A (3 of 38)
Green Mountain Reservoir, CO

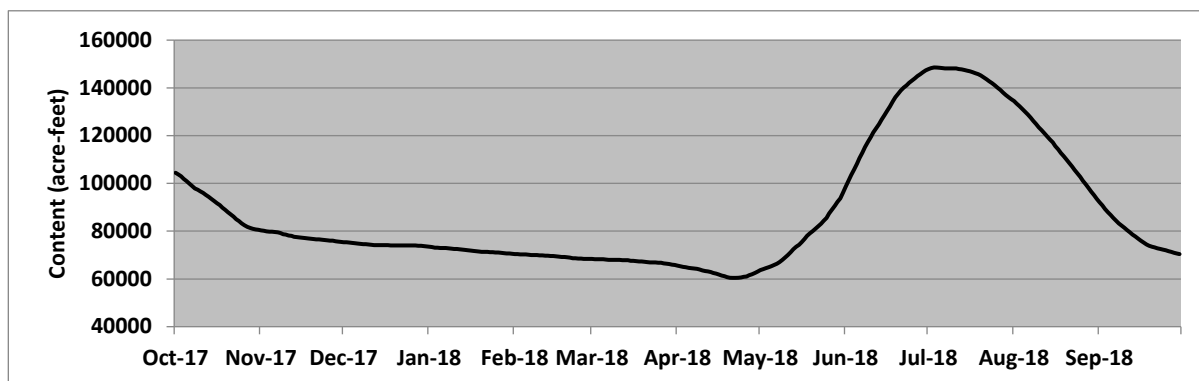
Location. --Lat 39°52'42", long 106°19'42", Summit County, Hydrologic Unit 14010002, on Green Mountain Dam, 13 miles southeast of Kremmling, Colorado, on the Blue River..

Gage. --Water level recorder with satellite telemetry. Elevation of gage is 7960 from topographic map.

Remarks. --Reservoir is formed by an earth-fill dam. Construction completed in 1943. Impoundment began on 16-Nov-1942. Green Mountain Reservoir provides storage used for replacement water of the C-BT diversions. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Maximum capacity is 153,639 AF at elevation 7950.00 ft, with 146,779 AF of active capacity. Records are complete and fair, but the data has not been revised. This record consists of operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	104510	80295	75406	73494	70442	68326	65559	63628	98712	147829	134547	92141
2	103781	80175	75330	73305	70357	68291	65295	64033	101173	148327	133398	90752
3	102925	79934	75190	73118	70285	68279	65065	64542	103538	148493	132299	89348
4	101903	79827	75075	73030	70260	68255	64836	64939	105786	148514	131144	87946
5	100905	79760	74985	73006	70200	68208	64655	65352	108190	148431	130017	86686
6	99895	79654	74832	72993	70163	68125	64497	65834	110608	148327	128820	85510
7	98915	79456	74666	72981	70054	68043	64328	66355	112910	148223	127552	84372
8	97939	79205	74577	72819	70006	67983	64248	67018	115144	148161	126220	83312
9	97309	78756	74501	72657	69933	67972	63943	67972	117305	148119	124860	82260
10	96635	78505	74350	72595	69884	67936	63561	68875	119367	148161	123545	81327
11	95952	78216	74249	72508	69836	67913	63305	69969	121307	148161	122275	80402
12	95224	77981	74211	72358	69763	67865	63138	71236	123103	147953	120979	79456
13	94399	77628	74199	72259	69702	67830	62881	72395	124879	147704	119691	78558
14	93488	77459	74173	72171	69654	67783	62526	73431	126708	147476	118447	77733
15	92599	77354	74136	72059	69557	67629	62152	74337	128517	147207	117162	76848
16	91731	77237	74111	71887	69473	67582	61812	75419	130323	146898	115639	76021
17	90853	77093	74085	71703	69342	67452	61461	76719	132260	146569	114199	75202
18	89868	77016	74060	71568	69246	67369	61115	78059	134410	146179	112807	74476
19	88904	76783	74035	71469	69138	67275	60714	79126	136111	145767	111358	73884
20	87960	76654	74022	71396	69019	67169	60465	80041	137568	145212	109927	73468
21	87012	76577	74022	71359	68887	67030	60433	81017	138856	144397	108560	73143
22	86013	76499	74022	71297	68672	66937	60433	82044	140094	143581	107141	72844
23	85036	76422	74010	71236	68588	66878	60465	83148	141115	142811	105639	72520
24	84178	76241	73997	71162	68552	66855	60649	84316	142144	142003	104121	72246
25	83285	76151	73985	71089	68505	66797	60822	85608	143053	141115	102654	71948
26	82518	76086	73959	71027	68433	66716	60996	87380	144009	140114	101141	71654
27	81814	75970	73947	70929	68373	66529	61559	89004	144907	139134	99646	71297
28	81341	75815	73922	70806	68338	66390	61955	90694	145767	138143	98047	70990
29	80977	75687	73846	70721		66262	62460	92200	146569	137094	96513	70685
30	80683	75521	73733	70648		66018	63048	93784	147289	136111	94999	70430
31	80522		73607	70539		65777		96012		135325	93547	
Min	80522	75521	73607	70539	68338	65777	60433	63628	98712	135325	93547	70430
Max	104510	80295	75406	73494	70442	68326	65559	96012	147289	148514	134547	92141
Mean	91583	77665	74298	71942	69452	67402	62613	76596	127391	144888	115061	78249
ac-ft	80522	75521	73607	70539	68338	65777	63048	96012	147289	135325	93547	70430



Appendix A (4 of 38)

Blue River below Green Mountain Reservoir, CO

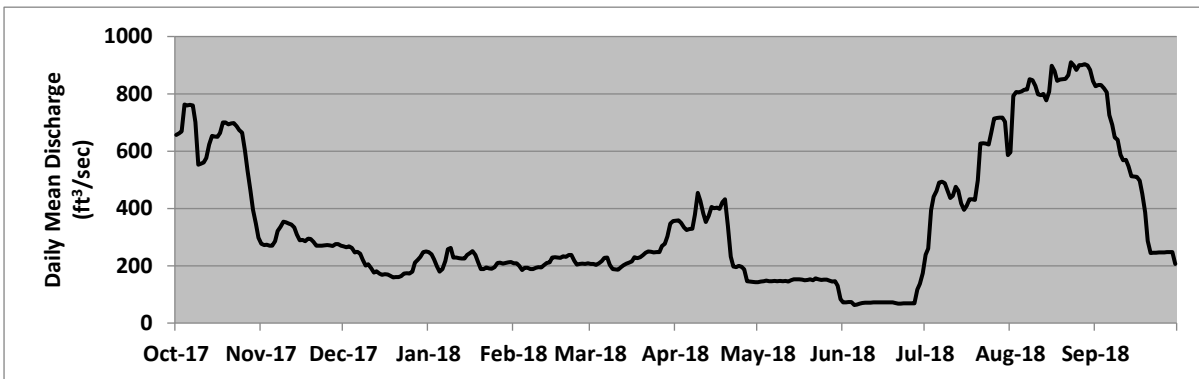
Location.--Lat 39°52'49", long 106°20'00", Summit County, Hydrologic Unit 14010002, on left bank 0.3 miles upstream from Elliot Creek, 0.3 miles downstream from Green Mountain Reservoir and 13 miles southeast of Kremmling.

Gage.-- Water-stage recorder with satellite telemetry. Datum of gage is 7682.66 feet (levels by U.S. Bureau of Reclamation).

Remarks.--Drainage area is 599 mi2 including 15.3 mi2 of Elliot Creek above the diversion for Elliot Creek feeder canal. Flow regulated by Green Mountain Reservoir since 1942. Diversions for irrigation of 5,000 acres upstream from station. Trans-mountain diversions upstream from station. Recorder was operated from 01-Oct-2017 to 30-Sep-2018; a missing daily values on 08-22-2017 was interpolated from available observed data. Recorded values are complete and reliable. This record consists of operational data which could be subject to future revisions and changes. Official record is published by the United States Geological Survey.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	657	277	268	247	208	206	357	143	72	239	597	827
2	662	273	265	240	208	206	358	145	72	260	793	831
3	669	273	267	222	200	203	349	146	73	394	807	831
4	762	270	262	197	185	208	334	148	73	441	805	820
5	759	270	247	180	193	216	324	146	63	461	809	805
6	761	285	249	189	192	227	328	146	65	490	815	726
7	759	321	242	216	188	229	330	147	68	494	816	692
8	701	336	221	258	188	203	378	146	70	488	851	648
9	553	353	201	262	193	189	454	147	71	464	847	640
10	556	352	205	228	195	188	427	146	71	437	828	588
11	560	347	192	229	194	187	383	147	71	444	798	569
12	576	343	177	226	202	195	353	144	72	476	795	569
13	623	333	180	225	210	202	374	149	72	463	800	547
14	653	309	173	225	212	208	405	153	72	418	777	513
15	651	289	169	237	228	210	401	153	72	395	807	511
16	650	290	171	244	230	215	403	153	72	408	898	510
17	663	285	169	251	229	229	398	151	72	432	879	497
18	700	294	166	238	228	227	421	150	72	432	846	451
19	701	294	159	211	234	229	432	150	72	430	849	386
20	693	283	160	189	231	237	339	153	70	498	851	287
21	697	270	160	188	238	246	232	150	68	627	852	244
22	698	270	163	194	238	250	197	156	68	628	865	245
23	687	270	172	190	218	249	195	153	68	627	910	246
24	674	271	174	189	204	247	199	151	69	624	899	247
25	665	272	173	196	206	248	197	152	69	664	884	247
26	601	271	180	210	207	247	188	151	69	713	900	247
27	531	269	210	210	207	269	146	148	69	715	900	247
28	462	276	221	207	209	277	145	145	116	717	903	248
29	395	276	230	210		303	144	146	137	716	900	248
30	347	270	248	212		348	142	130	174	703	883	206
31	298		250	213		356		83		586	845	
Min	298	269	159	180	185	187	142	83	63	239	597	206
Max	762	353	268	262	238	356	454	156	174	717	910	831
Mean	625	293	204	217	210	234	311	146	78	512	839	489
ac-ft	38344	17410	12524	13335	11634	14363	18484	8963	4604	31451	51498	29052



Appendix A (5 of 38)
Willow Creek Reservoir, CO

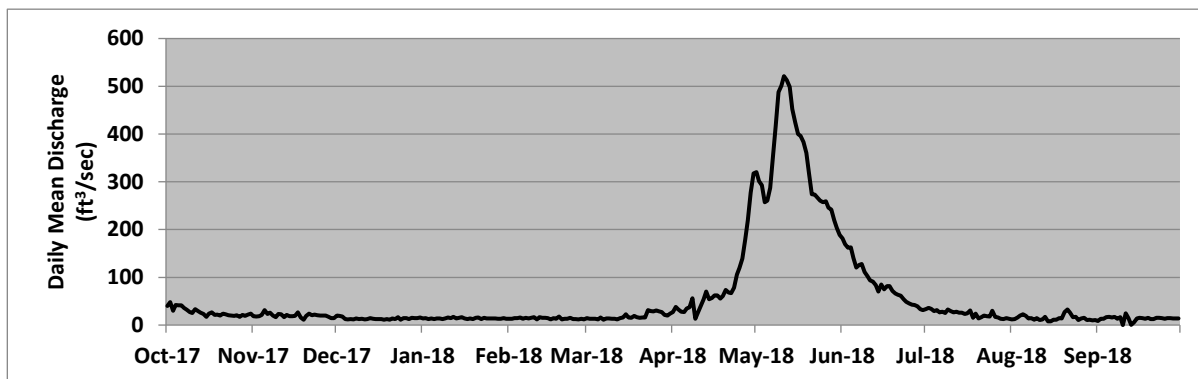
Location. — Lat 40°08'52", long 105°56'28", Grand County, Hydrologic Unit 14010001, at Willow Creek Dam, 4 miles north of Granby, Colorado, on Willow Creek, a tributary of the Colorado River.

Gage.— Water level recorder with satellite telemetry. Elevation of gage is 8130 from topographic map.

Remarks.—Inflow computed daily using change in content from midnight to midnight, plus the 24-hour average releases through the Willow Creek Pump Canal and the reservoir outlet works. Recorders were operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record consists of operational data which could be subject to future revisions and changes.

Inflow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	40	18	20	14	13	14	27	320	182	33	12	8
2	48	18	19	14	13	13	38	301	169	36	12	13
3	30	19	18	13	14	13	33	293	162	34	16	13
4	42	21	13	14	14	13	28	257	162	30	20	17
5	41	32	12	13	16	12	27	261	140	31	23	17
6	41	23	13	14	13	16	35	287	121	27	19	16
7	36	26	12	14	15	11	37	356	126	28	14	17
8	32	20	14	13	14	14	56	415	128	25	14	13
9	28	16	13	14	15	14	13	488	111	33	11	16
10	25	23	13	16	17	13	26	501	103	30	14	0
11	33	23	12	15	12	13	40	521	94	27	10	24
12	29	17	12	17	17	12	54	513	91	28	12	14
13	26	21	14	14	15	15	70	499	83	26	17	0
14	23	19	13	15	15	16	54	452	70	26	8	6
15	17	18	12	16	14	22	57	425	85	23	8	14
16	24	19	12	14	12	16	62	400	75	24	11	16
17	27	27	12	13	15	15	62	396	81	31	11	14
18	21	16	11	14	13	19	55	383	82	15	15	13
19	22	11	12	13	18	16	61	361	71	24	14	15
20	20	20	11	15	12	15	74	319	66	14	27	12
21	24	24	14	16	13	16	68	274	63	17	33	12
22	23	21	12	13	13	16	67	273	61	20	26	15
23	21	22	17	15	15	31	78	268	54	19	16	15
24	20	21	11	14	13	29	106	261	49	18	17	14
25	20	20	15	14	13	29	120	257	45	30	10	13
26	20	20	15	14	12	31	139	259	43	17	14	14
27	17	20	12	14	13	29	179	246	42	16	15	14
28	22	17	15	13	12	27	219	242	39	13	11	14
29	19	15	14	13		21	278	220	33	13	12	14
30	22	15	15	14		20	317	204	31	15	10	14
31	24		16	13		24		189		13	11	
Min	17	11	11	13	12	11	13	189	31	13	8	0
Max	48	32	20	17	18	31	317	521	182	36	33	24
Mean	27	20	14	14	14	18	83	337	89	24	15	13
ac-ft	1657	1185	840	861	779	1122	4913	20670	5271	1452	919	793



Appendix A (6 of 38)
Willow Creek Reservoir, CO

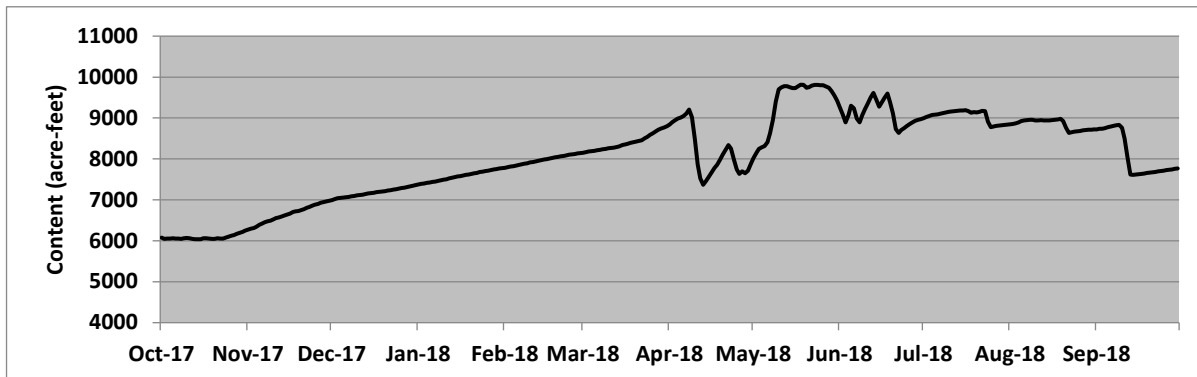
Location. —Lat 40° 08'52", long 105° 56'28", Grand County, Hydrologic Unit 14010001, at Willow Creek Dam, 4 miles north of Granby, Colorado, on Willow Creek, a tributary of the Colorado River.

Gage. — Water level recorder with satellite telemetry. Elevation of gage is 8130 from topographic map.

Remarks. —Reservoir is formed by an earth-fill dam. Construction completed in 1953. Impoundment began on April 2, 1953. Willow Creek Reservoir stores water from Willow Creek for diversion to Granby Reservoir via the Willow Creek Canal. Maximum capacity is 10,600 AF at elevation 8,130.00 ft, with 9,100 AF of active capacity between elevations 8077.00 and 8130.00 feet. Recorder was operated from 01-Oct 2017 to 30-Sep-2018. Record is complete and fair. This record consists of operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	6080	6273	6996	7376	7787	8154	8838	8017	9264	8999	8848	8723
2	6047	6294	7019	7391	7798	8166	8898	8140	9088	9030	8856	8733
3	6056	6316	7039	7402	7812	8178	8947	8246	8895	9054	8872	8741
4	6055	6342	7050	7415	7824	8190	8986	8280	9065	9070	8892	8756
5	6065	6390	7058	7424	7840	8200	9015	8316	9302	9083	8921	8774
6	6053	6418	7067	7437	7851	8214	9054	8405	9240	9091	8937	8792
7	6053	6454	7075	7450	7867	8222	9112	8632	8986	9107	8944	8810
8	6049	6479	7088	7461	7881	8234	9207	8952	8895	9118	8952	8822
9	6060	6496	7098	7474	7895	8246	9017	9402	9067	9136	8955	8830
10	6067	6527	7110	7490	7913	8258	8484	9701	9224	9149	8939	8761
11	6060	6554	7118	7505	7923	8268	7865	9746	9361	9157	8942	8492
12	6047	6571	7129	7525	7942	8278	7523	9775	9496	9168	8947	8043
13	6042	6598	7143	7538	7958	8292	7370	9775	9614	9176	8942	7621
14	6038	6620	7156	7554	7972	8309	7461	9757	9446	9181	8942	7610
15	6038	6641	7166	7570	7986	8338	7559	9732	9275	9184	8942	7619
16	6062	6663	7175	7583	7995	8353	7666	9729	9380	9189	8947	7630
17	6064	6700	7185	7594	8010	8368	7773	9777	9498	9168	8952	7637
18	6055	6716	7194	7607	8022	8390	7865	9814	9600	9131	8968	7644
19	6047	6723	7204	7619	8041	8408	7970	9809	9383	9144	8978	7655
20	6049	6747	7213	7632	8050	8422	8100	9740	9109	9139	8926	7664
21	6062	6777	7224	7650	8062	8437	8219	9757	8731	9154	8764	7671
22	6053	6803	7235	7661	8074	8454	8336	9792	8637	9176	8634	7682
23	6056	6831	7254	7677	8090	8502	8251	9809	8703	9171	8654	7693
24	6078	6857	7262	7691	8100	8544	7988	9809	8756	8908	8669	7705
25	6101	6881	7277	7703	8112	8586	7743	9803	8807	8774	8677	7716
26	6127	6903	7290	7716	8121	8632	7632	9800	8851	8792	8685	7727
27	6144	6927	7301	7729	8133	8674	7696	9769	8895	8807	8698	7739
28	6171	6946	7318	7741	8142	8715	7648	9735	8929	8817	8703	7748
29	6193	6960	7332	7752		8744	7716	9656	8952	8825	8710	7759
30	6221	6974	7348	7764		8769	7863	9551	8973	8833	8712	7771
31	6253		7363	7775		8800		9416		8840	8718	
Min	6038	6273	6996	7376	7787	8154	7370	8017	8637	8774	8634	7610
Max	6253	6974	7363	7775	8142	8800	9207	9814	9614	9189	8978	8830
Mean	6082	6646	7177	7578	7971	8398	8193	9376	9114	9051	8846	8085
ac-ft	6253	6974	7363	7775	8142	8800	7863	9416	8973	8840	8718	7771



Appendix A (7 of 38)
Willow Creek below Willow Creek Reservoir, CO

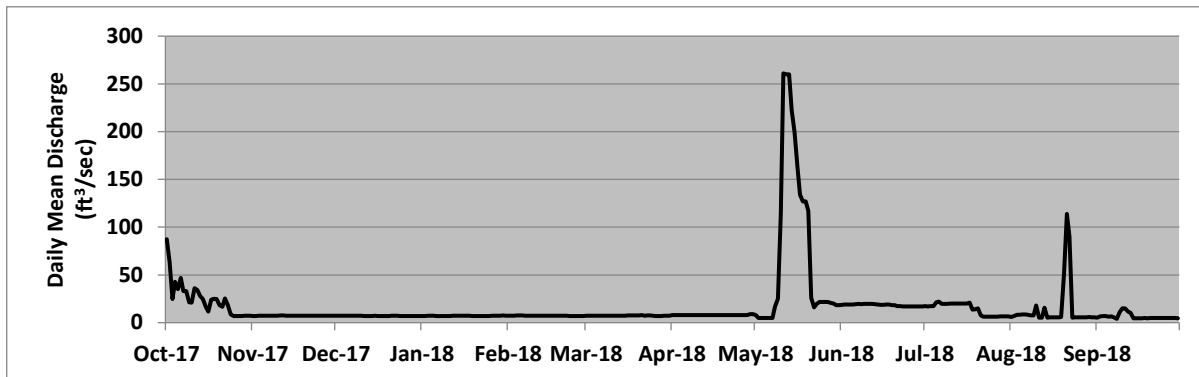
Location.--Lat 40°08'50", long 105°56'16", Grand County, Hydrologic Unit 14010001, at Willow Creek Dam, 4 miles north of Granby, Colorado, on Willow Creek, a tributary of the Colorado River.

Gage.--Water-stage recorder with satellite telemetry. Elevation of gage is 8040 feet from topographic map.

Remarks.-- Drainage area is 127 square miles. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. The official record is published by the Division of Water Resources, State of Colorado. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	87	7	7	7	7	7	8	8	19	17	6	5
2	64	7	7	7	7	7	8	5	19	17	7	7
3	25	7	7	7	7	7	8	5	19	17	8	7
4	43	7	7	7	8	7	8	5	19	17	8	7
5	35	7	7	7	8	7	8	5	19	21	8	6
6	47	7	7	7	8	7	8	5	19	22	9	7
7	33	7	7	7	7	7	8	5	20	20	8	6
8	33	7	7	7	7	7	8	17	19	20	8	4
9	21	7	7	7	7	7	8	25	20	20	7	11
10	21	7	7	7	7	7	8	114	20	20	18	15
11	36	8	7	7	7	7	8	261	20	20	5	15
12	34	8	7	7	7	7	8	260	20	20	5	12
13	28	7	7	7	7	7	8	260	19	20	16	10
14	25	7	7	7	7	7	8	222	19	20	5	5
15	17	7	7	7	7	7	8	199	19	20	5	5
16	12	7	7	7	7	7	8	163	19	20	5	5
17	24	7	7	7	7	8	8	134	19	21	6	5
18	25	7	7	7	7	8	8	127	19	14	6	5
19	25	7	7	7	7	8	8	127	18	14	6	5
20	18	7	7	7	7	8	8	117	18	15	51	5
21	17	7	7	7	7	8	8	26	17	8	114	5
22	25	7	7	7	7	7	8	16	17	6	90	5
23	18	7	7	7	7	8	8	20	17	6	5	5
24	9	7	7	7	7	8	8	22	17	6	6	5
25	7	7	7	7	7	7	8	22	17	6	6	5
26	7	7	7	7	7	7	8	22	17	6	5	5
27	7	7	7	7	7	7	8	22	17	6	5	5
28	7	7	7	7	7	7	8	21	17	6	6	5
29	7	7	7	7		7	9	20	17	7	6	5
30	7	7	7	7		7	9	18	17	7	6	5
31	7		7	7		7		18		7	6	
Min	7	7	7	7	7	7	8	5	17	6	5	4
Max	87	8	7	7	8	8	9	261	20	22	114	15
Mean	25	7	7	7	7	7	8	74	18	14	15	6
ac-ft	1526	434	437	437	403	452	479	4535	1094	887	896	383



Appendix A (8 of 38)
Willow Creek Pump Canal, CO

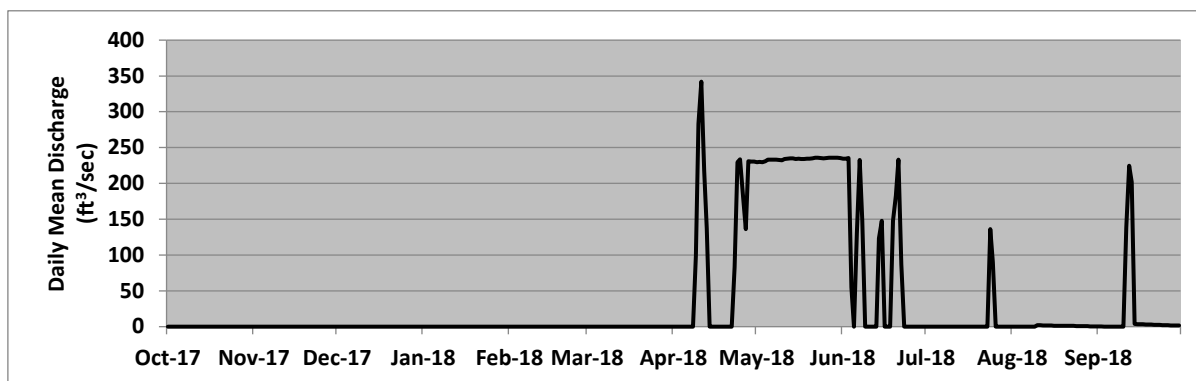
Location.—Lat 40°08'39", long 105°54'10", Grand County, Hydrologic Unit 14010001, at Willow Creek Pump Canal, 4 miles north of Granby, Colorado, on Willow Creek, a tributary of the Colorado River.

Gage.— Water-stage recorder with satellite telemetry at 15 foot Parshall Flume. Elevation of gage is 8300 feet from topographic map.

Remarks.—Canal is used to divert water from Willow Creek Reservoir to Granby Reservoir. Diversions are seasonal, mainly during late spring and early summer. Construction completed in 1953. Length of the canal is 3.4 miles. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record consists of operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	230	234	0	0	0
2	0	0	0	0	0	0	0	230	234	0	0	0
3	0	0	0	0	0	0	0	230	235	0	0	0
4	0	0	0	0	0	0	0	231	55	0	0	0
5	0	0	0	0	0	0	0	233	0	0	0	0
6	0	0	0	0	0	0	0	233	130	0	0	0
7	0	0	0	0	0	0	0	233	233	0	0	0
8	0	0	0	0	0	0	0	233	148	0	0	0
9	0	0	0	0	0	0	0	99	233	0	0	0
10	0	0	0	0	0	0	0	283	232	0	2	0
11	0	0	0	0	0	0	0	342	234	0	2	139
12	0	0	0	0	0	0	0	217	235	0	2	225
13	0	0	0	0	0	0	0	137	235	0	2	202
14	0	0	0	0	0	0	0	235	123	0	2	4
15	0	0	0	0	0	0	0	234	148	0	1	4
16	0	0	0	0	0	0	0	234	0	0	1	4
17	0	0	0	0	0	0	0	234	0	0	1	3
18	0	0	0	0	0	0	0	234	0	0	1	3
19	0	0	0	0	0	0	0	234	148	0	1	3
20	0	0	0	0	0	0	0	235	183	0	1	3
21	0	0	0	0	0	0	0	235	233	0	1	3
22	0	0	0	0	0	0	0	236	87	0	1	3
23	0	0	0	0	0	0	0	83	236	0	1	2
24	0	0	0	0	0	0	0	229	235	0	136	2
25	0	0	0	0	0	0	0	234	235	0	90	2
26	0	0	0	0	0	0	0	184	235	0	0	2
27	0	0	0	0	0	0	0	136	236	0	0	2
28	0	0	0	0	0	0	0	231	236	0	0	2
29	0	0	0	0	0	0	0	230	236	0	0	2
30	0	0	0	0	0	0	0	230	236	0	0	1
31	0	0	0	0	0	0	0	235	0	0	0	0
Min	0	0	0	0	0	0	0	230	0	0	0	0
Max	0	0	0	0	0	0	342	236	235	136	2	225
Mean	0	0	0	0	0	0	88	234	73	7	1	20
ac-ft	0	0	0	0	0	0	5220	14358	4339	447	48	1206



Appendix A (9 of 38)
Windy Gap Pumping Plant, CO

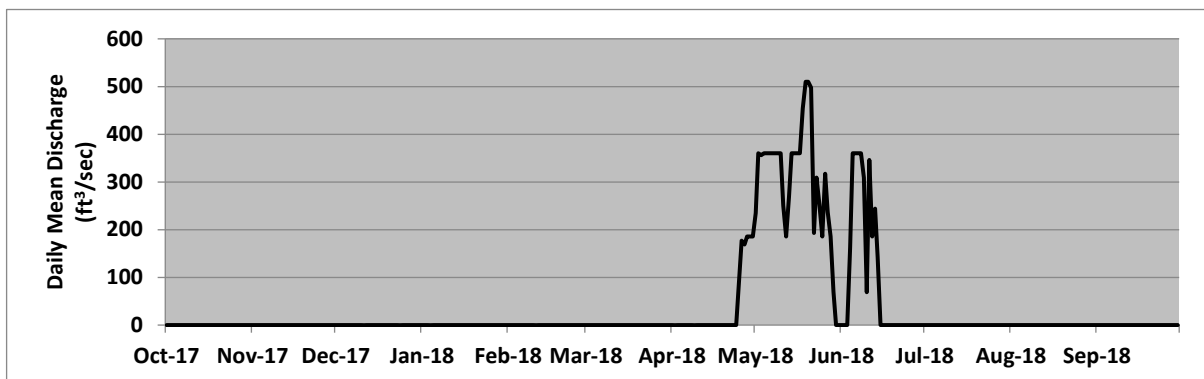
Location. --Lat 40°06'24", long 105°58'48", Grand County, Hydrologic Unit 14010001, 5.5 miles northeast of Granby, Colorado, on the Colorado River.

Gage.-- Reading taken directly from the pumps. Elevation of the pumping plant is 7823 from topographic map.

Remarks.-- Water is pumped from Windy Gap Reservoir to Granby Reservoir. Water is stored at Granby Reservoir before delivery through Adams Tunnel. Data was provided by Farr Pumping Plant operators each morning. Data was collected from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable, but the data has not been revised. This record consists of operational data which could be subject to future revisions and changes. Readings were provided by the Northern Water.

Windy Gap Pump Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	235	0	0	0	0
2	0	0	0	0	0	0	0	360	0	0	0	0
3	0	0	0	0	0	0	0	356	0	0	0	0
4	0	0	0	0	0	0	0	360	162	0	0	0
5	0	0	0	0	0	0	0	360	360	0	0	0
6	0	0	0	0	0	0	0	360	360	0	0	0
7	0	0	0	0	0	0	0	360	360	0	0	0
8	0	0	0	0	0	0	0	360	360	0	0	0
9	0	0	0	0	0	0	0	360	309	0	0	0
10	0	0	0	0	0	0	0	360	69	0	0	0
11	0	0	0	0	0	0	0	251	346	0	0	0
12	0	0	0	0	0	0	0	186	186	0	0	0
13	0	0	0	0	0	0	0	269	244	0	0	0
14	0	0	0	0	0	0	0	360	143	0	0	0
15	0	0	0	0	0	0	0	360	0	0	0	0
16	0	0	0	0	0	0	0	360	0	0	0	0
17	0	0	0	0	0	0	0	360	0	0	0	0
18	0	0	0	0	0	0	0	454	0	0	0	0
19	0	0	0	0	0	0	0	510	0	0	0	0
20	0	0	0	0	0	0	0	510	0	0	0	0
21	0	0	0	0	0	0	0	498	0	0	0	0
22	0	0	0	0	0	0	0	193	0	0	0	0
23	0	0	0	0	0	0	0	309	0	0	0	0
24	0	0	0	0	0	0	0	253	0	0	0	0
25	0	0	0	0	0	0	0	84	186	0	0	0
26	0	0	0	0	0	0	0	177	317	0	0	0
27	0	0	0	0	0	0	0	169	237	0	0	0
28	0	0	0	0	0	0	0	186	186	0	0	0
29	0	0	0	0	0	0	0	186	70	0	0	0
30	0	0	0	0	0	0	0	186	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	0	0	0	0	0	186	510	360	0	0	0
Mean	0	0	0	0	0	0	33	301	97	0	0	0
ac-ft	0	0	0	0	0	0	1956	18493	5740	0	0	0



Appendix A (10 of 38)
Granby Reservoir, CO

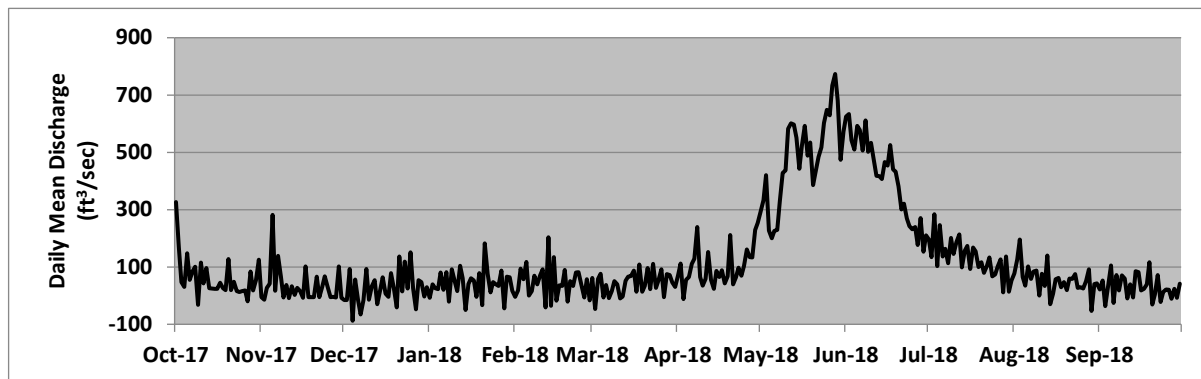
Location. --Lat 40°08'54", long 105°51'48", Grand County, Hydrologic Unit 14010001, on Granby Dam, 5.5 miles northeast of Granby, Colorado, on the Colorado River.

Gage.-- Water level recorder with satellite telemetry. Elevation of gage is 8300 from topographic map.

Remarks.-- Inflow computed daily based on change in content from midnight to midnight, and on the average daily releases through the reservoir outlet works. Recorders were operated from 01-Oct-2017 to 30-Sep-2018. Records are complete. Negative values are based on accounting procedures and mass balances. This record consists of operational data which could be subject to future revisions and changes.

Inflow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	326	-5	-15	-7	-4	62	71	292	625	196	77	22
2	169	-14	-16	39	18	-46	112	333	634	135	126	52
3	47	27	93	25	94	58	-12	420	542	284	196	-36
4	30	42	-88	23	57	76	55	227	509	103	65	34
5	148	281	56	80	117	-7	65	200	592	246	35	106
6	55	17	-16	20	1	37	111	226	578	137	101	-26
7	85	138	-66	82	15	-9	129	229	506	163	59	72
8	100	66	-16	-21	69	16	239	329	612	113	84	18
9	-33	-7	93	92	39	51	65	428	501	201	87	71
10	115	37	-15	51	71	39	35	437	533	145	0	59
11	42	-9	32	16	92	-10	59	582	479	187	77	-10
12	97	32	54	104	-41	-3	153	601	418	214	34	39
13	25	3	-30	60	203	52	54	597	416	99	140	-6
14	25	27	19	-50	-35	66	24	551	407	156	-29	85
15	24	16	64	41	135	69	86	443	466	173	7	82
16	24	-7	7	60	-17	88	65	523	454	93	57	18
17	45	102	-5	53	36	13	88	592	526	167	62	24
18	26	-6	78	-4	34	109	42	489	441	154	30	39
19	20	-6	24	78	89	14	67	534	432	100	48	117
20	128	-6	-41	-34	-21	34	211	385	381	116	20	-31
21	19	66	137	183	51	96	40	432	301	79	60	4
22	48	-6	14	76	33	23	64	485	321	103	58	72
23	16	31	118	11	80	111	98	517	270	133	75	-22
24	12	67	25	47	81	27	70	602	243	68	27	13
25	15	31	151	39	38	54	103	648	232	74	29	22
26	18	-6	26	34	-7	92	161	629	239	102	25	21
27	-20	-5	-48	88	57	-5	135	733	176	126	51	-11
28	84	-7	54	-44	-16	75	133	773	270	12	92	24
29	18	102	47	67		72	229	681	153	137	-54	-8
30	54	-7	-3	64		46	254	474	210	13	41	41
31	126		29	17		31		572		53	42	
Min	-33	-14	-88	-50	-41	-46	-12	200	153	12	-54	-36
Max	326	281	151	183	203	111	254	773	634	284	196	117
Mean	61	33	25	42	45	43	100	483	416	132	55	29
ac-ft	3740	1975	1515	2557	2513	2633	5949	29631	24686	8083	3406	1745



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Granby Reservoir, CO

Location. --Lat 40°08'54", long 105°51'48", Grand County, Hydrologic Unit 14010001, on Granby Dam, 5.5 miles northeast of Granby, Colorado, on the Colorado River.

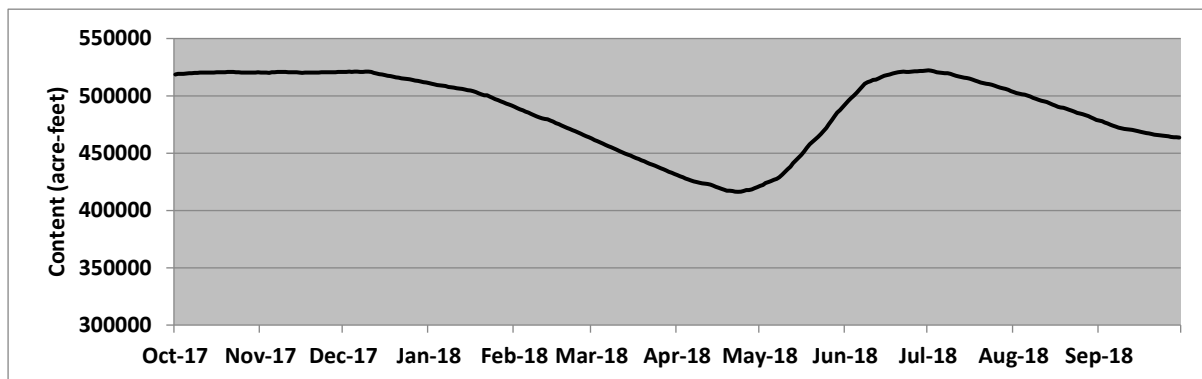
Gage.-- Water level recorder with satellite telemetry. Elevation of gage is 8300 from topographic map.

Remarks.--Reservoir is formed by an earth-fill dam and four earth-fill dikes. Construction completed in 1950. Impoundment began on 14-Sep-1949.

Granby Reservoir provides west-slope storage for the C-BT. Maximum capacity is 539,800 AF at elevation 8,280.00, with 463,300 AF of active capacity between elevations 8186.90 and 8280.00 feet. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record consists of operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	518682	520395	520897	511012	490293	462746	430779	421393	492880	522251	503183	478487
2	519110	520181	520897	510519	489181	461461	429930	422361	495673	522038	502337	477934
3	519110	520181	521112	509951	488273	460446	428829	423841	498055	521326	501917	476828
4	519110	520039	520969	509526	487225	459497	427853	424680	500162	520682	501422	475798
5	519325	520610	521112	509104	486324	458354	426880	425653	502688	520395	501000	474901
6	519612	520467	521112	508750	485280	457274	426039	426684	505151	520039	500301	473872
7	519754	520754	520897	508465	484167	456128	425265	427465	507971	519825	499318	472978
8	520039	520897	520897	507830	483126	455124	424809	428959	510449	519612	498337	472363
9	520039	520897	521112	507549	482157	454047	424101	431168	511789	519110	497424	471814
10	520181	520897	521112	507198	481185	452972	423712	433452	512713	518256	496447	471196
11	520181	520682	520754	506704	480282	451838	423452	435875	513778	517547	495744	470855
12	520395	520682	519968	506421	479662	450767	423195	438307	514275	517046	495255	470650
13	520395	520467	519397	506067	479593	449696	422617	441137	515336	516264	494624	470375
14	520395	520467	518895	505435	478348	448700	421586	443850	516476	515765	493506	469758
15	520395	520252	518682	505010	477453	447832	420686	446168	517404	515551	492459	469281
16	520467	520039	518114	504586	476278	446902	419787	448634	518043	514912	491412	468668
17	520610	520252	517618	504025	475247	445771	419020	451571	518611	514204	490501	468051
18	520682	520252	517118	503183	474079	444911	418056	454719	519397	513351	489876	467439
19	520682	520252	516618	502267	473183	443850	417223	457610	519968	512501	489460	467166
20	520897	520252	515980	501210	472089	442788	417223	459834	520467	511718	488690	466549
21	520897	520395	515765	500581	471059	441801	416903	461936	520969	511154	487926	466142
22	520897	520395	515336	500371	469962	440742	416457	464172	521183	510660	487017	465871
23	520682	520467	515124	499247	469077	439949	416267	466549	520897	510165	486186	465533
24	520610	520610	514700	498196	468051	438898	416457	469145	520897	509597	485210	465262
25	520395	520682	514487	497214	466961	437844	416903	471883	521183	508963	484655	464989
26	520395	520682	513992	496166	465871	436859	417673	475317	521397	508041	484028	464647
27	520252	520682	513351	495255	464852	435810	417801	478626	521539	507198	483126	464239
28	520181	520682	512925	494202	463765	434828	418247	482435	521753	506492	482227	463968
29	520181	520897	512501	493297		433847	419467	485490	521824	505997	481116	463833
30	520252	520897	512003	492388		432799	420428	487505	522038	505151	480075	463560
31	520467		511577	491412		431758		490015		504165	479042	
Min	518682	520039	511577	491412	463765	431758	416267	421393	492880	504165	479042	463560
Max	520897	520897	521112	511012	490293	462746	430779	490015	522038	522251	503183	478487
Mean	520170	520510	517581	503005	477251	446975	421588	450853	514166	514193	491736	469434
EOM	520467	520897	511577	491412	463765	431758	420428	490015	522038	504165	479042	463560



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Granby Reservoir, CO

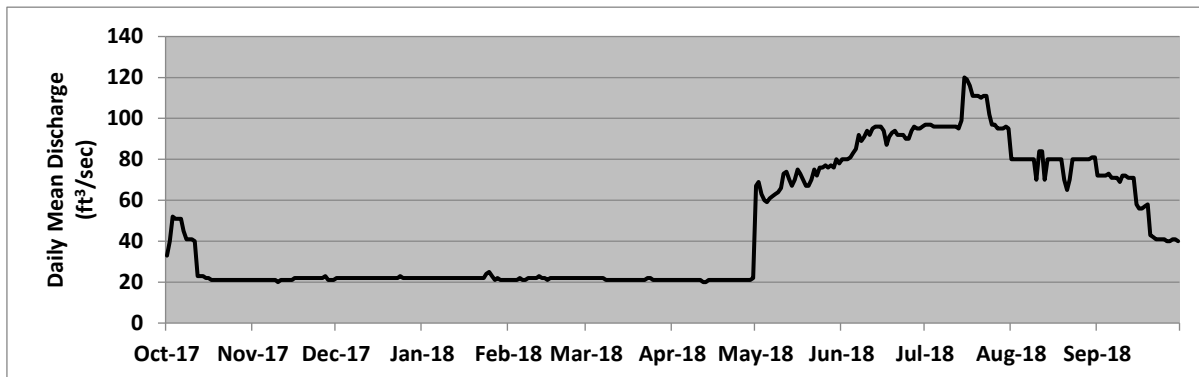
Location. --Lat 40°08'54", long 105°51'48", Grand County, Hydrologic Unit 14010001, on Granby Dam, 5.5 miles northeast of Granby, Colorado, on the Colorado River.

Gage.-- Water level recorder with satellite telemetry. Elevation of gage is 8300 feet, from topographic map.

Remarks.--Reservoir is formed by an earth-fill dam and four earth-fill dikes. Construction completed in 1950. Impoundment began on 14-Sep-1949. Granby Reservoir provides west-slope storage for the C-BT. Data was provided by personnel from the Northern Water. Releases were made through the outlet works valve. The stream gage directly below the dam is used to measure flows during winter. A USGS station further downstream is used to measure flows between spring and fall. Data was recorded from 01-Oct-2017 to 30-Sep-2018. Records are complete and fair. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	33	21	22	22	21	22	21	67	80	97	80	72
2	40	21	22	22	21	22	21	69	80	97	80	72
3	52	21	22	22	21	22	21	63	80	97	80	72
4	51	21	22	22	21	22	21	60	81	96	80	72
5	51	21	22	22	22	22	21	59	83	96	80	73
6	51	21	22	22	21	22	21	61	85	96	80	71
7	45	21	22	22	21	22	21	62	92	96	80	71
8	41	21	22	22	22	21	21	63	89	96	80	71
9	41	21	22	22	22	21	21	64	91	96	80	69
10	41	20	22	22	22	21	21	66	94	96	70	72
11	40	21	22	22	22	21	21	73	92	96	84	72
12	23	21	22	22	23	21	20	74	95	96	84	71
13	23	21	22	22	22	21	20	70	96	95	70	71
14	23	21	22	22	22	21	21	67	96	99	80	71
15	22	21	22	22	21	21	21	70	96	120	80	58
16	22	22	22	22	22	21	21	75	94	119	80	56
17	21	22	22	22	22	21	21	73	87	116	80	56
18	21	22	22	22	22	21	21	70	91	111	80	57
19	21	22	22	22	22	21	21	67	93	111	80	58
20	21	22	22	22	22	21	21	67	94	111	70	43
21	21	22	22	22	22	21	21	70	92	110	65	42
22	21	22	22	22	22	21	21	75	92	111	70	41
23	21	22	22	22	22	22	21	72	92	111	80	41
24	21	22	23	24	22	22	21	76	90	102	80	41
25	21	22	22	25	22	21	21	76	90	97	80	41
26	21	22	22	23	22	21	21	77	94	97	80	40
27	21	23	22	21	22	21	21	76	96	95	80	40
28	21	21	22	22	22	21	21	77	95	95	80	41
29	21	21	22	21		21	21	76	95	95	80	41
30	21	21	22	21		21	22	80	96	96	81	40
31	21		22	21		21		78		95	81	
Min	21	20	22	21	21	21	20	59	80	95	65	40
Max	52	23	23	25	23	22	22	80	96	120	84	73
Mean	29	21	22	22	22	21	21	70	91	101	79	58
ac-ft	1810	1271	1352	1354	1208	1307	1245	4303	5388	6219	4821	3437



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Farr Pumping Plant, Granby Reservoir, CO

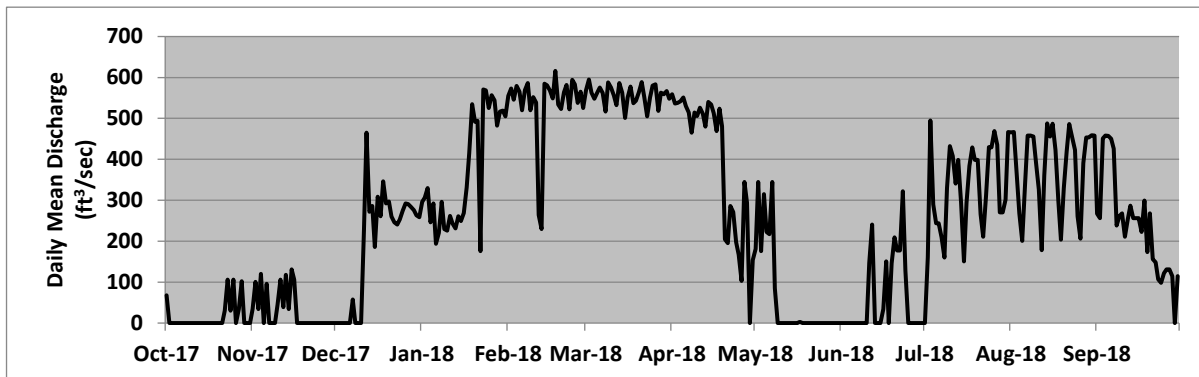
Location. --Lat 40°11'30", long 105°52'52", Grand County, Hydrologic Unit 14010001, at Farr Pumping Plant on the north end of Granby Reservoir, 8 miles northeast of Granby, Colorado, on the Colorado River.

Gage.-- Reading taken directly from the pumps, based on conduit pressure and Granby Reservoir's elevation. Elevation of the pumping plant is 8320 from topographic map.

Remarks.-- Water is pumped from Granby to the Granby Pump Canal which discharges into Shadow Mountain Reservoir. The operation keeps Shadow Mountain Reservoir/Grand Lake at a steady water surface level when trans-mountain diversions via Adams Tunnel are taking place. Data was provided by Farr Pumping Plant operators, Northern Water, each morning. Data was collected from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	68	34	0	296	555	569	559	181	0	0	466	267
2	0	101	0	306	573	595	536	345	0	161	467	256
3	0	34	0	330	546	563	538	176	0	495	362	451
4	0	120	0	246	579	548	542	315	0	290	268	458
5	0	0	0	292	565	563	551	223	0	244	201	457
6	0	96	0	194	520	575	530	217	0	244	340	450
7	0	0	58	220	569	562	514	345	0	209	458	426
8	0	0	0	296	586	517	465	85	0	160	458	238
9	0	0	0	230	520	588	514	0	0	330	456	262
10	0	45	0	226	552	575	506	0	0	432	393	268
11	0	106	227	262	539	556	526	0	147	408	326	211
12	0	39	465	243	264	532	511	0	241	341	178	254
13	0	118	272	231	230	586	480	0	0	399	361	287
14	0	34	286	261	585	563	540	0	0	294	488	256
15	0	131	186	249	581	501	534	0	0	151	456	256
16	0	106	309	269	568	551	513	0	34	294	487	256
17	0	0	261	331	549	578	469	3	151	384	423	223
18	0	0	346	416	616	537	524	0	0	429	298	299
19	0	0	292	535	534	543	481	0	146	399	204	173
20	0	0	297	492	523	564	205	0	209	399	330	268
21	0	0	260	494	564	589	195	0	177	266	420	156
22	30	0	246	176	582	552	286	0	177	211	486	148
23	106	0	241	571	522	505	271	0	322	311	454	107
24	30	0	253	568	594	551	198	0	128	430	423	98
25	106	0	274	525	583	580	167	0	0	429	261	122
26	0	0	292	557	538	583	103	0	0	469	206	131
27	34	0	291	544	565	518	345	0	0	435	391	131
28	102	0	284	482	525	563	294	0	0	270	453	115
29	0	0	276	517		559	0	0	0	270	453	0
30	0	0	263	519		567	154	0	0	302	459	115
31	0		259	505		548		0		467	458	
Min	0	0	0	176	230	501	0	0	0	0	178	0
Max	106	131	465	571	616	595	559	345	322	495	488	458
Mean	15	32	192	367	537	557	402	61	58	320	383	238
ac-ft	942	1909	11757	22538	29753	34216	23861	3742	3429	19648	23530	14135



Appendix A (14 of 38)
Shadow Mountain/Grand Lake, CO

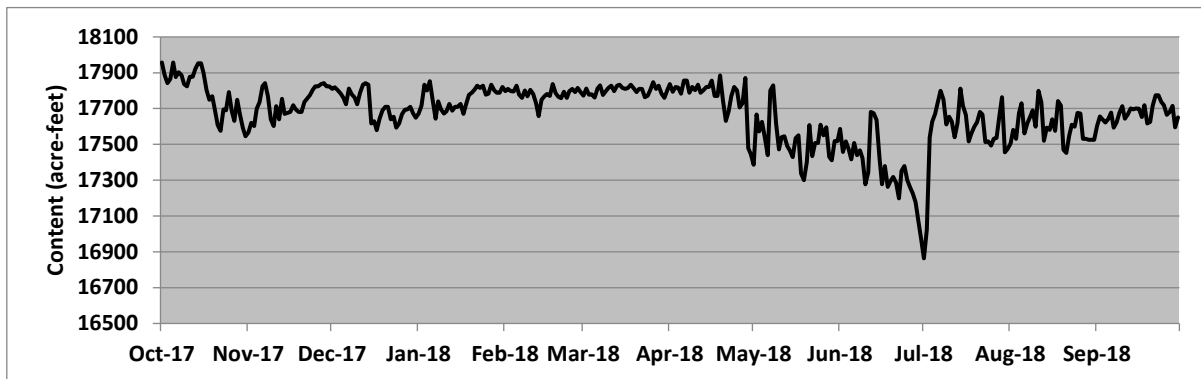
Location. --Lat 40°12'26", long 105°50'28", Grand County, Hydrologic Unit 14010001, on the Colorado River at the Shadow Mountain outlet works structure, 10 miles northeast of Granby, Colorado.

Gage.--Water-stage recorder with satellite telemetry. Elevation of gage is 8375 feet from topographic map.

Remarks.—Shadow Mountain/Grand Lake was constructed between 1944 and 1946. Impoundment began in 1946. Active capacity between elevations 8,366 and 8,367 is 1,800 AF. Grand Lake is used as forebay storage for Adams Tunnel. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Some data were provided by Farr Pumping Plant personnel during down time. Records are complete and fair. This record contains operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	17957	17566	17810	17672	17797	17773	17837	17385	17586	16864	17507	17603
2	17889	17621	17818	17717	17810	17811	17794	17667	17458	17023	17580	17656
3	17842	17603	17802	17832	17797	17778	17820	17573	17517	17538	17530	17641
4	17865	17700	17784	17801	17796	17779	17817	17625	17471	17627	17674	17623
5	17957	17737	17759	17852	17828	17761	17784	17536	17416	17671	17729	17642
6	17876	17823	17724	17745	17778	17811	17857	17441	17508	17740	17562	17678
7	17902	17842	17811	17643	17760	17830	17857	17801	17439	17800	17617	17593
8	17887	17768	17779	17740	17802	17775	17789	17829	17466	17751	17654	17621
9	17837	17640	17761	17696	17768	17797	17821	17616	17424	17611	17691	17677
10	17823	17603	17724	17672	17805	17815	17802	17472	17277	17655	17599	17713
11	17879	17713	17789	17685	17781	17828	17833	17540	17343	17628	17800	17643
12	17879	17640	17832	17726	17730	17797	17789	17545	17682	17541	17734	17666
13	17920	17755	17843	17688	17658	17828	17802	17490	17674	17619	17520	17700
14	17952	17671	17832	17709	17750	17833	17820	17467	17637	17811	17593	17695
15	17952	17676	17617	17709	17768	17815	17820	17430	17429	17715	17580	17700
16	17897	17681	17630	17725	17781	17810	17857	17535	17277	17665	17640	17699
17	17805	17718	17580	17670	17771	17815	17770	17551	17379	17517	17575	17653
18	17750	17695	17643	17722	17837	17833	17770	17338	17264	17560	17743	17719
19	17768	17681	17690	17775	17786	17814	17885	17301	17293	17596	17716	17617
20	17695	17681	17709	17789	17767	17792	17745	17401	17318	17623	17470	17626
21	17608	17737	17709	17806	17757	17810	17630	17608	17285	17682	17452	17716
22	17576	17755	17640	17828	17794	17810	17687	17434	17198	17666	17549	17774
23	17695	17773	17654	17815	17760	17764	17769	17508	17352	17514	17609	17774
24	17690	17805	17593	17828	17797	17773	17820	17508	17379	17517	17599	17737
25	17792	17823	17617	17778	17810	17805	17802	17610	17301	17494	17676	17719
26	17687	17823	17669	17783	17791	17847	17706	17550	17259	17530	17671	17665
27	17631	17837	17693	17833	17815	17810	17730	17595	17227	17536	17530	17682
28	17750	17842	17696	17802	17791	17828	17871	17432	17177	17661	17530	17715
29	17663	17823	17709	17789		17784	17480	17411	17067	17763	17525	17594
30	17589	17823	17672	17789		17760	17446	17519	16974	17457	17525	17650
31	17545		17649	17820		17802		17519		17475	17525	
Min	17545	17566	17580	17643	17658	17760	17446	17301	16974	16864	17452	17593
Max	17957	17842	17843	17852	17837	17847	17885	17829	17682	17811	17800	17774
Mean	17792	17729	17717	17756	17782	17803	17774	17524	17369	17576	17603	17673
EOM	17545	17823	17649	17820	17791	17802	17446	17519	16974	17475	17525	17650



Appendix A (15 of 38)
Alva B. Adams Tunnel at East Portal, near Estes Park, CO

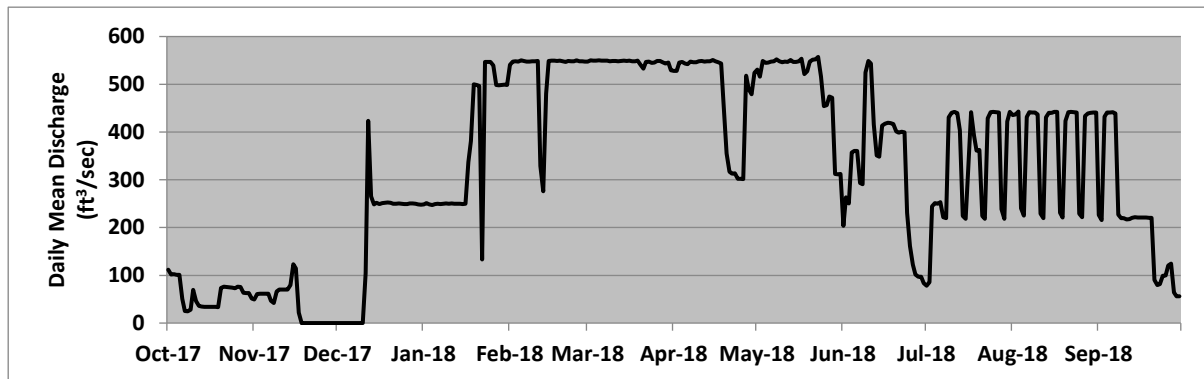
Location. --Lat 40°19'40", long 105°34'39", Larimer County, Hydrologic Unit 10190006, 4.5 miles southwest of Estes Park, Colorado.

Gage.-- Water-stage recorder with satellite telemetry at 15 foot Parshall flume. Elevation of gage is 8250 from topographic map.

Remarks.-- Constructed between 1940 and 1947. Tunnel is 13.1 miles long, and extends between Grand Lake and Estes Park. Its maximum capacity is 550 cfs. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record contains operational data which could be subject to future revisions and changes. Official record published by the Colorado Division of Water Resources.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	112	50	0	249	541	548	528	531	204	78	436	226
2	101	61	0	251	548	550	528	516	264	86	437	215
3	102	61	0	248	548	549	545	549	250	244	443	432
4	101	62	0	247	547	550	547	545	357	251	240	441
5	101	62	0	249	550	550	544	546	360	250	225	441
6	51	62	0	250	549	550	542	547	360	253	431	442
7	25	47	0	249	547	550	547	548	293	222	441	439
8	25	42	0	250	548	549	546	552	291	220	441	227
9	28	66	0	251	548	548	546	548	525	431	441	219
10	69	70	0	250	548	549	548	546	549	440	437	220
11	46	70	105	250	549	549	549	548	544	442	229	217
12	36	70	423	250	329	548	548	547	416	440	220	218
13	35	70	265	250	276	549	548	551	351	403	431	221
14	34	80	249	250	481	549	548	547	349	224	440	222
15	34	123	252	250	549	549	551	547	413	218	440	221
16	34	114	249	250	549	550	548	548	418	321	442	221
17	34	22	251	337	549	548	546	554	420	441	442	221
18	34	0	252	382	549	548	544	521	419	393	231	221
19	34	0	252	500	549	549	453	527	417	361	221	220
20	73	0	252	498	548	541	355	547	401	362	423	220
21	77	0	250	497	547	533	317	552	399	225	441	90
22	76	0	250	133	549	547	313	552	401	218	442	80
23	75	0	250	547	548	547	314	557	400	429	442	82
24	74	0	250	547	548	545	302	516	231	442	441	99
25	73	0	249	547	550	545	302	454	162	442	229	100
26	76	0	250	539	548	549	302	456	123	442	222	120
27	75	0	250	498	548	549	518	474	102	441	434	124
28	63	0	251	498	548	546	490	472	97	239	439	64
29	63	0	250	499		544	479	312	97	219	440	56
30	63	0	248	499		546	524	312	84	422	441	56
31	51		248	498		529		312		442	441	
Min	25	0	0	133	276	529	302	312	84	78	220	56
Max	112	123	423	547	550	550	551	557	549	442	443	442
Mean	60	38	171	355	528	547	482	511	323	324	384	213
ac-ft	3613	2246	10010	20856	29334	32576	28710	30786	19227	19041	22736	12645



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Marys Lake, CO

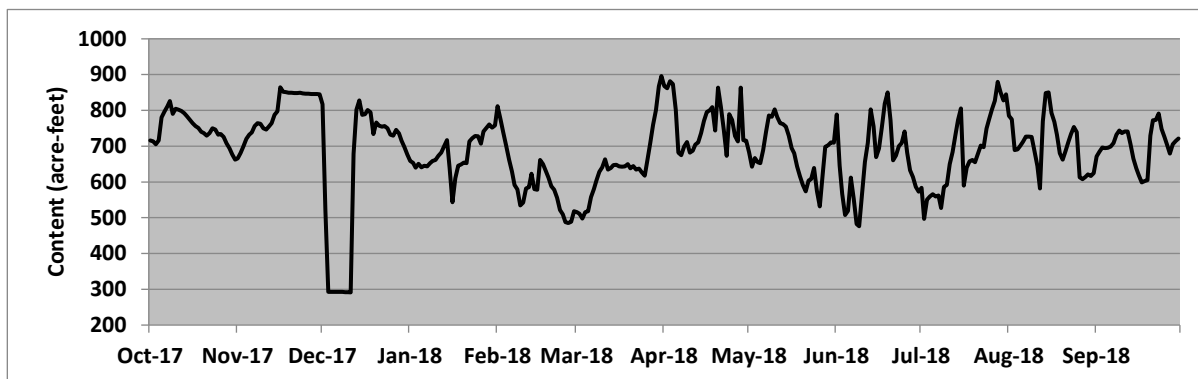
Location. --Lat 40°22'40", long 105°31'50", Larimer County, Hydrologic Unit 10190006, 2 miles southwest of Estes Park, Colorado.

Gage.-- Water-level recorder with satellite telemetry. Elevation of gage is 8060 feet from topographic map.

Remarks.-- Constructed between 1947 and 1949. Impoundment began in August, 1950. Active capacity between elevations 8,025 and 8,040 is 500 AF. Used as a forebay storage for Estes Powerplant. The only measurable inflow into the reservoir comes from Adams Tunnel. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and reliable. The gage does not record water surface levels below elevation 8,022.62 feet, content of 322 AF. These are operational data which could be subject to further revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	716	666	818	659	812	515	868	683	788	583	785	671
2	713	681	520	654	776	511	862	643	646	497	775	685
3	705	700	293	640	738	498	881	667	566	551	689	696
4	716	720	293	650	701	516	873	655	507	559	691	694
5	780	732	293	641	663	518	801	653	519	566	701	696
6	796	739	293	645	630	558	682	690	612	559	712	699
7	811	756	293	644	592	580	675	740	553	562	727	709
8	826	765	292	652	579	604	699	786	483	527	727	732
9	790	763	292	659	534	628	712	782	476	586	726	744
10	804	750	292	662	542	641	682	803	566	592	685	737
11	802	746	291	673	582	663	688	782	656	650	645	741
12	798	755	678	682	586	635	704	764	709	684	582	741
13	792	765	802	700	623	639	711	762	803	732	770	705
14	784	788	828	717	580	647	737	754	756	774	849	665
15	774	797	788	641	579	648	771	730	670	806	850	638
16	764	865	790	543	662	643	796	695	694	590	793	619
17	756	852	801	611	650	643	800	680	753	640	768	599
18	751	851	795	645	630	643	809	643	819	658	732	603
19	740	850	734	649	612	650	744	616	850	662	680	605
20	737	849	766	654	588	638	863	592	772	655	662	730
21	730	848	757	652	578	645	809	574	661	679	687	772
22	737	848	755	713	556	635	745	604	674	701	712	774
23	750	849	756	723	522	637	673	608	700	698	734	792
24	747	847	750	728	509	626	790	639	709	749	754	748
25	732	847	732	727	488	617	774	575	741	775	739	726
26	734	846	730	707	485	660	729	532	682	803	613	701
27	726	846	745	741	489	708	713	621	632	827	608	680
28	708	846	736	751	518	760	864	698	614	880	614	705
29	694	846	715	761		801	717	702	586	850	621	714
30	677	845	698	752		867	715	711	573	828	617	722
31	662		677	758		896		710		845	625	
Min	662	666	291	543	485	498	673	532	476	497	582	599
Max	826	865	828	761	812	896	881	803	850	880	850	792
Mean	750	795	613	679	600	641	763	680	659	680	706	701
EOM	662	845	677	758	518	896	715	710	573	845	625	722



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Big Thompson River above Lake Estes, CO

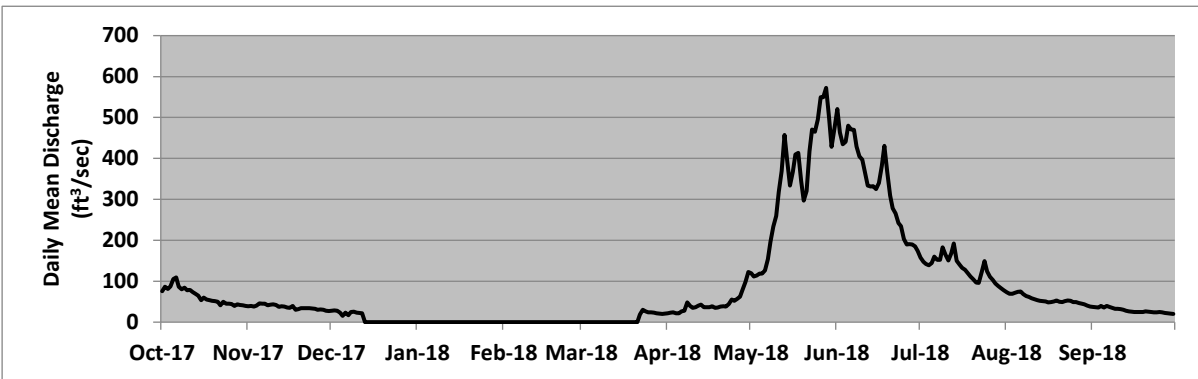
Location. --Lat 40°22'42", long 105°30'48", Larimer County, Hydrologic Unit 10190006, 600 feet downstream from bridge on state highways 7 and 36 in Estes Park, Colorado, downstream from Black Canyon Creek, and 0.3 miles northwest of Estes Powerplant.

Gage.-- Water-stage recorder with satellite telemetry. 15 foot Parshall flume with overflow weirs and supplemental outside gage. Datum of gage at 7492.5 feet.

Remarks.— Drainage area is 137 mi2. Station consists of data collection platform as primary record with graphic chart recorder as backup. Recorder was operated from 01-Oct-2017 until 12-Dec-2017, before it was winterized. The station was put back into service from 22-Mar-2017 to 30-Sep-2017. Values for the off-season are marked as zero, but winter month flows normally fluctuate between 10 and 30 cfs. This record contains operational data which could be subject to future revisions and changes. The official record for this station is published by the Colorado Division of Water Resources.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	76	39	28	0	0	0	21	120	520	158	74	37
2	86	40	28	0	0	0	23	112	464	147	69	37
3	81	38	28	0	0	0	24	114	435	142	70	36
4	88	40	23	0	0	0	22	119	441	139	72	40
5	105	46	15	0	0	0	22	119	480	144	74	36
6	109	45	23	0	0	0	26	126	471	160	75	40
7	87	45	17	0	0	0	28	154	470	152	68	38
8	80	42	24	0	0	0	48	196	429	152	64	35
9	84	43	25	0	0	0	40	233	405	183	61	33
10	78	43	23	0	0	0	35	260	397	165	58	32
11	79	42	22	0	0	0	37	318	367	151	56	32
12	73	37	22	0	0	0	40	369	334	168	54	30
13	70	38	0	0	0	0	43	458	332	192	52	28
14	65	38	0	0	0	0	37	397	332	150	52	26
15	54	36	0	0	0	0	36	334	325	140	51	26
16	60	35	0	0	0	0	37	368	340	133	48	25
17	56	39	0	0	0	0	39	410	381	128	49	25
18	53	30	0	0	0	0	35	413	431	119	50	25
19	52	32	0	0	0	0	36	344	367	112	53	25
20	52	34	0	0	0	0	38	297	309	104	50	27
21	50	34	0	0	0	0	39	321	278	97	49	26
22	41	34	0	0	0	18	38	417	266	96	51	25
23	50	34	0	0	0	30	44	471	242	122	53	24
24	45	34	0	0	0	26	55	465	234	149	52	24
25	45	32	0	0	0	24	52	495	203	124	49	25
26	44	31	0	0	0	24	56	549	190	111	49	24
27	40	31	0	0	0	23	62	550	190	103	47	22
28	44	31	0	0	0	22	79	572	190	94	45	22
29	42	28	0	0	0	21	99	501	185	88	43	21
30	41	27	0	0	0	20	123	428	174	82	40	20
31	40		0	0	0	21		473		78	38	
Min	40	27	0	0	0	0	21	112	174	78	38	20
Max	109	46	28	0	0	30	123	572	520	192	75	40
Mean	63	37	9	0	0	7	44	339	339	132	55	29
ac-ft	3903	2178	553	0	0	454	2608	20830	20196	8105	3404	1707



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Olympus Dam, CO

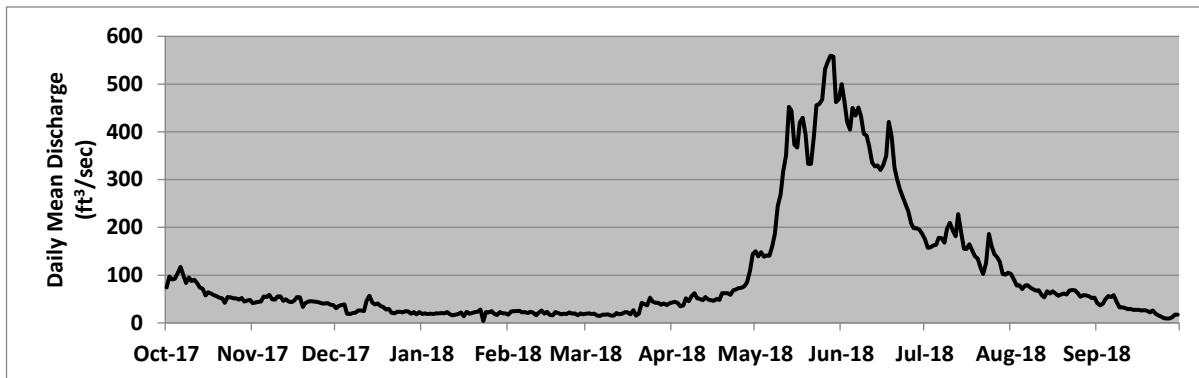
Location. --Lat 40°22'31", long 105°29'15", Larimer County, Hydrologic Unit 10190006, 1.5 miles east of Estes Park, Colorado, on the Big Thompson River.

Gage.—Water-stage recorders with satellite telemetry. Inflow computed daily based on the change in content from midnight to midnight at Marys Lake and Lake Estes, daily average releases from Olympus Dam, and daily average discharge at Olympus Tunnel and Adams Tunnel.

Remarks.— Olympus dam was constructed between 1947 and 1949. Impoundment began on November 1948. Total capacity at maximum water surface elevation of 7475.0 feet is 3,070 AF. Records are complete and reliable, except for a few missing values during October and December 2017, and a some missing values from January through April 2018. A total of 24 missing values were interpolated using observed values during this period. This record contains operational data which could be subject to future revisions and changes.

Computed Inflow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	74	42	31	18	17	19	43	150	500	176	102	42
2	97	43	35	20	24	20	44	139	465	158	91	37
3	91	44	38	18	25	19	42	148	420	158	78	40
4	92	45	39	19	24	19	35	138	404	162	79	50
5	104	55	20	19	25	15	37	141	450	164	71	56
6	117	54	19	20	22	14	51	140	434	178	78	54
7	101	59	20	20	23	17	45	161	451	178	79	58
8	84	50	22	20	20	17	56	186	433	168	73	44
9	95	48	26	20	23	18	62	244	396	197	70	33
10	88	55	26	23	21	15	51	269	392	210	68	32
11	90	55	24	18	16	15	50	317	369	193	68	32
12	83	46	46	16	21	20	48	351	336	182	58	28
13	74	49	56	17	26	18	54	452	327	228	53	29
14	71	45	43	18	19	19	49	445	330	190	66	27
15	57	43	39	22	23	22	47	373	320	156	62	27
16	64	46	40	14	16	22	46	367	331	155	66	27
17	61	54	35	23	16	18	50	420	350	165	61	26
18	58	53	34	19	22	26	48	430	421	151	57	26
19	56	33	28	20	21	15	62	395	390	140	60	25
20	53	41	29	22	18	20	62	333	325	135	61	22
21	51	45	21	23	19	42	62	333	301	116	59	26
22	42	45	20	28	19	39	59	390	279	103	68	19
23	54	45	23	4	22	37	68	455	264	125	69	16
24	54	44	23	22	19	53	70	459	249	186	68	14
25	51	43	22	22	20	45	73	467	234	162	63	10
26	51	41	24	24	16	42	74	531	208	144	55	9
27	49	41	24	19	20	42	77	546	198	137	58	9
28	52	41	19	16	18	38	85	560	198	128	57	12
29	45	38	22	23		40	108	558	195	103	56	17
30	47	37	18	20		38	144	463	187	101	52	17
31	48		22	20		41		469		105	53	
Min	42	33	18	4	16	14	35	138	187	101	52	9
Max	117	59	56	28	26	53	144	560	500	228	102	58
Mean	70	46	29	20	21	27	60	349	339	156	66	29
ac-ft	4270	2735	1761	1203	1139	1639	3567	21440	20113	9603	4078	1713



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Olympus Dam, CO

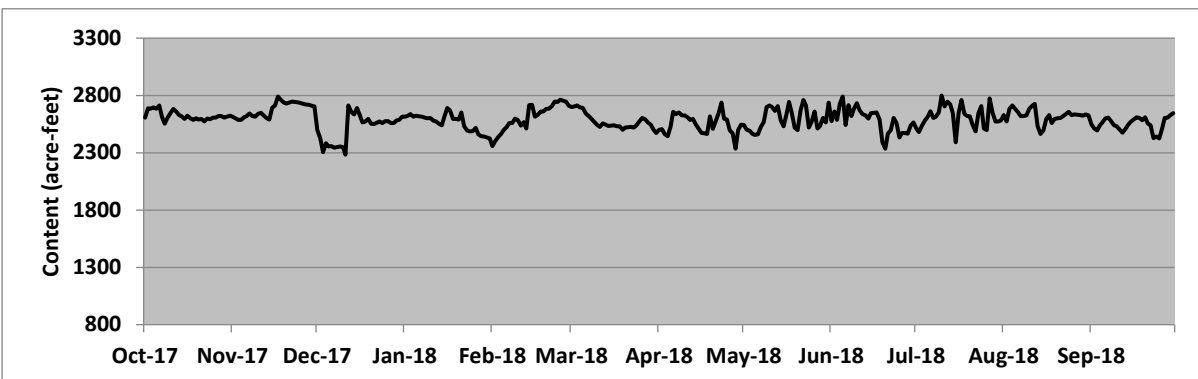
Location. --Lat 40°22'31", long 105°29'19", Larimer County, Hydrologic Unit 10190006, 1.5 miles east of Estes Park, Colorado, on the Big Thompson River.

Gage. -- Water-level recorder with satellite telemetry. Elevation of gage is 7490 feet from topographic map.

Remarks. -- Constructed between 1947 and 1949. Impoundment began in November, 1948. Active capacity between elevations 7,450.25 and 7,474.00 is 2,476 AF. Used as afterbay storage for Estes Powerplant and forebay for Olympus Tunnel. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	2608	2614	2497	2616	2357	2698	2499	2542	2577	2513	2628	2547
2	2688	2601	2427	2623	2403	2703	2506	2499	2660	2480	2572	2511
3	2686	2585	2306	2638	2437	2713	2460	2491	2585	2534	2684	2496
4	2696	2587	2384	2616	2464	2696	2445	2464	2728	2579	2711	2537
5	2684	2609	2354	2623	2501	2689	2527	2455	2791	2611	2681	2567
6	2711	2621	2357	2618	2525	2643	2657	2460	2542	2662	2657	2601
7	2609	2643	2343	2614	2559	2621	2637	2525	2716	2603	2621	2608
8	2554	2620	2351	2608	2559	2599	2650	2567	2621	2614	2621	2574
9	2608	2614	2355	2601	2599	2569	2625	2698	2686	2652	2626	2539
10	2647	2640	2349	2603	2584	2544	2625	2713	2733	2799	2686	2530
11	2681	2648	2284	2580	2536	2525	2609	2699	2669	2705	2710	2503
12	2659	2626	2711	2572	2567	2556	2587	2664	2637	2747	2727	2476
13	2630	2604	2657	2553	2511	2544	2594	2708	2626	2721	2530	2506
14	2618	2591	2635	2541	2716	2534	2546	2584	2597	2647	2465	2546
15	2594	2694	2689	2616	2718	2537	2508	2530	2647	2391	2496	2574
16	2623	2713	2626	2691	2616	2539	2473	2633	2648	2647	2594	2591
17	2601	2791	2564	2669	2631	2530	2468	2744	2650	2761	2628	2609
18	2587	2766	2572	2596	2659	2532	2464	2642	2589	2640	2559	2603
19	2601	2740	2594	2596	2659	2501	2618	2516	2392	2620	2596	2584
20	2589	2728	2553	2591	2681	2521	2508	2497	2335	2618	2601	2609
21	2594	2737	2551	2652	2686	2524	2577	2667	2467	2542	2604	2556
22	2574	2745	2563	2532	2706	2525	2645	2761	2497	2486	2621	2539
23	2597	2744	2572	2496	2747	2521	2737	2713	2604	2645	2638	2427
24	2592	2740	2559	2488	2744	2542	2599	2519	2558	2706	2657	2440
25	2606	2735	2577	2489	2764	2575	2591	2574	2434	2511	2630	2426
26	2608	2727	2575	2517	2754	2603	2496	2660	2473	2497	2635	2513
27	2621	2721	2559	2460	2745	2592	2470	2511	2472	2773	2631	2604
28	2620	2718	2558	2445	2710	2566	2336	2534	2467	2652	2630	2608
29	2608	2710	2582	2440		2546	2497	2604	2536	2574	2623	2628
30	2614	2705	2585	2434		2499	2546	2566	2564	2572	2633	2645
31	2623		2616	2424		2472		2739		2580	2625	
Min	2554	2585	2284	2424	2357	2472	2336	2455	2335	2391	2465	2426
Max	2711	2791	2711	2691	2764	2713	2737	2761	2791	2799	2727	2645
Mean	2623	2677	2513	2566	2612	2573	2550	2596	2583	2615	2623	2550
EOM	2623	2705	2616	2424	2710	2472	2546	2739	2564	2580	2625	2645



Appendix A (20 of 38)
Big Thompson River below Olympus Dam, CO

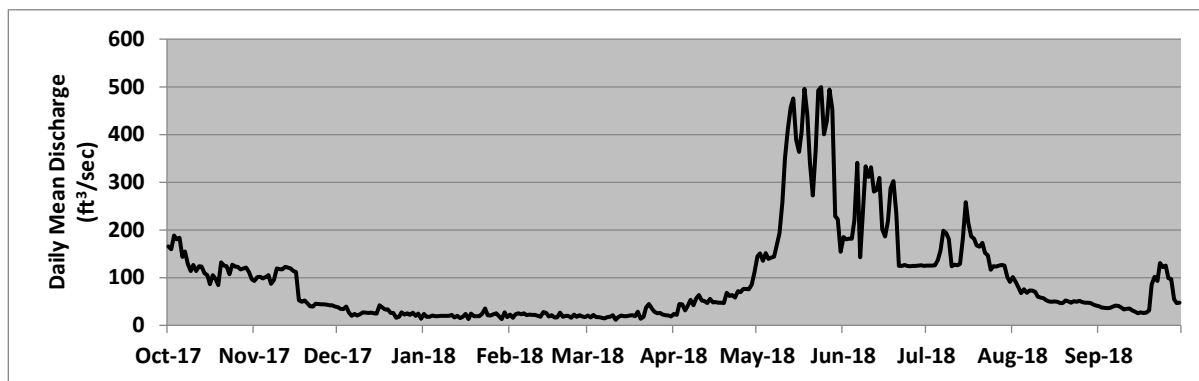
Location. --Lat 40°22'35", long 105°29'06", Larimer County, Hydrologic Unit 10190006, 620 feet downstream from Olympus Dam and 100 feet upstream of Dry Gulch, 2.0 miles east in Estes Park.

Gage. -- Water-stage recorder with satellite telemetry. 15 foot Parshall flume with overflow weirs in a concrete shelter with a supplemental outside gage. Datum of gage at 7422.50 feet.

Remarks.— Drainage area is 155 mi². Area at site used between 29-Jan-1934 and 21-Mar-1951 was 162 mi². Station consists of data collection platform and digital recorder as primary record. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete. Flow calculations during peak runoff could lose accuracy as the water begins to flow over the outside boards. This record contains operational data which could be subject to future revisions and changes. The official record for this station is published by the Colorado Division of Water Resources.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	166	93	38	24	22	21	24	145	185	125	101	40
2	159	101	35	18	16	17	22	151	180	125	91	37
3	188	102	34	18	23	22	45	135	182	125	79	37
4	180	98	39	20	25	17	44	151	182	126	68	36
5	184	101	27	19	23	17	31	139	221	137	76	37
6	143	105	20	19	25	16	41	142	341	157	68	40
7	155	87	24	20	21	15	53	144	143	198	73	41
8	129	95	21	20	23	17	42	167	232	193	73	41
9	114	120	23	20	22	18	57	194	333	181	70	37
10	127	118	28	20	22	22	64	258	311	124	60	33
11	114	118	27	22	20	12	52	350	332	127	58	35
12	124	122	26	17	18	17	51	411	281	126	57	35
13	124	122	27	20	28	21	46	457	284	128	53	32
14	109	120	25	16	26	19	55	476	309	182	50	28
15	105	114	25	18	18	19	48	389	201	258	49	26
16	87	112	42	24	21	21	49	364	186	214	50	27
17	105	53	37	14	16	21	47	406	219	187	49	26
18	97	50	33	24	17	20	48	496	287	182	47	27
19	85	52	33	19	27	29	47	441	302	168	47	31
20	132	47	26	20	18	14	68	342	234	165	52	86
21	125	40	26	19	20	18	61	273	125	173	50	102
22	124	40	16	25	20	37	64	367	125	152	48	93
23	107	45	18	35	16	44	58	493	127	147	51	131
24	128	45	28	21	22	35	71	499	125	116	50	122
25	123	44	23	21	18	29	70	400	124	124	51	125
26	123	44	25	23	21	25	76	428	125	123	49	99
27	117	43	22	25	19	26	76	494	124	125	48	97
28	120	42	26	19	17	23	76	454	125	127	47	55
29	121	42	20	13		22	85	229	126	125	47	47
30	112	39	25	27		20	112	223	125	101	44	48
31	96		14	17		18		154		91	42	
Min	85	39	14	13	16	12	22	135	124	91	42	26
Max	188	122	42	35	28	44	112	499	341	258	101	131
Mean	126	78	27	21	21	22	56	315	206	149	58	55
ac-ft	7762	4659	1646	1265	1155	1330	3335	19347	12266	9174	3555	3269



Appendix A (21 of 38)
Olympus Tunnel near Estes Park, CO

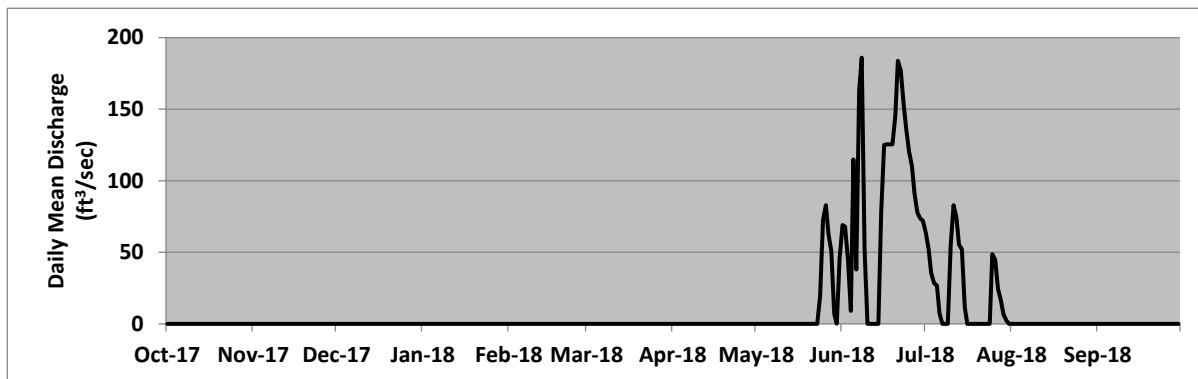
Location. --Lat 40°22'24", long 105°29'00", Larimer County, Hydrologic Unit 10190006, southeast of Estes Park, Colorado.

Gage. -- Water-stage recorder and satellite telemetry. Elevation of gage is 7460 from topographic map.

Remarks.— Constructed between 1949 and 1952. The tunnel is 7.2 miles long, between Estes Park and the Pole Hill Canal. Its diameter is 9.75 feet and maximum capacity is 550 cfs. The hydropower diversion operation, also known as the skim operation, diverts water from the Big Thompson River through Olympus Tunnel for power generation at three power plants down the foothills, before returning it to the Big Thompson River near the canyon mouth. The skim daily value is determined based on the data from the stream gages in the system. Period of record includes 01-Oct-2017 through 30-Sep-2018. Records are complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Hydropower Diversion (Skim), cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	0	69	64	0	0
2	0	0	0	0	0	0	0	0	68	52	0	0
3	0	0	0	0	0	0	0	0	45	35	0	0
4	0	0	0	0	0	0	0	0	9	29	0	0
5	0	0	0	0	0	0	0	0	115	27	0	0
6	0	0	0	0	0	0	0	0	38	8	0	0
7	0	0	0	0	0	0	0	0	163	0	0	0
8	0	0	0	0	0	0	0	0	186	0	0	0
9	0	0	0	0	0	0	0	0	51	0	0	0
10	0	0	0	0	0	0	0	0	0	55	0	0
11	0	0	0	0	0	0	0	0	0	83	0	0
12	0	0	0	0	0	0	0	0	0	74	0	0
13	0	0	0	0	0	0	0	0	0	55	0	0
14	0	0	0	0	0	0	0	0	0	52	0	0
15	0	0	0	0	0	0	0	0	79	12	0	0
16	0	0	0	0	0	0	0	0	125	0	0	0
17	0	0	0	0	0	0	0	0	126	0	0	0
18	0	0	0	0	0	0	0	0	126	0	0	0
19	0	0	0	0	0	0	0	0	126	0	0	0
20	0	0	0	0	0	0	0	0	145	0	0	0
21	0	0	0	0	0	0	0	0	184	0	0	0
22	0	0	0	0	0	0	0	0	177	0	0	0
23	0	0	0	0	0	0	0	0	153	0	0	0
24	0	0	0	0	0	0	0	20	136	0	0	0
25	0	0	0	0	0	0	0	72	120	49	0	0
26	0	0	0	0	0	0	0	83	110	45	0	0
27	0	0	0	0	0	0	0	63	91	24	0	0
28	0	0	0	0	0	0	0	51	78	17	0	0
29	0	0	0	0	0	0	0	7	74	7	0	0
30	0	0	0	0	0	0	0	0	72	2	0	0
31	0	0	0	0	0	0	0	46	0	0	0	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	0	0	0	0	0	0	83	186	83	0	0
Mean	0	0	0	0	0	0	0	11	89	22	0	0
ac-ft	0	0	0	0	0	0	0	677	5278	1366	0	0



Appendix A (22 of 38)
Olympus Tunnel, CO

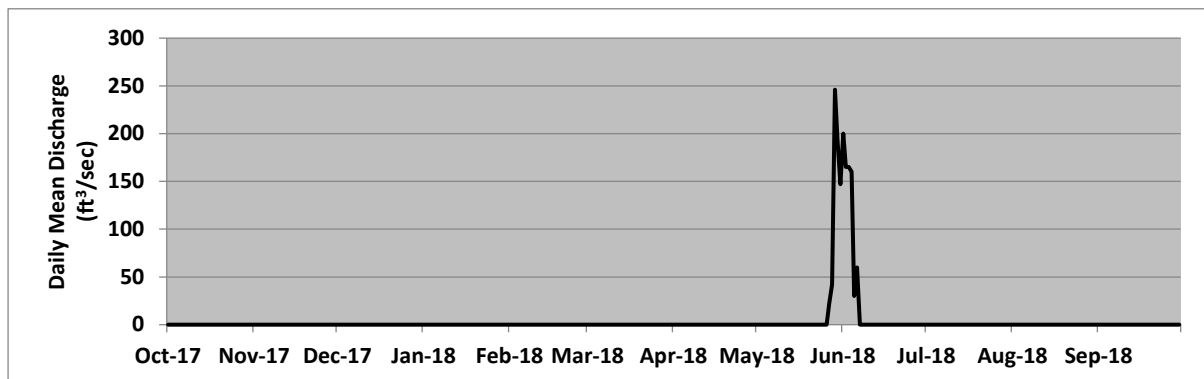
Location. --Lat 40°22'24", long 105°29'00", Larimer County, Hydrologic Unit 10190006, southeast of Estes Park, Colorado.

Gage. -- Water-stage recorder and satellite telemetry. Elevation of gage is 7460 from topographic map.

Remarks.— Constructed between 1949 and 1952. The tunnel is 7.2 miles long, between Estes Park and the Pole Hill Canal. Its diameter is 9.75 feet and maximum capacity is 550 cfs. The right to divert native run-off is determined by the Colorado Division of Water Resources. Period of record from 01-Oct-2017 through 30-Sep-2018. Record is complete and reliable.

Priority Diversion Flow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	0	200	0	0	0
2	0	0	0	0	0	0	0	0	165	0	0	0
3	0	0	0	0	0	0	0	0	165	0	0	0
4	0	0	0	0	0	0	0	0	160	0	0	0
5	0	0	0	0	0	0	0	0	30	0	0	0
6	0	0	0	0	0	0	0	0	60	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	22	0	0	0	0
28	0	0	0	0	0	0	0	42	0	0	0	0
29	0	0	0	0	0	0	0	246	0	0	0	0
30	0	0	0	0	0	0	0	193	0	0	0	0
31	0	0	0	0	0	0	0	147	0	0	0	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	0	0	0	0	0	0	246	200	0	0	0
Mean	0	0	0	0	0	0	0	21	26	0	0	0
ac-ft	0	0	0	0	0	0	0	1287	1544	0	0	0



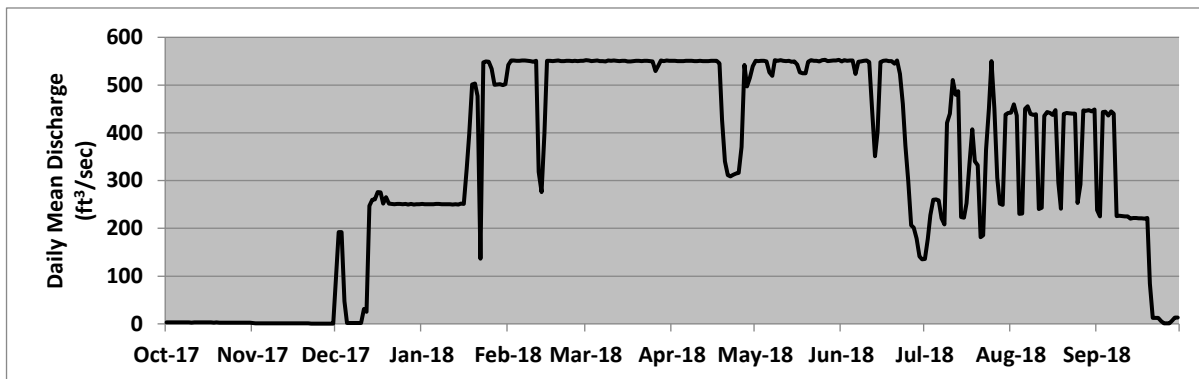
Appendix A (23 of 38)
Olympus Tunnel, CO

Location. --Lat 40°22'24", long 105°29'00", Larimer County, Hydrologic Unit 10190006, southeast of Estes Park, Colorado, on the Big Thompson River.
Gage. -- Water-stage recorder with satellite telemetry. Elevation of gage is 7460 from topographic map.

Remarks.— Constructed between 1949 and 1952. The tunnel is 7.2 miles long, between Estes Park and the Pole Hill Canal. Its diameter is 9.75 feet and maximum capacity is 550 cfs. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Records are complete and reliable. This record contains operational data which could be subject to future revisions and changes. Official record is published by the Colorado Division of Water Resources.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	3	2	102	251	542	552	551	551	549	136	442	239
2	3	1	192	251	552	551	551	550	552	178	460	225
3	3	1	192	250	551	550	550	551	551	228	436	444
4	3	1	48	251	551	551	550	551	551	260	231	444
5	3	1	2	250	551	551	550	550	552	261	231	436
6	3	1	2	251	551	550	551	527	523	259	450	445
7	3	1	2	251	551	550	551	519	549	221	456	440
8	3	1	2	250	551	550	551	552	550	208	440	226
9	3	1	2	251	550	551	550	551	551	421	438	227
10	3	1	2	250	549	551	550	552	551	440	439	226
11	3	1	31	250	551	552	551	551	548	510	241	225
12	3	1	25	250	319	551	550	550	448	480	243	225
13	3	1	247	250	276	550	550	551	351	487	436	220
14	3	1	260	250	399	551	550	549	402	224	444	222
15	3	1	261	252	551	551	551	549	548	222	442	222
16	3	1	276	251	551	550	551	543	551	253	438	221
17	3	1	275	324	550	550	551	527	552	334	447	221
18	3	1	252	398	551	550	546	525	550	407	295	221
19	3	1	265	501	552	551	428	524	550	340	241	222
20	3	1	252	503	550	551	340	549	545	332	440	84
21	3	1	251	477	550	550	311	552	552	181	441	13
22	3	1	250	137	551	551	309	551	524	185	441	13
23	3	1	251	547	551	551	312	551	461	364	440	13
24	3	1	251	549	550	550	315	550	373	451	440	6
25	2	1	251	549	551	549	316	552	298	550	253	1
26	3	1	251	534	550	530	370	553	206	452	292	1
27	3	1	250	501	551	541	542	550	201	306	447	1
28	3	1	251	501	551	551	497	551	179	252	447	7
29	3	1	250	502		550	515	552	142	249	448	13
30	3	1	250	500		551	539	552	135	438	445	13
31	3		250	502		551		553		441	449	
Min	2	1	2	137	276	530	309	519	135	136	231	1
Max	3	2	276	549	552	552	551	553	552	550	460	445
Mean	3	1	176	356	527	550	490	546	453	325	395	184
ac-ft	172	57	10779	21855	29212	33738	29105	33535	26917	19941	24216	10918



Appendix A (24 of 38)
Pinewood Reservoir near Loveland, Colorado, CO

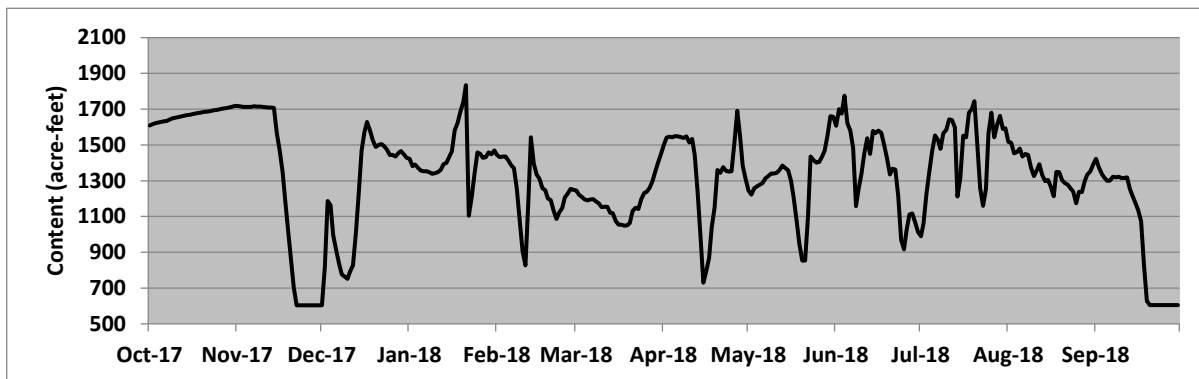
Location. --Lat 40°22', long 105°17.9', Larimer County, Hydrologic Unit 10190006, 10 miles southwest of Loveland, Colorado.

Gage. -- Water-level recorder with satellite telemetry. Elevation of gage is 6,600 feet from topographic map.

Remarks. -- Constructed between 1951 and 1952. Impoundment began in January 4, 1954. Active capacity between elevations 6,550.00 and 6,580.00 is 1,570 AF. The gage is capable of measuring the water surface elevation down to 6555.70 feet, a content of 604 AF. Used as the forebay storage for Flatiron Powerplant. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	1608	1718	604	1423	1444	1246	1498	1245	1607	990	1518	1422
2	1617	1716	815	1382	1431	1222	1540	1222	1700	1061	1513	1375
3	1621	1713	1186	1390	1435	1210	1547	1259	1675	1224	1454	1339
4	1625	1713	1163	1373	1435	1196	1542	1270	1776	1350	1461	1317
5	1630	1713	1000	1357	1411	1190	1550	1278	1622	1467	1481	1300
6	1632	1713	916	1354	1385	1195	1548	1287	1582	1553	1435	1301
7	1634	1716	841	1354	1371	1197	1545	1315	1484	1529	1450	1323
8	1642	1714	777	1348	1256	1185	1539	1327	1158	1478	1445	1319
9	1649	1714	765	1339	1079	1174	1548	1341	1252	1565	1372	1322
10	1652	1713	753	1342	908	1152	1514	1341	1340	1584	1326	1315
11	1656	1711	792	1348	827	1154	1533	1344	1454	1643	1358	1316
12	1659	1710	826	1361	1181	1155	1444	1360	1538	1640	1392	1318
13	1664	1709	1005	1392	1542	1121	1238	1385	1450	1598	1331	1252
14	1666	1708	1227	1400	1396	1118	990	1371	1579	1213	1298	1212
15	1669	1566	1469	1430	1336	1075	730	1359	1566	1318	1304	1172
16	1671	1469	1572	1464	1310	1054	795	1300	1580	1552	1266	1134
17	1675	1352	1629	1582	1258	1054	870	1209	1568	1542	1214	1073
18	1678	1196	1582	1623	1247	1050	1037	1082	1499	1681	1350	827
19	1681	1028	1526	1688	1201	1051	1149	948	1425	1701	1348	628
20	1685	867	1489	1741	1192	1062	1360	853	1335	1745	1303	605
21	1686	704	1499	1834	1134	1131	1344	854	1368	1506	1288	605
22	1688	604	1506	1104	1087	1149	1376	1100	1362	1259	1277	605
23	1692	604	1494	1208	1124	1142	1355	1435	1214	1160	1258	605
24	1696	604	1474	1340	1148	1198	1351	1416	969	1252	1238	605
25	1696	604	1444	1460	1206	1232	1353	1402	917	1564	1174	605
26	1701	604	1444	1450	1228	1239	1513	1406	1023	1681	1238	605
27	1704	604	1435	1429	1254	1260	1691	1435	1111	1543	1238	605
28	1706	604	1455	1432	1249	1298	1542	1467	1117	1612	1300	605
29	1710	604	1467	1459		1353	1384	1553	1067	1663	1335	605
30	1713	604	1448	1448		1406	1310	1661	1014	1589	1352	605
31	1719		1428	1469		1447		1657		1593	1390	
Min	1608	604	604	1104	827	1050	730	853	917	990	1174	605
Max	1719	1718	1629	1834	1542	1447	1691	1661	1776	1745	1518	1422
Mean	1669	1253	1227	1430	1253	1184	1358	1306	1378	1479	1345	997
EOM	1719	604	1428	1469	1249	1447	1310	1657	1014	1593	1390	605



Appendix A (25 of 38)
Flatiron Reservoir, CO

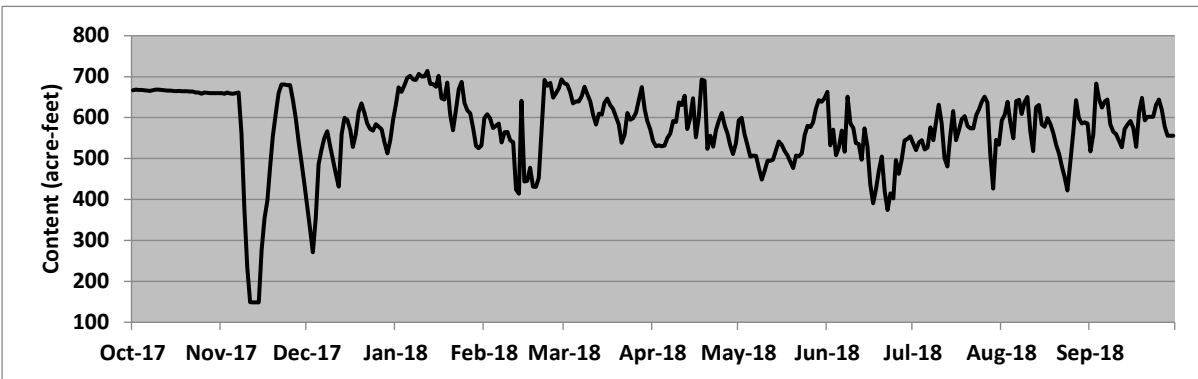
Location. --Lat 40°22.1', long 105°13.3', Larimer County, Hydrologic Unit 10190006, 8 miles southwest of Loveland, Colorado.

Gage. -- Water-level recorder with satellite telemetry. Elevation of gage is 5,600 feet from topographic map.

Remarks. -- Constructed between 1951 and 1953. Impoundment began in January, 1954. Active capacity between elevations 5,462.00 and 5,472.80 is 436 AF. Used as the afterbay storage for Flatiron Powerplant. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	667	659	380	630	599	684	543	593	663	537	593	517
2	668	658	323	674	608	680	530	600	532	520	607	560
3	668	661	271	663	598	663	532	560	570	539	639	683
4	668	659	353	678	574	634	530	533	508	545	587	644
5	667	658	486	697	580	639	531	505	528	522	549	624
6	666	659	522	702	585	640	550	508	568	526	641	639
7	665	661	550	694	540	652	561	506	517	576	644	644
8	667	561	567	692	565	676	591	476	651	545	609	584
9	668	378	530	707	565	656	589	449	585	592	638	566
10	668	235	496	700	544	640	637	471	575	631	650	560
11	668	149	462	701	540	607	631	495	538	586	568	544
12	667	149	431	714	425	583	653	494	536	501	518	528
13	666	149	559	683	414	610	572	497	497	481	625	572
14	666	149	600	681	641	608	599	520	574	556	631	583
15	665	277	594	676	444	635	647	542	530	616	583	591
16	665	354	569	702	445	646	552	534	437	545	578	575
17	665	398	528	647	477	631	601	519	391	569	599	528
18	665	475	559	644	431	621	693	508	426	597	584	614
19	664	555	614	686	431	603	690	492	471	604	562	648
20	664	609	635	609	453	583	524	477	505	579	533	593
21	663	659	612	569	572	539	555	508	420	574	511	602
22	663	680	586	618	692	557	529	506	374	574	480	602
23	662	680	572	669	678	611	570	513	415	606	455	602
24	662	679	568	688	685	595	593	557	402	621	422	631
25	658	679	584	635	649	599	612	580	496	638	490	644
26	661	642	578	618	659	612	581	577	463	651	561	619
27	661	596	571	610	672	644	560	588	496	637	642	578
28	660	539	539	574	693	674	533	621	544	511	599	556
29	659	489	513	530		621	511	642	548	427	585	556
30	660	435	544	525		592	537	639	554	545	589	556
31	659		595	532		572		647		534	586	
Min	658	149	271	525	414	539	511	449	374	427	422	517
Max	668	680	635	714	693	684	693	647	663	651	650	683
Mean	664	504	526	650	563	623	578	537	510	564	576	591
EOM	659	435	595	532	693	572	537	647	554	534	586	556



Appendix A (26 of 38)
Flatiron Powerplant Unit #3 Pump, CO

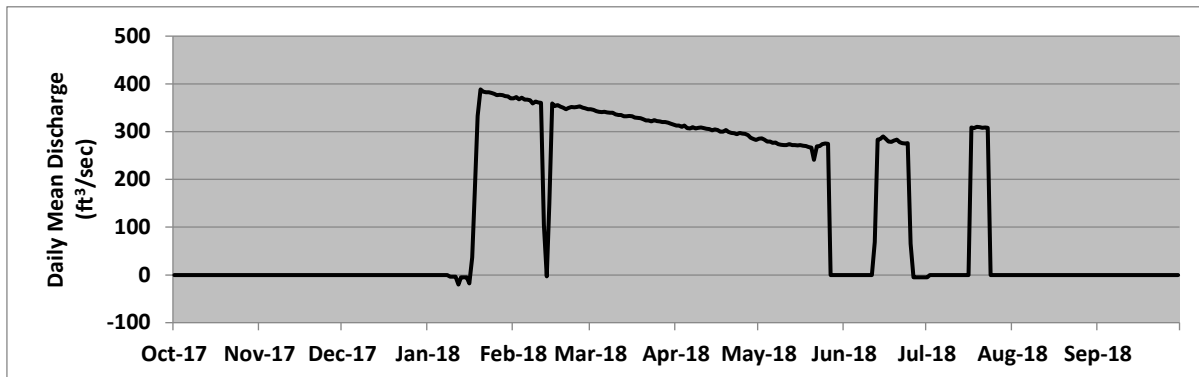
Location. --Lat 40°21'53", long 105°14'09", Larimer County, Hydrologic Unit 10190006, 9 miles west of Loveland, Colorado

Gage. -- There is a flow meter in place.

Remarks. -- Constructed between 1951 and 1953. The Powerplant consists of three generating units. Unit #3 can be used to pump water from Flatiron Reservoir to Carter Lake, or to generate power. For the purpose of this table, any negative values larger than 25 cfs indicate power generation, less than 25 cfs indicate leakage. The maximum capacity of the pump is approximately 480 cfs, but the efficiency varies according to the water surface levels at Carter Lake and Flatiron Reservoir. Discharges are measured using a flow meter inside the pressure conduit. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	370	347	312	285	0	-5	0	0
2	0	0	0	0	373	346	313	286	0	0	0	0
3	0	0	0	0	368	343	310	284	0	0	0	0
4	0	0	0	0	371	342	312	279	0	0	0	0
5	0	0	0	0	367	341	307	279	0	0	0	0
6	0	0	0	0	367	342	307	276	0	0	0	0
7	0	0	0	0	366	340	309	277	0	0	0	0
8	0	0	0	0	359	339	307	274	0	0	0	0
9	0	0	0	-4	363	340	308	273	0	0	0	0
10	0	0	0	-4	361	336	309	272	0	0	0	0
11	0	0	0	-4	360	335	307	272	0	0	0	0
12	0	0	0	-20	105	335	306	274	69	0	0	0
13	0	0	0	-5	-3	332	306	272	283	0	0	0
14	0	0	0	-5	149	332	303	272	285	0	0	0
15	0	0	0	-5	359	333	305	271	290	0	0	0
16	0	0	0	-18	354	332	304	272	285	0	0	0
17	0	0	0	36	356	330	300	270	279	309	0	0
18	0	0	0	173	352	329	300	270	278	308	0	0
19	0	0	0	333	351	328	303	268	281	310	0	0
20	0	0	0	388	347	326	299	267	283	310	0	0
21	0	0	0	384	349	324	298	241	278	308	0	0
22	0	0	0	383	352	324	296	269	276	309	0	0
23	0	0	0	382	351	321	295	270	275	308	0	0
24	0	0	0	381	351	324	298	274	276	0	0	0
25	0	0	0	379	353	322	296	275	65	0	0	0
26	0	0	0	376	350	321	295	274	-5	0	0	0
27	0	0	0	377	349	320	292	0	-5	0	0	0
28	0	0	0	377	347	320	287	0	-5	0	0	0
29	0	0	0	375		319	284	0	-5	0	0	0
30	0	0	0	374		317	283	0	-5	0	0	0
31	0		0	370		315		0		0	0	
Min	0	0	0	-20	-3	315	283	0	-5	-5	0	0
Max	0	0	0	388	373	347	313	286	290	310	0	0
Mean	0	0	0	162	328	331	302	229	116	70	0	0
ac-ft	0	0	0	9948	18208	20302	17922	14047	6888	4270	0	0



Appendix A (27 of 38)
CHFC 930 Section, CO

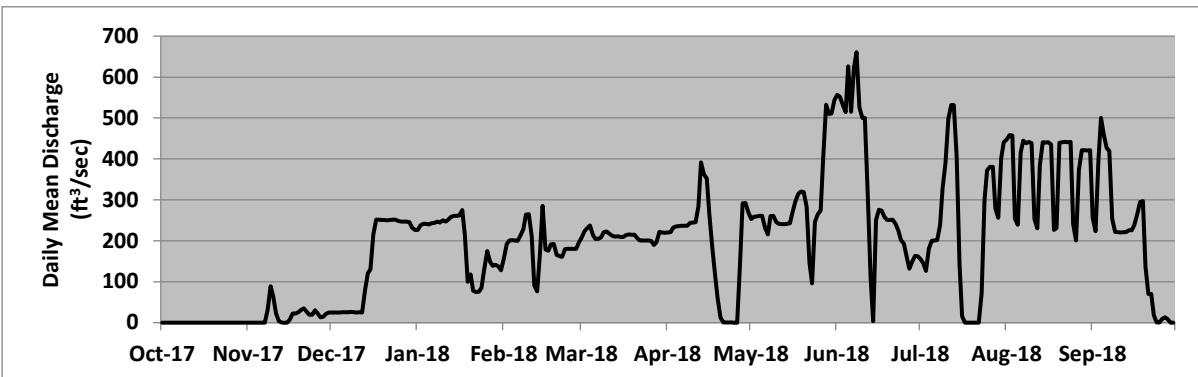
Location. --Lat 40°22'26", long 105°13'52", Larimer County, Hydrologic Unit 10190006, 8 miles southwest of Loveland, Colorado.

Gage. -- Water-stage recorder with satellite telemetry. Elevation of gage is 5470 feet from topographic map.

Remarks. -- Constructed between 1949 and 1953. The canal is 3.8 miles long and has a maximum capacity of 930 cfs. The canal is used to move C-BT water and diverted native water to the Big Thompson River and/or Horsetooth Reservoir. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Data from this station has been question in the past for its low accuracy, due to algae growth issues. The record is complete and fair. This record contains operational data which could be subject to future revisions and changes.

Flow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	25	227	157	208	221	253	557	156	447	256
2	0	0	25	238	192	223	221	258	552	145	458	223
3	0	0	25	241	200	230	232	259	532	126	458	397
4	0	0	25	241	202	238	235	261	514	180	254	500
5	0	0	26	240	201	215	236	261	626	200	239	458
6	0	0	25	243	200	205	236	232	516	201	415	426
7	0	0	25	244	214	205	237	216	623	201	445	420
8	0	33	26	247	229	208	236	260	661	238	438	253
9	0	89	26	245	264	221	244	261	526	329	441	222
10	0	65	25	250	265	223	245	246	500	390	438	221
11	0	22	25	247	211	217	245	241	500	499	253	220
12	0	4	25	252	91	212	285	241	314	531	230	221
13	0	0	78	259	76	210	392	241	110	532	385	221
14	0	0	121	261	172	211	363	242	4	405	441	226
15	0	0	130	261	286	210	352	243	251	140	440	226
16	0	8	215	262	179	210	266	273	275	15	441	238
17	0	23	251	275	176	214	186	297	274	0	436	264
18	0	23	252	215	191	216	116	315	259	0	226	294
19	0	26	251	100	192	215	60	321	251	0	232	297
20	0	31	251	118	166	215	12	319	251	0	439	137
21	0	35	250	78	162	206	0	284	251	0	441	70
22	0	27	251	75	161	201	0	146	242	0	441	70
23	0	20	251	75	180	201	0	96	224	72	441	19
24	0	19	252	85	181	201	0	246	201	300	441	0
25	0	30	248	132	181	201	0	265	193	372	241	0
26	0	23	247	175	181	200	0	274	160	380	201	9
27	0	13	247	148	181	189	145	405	132	380	374	13
28	0	15	247	139	195	197	291	532	150	279	421	8
29	0	22	245	141		222	292	510	163	256	421	0
30	0	25	232	137		220	270	511	162	401	420	0
31	0		227	128		220		544		441	421	
Min	0	0	25	75	76	189	0	96	4	0	201	0
Max	0	89	252	275	286	238	392	544	661	532	458	500
Mean	0	18	147	193	189	212	187	292	332	231	381	197
ac-ft	0	1089	9004	11837	10459	12992	11126	17922	19747	14196	23406	11704



Appendix A (28 of 38)
Dille Tunnel near Drake, CO

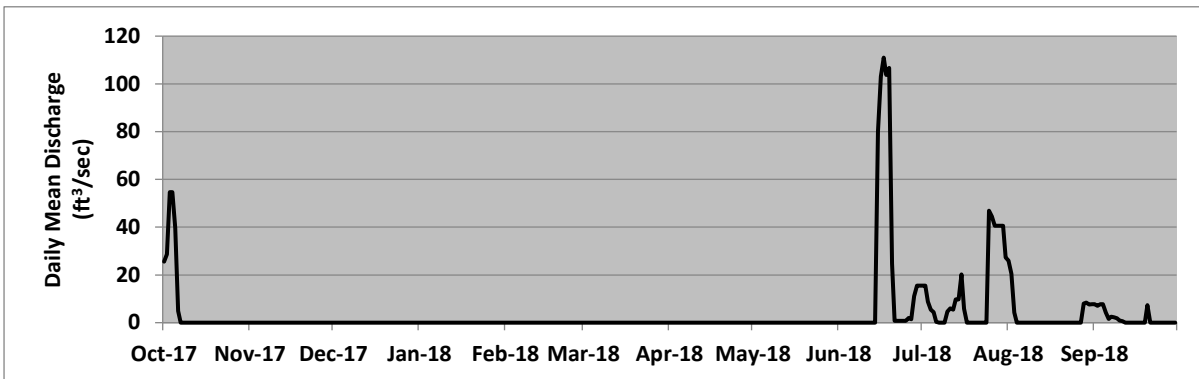
Location. --Lat 40°25'02", long 105°14'35", Larimer County, Hydrologic Unit 10190006, 11 miles west of Loveland, Colorado, on the Big Thompson River.

Gage. -- Water-stage recorder with satellite telemetry at Parshall Flume. Elevation of gage is 5520 feet from topographic map.

Remarks. -- Constructed in 1950. Maximum capacity is 600 cfs. Dille Tunnel diverts water from the Big Thompson River for power generation and water supply. The hydropower diversion operation, also known as the skim operation, diverts water from the Big Thompson River through Dille Tunnel for power generation at the Big Thompson Power Plant, where the diverted water is returned to the river. The skim daily value is determined based on the data from the gage. Record is complete and accurate.

Hydropower Diversion Flow (Skim), cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	26	0	0	0	0	0	0	0	0	16	26	8
2	29	0	0	0	0	0	0	0	0	16	21	7
3	55	0	0	0	0	0	0	0	0	9	4	8
4	55	0	0	0	0	0	0	0	0	5	0	8
5	40	0	0	0	0	0	0	0	0	4	0	4
6	5	0	0	0	0	0	0	0	0	0	0	2
7	0	0	0	0	0	0	0	0	0	0	0	3
8	0	0	0	0	0	0	0	0	0	0	0	2
9	0	0	0	0	0	0	0	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0	5	0	1
11	0	0	0	0	0	0	0	0	0	6	0	1
12	0	0	0	0	0	0	0	0	0	5	0	0
13	0	0	0	0	0	0	0	0	0	10	0	0
14	0	0	0	0	0	0	0	0	0	10	0	0
15	0	0	0	0	0	0	0	0	80	20	0	0
16	0	0	0	0	0	0	0	0	103	6	0	0
17	0	0	0	0	0	0	0	0	111	0	0	0
18	0	0	0	0	0	0	0	0	104	0	0	0
19	0	0	0	0	0	0	0	0	107	0	0	0
20	0	0	0	0	0	0	0	0	25	0	0	7
21	0	0	0	0	0	0	0	0	1	0	0	0
22	0	0	0	0	0	0	0	0	1	0	0	0
23	0	0	0	0	0	0	0	0	1	0	0	0
24	0	0	0	0	0	0	0	0	1	0	0	0
25	0	0	0	0	0	0	0	0	1	47	0	0
26	0	0	0	0	0	0	0	0	2	45	0	0
27	0	0	0	0	0	0	0	0	1	41	0	0
28	0	0	0	0	0	0	0	0	11	41	8	0
29	0	0	0	0	0	0	0	0	16	41	8	0
30	0	0	0	0	0	0	0	0	16	41	8	0
31	0	0	0	0	0	0	0	0	0	27	8	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	55	0	0	0	0	0	0	0	111	47	26	8
Mean	7	0	0	0	0	0	0	0	19	13	3	2
ac-ft	412	0	0	0	0	0	0	0	1145	777	163	102



Appendix A (29 of 38)
Dille Tunnel near Drake, CO

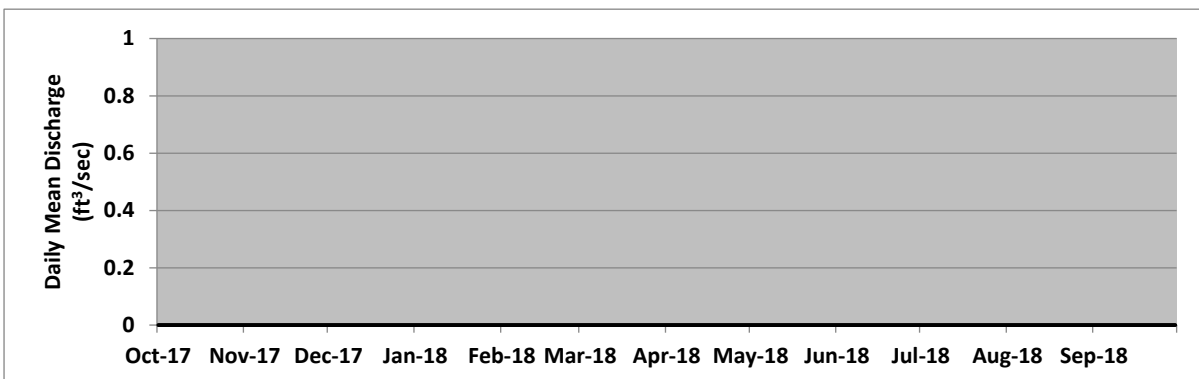
Location. --Lat 40°25'02", long 105°14'35", Larimer County, Hydrologic Unit 10190006, 11 miles west of Loveland, Colorado, on the Big Thompson River.

Gage. -- None.

Remarks. -- Constructed in 1950. Maximum capacity is 600 cfs. Dille Tunnel diverts water from the Big Thompson River for power generation and water supply. The right to divert native run-off is determined by the State of Colorado. The numbers presented in this table are based gaged flows and available priority water. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Priority Diversion Flow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0
ac-ft	0	0	0	0	0	0	0	0	0	0	0	0



Appendix A (30 of 38)
Dille Tunnel near Drake, CO

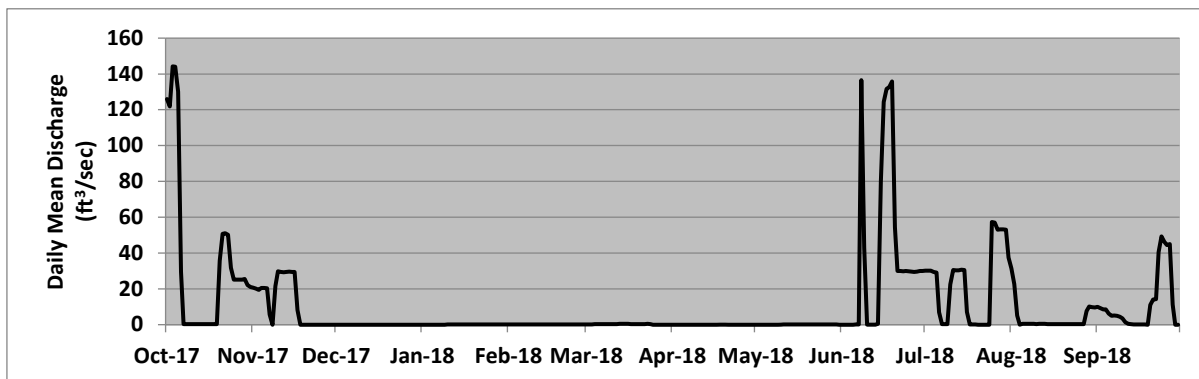
Location. --Lat 40°25'02", long 105°14'35", Larimer County, Hydrologic Unit 10190006, 11 miles west of Loveland, Colorado, on the Big Thompson River.

Gage. -- Water-stage recorder with satellite telemetry at Parshall Flume. Elevation of gage is 5520 feet from topographic map.

Remarks. — Constructed in 1950. The Dille Tunnel has a maximum capacity is 600 cfs, but only 400 cfs can be measured accurately. Dille Tunnel diverts water from the Big Thompson River for power generation and water supply. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes. The official record is published by the Colorado Division of Water Resources.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	126	21	0	0	0	0	0	0	0	30	31	10
2	122	20	0	0	0	0	0	0	0	30	23	9
3	144	19	0	0	0	0	0	0	0	30	5	9
4	144	21	0	0	0	0	0	0	0	30	0	8
5	130	20	0	0	0	0	0	0	0	29	0	6
6	30	20	0	0	0	0	0	0	0	7	0	5
7	0	6	0	0	0	0	0	0	0	0	0	5
8	0	0	0	0	0	0	0	0	136	0	0	5
9	0	22	0	0	0	0	0	0	43	0	0	4
10	0	30	0	0	0	0	0	0	0	23	0	4
11	0	29	0	0	0	0	0	0	0	31	0	1
12	0	29	0	0	0	0	0	0	0	30	0	1
13	0	30	0	0	0	0	0	0	0	30	0	0
14	0	30	0	0	0	0	0	0	0	31	0	0
15	0	30	0	0	0	0	0	0	80	31	0	0
16	0	29	0	0	0	0	0	0	124	7	0	0
17	0	8	0	0	0	0	0	0	132	0	0	0
18	0	0	0	0	0	0	0	0	133	0	0	0
19	0	0	0	0	0	0	0	0	136	0	0	0
20	36	0	0	0	0	0	0	0	54	0	0	11
21	51	0	0	0	0	0	0	0	30	0	0	14
22	51	0	0	0	0	0	0	0	30	0	0	14
23	50	0	0	0	0	0	0	0	30	0	0	41
24	32	0	0	0	0	0	0	0	30	0	0	49
25	25	0	0	0	0	0	0	0	30	57	0	46
26	25	0	0	0	0	0	0	0	30	57	0	45
27	25	0	0	0	0	0	0	0	29	53	0	45
28	25	0	0	0	0	0	0	0	30	53	8	11
29	26	0	0	0	0	0	0	0	30	53	10	0
30	22	0	0	0	0	0	0	0	30	53	10	0
31	21	0	0	0	0	0	0	0	0	38	10	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	144	30	0	0	0	0	0	0	136	57	31	49
Mean	35	12	0	0	0	0	0	0	38	23	3	11
ac-ft	2154	720	1	4	9	15	1	3	2251	1393	206	682



Appendix A (31 of 38)
Big Thompson Power Plant, CO

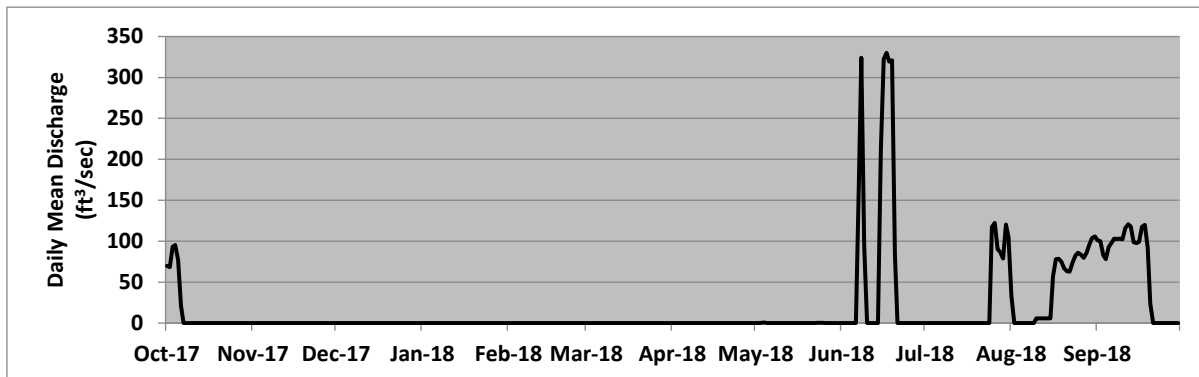
Location. --Lat 40°25'16", long 105°13'26", Larimer County, Hydrologic Unit 10190006, 9 miles west of Loveland, Colorado, on the Big Thompson River.

Gage. -- Flow meter with satellite telemetry. Elevation of gage is 5280 feet from topographic map.

Remarks. -- Initial operation in 1959. Maximum capacity is 400 cfs. Power plant returns hydropower diversions to the Big Thompson River downstream of the Big Thompson River canyon mouth. The plant is also used to deliver C-BT project and Windy Gap Project water to the Big Thompson River. The plant is winterized from November through April, each year. This record contains data recorded between 01-Oct-2017 and 30-Sep-2018. Record is complete and fair. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	70	0	0	0	0	0	0	0	0	0	33	101
2	68	0	0	0	0	0	0	0	0	0	0	100
3	94	0	0	0	0	0	0	0	0	0	0	83
4	95	0	0	0	0	0	0	0	0	0	0	78
5	77	0	0	0	0	0	0	0	0	0	0	93
6	21	0	0	0	0	0	0	0	0	0	0	98
7	0	0	0	0	0	0	0	0	164	0	0	103
8	0	0	0	0	0	0	0	0	324	0	0	103
9	0	0	0	0	0	0	0	0	95	0	0	103
10	0	0	0	0	0	0	0	0	0	0	6	102
11	0	0	0	0	0	0	0	0	0	0	6	116
12	0	0	0	0	0	0	0	0	0	0	6	121
13	0	0	0	0	0	0	0	0	0	0	6	118
14	0	0	0	0	0	0	0	0	0	0	6	99
15	0	0	0	0	0	0	0	0	211	0	6	98
16	0	0	0	0	0	0	0	0	322	0	57	99
17	0	0	0	0	0	0	0	0	330	0	78	118
18	0	0	0	0	0	0	0	0	319	0	78	120
19	0	0	0	0	0	0	0	0	321	0	75	92
20	0	0	0	0	0	0	0	0	83	0	67	24
21	0	0	0	0	0	0	0	0	0	0	63	0
22	0	0	0	0	0	0	0	0	0	0	63	0
23	0	0	0	0	0	0	0	0	0	0	74	0
24	0	0	0	0	0	0	0	0	0	0	82	0
25	0	0	0	0	0	0	0	0	0	117	86	0
26	0	0	0	0	0	0	0	0	0	122	83	0
27	0	0	0	0	0	0	0	0	0	90	79	0
28	0	0	0	0	0	0	0	0	0	87	86	0
29	0	0	0	0	0	0	0	0	0	79	95	0
30	0	0	0	0	0	0	0	0	0	120	104	0
31	0	0	0	0	0	0	0	0	0	105	106	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	95	0	0	0	0	0	0	0	330	122	106	121
Mean	14	0	0	0	0	0	0	0	72	23	43	66
ac-ft	841	0	0	0	0	0	0	4	4297	1426	2662	3897



Appendix A (32 of 38)
CHFC Wasteway, CO

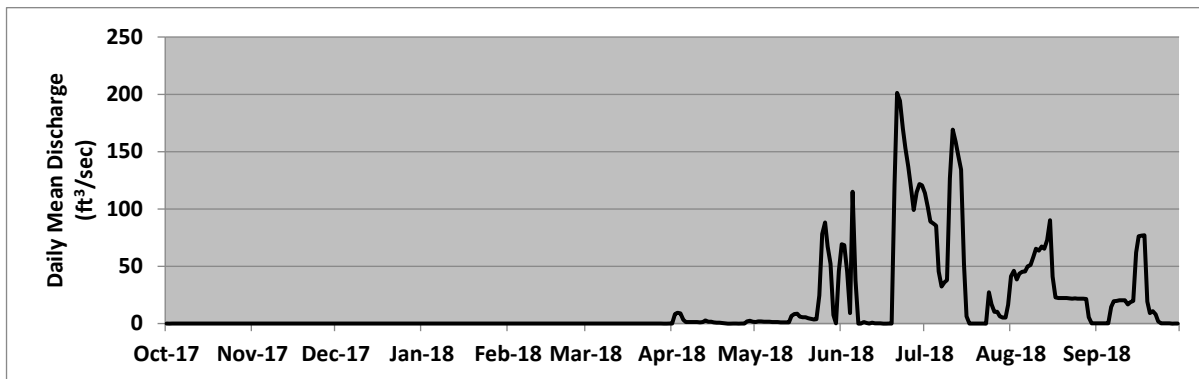
Location. --Lat 40°25'13", long 105°13'28", Larimer County, Hydrologic Unit 10190006, 9 miles west of Loveland, Colorado, on the Big Thompson River.

Gage. -- Water-stage recorder with satellite telemetry at 15 foot Parshall Flume. Elevation of gage is 5465 feet from Designer's Operating Criteria.

Remarks. -- Constructed between 1949 and 1953. Maximum capacity is 400 cfs. The structure is used to return diverted water and to deliver C-BT and Windy Gap Project water to the Big Thompson River. The facility is winterized between November and April. Recorder was operated during October 2017 and also between April 2018 and September 2018. Record is complete and reliable. These data are provisional operations data and are subject to further revision and change. The official record is published by the Colorado Division of Water Resources.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	0	0	0	0	0	0	0	1	69	114	41	0
2	0	0	0	0	0	0	8	2	68	101	46	0
3	0	0	0	0	0	0	9	2	45	89	39	0
4	0	0	0	0	0	0	9	2	9	87	43	0
5	0	0	0	0	0	0	3	1	115	85	45	0
6	0	0	0	0	0	0	1	1	38	45	46	14
7	0	0	0	0	0	0	1	1	0	32	50	19
8	0	0	0	0	0	0	1	1	0	36	51	20
9	0	0	0	0	0	0	1	1	1	38	58	20
10	0	0	0	0	0	0	1	1	1	127	65	20
11	0	0	0	0	0	0	1	1	0	169	64	20
12	0	0	0	0	0	0	1	1	1	159	67	17
13	0	0	0	0	0	0	3	1	0	147	65	19
14	0	0	0	0	0	0	2	6	0	134	73	20
15	0	0	0	0	0	0	1	8	0	52	90	62
16	0	0	0	0	0	0	1	9	0	6	41	76
17	0	0	0	0	0	0	1	6	0	0	23	77
18	0	0	0	0	0	0	1	6	0	0	22	77
19	0	0	0	0	0	0	1	6	0	0	22	19
20	0	0	0	0	0	0	0	5	121	0	22	9
21	0	0	0	0	0	0	0	4	201	0	22	11
22	0	0	0	0	0	0	0	4	194	0	22	8
23	0	0	0	0	0	0	0	4	170	0	22	2
24	0	0	0	0	0	0	0	25	153	27	22	0
25	0	0	0	0	0	0	0	78	137	17	22	0
26	0	0	0	0	0	0	0	88	117	10	22	0
27	0	0	0	0	0	0	0	67	99	10	22	0
28	0	0	0	0	0	0	2	52	115	6	21	0
29	0	0	0	0	0	0	2	8	122	5	5	0
30	0	0	0	0	0	0	2	0	121	5	0	0
31	0	0	0	0	0	0	0	46	0	16	0	0
Min	0	0	0	0	0	0	0	0	0	0	0	0
Max	0	0	0	0	0	0	9	88	201	169	90	77
Mean	0	0	0	0	0	0	2	14	63	49	37	17
ac-ft	0	0	0	0	0	0	106	868	3758	3011	2284	1012



Appendix A (33 of 38)
CHFC 550 Section, CO

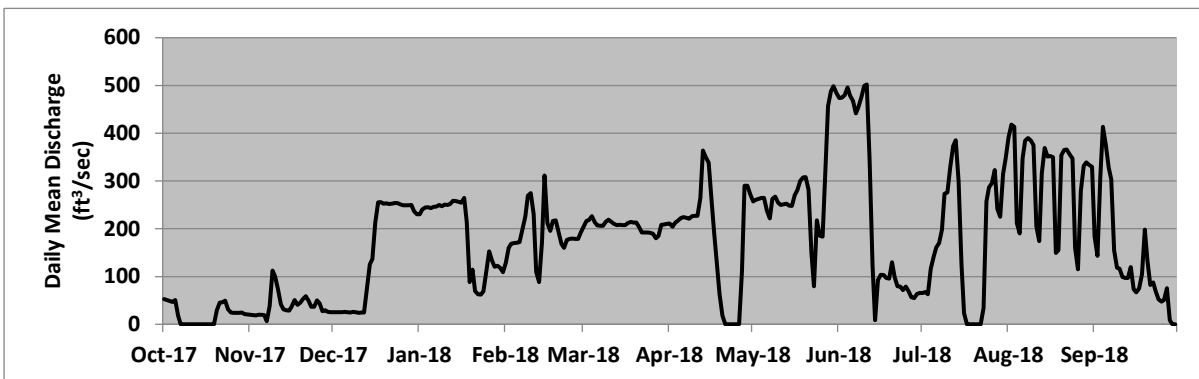
Location. --Lat 40°25'25", long 105°13'34", Larimer County, Hydrologic Unit 10190006, 9 miles west of Loveland, Colorado.

Gage. -- Water-stage recorder with satellite telemetry. Elevation of gage is 5460 feet from topographic map.

Remarks. -- Constructed between 1949 and 1953. The canal is 9.4 miles long and has a maximum capacity of 550 cfs. The canal is used to move C-BT water and Big Thompson River priority water to Horsetooth Reservoir. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	53	20	25	231	129	204	211	257	473	65	392	183
2	51	19	25	240	160	216	204	261	474	67	418	144
3	49	19	25	245	169	218	212	263	480	63	413	311
4	47	20	25	245	170	226	217	264	496	116	212	414
5	50	20	26	243	170	214	223	265	479	141	190	376
6	18	20	26	246	172	207	224	238	468	161	347	328
7	0	7	25	246	199	206	223	222	441	170	385	303
8	0	38	26	250	226	207	221	263	455	198	390	154
9	0	113	25	247	269	214	226	267	475	273	384	119
10	0	100	24	251	275	219	227	255	499	276	375	116
11	0	74	24	250	231	214	227	250	502	330	205	99
12	0	42	24	252	109	210	264	251	341	373	174	97
13	0	31	75	258	88	208	364	252	125	385	316	97
14	0	30	125	258	172	209	350	248	9	300	369	120
15	0	29	137	256	311	208	338	248	93	126	351	73
16	0	37	212	254	211	208	268	271	104	23	353	67
17	0	51	255	265	195	212	192	281	103	0	349	75
18	0	41	256	214	216	214	124	300	97	0	149	104
19	0	45	252	88	218	213	63	307	96	0	155	198
20	29	53	253	115	193	213	18	308	130	0	354	134
21	45	59	252	70	168	203	0	282	99	0	365	82
22	46	49	252	63	160	192	0	150	79	0	366	87
23	50	37	254	62	177	192	0	80	79	34	356	69
24	32	37	254	69	179	192	0	218	72	257	347	52
25	24	50	251	111	179	191	0	186	79	287	160	48
26	24	44	249	152	179	190	0	183	69	296	115	51
27	24	27	249	133	179	180	111	311	57	323	279	76
28	24	29	249	120	191	185	290	457	55	242	331	8
29	25	26	250	122		209	290	488	64	225	339	0
30	22	25	237	118		209	272	499	65	315	334	0
31	20		231	109		211		485		347	330	
Min	0	7	24	62	88	180	0	80	9	0	115	0
Max	53	113	256	265	311	226	364	499	502	385	418	414
Mean	20	40	148	187	189	206	179	278	235	174	310	133
ac-ft	1252	2355	9095	11449	10487	12657	10615	17044	13973	10679	19017	7889



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Horsetooth Reservoir near Fort Collins, CO

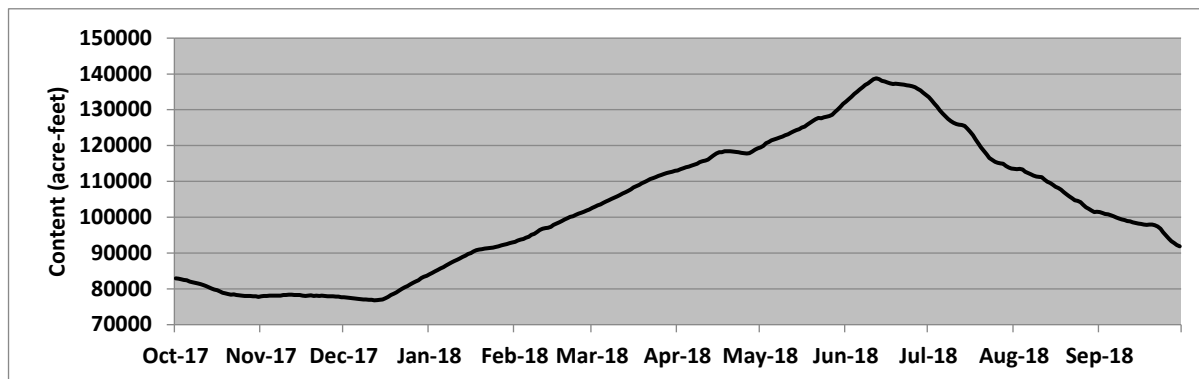
Location. —Lat 40°36'00", long 105°10'05" , Larimer County, Hydrologic Unit 10190007, at Horsetooth Dam outlet works, 4.8 miles west of Fort Collins, Colorado.

Gage. — Water level recorder with satellite telemetry. Elevation of gage is 5300 from topographic map.

Remarks. — Reservoir is formed by four earth-fill dams. Construction completed in 1949. Impoundment began in 1951. Horsetooth Reservoir is one of two terminal reservoirs for C-BT diversions. Trans-mountain diversions are stored at Horsetooth Reservoir before final delivery. Maximum capacity is 156,735 AF at elevation 5430.00 ft, with 142,038 AF of active storage. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and reliable. This record contains operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	82955	77943	77631	84089	93148	102577	113080	119529	132266	133496	113509	101455
2	82853	78014	77546	84488	93460	102954	113406	119953	132973	132750	113388	101163
3	82648	78014	77489	84873	93725	103296	113664	120660	133645	131766	113474	100887
4	82516	78085	77361	85289	93943	103624	113922	121050	134393	130823	113337	100790
5	82399	78114	77333	85721	94317	104051	114162	121423	135068	129847	112720	100549
6	82005	78128	77234	86079	94568	104363	114420	121761	135670	129003	112310	100242
7	81845	78100	77135	86512	95086	104726	114645	122010	136292	128290	111968	99936
8	81684	78071	77064	86991	95353	105073	114921	122278	136878	127486	111645	99662
9	81510	78271	77007	87367	95920	105419	115371	122545	137371	126832	111339	99421
10	81336	78300	76937	87728	96425	105817	115614	122849	137959	126360	111270	99228
11	81060	78385	76908	88076	96773	106165	115839	123117	138511	125997	111134	98972
12	80756	78400	76796	88484	96964	106630	116099	123583	138778	125852	110507	98828
13	80452	78314	76810	88893	97058	106947	116725	123977	138530	125726	109933	98588
14	80091	78300	76979	89319	97360	107296	117266	124319	138073	125455	109545	98380
15	79817	78242	77036	89730	97902	107765	117773	124607	137921	124769	109022	98237
16	79588	78142	77375	90036	98205	108283	118123	125004	137598	123852	108468	98093
17	79229	78057	77787	90479	98588	108652	118176	125310	137371	122849	108182	97950
18	78928	78128	78242	90801	98940	109072	118438	125871	137200	121725	107731	97838
19	78713	78157	78599	90955	99421	109460	118421	126378	137276	120571	106963	97934
20	78513	77972	78999	91063	99710	109831	118438	126941	137163	119459	106315	97918
21	78400	78071	79516	91247	100081	110219	118369	127359	137106	118491	105784	97774
22	78428	78043	79962	91339	100306	110626	118264	127706	137011	117511	105271	97408
23	78242	78128	80452	91385	100629	110913	118106	127651	136840	116552	104759	96757
24	78214	78000	80799	91493	100968	111168	118000	127906	136708	115960	104544	95809
25	78128	77943	81248	91678	101245	111508	117878	128089	136538	115493	104215	94866
26	78014	77929	81684	91894	101504	111815	117826	128290	136311	115180	103460	94052
27	78000	77915	82064	92157	101877	112037	117896	128636	135858	115059	102790	93289
28	77986	77844	82429	92311	102187	112378	118316	129387	135444	114973	102285	92761
29	77929	77816	83014	92527		112498	118825	130067	134768	114300	101845	92265
30	77943	77702	83411	92730		112720	119230	130879	134187	113887	101472	91863
31	77745		83661	92977		112994		131618		113629	101504	
Min	77745	77702	76796	84089	93148	102577	113080	119529	132266	113629	101472	91863
Max	82955	78400	83661	92977	102187	112994	119230	131618	138778	133496	113509	101455
Mean	79933	78084	78920	89313	97702	108093	116707	125185	136390	122708	108087	97764
EOM	77745	77702	83661	92977	102187	112994	119230	131618	134187	113629	101504	91863



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Charles Hansen Supply Canal below Horsetooth Reservoir, CO

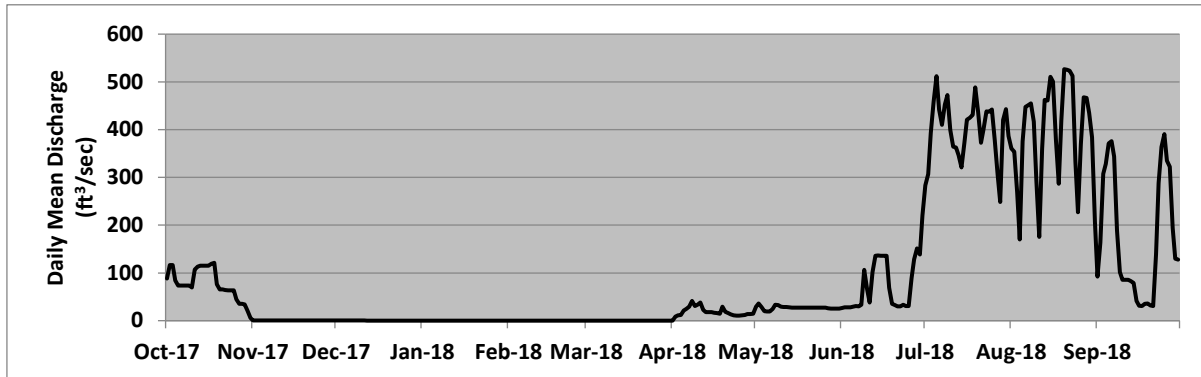
Location. --Lat 40°36'01", long 105°10'18", Larimer County, Hydrologic Unit 10190007, 4 miles west of Fort Collins, Colorado.

Gage. -- Two flow meters with satellite telemetry measure the flow for each conduits leading toward the hollow jet valves.

Remarks. -- Constructed between 1950 and 1952. The canal is 5.1 miles long and has a maximum capacity of 1500 cfs. The canal is used to deliver C-BT and Windy Gap Project water stored at Horsetooth Reservoir. Recorder was operated from 01-Oct-2017 to 30-Sep-2018 by the Northern Water and the Colorado Division of Water Resources. Record is complete and fair. This record contains operational data which could be subject to future revisions and changes.

Discharge, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	88	0	0	0	0	0	0	30	27	283	361	92
2	116	0	0	0	0	0	8	36	28	307	354	163
3	117	0	0	0	0	0	11	28	28	392	269	308
4	84	0	0	0	0	0	12	20	28	459	170	328
5	74	0	0	0	0	0	21	19	29	512	375	371
6	74	0	0	0	0	0	25	19	30	442	448	376
7	74	0	0	0	0	0	29	24	30	410	451	344
8	74	0	0	0	0	0	41	33	33	452	455	189
9	73	0	0	0	0	0	31	33	107	472	417	102
10	70	0	0	0	0	0	33	29	66	399	293	86
11	107	0	0	0	0	0	38	28	38	365	176	86
12	113	0	0	0	0	0	23	28	102	363	360	86
13	115	0	0	0	0	0	18	28	136	346	462	83
14	115	0	0	0	0	0	18	28	136	321	461	79
15	115	0	0	0	0	0	18	28	136	372	511	41
16	115	0	0	0	0	0	17	28	136	421	500	31
17	119	0	0	0	0	0	16	28	136	425	380	30
18	121	0	0	0	0	0	15	27	69	431	287	35
19	76	0	0	0	0	0	29	27	35	488	419	36
20	65	0	0	0	0	0	18	27	32	437	527	32
21	65	0	0	0	0	0	16	27	30	373	526	31
22	64	0	0	0	0	0	13	27	30	401	523	139
23	64	0	0	0	0	0	11	27	34	438	512	288
24	63	0	0	0	0	0	11	27	31	438	333	364
25	64	0	0	0	0	0	11	27	31	443	227	391
26	44	0	0	0	0	0	11	27	89	378	370	335
27	35	0	0	0	0	0	12	26	129	305	468	322
28	35	0	0	0	0	0	14	25	152	249	466	194
29	34	0	0	0	0	0	14	25	138	420	435	130
30	21	0	0	0	0	0	14	25	221	443	384	128
31	6	0	0	0	0	0	0	25	0	386	207	0
Min	6	0	0	0	0	0	0	19	27	249	170	30
Max	121	0	0	0	0	0	41	36	221	512	527	391
Mean	77	0	0	0	0	0	18	27	75	399	391	174
ac-ft	4754	16	5	0	0	0	1083	1659	4446	24493	24007	10334



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Carter Lake near Berthoud, Colorado, CO

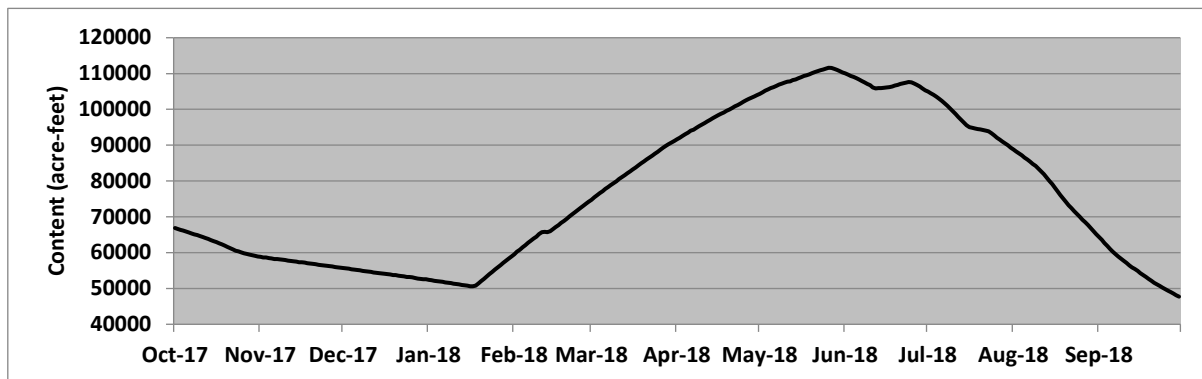
Location. --Lat 40°19' 28" , long 105°12' 41" , Larimer County, Hydrologic Unit 10190006, on Dam #1, 7 miles northwest of Berthoud, Colorado, and 10 miles west of Loveland, Colorado.

Gage. --Water level recorder with satellite telemetry. Elevation of gage is 5770 from topographic map.

Remarks. --Reservoir is formed by three earth-fill dams. Construction completed in 1952. Carter Lake is one of two terminal reservoirs for C-BT water diversions. Trans-mountain water diversions are stored at Carter Lake before final delivery. Maximum capacity is 112,200 AF at elevation 5759.00 feet, with 108,900 AF of active capacity. Recorder was operated from 01-Oct-2017 to 30-Sep-2018. Record is complete and fair. This record contains operational data which could be subject to future revisions and changes.

Storage, AF, 2400-hour Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	66879	58812	55698	52394	59546	74776	91652	104357	110040	104971	88777	64334
2	66611	58638	55609	52263	60255	75486	92122	104759	109711	104525	88250	63532
3	66372	58610	55511	52149	60783	76037	92636	105217	109371	104033	87724	62704
4	66152	58437	55332	52026	61479	76591	93086	105598	109042	103511	87157	61852
5	65903	58364	55287	51930	62020	77176	93483	105933	108679	102988	86560	61014
6	65607	58246	55135	51852	62722	77762	94009	106247	108308	102401	85975	60236
7	65350	58182	55055	51703	63343	78340	94354	106584	107923	101715	85390	59564
8	65122	58073	54930	51607	63909	78879	94861	106876	107540	101008	84787	58894
9	64903	58027	54841	51520	64486	79398	95304	107180	107135	100225	84173	58291
10	64666	57899	54752	51364	65169	79929	95792	107484	106730	99478	83490	57691
11	64382	57754	54645	51251	65730	80523	96237	107686	106124	98656	82724	57165
12	64098	57682	54494	51103	65817	81066	96682	107856	105821	97870	81879	56452
13	63852	57609	54378	50999	65740	81632	97052	108172	105911	97085	80963	55914
14	63522	57482	54298	50912	65951	82198	97498	108375	105967	96280	80052	55403
15	63239	57355	54175	50774	66563	82735	97946	108691	106035	95543	79102	54859
16	62901	57301	54069	50635	67187	83272	98394	109019	106124	95067	78096	54316
17	62582	57183	54024	50583	67716	83810	98755	109302	106247	94894	77064	53750
18	62283	57057	53882	50825	68285	84381	99171	109541	106382	94699	76088	53220
19	61927	56957	53759	51381	68866	84922	99566	109790	106629	94516	75116	52658
20	61591	56858	53697	52026	69458	85474	99973	110097	106853	94365	74088	52140
21	61275	56732	53573	52693	70119	86016	100402	110403	107068	94204	73185	51625
22	60912	56615	53450	53343	70686	86570	100875	110654	107293	94074	72424	51146
23	60551	56542	53370	53971	71254	87084	101239	110939	107472	93902	71636	50696
24	60356	56408	53176	54663	71853	87619	101681	111133	107675	93332	70793	50220
25	60089	56318	53185	55260	72463	88134	102113	111395	107506	92668	70002	49807
26	59822	56228	53114	55860	73056	88788	102512	111611	107180	92079	69224	49387
27	59619	56129	52973	56524	73631	89306	102911	111543	106808	91514	68449	48967
28	59445	56003	52789	57093	74198	89867	103289	111281	106348	90981	67668	48549
29	59251	55860	52693	57745		90301	103655	110996	105854	90450	66841	48106
30	59059	55770	52578	58382		90737	103989	110631	105351	89898	65999	47716
31	58894		52534	58940		91216		110358		89338	65179	
Min	58894	55770	52534	50583	59546	74776	91652	104357	105351	89338	65179	47716
Max	66879	58812	55698	58940	74198	91216	103989	111611	110040	104971	88777	64334
Mean	62813	57304	54097	53025	66867	83227	98041	108700	107171	96654	77705	55007
EOM	58894	55770	52534	58940	74198	91216	103989	110358	105351	89338	65179	47716



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Saint Vrain Canal below Carter Reservoir, CO

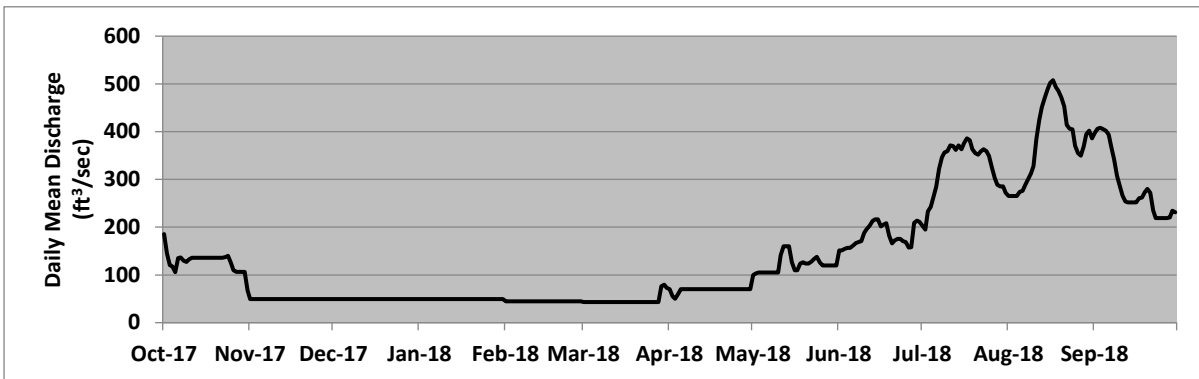
Location. --Lat 40°19'27", long 105°12'35", Larimer County, Hydrologic Unit 10190006, downstream from Carter Reservoir Dam #1, 7 miles northwest of Berthoud, Colorado, and 10 miles west of Loveland, Colorado.

Gage. -- Water-stage recorder with telephone telemetry. Data provided by the Northern Water. Elevation of gage is 5,590 feet from topographic map.

Remarks. -- Constructed between 1952 and 1954. The canal is 9.8 miles long and has a maximum capacity of 625 cfs. The canal is used to deliver C-BT and Windy Gap Project water, as well as diverted native water from conveyance contract holders. Record was provided by the Northern Water for the period 01-Oct-2017 to 30-Sep-2018. Record is complete and fair. This record contains operational data which could be subject to future revisions and changes.

Flow, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	185	50	49	49	44	43	70	100	151	203	265	396
2	146	50	49	49	44	43	55	103	151	195	265	406
3	121	50	49	49	44	43	50	105	155	233	265	408
4	118	50	49	49	44	43	59	105	156	242	265	405
5	106	50	49	49	44	43	70	105	156	265	274	402
6	135	50	49	49	44	43	70	105	161	285	276	394
7	136	50	49	49	44	43	70	105	167	322	288	369
8	130	50	49	49	44	43	70	105	168	347	300	341
9	127	50	49	49	44	43	70	105	170	356	312	308
10	133	50	49	49	44	43	70	105	188	359	328	288
11	136	50	49	49	44	43	70	142	196	371	384	266
12	136	50	49	49	44	43	70	160	203	370	424	254
13	136	50	49	49	44	43	70	160	213	362	451	252
14	136	50	49	49	44	43	70	160	216	371	470	252
15	136	50	49	49	44	43	70	127	216	363	488	252
16	136	50	49	49	44	43	70	110	202	376	502	252
17	136	50	49	49	44	43	70	110	206	386	508	261
18	136	50	49	49	44	43	70	124	208	382	493	262
19	136	50	49	49	44	43	70	126	182	363	485	273
20	136	50	49	49	44	43	70	124	166	355	472	280
21	136	50	49	49	44	43	70	124	172	352	453	272
22	136	50	49	49	44	43	70	128	175	359	414	235
23	137	50	49	49	44	43	70	133	175	363	406	219
24	140	50	49	49	44	43	70	138	171	359	405	219
25	125	50	49	49	44	43	70	127	168	349	371	219
26	110	50	49	49	44	43	70	120	157	325	355	219
27	107	50	49	49	44	43	70	120	158	303	350	219
28	107	50	49	49	44	43	70	120	209	289	369	220
29	107	50	49	49		77	70	120	214	285	395	235
30	107	50	49	49		80	70	120	211	285	402	231
31	67		49	49		73		120		272	386	
Min	67	50	49	49	44	43	50	100	151	195	265	219
Max	185	50	49	49	44	80	70	160	216	386	508	408
Mean	128	50	49	49	44	46	69	121	182	324	381	287
ac-ft	7854	2950	3022	3013	2460	2848	4090	7429	10784	19893	23406	17047



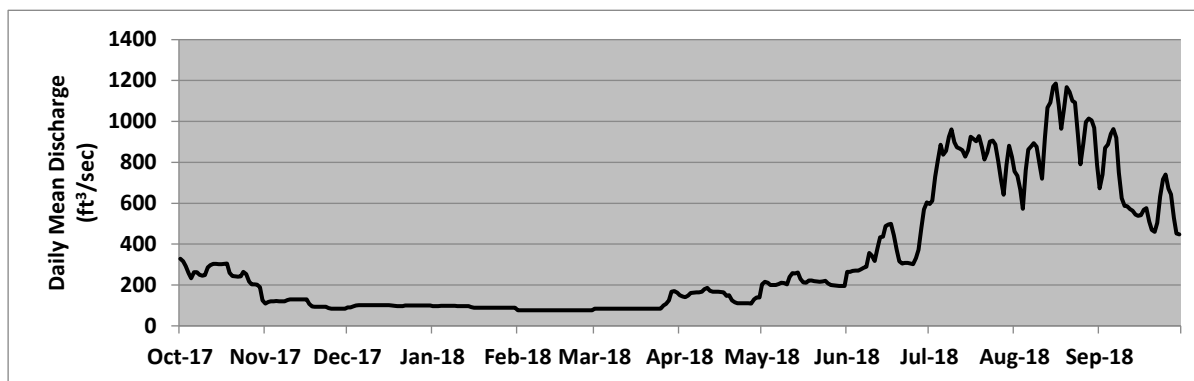
Appendix A (38 of 38)
Colorado-Big Thompson Project, CO

Location. -- Larimer , Grand, Summit, Boulder, Weld counties in Colorado, hydrologic units 14010001, 14010002 and 10190006, 10190007, on the Colorado River, Big Thompson River and Cache La Poudre River basins.

Remarks.— This table presents a summation of all the daily deliveries of C-BT and Windy Gap Project water through the Saint Vrain Canal, the Charles Hansen Supply Canal, the Dixon Canal, the Charles Hansen Feeder Canal and small deliveries upstream from Flatiron Reservoir. These values include metered water. The C-BT is a trans-mountain water diversion system. The water diverted is used for agricultural, municipal and industrial purposes, to generate hydroelectric power and to provide recreation for the public. This record contains operational data which could be subject to future revisions and changes. Period of record is between 01-Oct-2017 and 30-Sep-2018. Data was provided by the Northern Water. Record is complete and reliable.

Total Daily Water Deliveries, cfs, Daily Mean Values

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	328	110	90	97	76	84	151	204	265	596	756	673
2	316	116	90	97	76	84	143	216	265	612	733	740
3	292	120	96	97	76	84	140	211	268	728	667	871
4	258	120	100	98	76	84	148	201	270	805	572	887
5	232	121	101	98	76	84	161	199	270	886	760	939
6	262	120	101	98	76	84	163	199	276	837	862	962
7	263	120	101	98	76	84	164	204	284	856	877	920
8	251	120	101	98	76	84	164	211	289	924	894	749
9	246	126	101	97	76	84	167	209	357	960	877	624
10	248	130	101	97	76	84	180	204	343	898	792	587
11	286	130	101	97	76	84	185	239	318	874	720	586
12	297	130	101	97	76	84	172	258	382	867	920	571
13	304	130	101	97	76	84	167	256	433	860	1068	563
14	303	130	101	97	76	84	167	261	437	828	1092	544
15	301	129	101	91	76	84	167	229	488	859	1172	538
16	301	129	101	88	76	84	166	213	495	926	1185	542
17	303	107	100	88	76	84	165	211	499	914	1081	568
18	305	95	98	88	76	84	147	221	442	903	964	576
19	259	93	97	88	76	84	151	222	371	928	1066	510
20	243	93	97	88	76	84	126	219	316	875	1168	469
21	243	93	97	88	76	84	115	218	304	813	1144	461
22	240	93	99	88	76	84	111	215	307	848	1100	503
23	242	93	100	88	76	84	110	217	308	901	1092	632
24	264	87	100	88	76	84	110	220	305	906	936	717
25	253	83	100	88	76	84	110	208	302	887	790	739
26	217	83	100	88	76	100	110	201	332	806	892	671
27	203	83	100	88	76	108	110	199	373	713	997	644
28	203	83	99	88	76	125	129	196	480	641	1014	529
29	201	83	100	88		166	138	196	570	789	1004	452
30	189	83	100	88		170	139	195	604	881	969	448
31	124		100	88		163		195		826	788	
Min	124	83	90	88	76	84	110	195	265	596	572	448
Max	328	130	101	98	76	170	185	261	604	960	1185	962
Mean	257	108	99	93	76	95	146	214	365	837	934	640
ac-ft	15797	6409	6084	5678	4229	5805	8661	13160	21688	51380	57328	38045



APPENDIX B—TABLES

B-1: WESTERN DIVISION—PICK-SLOAN MISSOURI BASIN PROGRAM PERTINENT RESERVOIR DATA

WESTERN DIVISION – PICK-SLOAN MISSOURI BASIN PROGRAM					
PERTINENT RESERVOIR DATA					
(Data in AF)					
Reservoir	Dead Storage ¹ /	Active Storage ² /	Total Storage	Normal Minimum Storage	Limitation on normal minimum storage
Green Mountain	6,860	146,779	153,639	47,684	Minimum elevation for rated power output
Willow Creek	1,486	9,779	10,553	6,675	Elevation of pump canal head-works
Lake Granby	74,190	465,568	539,758	74,190	Lowest outlet elevation
Shadow Mountain	506	16,848	17,354	16,026	Minimum permissible Grand Lake elevation; 8,366 ft.
Grand Lake	3/	511	1,015	504	Legislation limits fluctuation
Marys Lake	42	885	927	308	Minimum elevation for power generation
Lake Estes	409	2,659	3,068	740	Minimum elevation to release 550 cfs
Pinewood Lake	416	1,765	2,181	613	Minimum elevation for power generation
Flatiron	125	635	760	324	Minimum elevation to release 550 cfs
Carter Lake	3,306	108,924	112,230	306	Lowest outlet elevation
Horsetooth	7,003	149,732	156,735	17,600	Elevation on highest delivery works
Total	94,343	903,373	998,220	167,970	
1/ Storage capacity below elevation of lowest outlet					
2/ Total storage minus dead storage					
3/ Not determined					

B-2: C-BT MONTHLY SUMMARY OF BLUE RIVER OPERATIONS

C-BT MONTHLY SUMMARY OF BLUE RIVER OPERATIONS

WATER YEAR 2018

(AF)

	INITIAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
UNDEPLETED RUNOFF ABOVE GREEN MNT RESV		18,032	11,901	8,910	9,061	8,322	10,614	20,924	81,126	71,008	24,089	14,030	8,944	286,961
UNDEPLETED RUNOFF ABOVE DILLON RES.		10,176	6,755	4,553	5,254	4,784	5,229	11,924	51,500	41,239	13,845	7,980	5,786	169,024
PERCENT OF TOTAL UNDEPLETED RUNOFF ABOVE DILLON		0.564	0.568	0.511	0.580	0.575	0.493	0.570	0.635	0.581	0.575	0.569	0.647	0.589
DEPLETIONS BY 1929 COLORADO SPRINGS RIGHT		0	0	0	0	0	0	115	267	334	96	0	0	813
DEPLETIONS BY 1948 COLORADO SPRINGS RIGHT		1,669	392	0	0	0	0	1	2,287	2,704	336	0	252	7,641
INFLOW TO DILLON		10,060	6,899	4,553	5,254	4,784	5,229	11,791	48,241	36,901	13,754	7,983	5,788	161,237
DILLON STORAGE (1000 AF)	245.3	247.8	246.3	244.5	243.3	242.2	239.4	236.9	260.3	250.5	236.7	223.3	203.1	
ROBERTS TUNNEL DIVERSIONS		204	1	4	2	2	1,585	7,361	11,587	18,609	16,100	15,977	21,594	93,025
DILLON OUTFLOW TO THE RIVER		6,180	7,424	6,312	6,483	5,915	6,442	6,898	12,780	27,135	10,274	4,414	3,304	103,561
TOTAL DEPLETIONS BY DENVER		3,880	-525	-1,759	-1,230	-1,131	-1,213	4,893	35,461	9,766	3,480	3,569	2,484	57,676
RUNOFF BETWEEN DILLON & GREEN MTN RESV.		7,861	5,190	4,344	3,800	3,547	5,391	8,985	30,324	29,190	10,022	6,021	3,158	117,833
ACTUAL INFLOW TO GREEN MTN RESERVOIR		14,037	12,570	10,669	10,291	9,453	11,827	15,897	42,407	56,905	20,518	10,464	6,462	221,498
GREEN MOUNTAIN EOM STORAGE (1000 AF)	105.2	80.5	75.5	73.6	70.5	68.3	65.8	63.0	96.0	147.3	135.3	93.5	70.4	
TOTAL GREEN MOUNTAIN OUTFLOW		38,411	17,440	12,546	13,359	11,654	14,388	18,516	8,979	4,612	31,506	51,589	29,103	252,102

B-3: PICK-SLOAN MISSOURI BASIN PROGRAM 2018 SUMMARY ACTUAL OPERATIONS

													Table 3		1 OF 3
PICK-SLOAN MISSOURI BASIN PROGRAM															
WESTERN DIVISION WATER AND POWER SYSTEM															
C-BT															
2018 ACTUAL OPERATIONS															
	WATER IN 1000 AF				***	***	***	***	***	***	ENERGY IN GWH				
	INITIAL														
	OR TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
GREEN MOUNTAIN RESERVOIR															
Depleted Watershed Inflow	221.5	14.0	12.6	10.7	10.3	9.5	11.8	15.9	42.4	56.9	20.5	10.5	6.5		
Turbine Release	232.8	38.4	17.4	12.5	13.4	11.7	14.4	18.3	8.9	0.8	31.5	51.6	13.9		
Bypass	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	3.8	0.0	0.0	15.3		
Spill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
End of Month Content	105.2	80.5	75.5	73.6	70.5	68.3	65.8	63.0	96.0	147.3	135.3	93.5	70.4		
Kwh/AF		176.7	163.5	137.3	143.0	138.7	141.7	158.7	115.2	139.5	210.9	197.9	183.6		
Generation	40.4	6.8	2.9	1.7	1.9	1.6	2.0	2.9	1.0	0.1	6.6	10.2	2.6		
WILLOW CREEK RESERVOIR															
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
Inflow	40.5	1.7	1.2	0.8	0.9	0.8	1.1	4.9	20.7	5.3	1.5	0.9	0.8		
Release to River	12.0	1.5	0.4	0.4	0.4	0.4	0.5	0.5	4.5	1.1	0.9	0.9	0.4		
Pumped to Granby	25.8	0.0	0.0	0.0	0.0	0.0	0.0	5.3	14.4	4.3	0.4	0.1	1.2		
End of Month Content	6.2	6.3	7.0	7.4	7.8	8.1	8.8	7.9	9.4	9.0	8.8	8.7	7.8		
Pump Energy	5.3	0.0	0.0	0.0	0.0	0.0	0.0	1.1	3.0	0.9	0.1	0.0	0.2		
GRANBY - SHADOW MOUNTAIN - GRAND LAKE															
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP		
Natural Watershed Inflow	191.0	10.1	5.6	3.1	3.7	3.3	3.3	11.8	75.7	51.4	12.9	6.8	3.3		
Total Inflow into Granby	191.8	7.2	4.8	4.5	4.3	3.8	4.0	14.4	80.3	45.4	11.7	6.2	5.2		
Granby Fish Release	33.8	1.8	1.3	1.4	1.4	1.2	1.3	1.2	4.3	5.4	6.2	4.8	3.4		
Granby Seepage	5.8	0.6	0.5	0.5	0.5	0.4	0.4	0.3	0.4	0.5	0.6	0.6	0.5		
Granby Spill	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Adams Tunnel	236.5	3.7	2.2	10.5	21.8	29.2	33.6	28.7	31.4	19.2	19.9	23.6	12.6		
Granby End of Month content	518.2	520.5	520.9	511.6	491.4	463.8	431.8	420.4	490.0	522.0	504.2	479.0	463.6		
SM-GL End of Month Content	17.8	17.5	17.8	17.6	17.8	17.8	17.8	17.4	17.5	17.0	17.5	17.5	17.7		
Pumped from Granby	189.8	0.9	1.9	11.8	22.6	29.8	34.3	23.9	3.7	3.4	19.7	23.6	14.2		
Granby Pump Kwh/AF		138.8	140.2	139.5	141.9	144.9	148.2	151.9	157.4	141.8	143.6	146.8	144.3		
Granby Pump Energy	27.7	0.1	0.3	1.6	3.2	4.3	5.1	3.6	0.6	0.5	2.8	3.5	2.0		

PICK-SLOAN MISSOURI BASIN PROGRAM
 WESTERN DIVISION WATER AND POWER SYSTEM
 C-BT

2018 ACTUAL OPERATIONS													
	WATER IN 1000 AF				***					ENERGY IN GWH			
	INITIAL												
	OR TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
BASE GENERATION													
Green Mountain	40.4	6.8	2.9	1.7	1.9	1.6	2.0	2.9	1.0	0.1	6.6	10.2	2.6
Flatiron 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Big Thompson	1.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.2	0.4
TOTAL	41.8	6.9	2.9	1.7	1.9	1.6	2.0	2.9	1	0.7	6.7	10.4	3.0
LOAD FOLLOWING GENERATION													
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Marys Lake	38.6	0.0	0.0	1.6	3.6	5.2	6.0	5.1	5.4	2.9	3.2	3.9	1.7
Estes	110.8	1.3	0.7	4.9	10.5	14.1	15.8	14.4	14.9	8.5	9.1	10.9	5.6
Pole Hill	142.8	0.0	0.0	0.0	0.3	20.9	24.6	19.7	22.8	18.7	12.9	15.9	6.9
Flatiron 1 & 2	210.3	0.0	0.0	7.4	18.5	25.5	29.5	26.0	30.5	25.0	16.9	21.1	9.9
TOTAL	502.5	1.3	0.7	13.9	32.9	65.7	75.9	65.2	73.6	55.1	42.1	51.8	24.1
PUMP ENERGY													
		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Willow Creek	5.3	0.0	0.0	0.0	0.0	0.0	0.0	1.1	3.0	0.9	0.1	0.0	0.2
Granby	27.7	0.1	0.3	1.6	3.2	4.3	5.1	3.6	0.6	0.5	2.8	3.5	2.0
Flatiron 3	30.9	0.0	0.000	0.0	3.0	5.7	6.6	6.2	5.2	2.5	1.6	0.0	0.0
TOTAL	63.9	0.1	0.3	1.6	6.2	10	11.7	10.9	8.8	3.9	4.5	3.5	2.2
TOTAL GENERATION	544.3	8.2	3.6	15.6	34.8	67.3	77.9	68.1	74.6	55.8	48.8	62.2	27.1
TOTAL GENERATION MINUS PUMP	480.4	8.1	3.3	14	28.6	57.3	66.2	57.2	65.8	51.9	44.3	58.7	24.9

B-4: 2018 FLOOD DAMAGE PREVENTED

C-BT
FLOOD DAMAGE PREVENTED IN WATER YEAR 2018

	Cumulative Total Prior to WY 2018	WY 2018	Cumulative Total Current
Granby, Willow Creek, Shadow Mountain and Grand Lake	\$502,700	\$52,187	\$554,887
Green Mountain	\$216,394	\$0	\$216,394
Total	\$719,094	\$52,187	\$771,281

B-5: C-BT OCTOBER 2018 MOST PROBABLE PLAN FOR WATER YEAR 2019



COLORADO - BIG THOMPSON MONTHLY OPERATIONS

United States Bureau of Reclamation
Eastern Colorado Area Office



CBT October 2018 Most Probable: 01-OCT-2018

Loveland, Colorado

HYDROLOGY OPERATIONS

Dillon Reservoir

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Dillon Inflow	kaf	5.1	5.2	4.4	3.7	3.0	3.2	6.1	26.9	59.7	34.7	16.0	9.7	177.7
DL to GM Gain	kaf	4.0	3.8	3.4	3.0	2.5	3.5	7.0	19.0	40.2	22.4	13.3	7.2	129.3

Green Mountain Reservoir

Init Cont:	70.00 kaf	Maximum Cont:	154.60 kaf	Minimum Cont:	8.00 kaf
Elev:	7899.7 ft	Elev:	7950.4 ft	Elev:	7804.7 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Undepleted Inflow	kaf	9.1	9.0	7.9	6.7	5.5	6.7	13.2	46.8	105.5	57.9	29.9	16.9	315.1
Depletion	kaf	1.7	1.9	1.1	0.3	-0.1	-0.1	1.0	20.8	56.4	27.0	9.3	3.7	123.0
Depleted Inflow	kaf	7.5	7.1	6.8	6.4	5.6	6.9	12.2	26.0	49.1	30.8	20.7	13.2	192.3
Turbine Release	kaf	13.5	8.6	8.7	9.1	8.2	9.1	7.0	3.7	3.6	11.5	23.8	47.8	154.6
Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	cfs	220	145	142	148	148	148	118	60	60	187	387	803	
Min Release	cfs	60	60	60	60	60	60	60	60	60	60	60	60	
Total River Release	kaf	13.5	8.6	8.7	9.1	8.2	9.1	7.0	3.7	3.6	11.5	23.8	47.8	154.6
Evaporation	kaf	0.2	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.6	0.5	0.4	2.9
End-Month Targets	kaf	64.0	60.6	60.6	53.0	53.0	53.0	58.0	80.0	140.0	145.0	140.0	105.0	
End-Month Contents	kaf	64.2	62.6	60.7	58.0	55.3	53.0	58.0	80.0	125.0	143.7	140.0	105.0	
End-Month Elevation	ft	7894.37	7892.96	7891.17	7888.62	7886.01	7883.66	7888.65	7907.18	7935.59	7945.21	7943.38	7924.16	

Willow Creek Reservoir

Init Cont:	8.00 kaf	Maximum Cont:	10.20 kaf	Minimum Cont:	7.20 kaf
Elev:	8119.5 ft	Elev:	8128.8 ft	Elev:	8116.9 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	0.8	0.8	0.7	0.6	0.5	0.8	2.9	16.3	12.4	3.8	1.6	1.1	42.3
Minimum Release	kaf	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.8
5412.5 Release	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.8
Pumped to Granby	kaf	0.0	1.2	0.0	0.0	0.0	0.0	2.0	15.7	11.9	3.3	1.1	0.6	35.8
Evaporation	kaf	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.7
End-Month Targets	kaf	9.0	7.2	7.6	8.2	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	
End-Month Contents	kaf	8.1	7.2	7.5	7.6	7.7	8.1	8.5	8.6	8.5	8.5	8.5	8.5	
End-Month Elevation	ft	8120.78	8116.90	8118.06	8118.82	8119.28	8120.74	8122.54	8122.75	8122.54	8122.54	8122.54	8122.54	



CBT October 2018 Most Probable: 01-OCT-2018

Granby Reservoir		Init Cont: 464.00 kaf			Maximum Cont: 539.80 kaf			Minimum Cont: 76.50 kaf						
		Elev: 8269.2 ft			Elev: 8280.0 ft			Elev: 8186.9 ft						
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	1.9	1.9	1.6	1.4	1.2	1.6	4.0	17.7	35.6	14.1	5.4	3.1	89.5
Release from Shadow Mtn	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	3.5	25.6	7.5	2.5	2.1	53.6
Pump from Windy Gap	kaf	0.0	0.0	0.0	0.0	0.0	0.0	2.6	23.8	13.7	0.0	0.0	0.0	40.1
Pump from Willow Creek	kaf	0.0	1.2	0.0	0.0	0.0	0.0	2.0	15.7	11.9	3.3	1.1	0.6	35.8
Total Inflow	kaf	4.1	5.7	4.4	2.7	2.3	2.9	9.8	60.8	86.8	25.0	9.0	5.9	219.4
Minimum River Release	kaf	1.2	1.2	1.2	1.2	1.1	1.2	1.2	4.6	4.5	4.6	2.5	1.2	25.7
5412.5 Release	kaf	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	3.2	5.5
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	1.3	1.2	1.2	1.2	1.1	1.2	1.2	4.6	4.5	4.6	4.6	4.4	31.1
Pumped to Shadow Mtn	kaf	25.4	6.9	20.2	33.1	30.1	21.2	29.1	11.5	0.0	2.1	9.8	9.7	199.1
Evaporation	kaf	1.6	0.7	0.0	0.0	0.0	0.8	1.3	2.0	2.8	2.7	2.1	1.9	15.9
Seepage loss	kaf	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	3.6
End-Month Contents	kaf	439.1	435.8	418.4	386.4	357.3	336.6	314.6	357.0	436.3	451.5	443.6	433.2	
End-Month Elevation	ft	8265.50	8265.00	8262.32	8257.23	8252.41	8248.88	8245.01	8252.36	8265.07	8267.37	8266.19	8264.60	

Shadow Mountain Reservoir		Init Cont: 17.00 kaf			Maximum Cont: 18.40 kaf			Minimum Cont: 16.60 kaf						
		Elev: 8366.6 ft			Elev: 8367.0 ft			Elev: 8366.0 ft						
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	2.6	2.5	2.2	1.9	1.6	2.1	5.3	22.9	46.5	20.0	7.1	4.2	118.9
Pumped from Granby	kaf	25.4	6.9	20.2	33.1	30.1	21.2	29.1	11.5	0.0	2.1	9.8	9.7	199.1
Total Inflow	kaf	28.0	9.4	22.4	35.0	31.7	23.4	34.3	34.4	46.5	22.1	16.9	13.9	318.0
Minimum River Release	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	1.2	3.0	3.1	2.5	2.1	24.3
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	3.5	25.6	7.5	2.5	2.1	53.6
Adams Tunnel Flow	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	30.2	20.0	13.8	13.8	11.3	259.6
Evaporation	kaf	0.3	0.1	0.0	0.0	0.0	0.2	0.3	0.5	0.6	0.5	0.4	0.4	3.3
End-Month Contents	kaf	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	
End-Month Elevation	ft	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	

Adams Tunnel		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Tunnel Capacity	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	30.2	20.0	13.8	13.8	25.6	334.5
Actual Diversion	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	30.2	20.0	13.8	13.8	11.3	259.6
% Maximum Delivery	%	75	20	58	100	100	65	100	100	100	100	100	44	



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Lake Estes														
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Big Thompson Inflow	kaf	1.0	0.5	0.3	0.2	0.1	1.0	3.2	10.3	20.1	13.3	6.1	2.9	59.0
Minimum River Release	kaf	3.1	1.5	1.5	1.5	1.4	1.5	3.6	6.9	7.4	7.7	6.9	3.7	46.7
Actual River Release	kaf	2.6	0.5	0.3	0.2	0.1	1.0	3.2	6.7	7.4	7.7	6.0	2.9	38.6
Max Diversion Available	kaf	0.0	0.0	0.0	0.0	0.0	0.1	0.4	3.6	12.7	5.6	0.1	0.0	22.5
Priority Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.7	0.0	0.0	0.0	2.9
Skim Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	10.0	5.6	0.1	0.0	19.1
% Maximum Diversion	%	0	0	0	0	0	0	0	100	100	100	101	0	
Irrigation Demand	kaf	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	1.6
Irrigation Delivery	kaf	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1	1.6
Total River Release	kaf	2.6	0.5	0.3	0.2	0.1	1.0	3.2	6.7	7.4	7.7	6.0	2.9	38.6

Olympus Tunnel														
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Tunnel Capacity	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.8	32.7	33.8	33.8	32.7	397.9
Actual Delivery	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.6	33.6	32.6	19.2	13.8	11.2	278.7
% Maximum Delivery	%	70	20	58	100	100	65	100	99	99	57	41	34	
Inflow to Flatiron	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.6	33.6	32.6	19.2	13.8	11.2	278.7

Carter Lake														
		Init Cont: 48.00 kaf			Maximum Cont: 112.20 kaf			Minimum Cont: 6.00 kaf						
		Elev: 5694.8 ft			Elev: 5759.0 ft			Elev: 5626.8 ft						
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Pumped from Flatiron	kaf	17.4	2.9	12.2	20.3	16.6	16.7	9.3	7.6	9.5	0.0	0.0	0.0	112.5
Flatiron Bifurcation	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carter to Flatiron	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Evaporation Loss	kaf	0.2	0.1	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.5	0.3	0.3	2.7
Seepage Loss	kaf	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	1.8
End-Month Targets	kaf	112.0	20.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	
End-Month Contents	kaf	56.6	56.2	65.1	82.3	95.5	108.4	112.0	112.0	112.0	93.0	69.7	52.8	
End-Month Elevation	ft	5704.92	5704.47	5714.11	5731.48	5743.49	5755.19	5758.63	5758.58	5758.52	5741.63	5718.94	5700.63	
Priority Water Diverted to Carter	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation Demand	kaf	7.7	2.5	2.6	2.4	2.8	3.1	5.0	6.5	7.6	17.3	21.6	15.6	94.7
Metered Demand	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Windy Gap demand	kaf	0.5	0.6	0.5	0.5	0.4	0.5	0.3	0.6	1.3	1.1	1.2	1.0	8.5
Total Demand	kaf	8.2	3.1	3.1	2.9	3.2	3.6	5.3	7.1	8.9	18.4	22.8	16.6	103.2
Total Delivery	kaf	8.2	3.1	3.1	2.9	3.2	3.6	5.3	7.1	8.9	18.4	22.8	16.6	103.2
% Required Delivery	%	100	100	100	100	100	100	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



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Hansen Canal 930

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Minimum Flow	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Flow	kaf	35.0	55.3	57.2	57.2	51.6	16.6	55.3	57.2	55.3	57.2	57.2	55.3	610.4
Actual Flow	kaf	6.4	3.5	7.4	13.4	13.9	5.1	23.2	25.9	23.0	19.2	13.8	11.2	166.0

Dille Tunnel

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Big Thompson River Below Lake Estes	kaf	2.6	0.5	0.3	0.2	0.1	1.0	3.2	6.7	7.4	7.7	6.0	2.9	38.6
North Fork Big Thompson River at Drake	kaf	0.5	0.4	0.3	0.3	0.2	0.2	0.4	1.7	2.7	1.7	1.0	0.6	10.0
Dille Skim Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	7.7	6.9	4.6	1.1	26.2
Dille Priority Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
water available	kaf	3.2	0.9	0.7	0.5	0.3	1.2	3.6	8.4	10.1	9.4	7.0	3.5	48.8
water diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	7.7	6.9	4.6	1.1	26.2
% Diverted	%	0	0	0	0	0	0	0	110	142	128	85	21	
Big T @ Canyon Mouth	kaf	3.2	0.9	0.7	0.5	0.3	1.2	3.6	2.5	2.4	2.5	2.5	2.4	22.7

Trifurcation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Release from Flatiron	kaf	6.4	3.5	7.4	13.4	13.9	5.1	23.2	25.9	23.0	19.2	13.8	11.2	166.0
Release to 550 Canal	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.1	22.3	12.7	11.8	8.5	2.7	127.5
Dille Tunnel	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	7.7	6.9	4.6	1.1	26.2
Total release to river	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.5	7.9	17.8
Irrigation demand	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.4	7.8	17.6
Windy Gap demand	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total requirement	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.5	7.9	17.8
Total delivery	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.5	7.9	17.8
% Required Delivery	%	100	100	100	0	0	0	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



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Hansen Canal 550

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow from Flatiron	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.1	22.3	12.7	11.8	8.5	2.7	127.5
Maximum flow	kaf	19.5	30.8	31.8	31.8	28.7	9.2	30.8	31.8	30.8	31.8	31.8	30.8	339.6
Irrigation demand	kaf	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.6	0.7	0.5	3.5
Irrigation delivery	kaf	0.3	0.1	0.1	0.1	0.1	0.0	0.2	0.3	0.3	0.6	0.7	0.5	3.3
Minimum flow	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	17.9
Rels to Horsetooth	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.1	22.3	12.7	11.8	8.5	2.7	127.5

Horsetooth Reservoir

Init Cont:	92.00 kaf	Maximum Cont:	157.00 kaf	Minimum Cont:	13.00 kaf
Elev:	5393.7 ft	Elev:	5430.0 ft	Elev:	5316.8 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.1	22.3	12.7	11.8	8.5	2.7	127.5
Total irrigation delivery	kaf	16.1	1.9	2.0	2.2	1.9	2.1	3.2	5.4	6.1	29.4	33.7	15.6	119.6
Evaporation loss	kaf	0.3	0.1	0.0	0.0	0.0	0.2	0.4	0.7	0.9	0.8	0.6	0.5	4.5
Seepage loss	kaf	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.2
End-Month Targets	kaf	156.0	80.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	140.0	80.0	
End-Month Content	kaf	78.8	80.0	85.1	96.1	107.8	110.3	129.6	145.6	151.2	132.7	106.8	93.3	
End-Month Elevation	ft	5384.87	5385.74	5389.20	5396.36	5403.55	5405.04	5415.98	5424.44	5427.28	5417.67	5402.98	5394.56	
Priority water diverted to Horsetooth	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.5	0.0	0.0	0.0	2.7
Irrigation demand	kaf	13.1	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.8	21.5	26.4	10.4	73.1
Metered Demand	kaf	2.5	1.5	1.6	1.8	1.6	1.7	2.4	4.2	4.5	7.2	6.1	4.0	39.1
Windy Gap demand	kaf	0.6	0.4	0.4	0.4	0.3	0.4	0.6	0.6	0.8	0.7	1.2	1.3	7.7
Total demand	kaf	16.1	1.9	2.0	2.2	1.9	2.1	3.2	5.4	6.1	29.4	33.7	15.6	119.6
Total irrigation	kaf	16.1	1.9	2.0	2.2	1.9	2.1	3.2	5.4	6.1	29.4	33.7	15.6	119.6
% Required Delivery	%	100	100	100	100	100	100	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CBT Project Summary

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total CBT Delivery	kaf	27.8	4.1	4.4	4.4	4.6	4.9	8.0	11.8	13.3	48.1	59.3	38.4	229.1



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Windy Gap														
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Pumping	kaf	0.0	0.0	0.0	0.0	0.0	0.0	2.6	23.8	13.7	0.0	0.0	0.0	40.1
Losses	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.4	1.4	0.0	0.0	0.0	4.1
Spill	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delivery	kaf	1.1	1.0	0.9	0.9	0.7	0.9	0.9	1.2	2.1	1.8	2.4	2.3	16.2
Account Balance	kaf	-1.1	-2.1	-3.0	-3.9	-4.6	-5.5	-4.0	16.2	26.5	24.7	22.3	19.9	



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PUMPING AND GENERATION OPERATIONS

Green Mountain Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Generation	gwh	18.600	18.000	18.600	18.600	16.800	18.600	18.000	18.600	18.000	18.600	18.600	18.000	219.000
Generation	gwh	2.200	1.400	1.400	1.400	1.300	1.400	1.100	0.600	0.700	2.400	4.900	9.500	28.300
% Maximum Generation	%	12	8	7	8	8	8	6	3	4	13	27	53	
Average	kwh/af	164	161	159	158	156	154	155	163	187	207	208	198	

Willow Creek Pumping

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	24.6	23.8	0.0	0.0	0.0	0.0	23.8	24.6	23.8	24.6	24.6	23.8	193.6
Actual Pumping	kaf	0.0	1.2	0.0	0.0	0.0	0.0	2.0	15.7	11.9	3.3	1.1	0.6	35.8
Pump Energy	gwh	0.000	0.300	0.000	0.000	0.000	0.000	0.400	3.300	2.500	0.700	0.200	0.100	7.500
% Maximum Pumping	%	0	5	0	0	0	0	9	64	50	13	5	3	149
Average	kwh/af	0	213	0	0	0	0	213	213	213	213	213	213	

Lake Granby Pumping

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	36.9	35.7	36.9	36.9	33.3	36.9	35.7	36.9	35.7	36.9	36.9	35.7	434.4
Actual Pumping	kaf	25.4	6.9	20.2	33.1	30.1	21.2	29.1	11.5	0.0	2.1	9.8	9.7	199.1
Pump Energy	gwh	3.700	1.000	2.900	4.900	4.500	3.200	4.500	1.800	0.000	0.300	1.400	1.400	29.600
% Maximum Pumping	%	69	19	55	90	90	58	81	31	0	6	27	27	
Average	kwh/af	144	145	145	147	149	151	154	154	0	144	144	145	



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Marys Lake Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Adams Tunnel Flow	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	30.2	20.0	13.8	13.8	11.3	259.6
Maximum Generation	gwh	6.400	0.800	3.500	6.400	5.800	6.400	6.200	6.400	6.200	6.400	6.400	6.200	67.100
Generation	gwh	4.600	0.800	3.500	6.400	5.800	4.000	6.200	5.600	3.600	2.300	2.300	0.800	45.900
% Maximum Generation	%	18	13	18	19	19	18	19	19	18	17	17	7	
Average	kwh/af	180	127	179	189	189	181	189	186	178	165	165	72	

Lake Estes Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Adams Tunnel Flow	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	30.2	20.0	13.8	13.8	11.3	259.6
Maximum Generation	gwh	16.000	15.500	16.000	16.000	14.500	16.000	15.500	16.000	15.500	16.000	16.000	15.500	188.500
Generation	gwh	11.800	2.400	8.900	16.000	14.400	9.900	15.400	14.100	8.800	6.300	6.400	5.100	119.500
% Maximum Generation	%	74	15	56	100	100	62	100	88	57	40	40	33	
Average	kwh/af	463	366	454	473	473	453	472	468	439	458	460	449	

Pole Hill Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Olympus Tunnel Flow	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.8	32.7	33.8	33.8	32.7	397.9
Maximum Generation	gwh	25.800	25.000	25.800	25.800	23.300	25.800	25.000	25.800	25.000	25.800	25.800	25.000	303.900
Generation	gwh	18.100	3.300	14.100	25.700	23.200	15.800	24.800	25.600	24.800	13.700	9.300	3.300	201.700
% Maximum Generation	%	70	13	55	100	100	61	100	99	99	53	36	13	
Average	kwh/af	536	101	417	761	761	468	759	757	758	404	274	100	



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Flatiron Units 1 and 2 Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow to Flatiron	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.6	33.6	32.6	19.2	13.8	11.2	278.7
Maximum Generation	gwh	32.200	31.200	32.200	32.200	29.100	32.200	31.200	32.200	31.200	32.200	32.200	31.200	379.300
Generation	gwh	22.300	5.000	18.000	32.100	29.000	18.900	30.900	31.800	30.800	15.500	10.500	8.100	252.900
% Maximum Generation	%	69	16	56	100	99	58	99	99	99	48	32	26	
Average	kwh/af	936	773	920	951	951	863	949	946	948	808	758	725	

Flatiron Unit 3 Pump/Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	17.4	2.9	12.2	20.3	16.6	16.7	15.2	15.6	15.1	0.0	0.0	0.0	132.0
Pump from Flatiron	kaf	17.4	2.9	12.2	20.3	16.6	16.7	9.3	7.6	9.5	0.0	0.0	0.0	112.5
Pump Energy	gwh	5.000	0.900	3.600	6.400	5.600	5.900	3.400	2.800	3.500	0.000	0.000	0.000	37.100
% Maximum Pumping	%	100	100	100	100	100	100	62	49	63	0	0	0	
Average	kwh/af	288	297	299	317	336	353	365	366	366	0	0	0	
Maximum Turbine release	kaf	16.8	3.0	12.8	24.4	22.9	26.2	26.1	27.1	26.2	0.0	0.0	0.0	185.5
Carter to Flatiron	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Generation	gwh	3.100	0.600	2.500	5.000	4.900	5.800	5.800	6.000	5.800	0.000	0.000	0.000	39.500
Actual Generation	gwh	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
% Maximum Generation	%	0	0	0	0	0	0	0	0	0	0	0	0	

Big Thompson Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total release	kaf	2.6	0.0	0.0	0.0	0.0	0.0	0.0	9.3	17.8	13.7	9.2	9.0	61.6
Turbine release	kaf	2.6	0.0	0.0	0.0	0.0	0.0	0.0	9.3	17.8	13.7	9.2	9.0	61.6
Wasteway release	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Generation	gwh	3.800	1.900	0.000	0.000	0.000	0.000	0.000	3.800	3.700	3.800	3.800	3.700	24.500
Generation	gwh	0.200	0.000	0.000	0.000	0.000	0.000	0.000	1.200	2.900	2.100	1.200	1.200	8.800
% Maximum Generation	%	4	0	0	0	0	0	0	32	77	54	32	33	
Average	kwh/af	64	0	0	0	0	0	0	133	161	151	133	134	



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Project Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total Generation	gwh	59.100	12.900	45.900	81.600	73.700	50.000	78.500	79.000	71.500	42.300	34.500	27.900	656.900
Total Max Generation	gwh	106.000	92.900	98.700	104.100	94.400	104.800	101.700	108.900	105.400	102.900	102.900	99.600	1222.300

Project Pump Energy

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Granby	gwh	3.700	1.000	2.900	4.900	4.500	3.200	4.500	1.800	0.000	0.300	1.400	1.400	29.600
Willow Creek	gwh	0.000	0.300	0.000	0.000	0.000	0.000	0.400	3.300	2.500	0.700	0.200	0.100	7.500
Flatiron Unit 3	gwh	5.000	0.900	3.600	6.400	5.600	5.900	3.400	2.800	3.500	0.000	0.000	0.000	37.100
Total Pump Energy	gwh	8.700	2.100	6.600	11.300	10.100	9.100	8.300	7.900	6.000	1.000	1.700	1.600	74.400

B-6: C-BT OCTOBER 2018 MINIMUM REASONABLE PLAN FOR WATER YEAR 2019



COLORADO - BIG THOMPSON MONTHLY OPERATIONS
 United States Bureau of Reclamation
 Eastern Colorado Area Office
 Loveland, Colorado



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HYDROLOGY OPERATIONS

Dillon Reservoir

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Dillon Inflow	kaf	5.0	4.2	3.9	3.5	2.9	3.7	11.4	18.6	9.9	7.7	5.0	4.1	79.9
DL to GM Gain	kaf	3.9	3.4	3.1	2.8	2.3	3.0	6.5	11.5	14.3	9.9	8.7	4.6	74.0

Green Mountain Reservoir

Init Cont:	70.00 kaf	Maximum Cont:	154.60 kaf	Minimum Cont:	8.00 kaf
Elev:	7899.7 ft	Elev:	7950.4 ft	Elev:	7804.7 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Undepleted Inflow	kaf	8.8	7.5	7.0	6.3	5.2	6.7	18.0	30.9	29.8	18.4	14.4	8.8	161.8
Depletion	kaf	1.5	0.9	0.5	0.1	-0.2	0.3	5.5	13.2	9.5	2.3	-0.4	-1.8	31.4
Depleted Inflow	kaf	7.3	6.6	6.5	6.2	5.4	6.4	12.5	17.6	20.2	16.1	14.9	10.6	130.3
Turbine Release	kaf	13.3	8.2	8.4	8.8	8.0	8.8	3.7	3.7	3.6	3.7	32.8	25.3	128.3
Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	cfs	217	138	136	143	144	144	63	60	60	60	533	425	
Min Release	cfs	60	60	60	60	60	60	60	60	60	60	60	60	
Total River Release	kaf	13.3	8.2	8.4	8.8	8.0	8.8	3.7	3.7	3.6	3.7	32.8	25.3	128.3
Evaporation	kaf	0.2	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.5	0.5	0.4	0.3	2.6
End-Month Targets	kaf	64.0	60.6	60.6	53.0	53.0	53.0	80.0	153.5	106.0	106.0	85.0	70.0	
End-Month Contents	kaf	64.2	62.5	60.7	58.1	55.5	52.9	61.5	75.2	91.4	103.3	85.0	70.0	
End-Month Elevation	ft	7894.38	7892.89	7891.17	7888.70	7886.16	7883.61	7891.97	7903.51	7915.36	7923.11	7910.88	7899.33	

Willow Creek Reservoir

Init Cont:	8.00 kaf	Maximum Cont:	10.20 kaf	Minimum Cont:	7.20 kaf
Elev:	8119.5 ft	Elev:	8128.8 ft	Elev:	8116.9 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	0.8	0.7	0.6	0.6	0.5	0.5	1.3	3.9	2.4	1.1	0.8	0.6	13.8
Minimum Release	kaf	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.8
5412.5 Release	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.8
Pumped to Granby	kaf	0.0	1.1	0.0	0.0	0.0	0.0	0.1	3.4	1.9	0.6	0.3	0.1	7.5
Evaporation	kaf	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.7
End-Month Targets	kaf	9.0	7.2	7.6	8.2	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	
End-Month Contents	kaf	8.1	7.2	7.4	7.6	7.7	7.7	8.5	8.5	8.5	8.5	8.5	8.5	
End-Month Elevation	ft	8120.71	8116.90	8117.87	8118.56	8118.97	8119.35	8122.54	8122.54	8122.54	8122.54	8122.54	8122.54	



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Granby Reservoir		Init Cont: 464.00 kaf			Maximum Cont: 539.80 kaf			Minimum Cont: 76.50 kaf						
		Elev: 8269.2 ft			Elev: 8280.0 ft			Elev: 8186.9 ft						
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	1.9	1.6	1.5	1.4	1.2	1.3	2.0	8.3	15.6	6.0	3.0	2.1	45.9
Release from Shadow Mtn	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	1.2	3.0	3.1	2.5	2.1	24.3
Pump from Windy Gap	kaf	0.0	0.0	0.0	0.0	0.0	0.0	2.6	23.8	13.7	0.0	0.0	0.0	40.1
Pump from Willow Creek	kaf	0.0	1.1	0.0	0.0	0.0	0.0	0.1	3.4	1.9	0.6	0.3	0.1	7.5
Total Inflow	kaf	4.1	5.4	4.3	2.6	2.3	2.5	5.9	36.7	34.1	9.7	5.7	4.3	117.6
Minimum River Release	kaf	1.2	1.2	1.2	1.2	1.1	1.2	1.2	4.6	4.5	4.6	2.5	1.2	25.7
5412.5 Release	kaf	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	3.2	5.5
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	1.3	1.2	1.2	1.2	1.1	1.2	1.2	4.6	4.5	4.6	4.6	4.4	31.1
Pumped to Shadow Mtn	kaf	25.5	7.1	20.3	33.2	30.1	21.7	31.7	24.8	6.7	9.8	13.0	12.1	236.0
Evaporation	kaf	1.6	0.7	0.0	0.0	0.0	0.8	1.3	2.0	2.5	2.3	1.8	1.6	14.6
Seepage loss	kaf	0.3	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	3.5
End-Month Contents	kaf	439.0	435.1	417.6	385.5	356.3	334.8	306.3	311.4	331.5	324.1	310.2	296.2	
End-Month Elevation	ft	8265.48	8264.89	8262.18	8257.08	8252.24	8248.57	8243.52	8244.42	8247.99	8246.69	8244.21	8241.66	

Shadow Mountain Reservoir		Init Cont: 17.00 kaf			Maximum Cont: 18.40 kaf			Minimum Cont: 16.60 kaf						
		Elev: 8366.6 ft			Elev: 8367.0 ft			Elev: 8366.0 ft						
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	2.5	2.2	2.1	1.9	1.5	1.7	2.7	10.6	20.7	7.8	3.9	2.8	60.4
Pumped from Granby	kaf	25.5	7.1	20.3	33.2	30.1	21.7	31.7	24.8	6.7	9.8	13.0	12.1	236.0
Total Inflow	kaf	28.0	9.3	22.4	35.0	31.7	23.4	34.3	35.4	27.5	17.7	16.9	14.9	296.5
Minimum River Release	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	1.2	3.0	3.1	2.5	2.1	24.3
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	1.2	3.0	3.1	2.5	2.1	24.3
Adams Tunnel Flow	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	33.5	23.7	13.8	13.8	12.3	267.6
Evaporation	kaf	0.3	0.1	0.0	0.0	0.0	0.2	0.3	0.5	0.6	0.5	0.4	0.4	3.3
End-Month Contents	kaf	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	
End-Month Elevation	ft	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	

Adams Tunnel		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Tunnel Capacity	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.5	30.3	13.8	13.8	25.6	348.1
Actual Diversion	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	33.5	23.7	13.8	13.8	12.3	267.6
% Maximum Delivery	%	75	20	58	100	100	65	100	100	78	100	100	48	



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Lake Estes

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Big Thompson Inflow	kaf	1.0	0.5	0.3	0.2	0.1	0.2	1.5	5.6	9.8	5.9	2.8	1.4	29.3
Minimum River Release	kaf	3.1	1.5	1.5	1.5	1.4	1.5	3.6	6.9	7.4	7.7	6.9	3.7	46.7
Actual River Release	kaf	2.6	0.5	0.3	0.2	0.1	0.2	1.5	5.2	7.4	5.9	2.8	1.4	28.1
Max Diversion Available	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.4	0.0	0.0	0.0	2.7
Priority Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Skim Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.4	0.0	0.0	0.0	2.7
% Maximum Diversion	%	0	0	0	0	0	0	0	99	100	99	0	0	
Irrigation Demand	kaf	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.2	0.3	0.2	0.1	1.8
Irrigation Delivery	kaf	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.3	0.2	0.3	0.2	0.1	1.8
Total River Release	kaf	2.6	0.5	0.3	0.2	0.1	0.2	1.5	5.2	7.4	5.9	2.8	1.4	28.1

Olympus Tunnel

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Tunnel Capacity	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.8	32.7	33.8	33.8	32.7	397.9
Actual Delivery	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.6	33.6	25.9	13.6	13.6	12.1	267.1
% Maximum Delivery	%	70	20	58	100	100	65	100	99	79	40	40	37	
Inflow to Flatiron	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.6	33.6	25.9	13.6	13.6	12.1	267.1

Carter Lake

Init Cont: 48.00 kaf Maximum Cont: 112.20 kaf Minimum Cont: 6.00 kaf
Elev: 5694.8 ft Elev: 5759.0 ft Elev: 5626.8 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Pumped from Flatiron	kaf	17.4	2.9	12.2	20.3	16.6	16.7	9.2	7.5	9.4	0.0	0.0	0.0	112.2
Flatiron Bifurcation	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carter to Flatiron	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Evaporation Loss	kaf	0.2	0.1	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.5	0.3	0.3	2.7
Seepage Loss	kaf	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	1.8
End-Month Targets	kaf	112.0	20.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	
End-Month Contents	kaf	56.6	56.2	65.1	82.4	95.6	108.5	112.0	112.0	112.0	91.2	65.4	46.7	
End-Month Elevation	ft	5704.92	5704.50	5714.16	5731.54	5743.56	5755.28	5758.63	5758.59	5758.53	5740.01	5714.43	5693.58	
Priority Water Diverted to Carter	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation Demand	kaf	7.7	2.5	2.6	2.4	2.8	3.0	5.0	6.4	7.5	19.0	24.2	17.3	100.4
Metered Demand	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Windy Gap demand	kaf	0.5	0.6	0.5	0.5	0.4	0.5	0.3	0.6	1.3	1.1	1.2	1.0	8.5
Total Demand	kaf	8.2	3.1	3.1	2.9	3.2	3.5	5.3	7.0	8.8	20.1	25.4	18.3	108.9
Total Delivery	kaf	8.2	3.1	3.1	2.9	3.2	3.5	5.3	7.0	8.8	20.1	25.4	18.3	108.9
% Required Delivery	%	100	100	100	100	100	100	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



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Hansen Canal 930

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Minimum Flow	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Flow	kaf	35.0	55.3	57.2	57.2	51.6	16.6	55.3	57.2	55.3	57.2	57.2	55.3	610.4
Actual Flow	kaf	6.4	3.5	7.3	13.4	13.9	5.1	23.4	26.0	16.5	13.6	13.6	12.1	154.8

Dille Tunnel

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Big Thompson River Below Lake Estes	kaf	2.6	0.5	0.3	0.2	0.1	0.2	1.5	5.2	7.4	5.9	2.8	1.4	28.1
North Fork Big Thompson River at Drake	kaf	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.7	1.0	0.7	0.5	0.3	5.3
Dille Skim Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	6.0	4.1	0.8	0.0	14.4
Dille Priority Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
water available	kaf	3.1	0.9	0.6	0.4	0.3	0.4	1.7	5.9	8.4	6.6	3.2	1.7	33.2
water diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	6.0	4.1	0.8	0.0	14.4
% Diverted	%	0	0	0	0	0	0	0	64	110	76	15	0	
Big T @ Canyon Mouth	kaf	3.1	0.9	0.6	0.4	0.3	0.4	1.7	2.5	2.4	2.5	2.4	1.7	18.9

Trifurcation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Release from Flatiron	kaf	6.4	3.5	7.3	13.4	13.9	5.1	23.4	26.0	16.5	13.6	13.6	12.1	154.8
Release to 550 Canal	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.2	25.4	13.7	11.5	7.5	2.1	129.8
Dille Tunnel	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	6.0	4.1	0.8	0.0	14.4
Total release to river	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	5.3	9.4	20.3
Irrigation demand	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	5.3	9.4	20.3
Windy Gap demand	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total requirement	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	5.3	9.4	20.3
Total delivery	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	5.3	9.4	20.3
% Required Delivery	%	100	100	100	0	0	0	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



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Hansen Canal 550

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow from Flatiron	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.2	25.4	13.7	11.5	7.5	2.1	129.8
Maximum flow	kaf	19.5	30.8	31.8	31.8	28.7	9.2	30.8	31.8	30.8	31.8	31.8	30.8	339.6
Irrigation demand	kaf	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.7	0.8	0.6	3.8
Irrigation delivery	kaf	0.3	0.1	0.1	0.1	0.1	0.0	0.2	0.3	0.3	0.7	0.8	0.6	3.6
Minimum flow	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	17.9
Rels to Horsetooth	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.2	25.4	13.7	11.5	7.5	2.1	129.8

Horsetooth Reservoir

Init Cont: 92.00 kaf **Maximum Cont:** 157.00 kaf **Minimum Cont:** 13.00 kaf
Elev: 5393.7 ft **Elev:** 5430.0 ft **Elev:** 5316.8 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.2	25.4	13.7	11.5	7.5	2.1	129.8
Total irrigation delivery	kaf	16.1	1.8	2.0	2.1	1.9	2.1	3.1	5.3	6.0	33.9	39.4	17.8	131.5
Evaporation loss	kaf	0.3	0.1	0.0	0.0	0.0	0.2	0.4	0.7	0.9	0.8	0.6	0.5	4.5
Seepage loss	kaf	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.2
End-Month Targets	kaf	156.0	80.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	140.0	80.0	
End-Month Content	kaf	78.8	80.0	85.1	96.2	107.9	110.5	130.0	149.3	156.0	132.7	100.1	83.9	
End-Month Elevation	ft	5384.87	5385.74	5389.22	5396.42	5403.63	5405.16	5416.23	5426.30	5429.64	5417.68	5398.90	5388.36	
Priority water diverted to Horsetooth	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Irrigation demand	kaf	13.1	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.8	26.1	32.1	12.5	85.5
Metered Demand	kaf	2.5	1.4	1.6	1.7	1.6	1.7	2.3	4.1	4.4	7.1	6.1	4.0	38.5
Windy Gap demand	kaf	0.6	0.4	0.4	0.4	0.3	0.4	0.6	0.6	0.8	0.7	1.2	1.3	7.7
Total demand	kaf	16.1	1.8	2.0	2.1	1.9	2.1	3.1	5.3	6.0	33.9	39.4	17.8	131.5
Total irrigation	kaf	16.1	1.8	2.0	2.1	1.9	2.1	3.1	5.3	6.0	33.9	39.4	17.8	131.5
% Required Delivery	%	100	100	100	100	100	100	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CBT Project Summary

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total CBT Delivery	kaf	27.8	4.1	4.3	4.3	4.6	4.9	7.9	11.6	13.1	54.5	68.7	43.9	249.7



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Windy Gap														
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Pumping	kaf	0.0	0.0	0.0	0.0	0.0	0.0	2.6	23.8	13.7	0.0	0.0	0.0	40.1
Losses	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.4	1.4	0.0	0.0	0.0	4.1
Spill	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delivery	kaf	1.1	1.0	0.9	0.9	0.7	0.9	0.9	1.2	2.1	1.8	2.4	2.3	16.2
Account Balance	kaf	-1.1	-2.1	-3.0	-3.9	-4.6	-5.5	-4.0	16.2	26.5	24.7	22.3	19.9	



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PUMPING AND GENERATION OPERATIONS

Green Mountain Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Generation	gwh	18.600	18.000	18.600	18.600	16.800	18.600	18.000	18.600	18.000	18.600	18.600	18.000	219.000
Generation	gwh	2.200	1.300	1.300	1.400	1.200	1.400	0.600	0.600	0.600	0.700	6.000	4.300	21.600
% Maximum Generation	%	12	7	7	7	7	7	3	3	3	4	32	24	
Average	kwh/af	164	161	159	158	156	154	156	164	176	184	182	171	

Willow Creek Pumping

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	24.6	23.8	0.0	0.0	0.0	0.0	23.8	24.6	23.8	24.6	24.6	23.8	193.6
Actual Pumping	kaf	0.0	1.1	0.0	0.0	0.0	0.0	0.1	3.4	1.9	0.6	0.3	0.1	7.5
Pump Energy	gwh	0.000	0.200	0.000	0.000	0.000	0.000	0.000	0.700	0.400	0.100	0.100	0.000	1.500
% Maximum Pumping	%	0	5	0	0	0	0	0	14	8	2	1	1	31
Average	kwh/af	0	213	0	0	0	0	213	213	213	213	213	213	

Lake Granby Pumping

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	36.9	35.7	36.9	36.9	33.3	36.9	35.7	36.9	35.7	36.9	36.9	35.7	434.4
Actual Pumping	kaf	25.5	7.1	20.3	33.2	30.1	21.7	31.7	24.8	6.7	9.8	13.0	12.1	236.0
Pump Energy	gwh	3.700	1.000	3.000	4.900	4.500	3.300	4.900	3.900	1.000	1.500	2.000	1.900	35.600
% Maximum Pumping	%	69	20	55	90	90	59	89	67	19	27	35	34	
Average	kwh/af	144	145	145	147	149	151	154	156	154	153	155	157	



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Marys Lake Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Adams Tunnel Flow	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	33.5	23.7	13.8	13.8	12.3	267.6
Maximum Generation	gwh	6.400	0.800	3.500	6.400	5.800	6.400	6.200	6.400	6.200	6.400	6.400	6.200	67.100
Generation	gwh	4.600	0.800	3.500	6.400	5.800	4.000	6.200	6.300	4.300	2.300	2.300	0.800	47.300
% Maximum Generation	%	18	13	18	19	19	18	19	19	18	17	17	7	
Average	kwh/af	180	128	179	189	189	181	189	189	182	165	165	66	

Lake Estes Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Adams Tunnel Flow	kaf	25.5	6.5	19.6	33.8	30.5	21.9	32.7	33.5	23.7	13.8	13.8	12.3	267.6
Maximum Generation	gwh	16.000	15.500	16.000	16.000	14.500	16.000	15.500	16.000	15.500	16.000	16.000	15.500	188.500
Generation	gwh	11.800	2.400	8.900	16.000	14.400	9.900	15.400	15.800	10.800	6.300	6.400	5.500	123.600
% Maximum Generation	%	74	15	56	100	100	62	100	99	70	39	40	36	
Average	kwh/af	463	367	455	473	473	453	472	471	457	457	459	450	

Pole Hill Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Olympus Tunnel Flow	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.8	32.7	33.8	33.8	32.7	397.9
Maximum Generation	gwh	25.800	25.000	25.800	25.800	23.300	25.800	25.000	25.800	25.000	25.800	25.800	25.000	303.900
Generation	gwh	18.100	3.300	14.100	25.700	23.200	15.800	24.800	25.600	19.300	9.100	9.100	3.300	191.400
% Maximum Generation	%	70	13	55	100	100	61	99	99	77	35	35	13	
Average	kwh/af	536	101	417	761	761	468	759	757	589	270	270	100	



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Flatiron Units 1 and 2 Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow to Flatiron	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.6	33.6	25.9	13.6	13.6	12.1	267.1
Maximum Generation	gwh	32.200	31.200	32.200	32.200	29.100	32.200	31.200	32.200	31.200	32.200	32.200	31.200	379.300
Generation	gwh	22.300	4.900	18.000	32.100	29.000	18.800	30.900	31.700	23.400	10.300	10.300	9.000	240.700
% Maximum Generation	%	69	16	56	99	99	58	99	98	75	32	32	29	
Average	kwh/af	936	773	920	951	951	863	948	945	901	756	756	740	

Flatiron Unit 3 Pump/Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	17.4	2.9	12.2	20.3	16.6	16.7	15.2	15.6	15.1	0.0	0.0	0.0	132.0
Pump from Flatiron	kaf	17.4	2.9	12.2	20.3	16.6	16.7	9.2	7.5	9.4	0.0	0.0	0.0	112.2
Pump Energy	gwh	5.000	0.900	3.600	6.400	5.600	5.900	3.300	2.800	3.500	0.000	0.000	0.000	37.000
% Maximum Pumping	%	100	100	100	100	100	100	60	48	62	0	0	0	
Average	kwh/af	288	297	299	317	336	353	365	366	366	0	0	0	
Maximum Turbine release	kaf	16.8	3.0	12.8	24.4	22.9	26.2	26.1	27.1	26.2	0.0	0.0	0.0	185.5
Carter to Flatiron	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Generation	gwh	3.100	0.600	2.500	5.000	4.900	5.800	5.800	6.000	5.800	0.000	0.000	0.000	39.500
Actual Generation	gwh	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
% Maximum Generation	%	0	0	0	0	0	0	0	0	0	0	0	0	

Big Thompson Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total release	kaf	2.6	0.0	0.0	0.0	0.0	0.0	0.0	3.8	8.4	5.5	6.1	9.4	35.8
Turbine release	kaf	2.6	0.0	0.0	0.0	0.0	0.0	0.0	3.8	8.4	5.5	6.1	9.4	35.8
Wasteway release	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Generation	gwh	3.800	1.900	0.000	0.000	0.000	0.000	0.000	3.800	3.700	3.800	3.800	3.700	24.500
Generation	gwh	0.200	0.000	0.000	0.000	0.000	0.000	0.000	0.300	1.100	0.500	0.600	1.300	4.000
% Maximum Generation	%	4	0	0	0	0	0	0	9	30	14	17	35	
Average	kwh/af	64	0	0	0	0	0	0	89	130	95	106	136	



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Project Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total Generation	gwh	59.100	12.800	45.800	81.600	73.700	49.900	77.900	80.400	59.500	29.300	34.700	24.200	628.900
Total Max Generation	gwh	106.000	92.900	98.700	104.100	94.400	104.800	101.700	108.900	105.400	102.900	102.900	99.600	1222.300

Project Pump Energy

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Granby	gwh	3.700	1.000	3.000	4.900	4.500	3.300	4.900	3.900	1.000	1.500	2.000	1.900	35.600
Willow Creek	gwh	0.000	0.200	0.000	0.000	0.000	0.000	0.000	0.700	0.400	0.100	0.100	0.000	1.500
Flatiron Unit 3	gwh	5.000	0.900	3.600	6.400	5.600	5.900	3.300	2.800	3.500	0.000	0.000	0.000	37.000
Total Pump Energy	gwh	8.700	2.100	6.600	11.300	10.100	9.200	8.300	7.400	4.900	1.600	2.100	1.900	74.200



COLORADO - BIG THOMPSON MONTHLY OPERATIONS
 United States Bureau of Reclamation
 Eastern Colorado Area Office
 Loveland, Colorado



CBT October 2018 Max Reasonable: 01-OCT-2018

HYDROLOGY OPERATIONS

Dillon Reservoir

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Dillon Inflow	kaf	6.5	5.9	4.4	3.7	3.0	3.4	4.1	20.4	106.4	90.0	33.3	16.1	297.2
DL to GM Gain	kaf	4.0	3.8	3.4	3.0	2.8	5.4	8.9	37.5	74.5	44.0	22.0	10.2	219.5

Green Mountain Reservoir

Init Cont:	70.00 kaf	Maximum Cont:	154.60 kaf	Minimum Cont:	8.00 kaf
Elev:	7899.7 ft	Elev:	7950.4 ft	Elev:	7804.7 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Undepleted Inflow	kaf	10.5	9.7	7.8	6.7	5.8	8.8	13.0	58.8	186.5	134.8	56.0	26.3	524.7
Depletion	kaf	3.0	2.6	1.0	0.3	-0.1	0.0	-1.8	12.0	85.2	20.2	11.0	5.9	139.3
Depleted Inflow	kaf	7.5	7.1	6.8	6.4	5.8	8.8	14.8	46.8	101.3	114.6	45.0	20.3	385.2
Turbine Release	kaf	13.5	8.6	8.7	9.8	8.9	9.9	12.6	36.5	55.8	70.8	47.7	49.9	332.7
Spill/Waste	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	cfs	220	144	142	160	161	161	212	594	938	1151	775	839	
Min Release	cfs	60	60	60	60	60	60	60	60	60	60	60	60	
Total River Release	kaf	13.5	8.6	8.7	9.8	8.9	9.9	12.6	36.5	55.8	70.8	47.7	49.9	332.7
Evaporation	kaf	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.3	0.4	0.6	0.6	0.4	2.8
End-Month Targets	kaf	64.0	60.6	60.6	53.0	53.0	53.0	55.0	65.0	110.0	153.5	150.0	120.0	
End-Month Contents	kaf	64.2	62.6	60.7	57.2	54.1	53.0	55.0	65.0	110.0	153.2	150.0	120.0	
End-Month Elevation	ft	7894.37	7892.96	7891.18	7887.89	7884.81	7883.64	7885.71	7895.07	7927.16	7949.80	7948.27	7932.87	

Willow Creek Reservoir

Init Cont:	8.00 kaf	Maximum Cont:	10.20 kaf	Minimum Cont:	7.20 kaf
Elev:	8119.5 ft	Elev:	8128.8 ft	Elev:	8116.9 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	1.0	1.0	0.8	0.6	0.6	1.8	7.1	35.0	36.8	8.1	3.3	2.0	98.1
Minimum Release	kaf	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.8
5412.5 Release	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.4	14.5	0.0	0.0	0.0	23.9
Total River Release	kaf	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.8
Pumped to Granby	kaf	0.0	1.6	0.0	0.0	0.0	0.0	7.4	22.8	23.8	7.7	2.8	1.5	67.6
Evaporation	kaf	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.7
End-Month Targets	kaf	9.0	7.2	7.6	8.2	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	
End-Month Contents	kaf	8.2	7.2	7.5	7.8	8.0	9.3	8.5	10.7	8.6	8.5	8.5	8.5	
End-Month Elevation	ft	8121.49	8116.90	8118.49	8119.43	8120.44	8125.61	8122.54	8130.57	8123.07	8122.54	8122.54	8122.54	



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Granby Reservoir		Init Cont:			Maximum Cont:			Minimum Cont:						
		464.00	kaf		539.80	kaf		76.50	kaf					
		Elev:	8269.2	ft	Elev:	8280.0	ft	Elev:	8186.9	ft				
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	2.1	2.3	1.8	1.5	1.3	2.9	9.8	30.5	67.6	34.4	10.0	5.3	169.5
Release from Shadow Mtn	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	17.0	77.9	25.9	3.2	2.1	138.5
Pump from Windy Gap	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pump from Willow Creek	kaf	0.0	1.6	0.0	0.0	0.0	0.0	7.4	22.8	23.8	7.7	2.8	1.5	67.6
Total Inflow	kaf	4.3	6.6	4.6	2.7	2.4	4.1	18.4	70.3	169.3	68.0	16.1	8.9	375.7
Minimum River Release	kaf	1.2	1.2	1.2	1.2	1.1	1.2	1.2	4.6	4.5	4.6	2.5	1.2	25.7
5412.5 Release	kaf	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	3.2	5.5
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.0	62.0	7.3	0.0	91.3
Total River Release	kaf	1.3	1.2	1.2	1.2	1.1	1.2	1.2	4.6	4.5	4.6	4.6	4.4	31.1
Pumped to Shadow Mtn	kaf	24.7	6.2	20.0	33.1	29.9	19.5	21.4	1.2	0.0	0.0	2.9	3.1	162.0
Evaporation	kaf	1.6	0.7	0.0	0.0	0.0	0.8	1.3	2.1	3.1	3.0	2.3	2.1	17.0
Seepage loss	kaf	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	3.6
End-Month Contents	kaf	439.9	438.1	421.1	389.3	360.5	342.8	337.0	399.1	538.5	536.7	535.3	534.3	
End-Month Elevation	ft	8265.63	8265.35	8262.74	8257.69	8252.94	8249.94	8248.94	8259.27	8279.83	8279.58	8279.38	8279.25	

Shadow Mountain Reservoir		Init Cont:			Maximum Cont:			Minimum Cont:						
		17.00	kaf		18.40	kaf		16.60	kaf					
		Elev:	8366.6	ft	Elev:	8367.0	ft	Elev:	8366.0	ft				
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Native Inflow	kaf	3.3	3.1	2.4	2.0	1.7	3.8	12.9	37.5	80.7	40.5	14.7	8.0	210.6
Pumped from Granby	kaf	24.7	6.2	20.0	33.1	29.9	19.5	21.4	1.2	0.0	0.0	2.9	3.1	162.0
Total Inflow	kaf	28.0	9.3	22.4	35.0	31.7	23.4	34.3	38.7	80.7	40.5	17.7	11.1	372.8
Minimum River Release	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	1.2	3.0	3.1	2.5	2.1	24.3
Spill/Bypass	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total River Release	kaf	2.2	2.7	2.8	1.2	1.1	1.2	1.2	17.0	77.9	25.9	3.2	2.1	138.5
Adams Tunnel Flow	kaf	25.5	6.4	19.6	33.8	30.5	21.9	32.7	21.0	2.0	13.8	13.8	8.5	229.5
Evaporation	kaf	0.3	0.1	0.0	0.0	0.0	0.2	0.3	0.5	0.6	0.5	0.4	0.4	3.3
End-Month Contents	kaf	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	16.9	
End-Month Elevation	ft	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	8366.62	

Adams Tunnel		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Tunnel Capacity	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	21.0	2.6	13.8	13.8	25.6	307.9
Actual Diversion	kaf	25.5	6.4	19.6	33.8	30.5	21.9	32.7	21.0	2.0	13.8	13.8	8.5	229.5
% Maximum Delivery	%	75	20	58	100	100	65	100	100	78	100	100	33	



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Lake Estes

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Big Thompson Inflow	kaf	1.2	1.0	0.8	0.7	0.6	3.8	8.7	20.3	43.4	31.9	13.6	5.6	131.6
Minimum River Release	kaf	3.1	1.5	1.5	1.5	1.4	1.5	3.6	6.9	7.4	7.7	6.9	3.7	46.7
Actual River Release	kaf	2.8	1.0	0.8	0.7	0.6	3.8	8.8	7.4	12.5	12.2	7.0	3.7	61.3
Max Diversion Available	kaf	0.0	0.0	0.0	0.0	0.0	2.2	5.0	13.3	36.0	24.2	6.7	1.9	89.3
Priority Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	22.8	0.0	0.0	0.0	28.0
Skim Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6	8.1	19.7	6.7	1.9	44.0
% Maximum Diversion	%	0	96	0	0	0	0	0	96	86	81	99	100	
Irrigation Demand	kaf	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	1.5
Irrigation Delivery	kaf	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.1	1.5
Total River Release	kaf	2.8	1.0	0.8	0.7	0.6	3.8	8.8	7.4	12.5	12.2	7.0	3.7	61.3

Olympus Tunnel

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Tunnel Capacity	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.8	32.7	33.8	33.8	32.7	397.9
Actual Delivery	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.5	33.6	32.7	33.4	20.3	10.2	298.4
% Maximum Delivery	%	70	20	58	100	100	65	99	99	100	99	60	31	
Inflow to Flatiron	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.5	33.6	33.0	33.4	20.3	10.2	298.7

Carter Lake

Init Cont: 48.00 kaf
Elev: 5694.8 ft
Maximum Cont: 112.20 kaf
Elev: 5759.0 ft
Minimum Cont: 6.00 kaf
Elev: 5626.8 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Pumped from Flatiron	kaf	17.4	2.9	12.2	20.3	16.6	16.7	9.0	7.4	2.0	0.0	0.0	0.0	104.5
Flatiron Bifurcation	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Carter to Flatiron	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
Evaporation Loss	kaf	0.2	0.1	0.0	0.0	0.0	0.1	0.3	0.4	0.5	0.4	0.3	0.3	2.6
Seepage Loss	kaf	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	1.7
End-Month Targets	kaf	112.0	20.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	112.0	
End-Month Contents	kaf	56.6	56.2	65.2	82.5	95.8	108.7	112.0	111.9	103.5	87.1	67.3	52.8	
End-Month Elevation	ft	5704.92	5704.55	5714.23	5731.63	5743.68	5755.41	5758.64	5758.58	5751.25	5736.07	5716.40	5700.63	
Priority Water Diverted to Carter	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
Irrigation Demand	kaf	7.7	2.4	2.6	2.4	2.7	3.0	4.9	6.3	8.1	14.8	18.1	13.1	86.1
Metered Demand	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Windy Gap demand	kaf	0.5	0.6	0.5	0.5	0.4	0.5	0.3	0.6	1.3	1.1	1.2	1.0	8.5
Total Demand	kaf	8.2	3.0	3.1	2.9	3.1	3.5	5.2	6.9	9.4	15.9	19.3	14.1	94.6
Total Delivery	kaf	8.2	3.0	3.1	2.9	3.1	3.5	5.2	6.9	9.4	15.9	19.3	14.1	94.6
% Required Delivery	%	100	100	100	100	100	100	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



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Hansen Canal 930

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Minimum Flow	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum Flow	kaf	35.0	55.3	57.2	57.2	51.6	16.6	55.3	57.2	55.3	57.2	57.2	55.3	610.4
Actual Flow	kaf	6.4	3.5	7.3	13.5	13.9	5.1	23.5	26.3	31.0	33.4	20.3	10.2	194.4

Dille Tunnel

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Big Thompson River Below Lake Estes	kaf	2.8	1.0	0.8	0.7	0.6	3.8	8.8	7.4	12.5	12.2	7.0	3.7	61.3
North Fork Big Thompson River at Drake	kaf	0.5	0.4	0.3	0.3	0.2	0.4	1.1	4.0	7.3	5.8	3.3	1.7	25.3
Dille Skim Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	14.4	3.4	7.0	3.0	36.7
Dille Priority Water Diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
water available	kaf	3.4	1.4	1.2	1.0	0.8	4.1	9.9	11.4	19.9	18.0	10.3	5.4	86.8
water diverted	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	14.4	3.4	7.0	3.0	36.7
% Diverted	%	0	0	0	0	0	0	0	165	266	62	128	56	
Big T @ Canyon Mouth	kaf	3.4	1.4	1.2	1.0	0.8	4.1	9.9	2.5	5.4	14.6	3.3	2.4	50.0

Trifurcation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Release from Flatiron	kaf	6.4	3.5	7.3	13.5	13.9	5.1	23.5	26.3	31.0	33.4	20.3	10.2	194.4
Release to 550 Canal	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.4	17.3	22.1	11.6	9.3	2.7	132.8
Dille Tunnel	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.9	14.4	3.4	7.0	3.0	36.7
Total release to river	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.6	1.5	3.8	5.2	16.5
Irrigation demand	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.6	1.5	3.8	5.1	16.4
Windy Gap demand	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total requirement	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.6	1.5	3.8	5.2	16.5
Total delivery	kaf	4.2	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.6	1.5	3.8	5.2	16.5
% Required Delivery	%	100	100	100	0	0	0	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



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Hansen Canal 550

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow from Flatiron	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.4	17.3	22.1	11.6	9.3	2.7	132.8
Maximum flow	kaf	19.5	30.8	31.8	31.8	28.7	9.2	30.8	31.8	30.8	31.8	31.8	30.8	339.6
Irrigation demand	kaf	0.4	0.1	0.1	0.1	0.1	0.1	0.2	0.3	0.2	0.5	0.5	0.5	3.1
Irrigation delivery	kaf	0.3	0.1	0.1	0.1	0.1	0.0	0.2	0.3	0.2	0.5	0.5	0.5	2.9
Minimum flow	kaf	1.5	1.5	1.5	1.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	17.9
Rels to Horsetooth	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.4	17.3	22.1	11.6	9.3	2.7	132.8

Horsetooth Reservoir

Init Cont:	92.00 kaf	Maximum Cont:	157.00 kaf	Minimum Cont:	13.00 kaf
Elev:	5393.7 ft	Elev:	5430.0 ft	Elev:	5316.8 ft

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow	kaf	3.6	3.4	7.2	13.3	13.8	5.1	23.4	17.3	22.1	11.6	9.3	2.7	132.8
Total irrigation delivery	kaf	16.1	1.8	1.9	2.1	1.9	2.1	3.1	8.3	8.0	22.8	26.1	11.5	105.7
Evaporation loss	kaf	0.3	0.1	0.0	0.0	0.0	0.2	0.4	0.7	0.9	0.8	0.6	0.5	4.5
Seepage loss	kaf	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	2.2
End-Month Targets	kaf	156.0	80.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	156.0	140.0	80.0	
End-Month Content	kaf	78.8	80.0	85.2	96.2	108.0	110.6	130.3	138.5	151.6	139.4	121.9	112.4	
End-Month Elevation	ft	5384.87	5385.74	5389.24	5396.45	5403.70	5405.24	5416.39	5420.75	5427.44	5421.24	5411.74	5406.32	
Priority water diverted to Horsetooth	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	21.8	0.0	0.0	0.0	26.3
Irrigation demand	kaf	13.1	0.0	0.0	0.0	0.0	0.0	0.3	3.6	2.9	15.3	19.1	6.5	60.8
Metered Demand	kaf	2.5	1.4	1.5	1.7	1.6	1.7	2.3	4.0	4.3	6.9	5.8	3.8	37.5
Windy Gap demand	kaf	0.6	0.4	0.4	0.4	0.3	0.4	0.6	0.6	0.8	0.7	1.2	1.3	7.7
Total demand	kaf	16.1	1.8	1.9	2.1	1.9	2.1	3.1	8.3	8.0	22.8	26.1	11.5	105.7
Total irrigation	kaf	16.1	1.8	1.9	2.1	1.9	2.1	3.1	8.3	8.0	22.8	26.1	11.5	105.7
% Required Delivery	%	100	100	100	100	100	100	100	100	100	100	100	100	
Shortage	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

CBT Project Summary

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total CBT Delivery	kaf	27.8	4.0	4.3	4.3	4.5	4.8	7.9	15.5	16.3	39.1	47.5	29.1	205.1



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Windy Gap														
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Pumping	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Losses	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spill	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.2	0.0	0.0	0.0	-9.2
Total Delivery	kaf	1.1	1.0	0.9	0.9	0.7	0.9	0.9	1.2	2.1	1.8	2.4	2.3	16.2
Account Balance	kaf	-1.1	-2.1	-3.0	-3.9	-4.6	-5.5	-6.4	-7.6	0.0	0.0	-0.5	-2.9	



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PUMPING AND GENERATION OPERATIONS

Green Mountain Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Generation	gwh	18.600	18.000	18.600	18.600	16.800	18.600	18.000	18.600	18.000	18.600	18.600	18.000	219.000
Generation	gwh	2.200	1.400	1.400	1.500	1.400	1.500	1.900	5.700	9.700	14.600	10.100	10.200	61.600
% Maximum Generation	%	12	8	7	8	8	8	11	30	54	79	54	57	
Average	kwh/af	164	161	159	157	155	153	154	155	173	207	212	204	

Willow Creek Pumping

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	24.6	23.8	0.0	0.0	0.0	0.0	23.8	24.6	23.8	24.6	24.6	23.8	193.6
Actual Pumping	kaf	0.0	1.6	0.0	0.0	0.0	0.0	7.4	22.8	23.8	7.7	2.8	1.5	67.6
Pump Energy	gwh	0.000	0.300	0.000	0.000	0.000	0.000	1.600	4.900	5.100	1.600	0.600	0.300	14.400
% Maximum Pumping	%	0	7	0	0	0	0	31	93	100	31	11	6	279
Average	kwh/af	0	213	0	0	0	0	213	213	213	213	213	213	

Lake Granby Pumping

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	36.9	35.7	36.9	36.9	33.3	36.9	35.7	36.9	35.7	36.9	36.9	35.7	434.4
Actual Pumping	kaf	24.7	6.2	20.0	33.1	29.9	19.5	21.4	1.2	0.0	0.0	2.9	3.1	162.0
Pump Energy	gwh	3.600	0.900	2.900	4.900	4.500	2.900	3.300	0.200	0.000	0.000	0.400	0.400	24.000
% Maximum Pumping	%	67	18	54	90	90	53	60	3	0	0	8	9	
Average	kwh/af	144	145	145	147	149	151	152	152	0	0	140	140	



CBT October 2018 Max Reasonable: 01-OCT-2018

Marys Lake Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Adams Tunnel Flow	kaf	25.5	6.4	19.6	33.8	30.5	21.9	32.7	21.0	2.0	13.8	13.8	8.5	229.5
Maximum Generation	gwh	6.400	0.800	3.500	6.400	5.800	6.400	6.200	6.400	6.200	6.400	6.400	6.200	67.100
Generation	gwh	4.600	0.800	3.500	6.400	5.800	4.000	6.200	3.500	0.000	2.300	2.300	0.400	39.800
% Maximum Generation	%	18	13	18	19	19	18	19	17	0	17	17	5	
Average	kwh/af	180	128	179	189	189	181	189	166	0	165	165	52	

Lake Estes Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Adams Tunnel Flow	kaf	25.5	6.4	19.6	33.8	30.5	21.9	32.7	21.0	2.0	13.8	13.8	8.5	229.5
Maximum Generation	gwh	16.000	15.500	16.000	16.000	14.500	16.000	15.500	16.000	15.500	16.000	16.000	15.500	188.500
Generation	gwh	11.800	2.400	8.900	16.000	14.400	9.900	15.500	9.400	0.300	6.400	6.400	3.600	105.000
% Maximum Generation	%	74	15	56	100	100	62	100	59	2	40	40	23	
Average	kwh/af	463	368	455	473	473	453	472	448	135	460	462	418	

Pole Hill Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Olympus Tunnel Flow	kaf	33.8	32.7	33.8	33.8	30.5	33.8	32.7	33.8	32.7	33.8	33.8	32.7	397.9
Maximum Generation	gwh	25.800	25.000	25.800	25.800	23.300	25.800	25.000	25.800	25.000	25.800	25.800	25.000	303.900
Generation	gwh	18.100	3.300	14.100	25.700	23.200	15.800	24.800	25.600	24.900	25.400	14.600	2.000	217.500
% Maximum Generation	%	70	13	55	100	100	61	99	99	100	99	57	8	
Average	kwh/af	536	101	417	761	761	467	757	758	762	752	432	62	



CBT October 2018 Max Reasonable: 01-OCT-2018

Flatiron Units 1 and 2 Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Inflow to Flatiron	kaf	23.8	6.4	19.5	33.7	30.5	21.8	32.5	33.6	33.0	33.4	20.3	10.2	298.7
Maximum Generation	gwh	32.200	31.200	32.200	32.200	29.100	32.200	31.200	32.200	31.200	32.200	32.200	31.200	379.300
Generation	gwh	22.300	4.900	18.000	32.100	29.000	18.800	30.800	31.800	31.200	31.500	16.800	7.300	274.500
% Maximum Generation	%	69	16	56	100	100	58	99	99	100	98	52	24	
Average	kwh/af	936	773	920	951	951	863	946	947	944	944	826	716	

Flatiron Unit 3 Pump/Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Maximum Pumping	kaf	17.4	2.9	12.2	20.3	16.6	16.7	15.2	15.6	15.5	0.0	0.0	0.0	132.4
Pump from Flatiron	kaf	17.4	2.9	12.2	20.3	16.6	16.7	9.0	7.4	2.0	0.0	0.0	0.0	104.5
Pump Energy	gwh	5.000	0.900	3.600	6.400	5.600	5.900	3.300	2.700	0.700	0.000	0.000	0.000	34.100
% Maximum Pumping	%	100	100	100	100	100	100	59	47	13	0	0	0	
Average	kwh/af	288	297	299	317	336	353	365	366	361	0	0	0	
Maximum Turbine release	kaf	16.8	3.0	12.8	24.4	22.9	26.2	26.1	27.1	25.8	0.0	0.0	0.0	185.1
Carter to Flatiron	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.3
Maximum Generation	gwh	3.100	0.600	2.500	5.000	4.900	5.800	5.800	6.000	5.700	0.000	0.000	0.000	39.400
Actual Generation	gwh	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.100	0.000	0.000	0.000	0.100
% Maximum Generation	%	0	0	0	0	0	0	0	0	1	0	0	0	
Average	kwh/af	0	0	0	0	0	0	0	0	221	0	0	0	

Big Thompson Generation

		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total release	kaf	2.6	0.0	0.0	0.0	0.0	0.0	0.0	17.6	23.1	24.6	17.5	10.1	95.5
Turbine release	kaf	2.6	0.0	0.0	0.0	0.0	0.0	0.0	17.6	21.7	24.6	17.5	10.1	94.1
Wasteway release	kaf	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	1.4
Maximum Generation	gwh	3.800	1.900	0.000	0.000	0.000	0.000	0.000	3.800	3.700	3.800	3.800	3.700	24.500
Generation	gwh	0.200	0.000	0.000	0.000	0.000	0.000	0.000	2.800	3.400	3.800	2.700	1.400	14.300
% Maximum Generation	%	4	0	0	0	0	0	0	73	93	100	71	38	
Average	kwh/af	64	0	0	0	0	0	0	159	159	156	155	140	



CBT October 2018 Max Reasonable: 01-OCT-2018

Project Generation

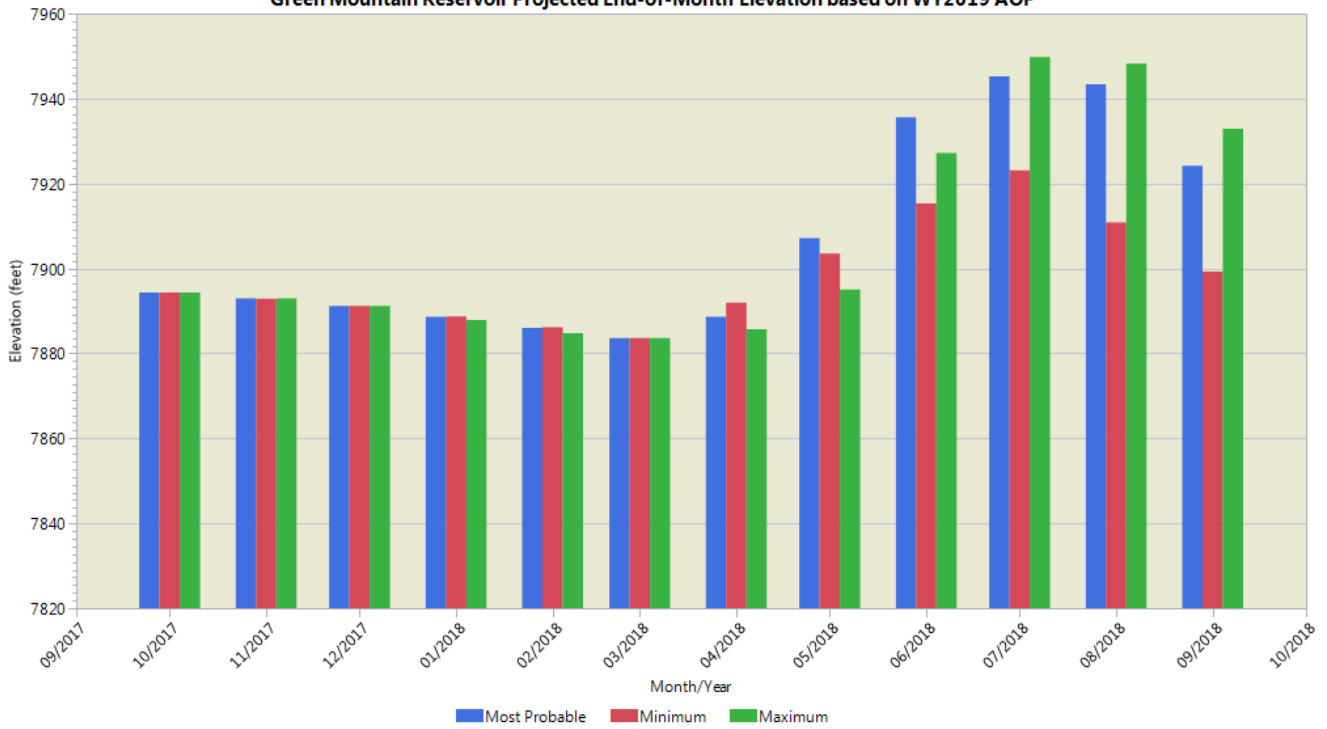
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Total Generation	gwh	59.100	12.800	45.900	81.800	73.800	50.000	79.100	78.800	69.600	84.100	52.900	24.900	712.800
Total Max Generation	gwh	106.000	92.900	98.700	104.100	94.400	104.800	101.700	108.900	105.300	102.900	102.900	99.600	1222.200

Project Pump Energy

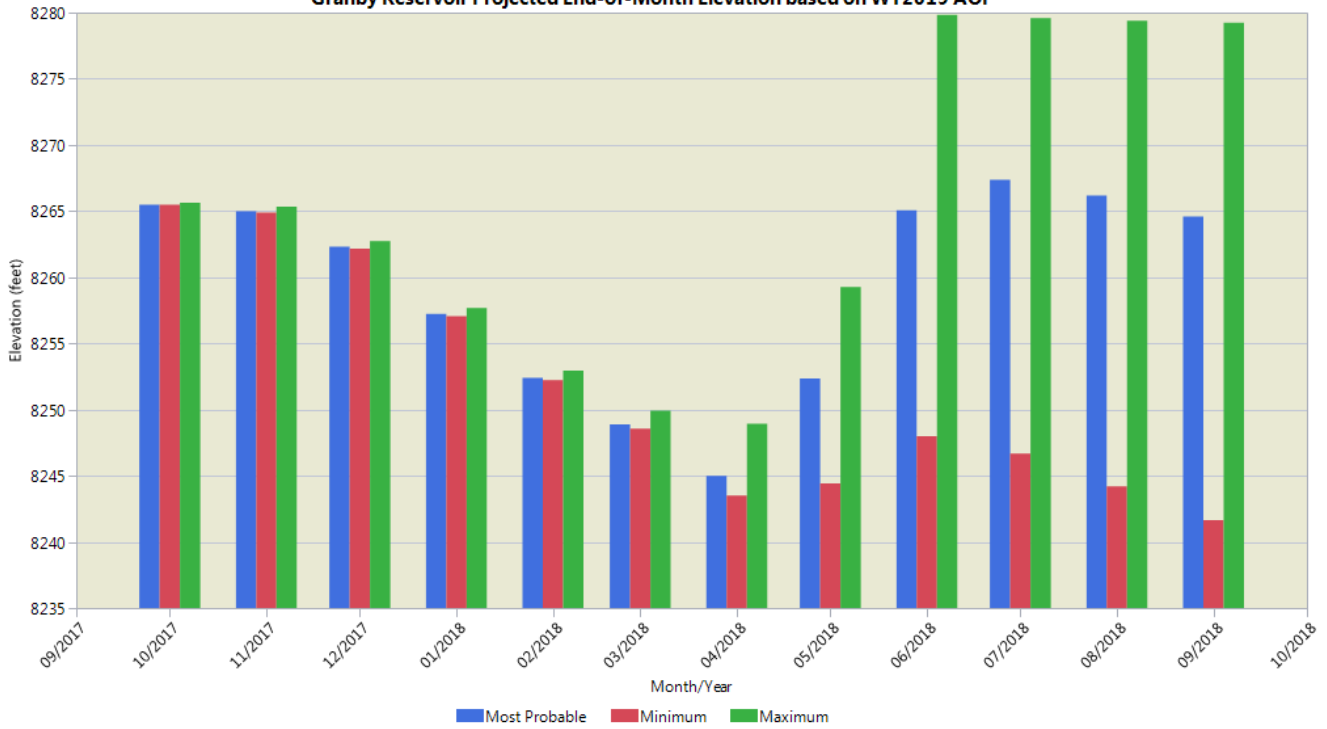
		Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Total
Granby	gwh	3.600	0.900	2.900	4.900	4.500	2.900	3.300	0.200	0.000	0.000	0.400	0.400	24.000
Willow Creek	gwh	0.000	0.300	0.000	0.000	0.000	0.000	1.600	4.900	5.100	1.600	0.600	0.300	14.400
Flatiron Unit 3	gwh	5.000	0.900	3.600	6.400	5.600	5.900	3.300	2.700	0.700	0.000	0.000	0.000	34.100
Total Pump Energy	gwh	8.600	2.100	6.500	11.300	10.000	8.800	8.100	7.700	5.800	1.600	1.000	0.800	72.300

B-8: WATER YEAR 2019 PLAN SUMMARY CHARTS

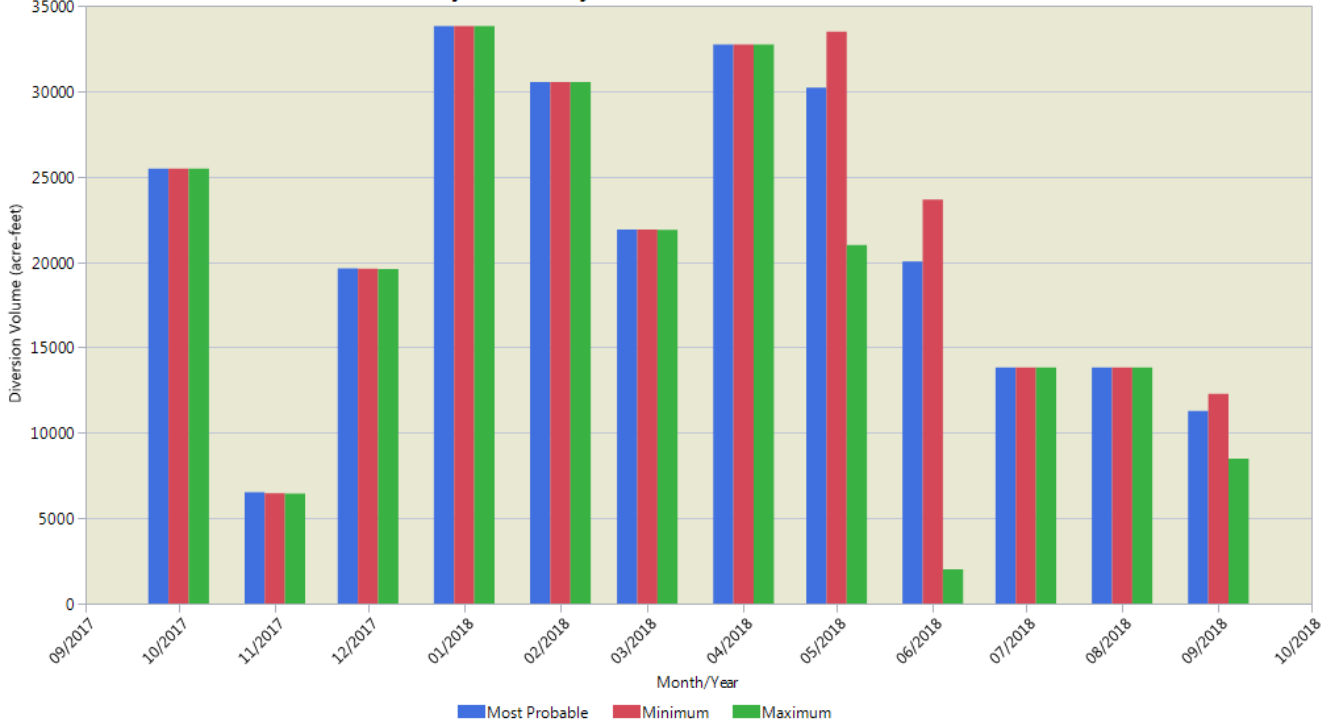
Green Mountain Reservoir Projected End-of-Month Elevation based on WY2019 AOP



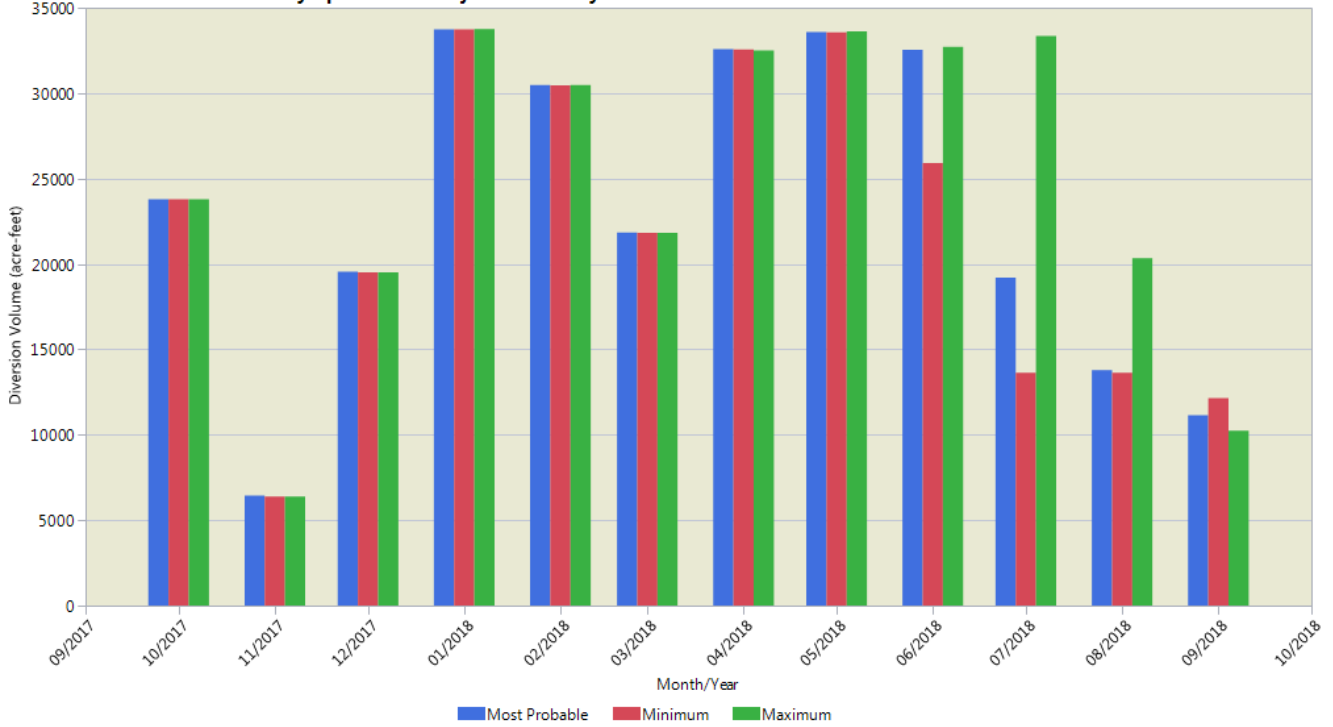
Granby Reservoir Projected End-of-Month Elevation based on WY2019 AOP



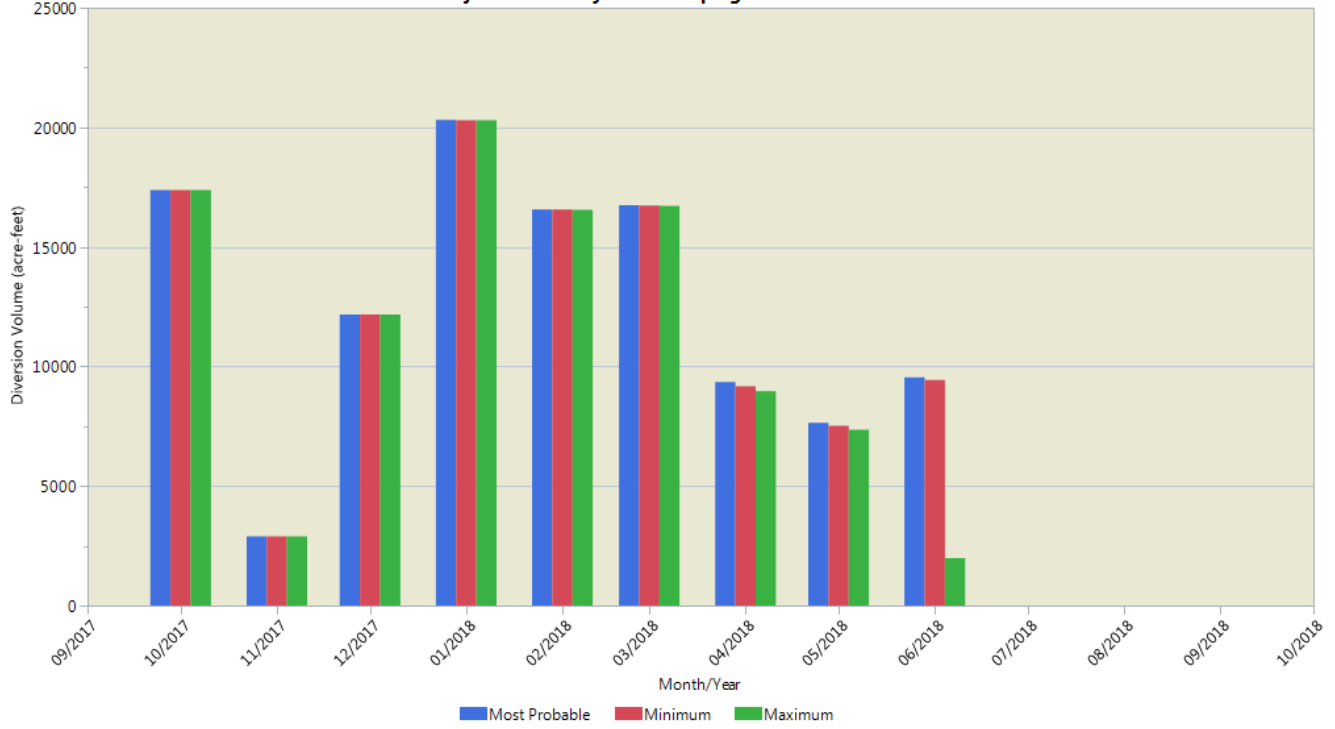
Adams Tunnel Projected Monthly Total Diversion Volume based on WY2019 AOP



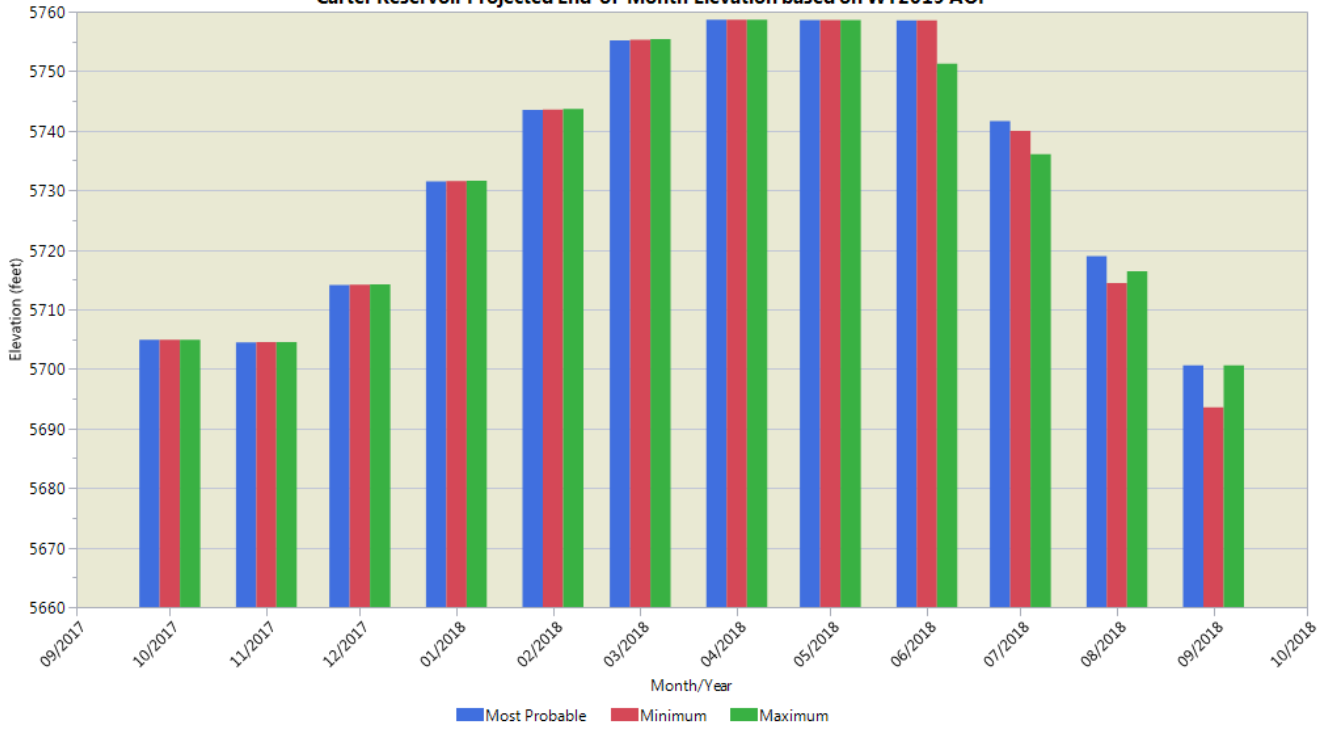
Olympus Tunnel Projected Monthly Total Diversion Volume based on WY2019 AOP



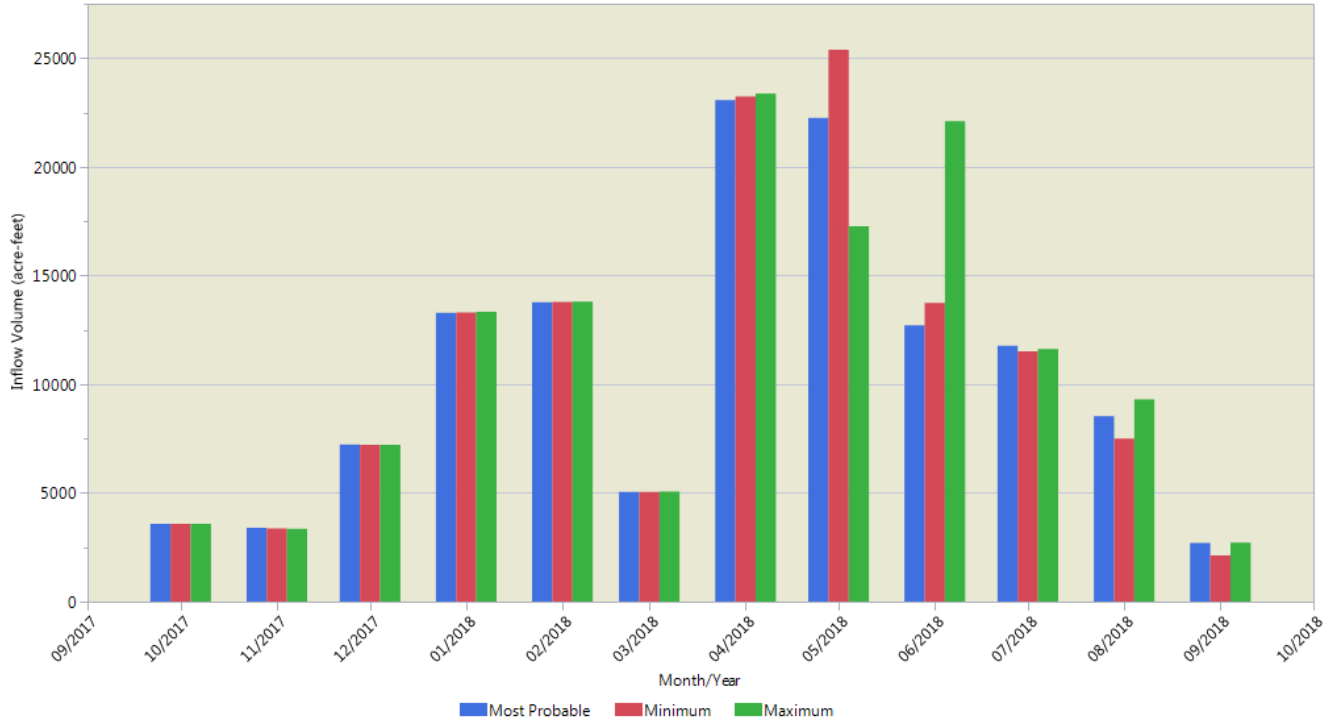
Carter Reservoir Projected Monthly Total Pumping Volume based on WY2019 AOP



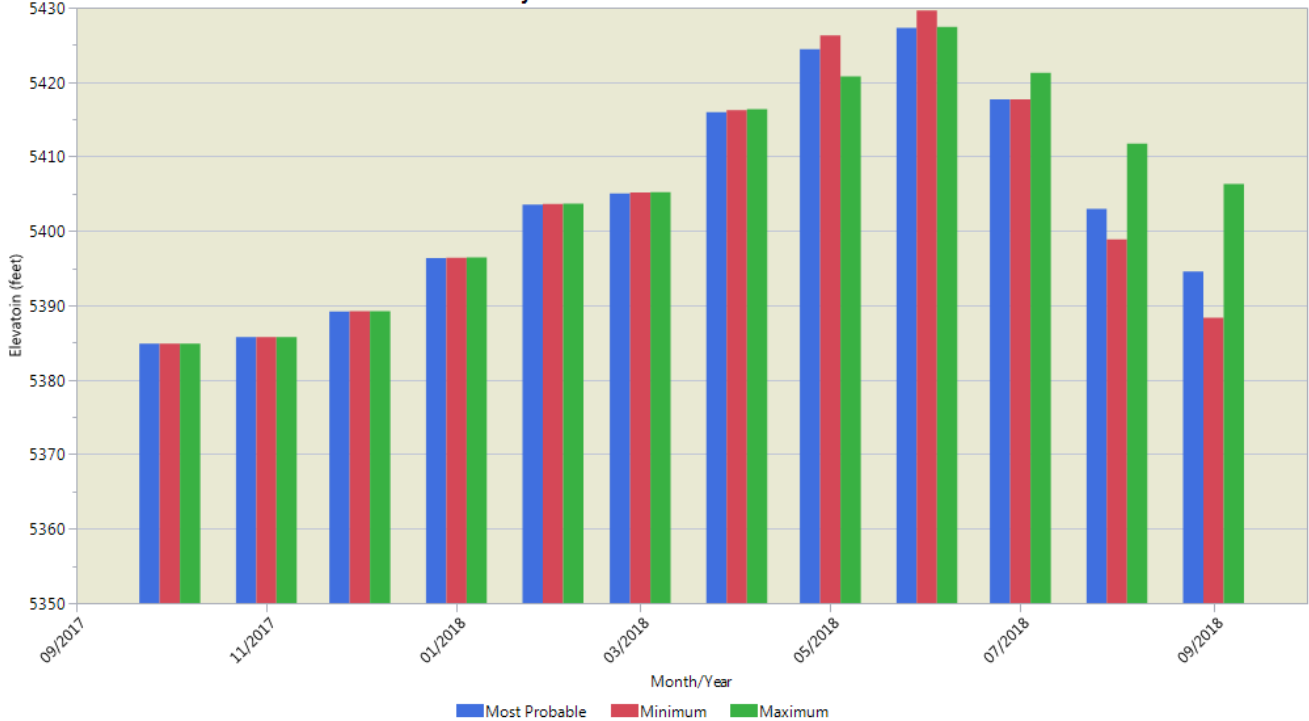
Carter Reservoir Projected End-of-Month Elevation based on WY2019 AOP



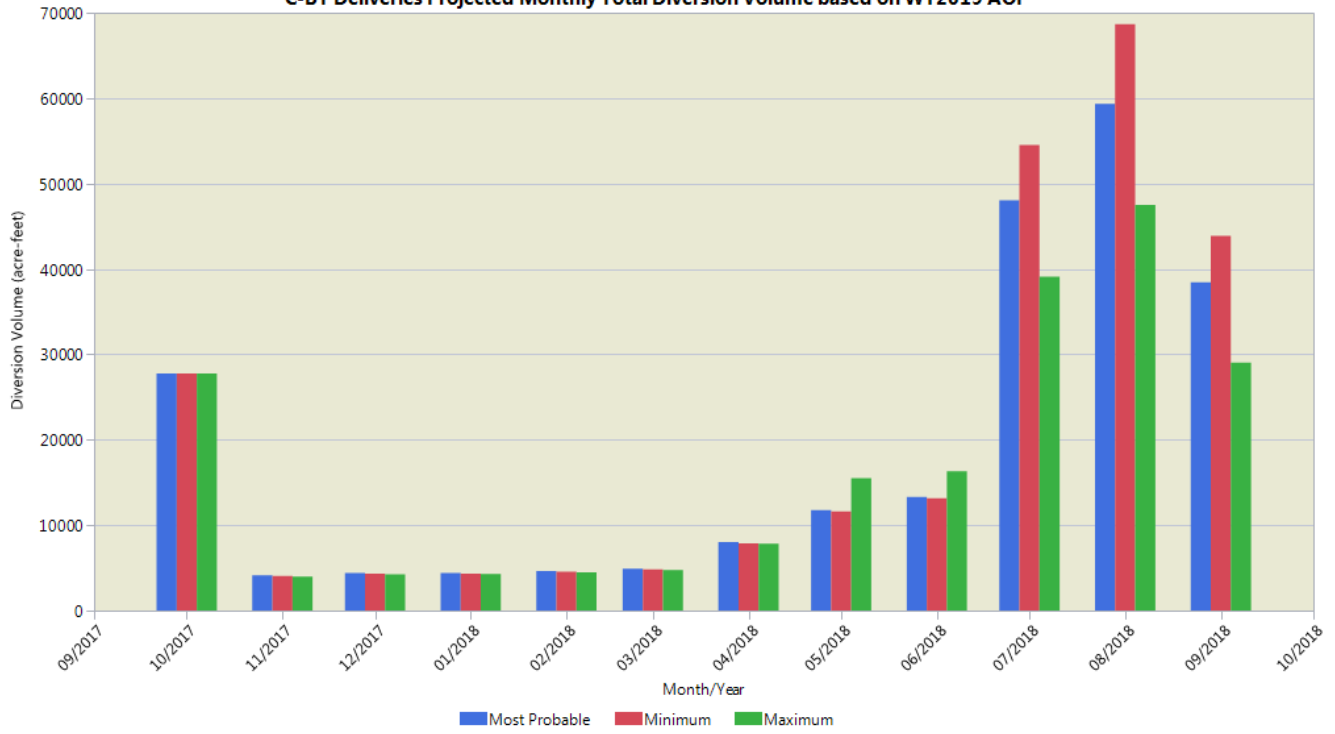
Horsetooth Reservoir Projected Monthly Total Inflow Volume based on WY2019 AOP



Horsetooth Reservoir Projected End-of-Month Elevation based on WY2019 AOP

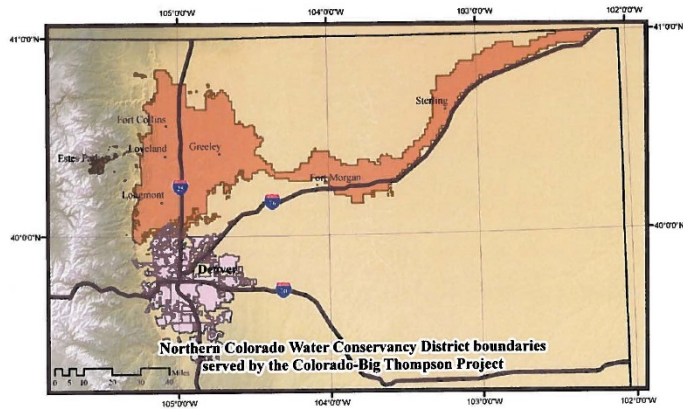


C-BT Deliveries Projected Monthly Total Diversion Volume based on WY2019 AOP



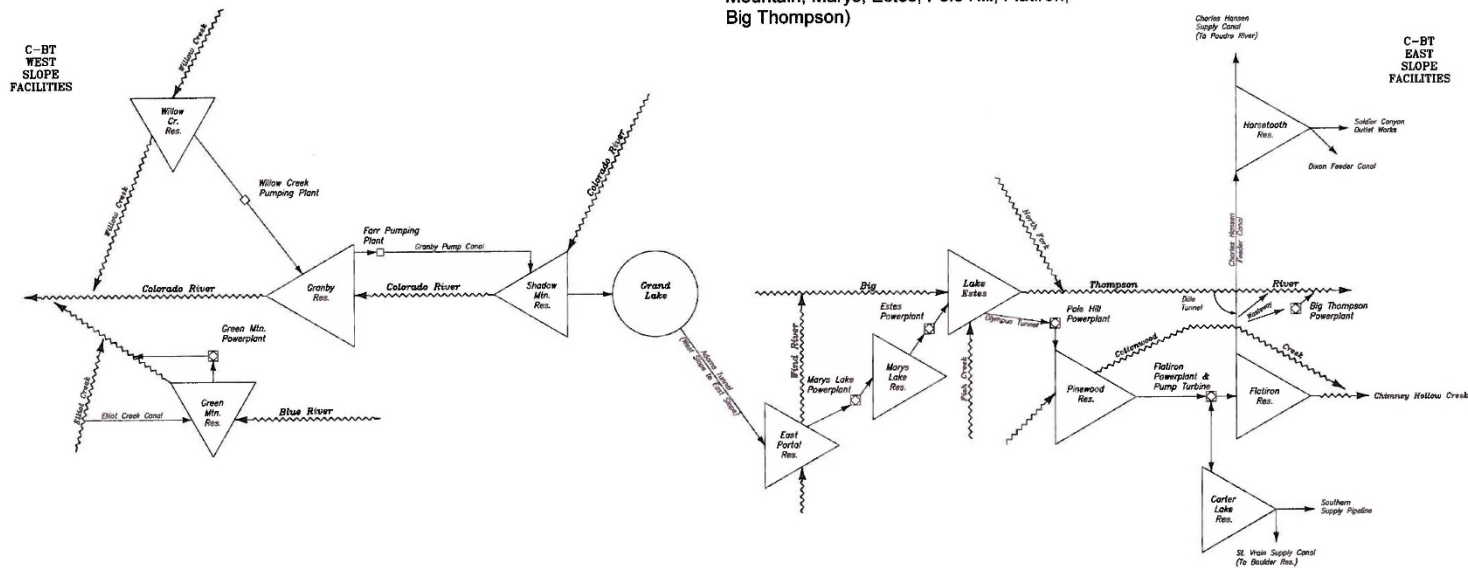
APPENDIX C—EXHIBITS

C-1: PUBLICITY MAP, EXTENTS, FACTS AND CONNECTIVITY SCHEMATIC OF THE COLORADO-BIG THOMPSON PROJECT

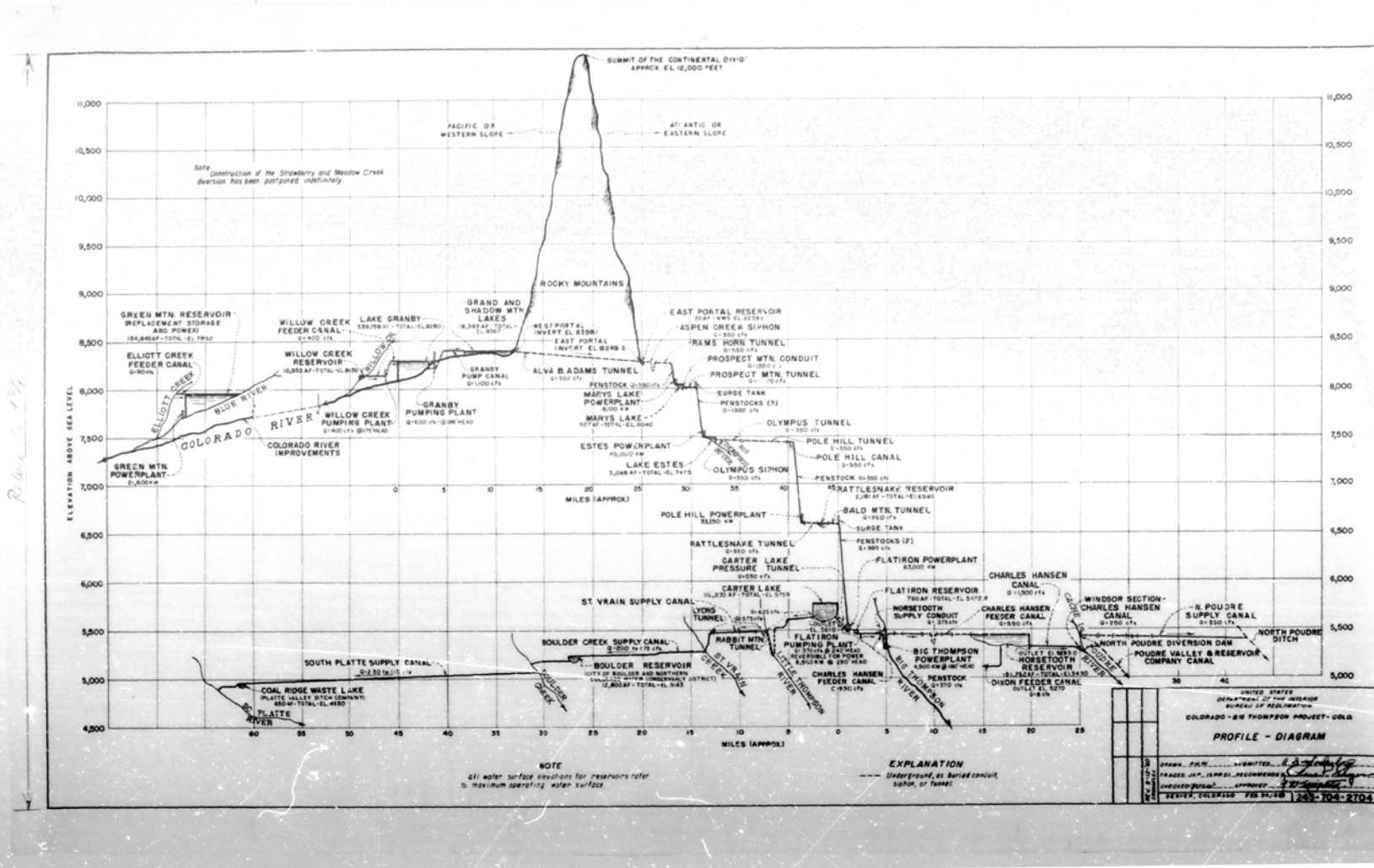


Colorado-Big Thompson Facts

- A trans-mountain, trans-basin water diversion, storage, and delivery project
- Signed into law by President Roosevelt in 1937
- Construction period: 1938-1952
- Ten major reservoirs (Green Mountain, Willow Creek, Granby, Shadow Mountain, Marys Lake, Estes, Pinewood, Carter, Flatiron and Horsetooth)
- Twenty major dams and dikes
- Twenty-two tunnels, canals and other conduits covering about 130 miles
- Six hydroelectric powerplants (Green Mountain, Marys, Estes, Pole Hill, Flatiron, Big Thompson)
- Water right allows for diversion of up to 310,000 acre-feet of water a year
- Average annual diversion over life of project is 260,000 acre-feet
- Water falls over 2000 feet from Continental Divide to Colorado's eastern Plains, providing for hydroelectric power generation.
- Together, all six powerplants generate approximately 759 million kilo-Watt hours of electricity a year—enough to power 58,300 American homes for a year.
- The C-BT provides water to 29 cities and towns, including 620,000 irrigated acres and a population of 725,000 people



C-2: PROFILE VIEW OF THE COLORADO-BIG THOMPSON PROJECT



SIXTY-SEVENTH ANNUAL REPORT OF THE WESTERN DIVISION SYSTEM POWER OPERATIONS

PREFACE

This is the sixty-seventh annual report for the Pick-Sloan Missouri Basin Program, Western Division System (System) power operations. For the purpose of this report, the System also includes the Yellowtail Powerplant Units 1 and 2 and the generating facilities of the Fryingpan Arkansas (Fry Ark) Project. The purpose of the report is to inform interested parties of the generation and pump energy requirements of the hydropower system. The report consists of two parts: One part describes the actual generation and pumping operations for WY 2018 and the other part presents the plan of generation and pumping operations for WY 2019.

An update on the System generation and pumping operations is included in the "Water Supply and Utilization" report, which is issued separately, monthly.

WATER YEAR 2018—GENERATION AND PUMP ENERGY SUMMARY

Power generation for the C-BT and the Fry Ark projects was above average for WY 2018 and slightly lower than WY 2017, while much of the Western Division System during WY 2018 was higher than average and higher than WY 2017. With the exception of Mt. Elbert Powerplant, most of the plants in the C-BT and Fry Ark projects produced less than to average power, while about half the plants in Wyoming and Montana had substantially above average production and the other half had slightly less than average production.

In the case of the C-BT, demands for water were slightly above average for WY 2018 (with declared quota of 80%; average is 70%), and that translated into roughly average diversions of project water, with above average power generation for the last eight months of the water year. The Maitland siphon repair work, the Pole Hill switchyard work and the Flatiron Unit #3 work in the first quarter of WY 2018 all had an impact on the Lower Power Arm and caused the C-BT to end the water year less than average for power generation.

The C-BT powerplants produced an accumulated gross generation total of 544.3 gigawatt-hours (GWh) of electricity representing 91 percent of its 30 year average, 18.7 percent of gross system generation, and 21 percent of sales. The gross generation produced by the entire System was 2,913.0 GWh or 110 percent of the 30 year average. Gross generation includes one-half of the Yellowtail generation. Net generation is the gross generation less the energy used for pumping at Farr Plant, Willow Creek Pump, Flatiron Unit 3 and the two Mount Elbert units. The System net generation for WY 2018 was 2,490.6 GWh. The

average for a water year is 2,400.5 GWh. The total System load includes firm energy deliveries, C-BT use-energy, support-energy, plant station service, and an estimate of transmission-system losses.

The System boundaries are illustrated in Appendix B-1. Table A-1 in Appendix A includes the gross generation for every powerplant in the System. Table A-3 shows monthly generation and pumping energy, by plant, and monthly System loads. Table A-2 reports the total energy required to operate the pumps in the System. Some of the numbers included in this section were provided by WAPA.

In WY2018, the Willow Creek Pumping Station pumped to Granby slightly less than half the volume pumped during WY 2016 and 2017. The Willow Creek Pumping Station used 5.3 GWh of power during its WY 2018 operation. Two pumps were unavailable during a significant period when pumping occurs and some of the water that normally would have been pumped was spilled. Meanwhile, the Farr Pumping Plant and the Flatiron Powerplant Unit 3 required 27.5 and 30.8 GWh, respectively. The Farr Pumping Plant required slightly below average energy, while Flatiron Powerplant Unit 3 operations required more than average. Their combined power requirement was 63.6 GWh, 102 percent of the 30 year average, 2.2 percent of gross system generation, and 2.5 percent of sales. The electrical demand is defined primarily by how much water is pumped and secondarily by how high the pump lifts that water.

According to the numbers provided by WAPA, sales of electric power totaled 2,545.8 GWh during WY 2018, with a revenue of \$73,098,080. Energy deficits were covered by a combination of scheduled interchange energy, use of the Mount Elbert pumped storage plant, and power purchases. The power purchases totaled 538.4 GWh during WY 2018 for which WAPA paid a total of \$14,686,120, an increase from the previous water year.

WATER YEAR 2019—GENERATION AND PUMP ENERGY FORECAST

Under the most-probable runoff condition plan (2019 AOP), the gross generation for the C-BT powerplants is projected to be 582.9 GWh during WY 2019 (Table A-4), while pump energy requirements from the C-BT Power System are expected to reach 74.2 GWh. The gross generation for the entire System is expected to be 2,070.9 GWh, with a total load of 2,162.5 GWh, leaving a power deficit of 91.6 GWh. The System generation includes one-half of the total Yellowtail Powerplant generation and the Mount Elbert Powerplant generation resulting from Fry Ark Project water deliveries. The total load includes energy deliveries under firm contracts, seasonal support energy deliveries, energy dedicated for C-BT use, estimates of station service energy, and estimates of transmission System losses.

Table A-4 summarizes the projected monthly System generation, pump energy, and loads for the most probable forecasted runoff conditions for WY 2019. Figure B-3 graphically displays the System gross generation less pumping, including the C-BT contribution for the most probable inflow conditions. Table A-5 lists the scheduled maintenance for the various facilities in the C-BT as anticipated when the AOP simulation was completed. Tables A-6 and A-7 summarize the capacity data for the powerplants and pumping plants within the System, including the Yellowtail and Mount Elbert Units.

APPENDICES

APPENDIX A—TABLES

A-1: WESTERN DIVISION SYSTEM GENERATION FOR WATER YEAR 2018
WESTERN DIVISION SYSTEM
GENERATION FOR WY 2018

Powerplant	Accum. Gross Generation <u>1/</u>		
	WY 2018 (GWH)	Avg <u>2/</u> (GWH)	Percent of Avg
Green Mtn.	40.4	51.9	78
Marys Lake	38.6	37.2	104
Estes	110.8	100.3	110
Pole Hill	142.8	172.3	83
Flatiron 1&2	210.4	226.9	93
Big Thompson	1.4	10.9	13
Seminole	105.3	132.5	79
Kortes	115.7	140.4	82
Freemont C.	239.9	239.6	100
Alcova	109.2	118.0	93
Glendo	78.0	80.1	97
Guernsey	16.5	19.4	85
Boysen	79.5	69.3	115
Heart Mtn.	22.7	15.8 <u>3/</u>	144
Buffalo Bill	122.9	68.3 <u>3/</u>	180
Shoshone	19.9	20.2 <u>3/</u>	98
Spirit Mtn.	15.7	14.7 <u>3/</u>	107
Mt. Elbert	276.4	169 <u>4/</u>	164
Yellowtail	1167.1	959 <u>5/</u>	122
Total	2913.0	2645.8	110

1/ Oct-Sep

2/ 1976-2005 average

3/ 1995-2012 average

4/ 1990-1999 average

5/ 1971-1990 average; In general 1/2 of Yellowtail energy is dedicated to the Western Division System through marketing arrangement. The other 1/2 is marketed in Eastern Division System.

A-2: PUMP ENERGY USED DURING WATER YEAR 2018

Pumping Plan	October-September Pump Energy		
	WY2018 (GWH)	Avg <u>1/</u> (GWH)	Percent of Avg
Willow Cr	5.3	5.8	91
Farr	27.5	30.7	90
Flatiron 3	30.8	26.7	115
Mt. Elbert	358.8	182.1 <u>2/</u>	197
Total	422.4	245.3	172

1/ 1976-2005 average

2/ 1990-1999 average

A-4: MOST PROBABLE INFLOW PROJECTED GROSS GENERATION AND PUMPING FOR WATER YEAR 2019

PICK-SLOAN MISSOURI BASIN PROGRAM WESTERN DIVISION POWER SYSTEM WATER YEAR 2019 FORECASTED OPERATIONS MOST PROBABLE WATER SUPPLY CONDITION GROSS GENERATION AND PUMPING IN GIGAWATT-HOURS

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Mt. Elbert *	1.3	2.4	2.4	2.5	3.1	2.5	3.5	3.9	4.7	4.4	2.0	1.0	33.7
Green Mtn.	2.2	1.4	1.4	1.4	1.3	1.4	1.1	0.6	0.7	2.4	4.9	9.5	28.3
Willow Cr. pump	0.0	0.3	0.0	0.0	0.0	0.0	0.4	3.3	2.5	0.7	0.2	0.1	7.5
Farr pump	3.7	1.0	2.9	4.9	4.5	3.2	4.5	1.8	0.0	0.3	1.4	1.4	29.6
Marys Lake	4.6	0.8	3.5	6.4	5.8	4.0	6.2	5.6	3.6	2.3	2.3	0.8	45.9
Estes	11.8	2.4	8.9	16.0	14.4	9.9	15.4	14.1	8.8	6.3	6.4	5.1	119.5
Pole Hill	18.1	3.3	14.1	25.7	23.2	15.8	24.8	25.6	24.8	13.7	9.3	3.3	201.7
Flatiron 1&2	22.3	5.0	18.0	32.1	29.0	18.9	30.9	31.8	30.8	15.5	10.5	8.1	252.9
Flatiron 3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Flatiron 3 pump	5.0	0.9	3.6	6.4	5.6	5.9	3.4	2.8	3.5	0.0	0.0	0.0	37.1
Big Thompson	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2	2.9	2.1	1.2	1.2	8.8
Seminole	5.4	5.2	5.4	5.4	4.8	11.1	15.7	26.8	26.9	28.1	21.0	8.2	164
Kortes	5.6	5.4	5.6	5.6	5.0	11.6	16.4	27.6	26.7	27.6	21.2	8.4	166.7
Fremont Canyon	0.0	0.0	0.0	0.0	6.4	12.2	18.4	27.8	45.3	46.6	44.4	17.8	218.9
Alcova	4.3	4.1	4.2	4.2	3.8	6.7	6.6	13.3	23.1	23.3	21.0	8.4	123
Glendo	0.0	0.0	0.0	0.0	0.0	0.6	1.9	16.3	19.1	24.3	20.0	5.9	88.1
Guernsey	0.0	0.0	0.0	0.0	0.0	0.0	0.6	3.8	3.7	3.8	3.8	3.4	19.1
Pilot Butte**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Boysen	5.4	5.2	5.3	5.2	4.7	5.1	7.3	10.2	10.5	11.8	9.0	7.0	86.7
Shoshone	1.1	1.1	1.1	1.1	0.3	1.1	1.1	1.1	1.1	1.2	1.1	1.1	12.5
Buffalo Bill	8.0	4.1	4.2	4.2	3.7	4.2	4.0	13.0	12.7	13.1	13.2	12.9	97.3
Spirit Mtn.	1.6	0.0	0.0	0.0	0.0	0.0	1.8	2.7	2.8	3.0	2.8	2.6	17.3
Diamond Cr. pump	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Heart Mtn.	1.7	0.0	0.0	0.0	0.0	0.0	0.0	2.7	4.0	2.9	1.9	0.4	13.6
Yellowtail/2	32.9	33.7	34.5	34.0	29.9	33.8	42.3	47.8	49.9	35.1	38.4	35.1	447.1
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Fry-Ark	1.3	2.4	2.4	2.5	3.1	2.5	3.5	3.9	4.7	4.4	2.0	1.0	33.7
CBT	50.5	10.7	39.4	70.3	63.6	40.9	70.1	71.0	65.6	41.3	33.0	26.5	582.9
North Platte	15.3	14.7	15.2	15.2	20.0	42.2	59.6	115.6	144.8	153.7	131.4	52.1	779.8
Bighorn	50.7	44.1	45.1	44.5	38.6	44.2	56.5	77.5	81.0	67.1	66.4	59.1	674.5
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TOTAL GEN	117.8	71.9	102.1	132.5	125.3	129.8	189.7	268.0	296.1	266.5	232.8	138.7	2070.9
TOTAL LOAD	156.6	162.4	162.2	177.1	172.6	137.0	149.3	176.4	184.7	211.0	262.0	211.2	2162.5
SURPLUS/DEFICIT	-38.9	-90.6	-60.1	-44.6	-47.3	-7.2	40.4	91.6	111.4	55.5	-29.3	-72.5	-91.6
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*	PROJECTED VALUES ARE HISTORIC AVERAGE FLOW THROUGH ENERGY												
**	PROJECTED VALUES ARE MARKETED ENERGY												

A-5: ESTIMATED MAINTENANCE SCHEDULE FOR WATER YEAR 2019—COLORADO-BIG THOMPSON AND FRYINGPAN-ARKANSAS PROJECTS

**COLORADO-BIG THOMPSON AND FRYINGPAN-ARKANSAS PROJECTS
ESTIMATED MAINTENANCE SCHEDULE FOR WATER YEAR 2019**

	Task Name	Start	Finish
Big T Unit 1	2019 Annual Maintenance	Wed 1/2/19	Fri 2/8/19
Big T XFMR KW1A	2019 Annual Maintenance	Mon 1/14/19	Fri 2/1/19
Adams Tunnel	2019 Annual Inspection	Mon 11/4/19	Fri 12/13/19
Marys Powerplant	2019 Annual Maintenance	Mon 11/4/19	Fri 12/13/19
Estes Unit 1	2019 Annual Maintenance	Mon 1/7/19	Fri 2/1/19
Estes Unit 2	2019 Annual Maintenance	Mon 2/11/19	Fri 3/15/19
Estes Unit 3	2019 Annual Maintenance	Mon 3/25/19	Fri 4/19/19
Flatiron XMFR KW1A	2019 Annual Maintenance	Mon 2/25/19	Fri 3/14/19
Flatiron XMFR KW2A	2019 Annual Maintenance	Mon 4/22/19	Thu 5/9/19
Flatiron Unit 1	2019 Annual Maintenance	Tue 2/19/19	Fri 3/29/19
Flatiron Unit 2	2019 Annual Maintenance	Mon 4/15/19	Fri 5/24/19
Flatiron Unit 3	2019 Annual Maintenance	Mon 9/9/19	Fri 10/18/19
Flatiron Unit 1	WAPA Substn. Disconnect Replacement	Wed 2/20/19	Wed 3/20/19
Green Mtn. Unit 1	2019 Annual Maintenance	Mon 1/7/19	Thu 2/14/19
Green Mtn. SWYD KZ1A	2019 Annual Maintenance	Mon 1/28/19	Thu 1/31/19
Green Mtn. Unit 2	2019 Annual Maintenance	Mon 2/25/19	Thu 4/4/19
Green Mtn. SWYD KZ2A	2019 Annual Maintenance	Mon 3/18/19	Thu 3/21/19
Green Mtn. Unit 1	Penstock Refurb. *	Fri 11/1/19	Fri 2/28/20
Green Mtn. Unit 2	Penstock Refurb. *	Wed 5/8/19	Sat 8/31/19
Pole Hill Unit G1	2019 Unit Annual Maintenance	Mon 11/4/19	Fri 12/13/19
Pole Hill XFMR K1A	2019 Annual Maintenance	Mon 11/12/18	Wed 11/27/19
Mt Elbert Unit 1	2018-2019 Annual Maintenance	Mon 9/24/18	Fri 12/14/18
Mt Elbert Unit 2	2019 Annual Maintenance	Mon 2/11/19	Fri 4/19/19
Mt Elbert Units 1 & 2	WAPA Brkr Replacement (Malta Substn.)	Mon 8/5/19	Fri 9/13/19
CHFC 930 & 550 Sections	2019 Annual Maintenance	Fri 3/1/19	Fri 3/22/19
CHFC 930 & 550 Sections	2019 Annual Maintenance *	Wed 7/1/20	Mon 11/16/19

* Awaiting approval as of February 11, 2019.

A-6: POWER PLANT DATA

WESTERN DIVISION - PICK-SLOAN MISSOURI BASIN PROGRAM POWERPLANT DATA

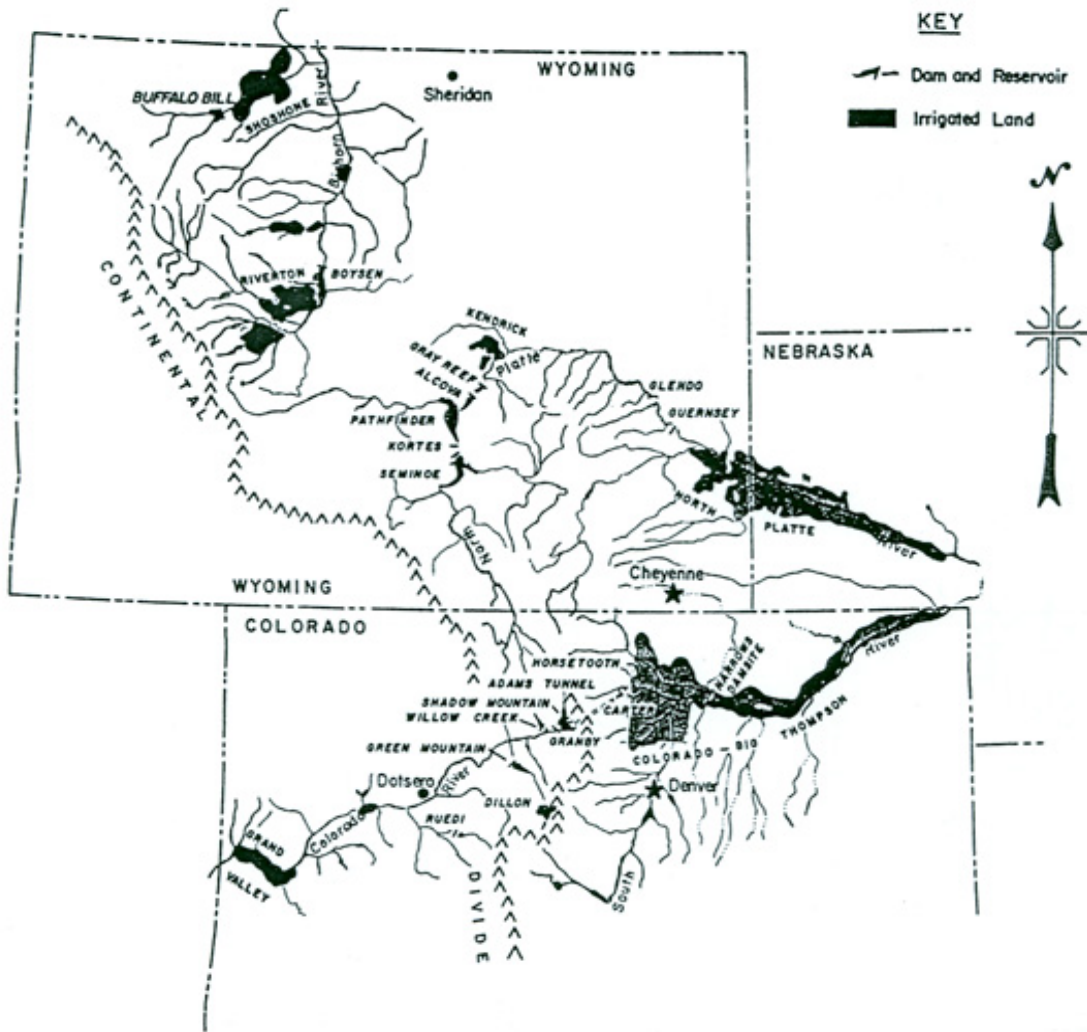
Facility	No. Units	Capacity Each Unit (kWh)	Total Installed Capacity (kWh)	Normal Operating Head (ft)	Output at Rated Head (ft ³ /s)
Green Mountain	2	13,000	26,000	192-262	1,660
Marys Lake	1	8,100	8,100	202-217	550
Estes	3	16,500	49,500	551-571	1,300
Pole Hill	1	33,250	33,250	830-838	550
Flatiron units #1 & #2	2	43,000	86,000	1,096 - 1,118	1,070
(Flatiron <u>1</u> /)	1	8,500	8,500	158-287	440
Big Thompson	1	5,300	5,300	183- 184	350
Seminole	3	15,000	45,000	97-227	2,850
Kortes	3	12,000	36,000	192-204	2,700
Fremont Canyon	2	33,000	66,000	247-363	2,200
Alcova	2	18,000	36,000	153-165	2,200
Glendo	2	19,000	38,000	73-156	2,800
Guernsey	2	2,400	4,800	89-91	820
Pilot Butte ² /	2	800	1,600	---	---
Boysen	2	7,500	15,000	72-112	2,415
Shoshone ³ /	1	3,000	3,000	---	---
Buffalo Bill ³ /	3	6,000	18,000	---	---
Heart Mountain	1	5,000	5,000	265-275	355
Mt. Elbert	2	103,000	206,000	447-477	6,400
Yellowtail	4	72,000	288,000	327-440	8,500
TOTAL	34	-----	979,050	-----	-----

A-7: PUMPING PLANT DATA**WESTERN DIVISION - PICK-SLOAN MISSOURI BASIN PROGRAM****PUMPING PLANT DATA**

Facilities	<u>Pumping Units</u>		<u>Plant Rating</u>		Kwh to Pump 1 AF at Maximum Head
	No	Capacity (ft ³ /s)	Normal Operating Head (ft)	Installed (Hp)	
Granby	3	600	92-186	18,000	227
Willow Creek	2	400	167-169	18,000	227
Flatiron	11/	440	173-287	13,000	391
Mt. Elbert	2	5,690	447-477	340,000	620

APPENDIX B—EXHIBITS

B-1: WESTERN DIVISION WATER RESOURCE MAP



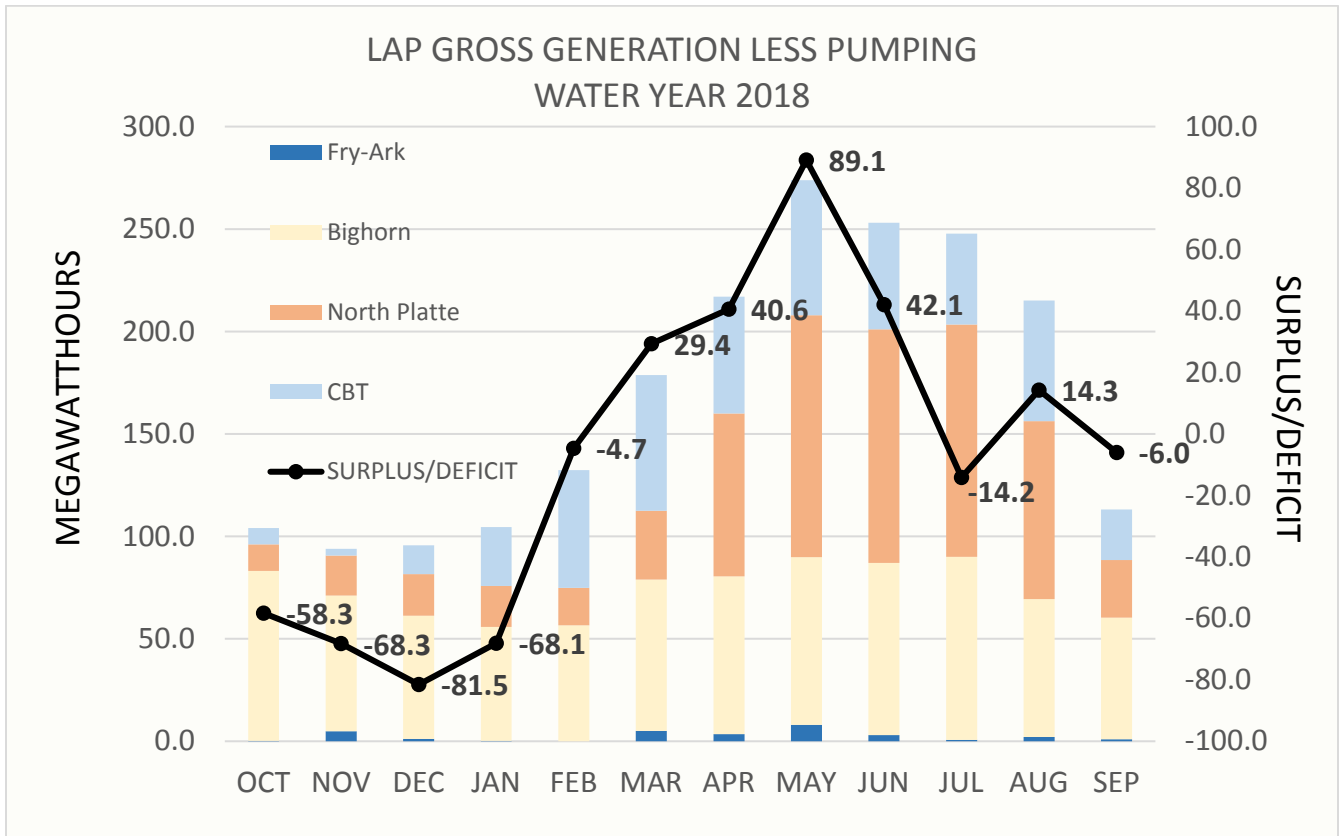
PICK-SLOAN MISSOURI BASIN PROJECT
WESTERN DIVISION
WATER RESOURCE MAP

50 0 50 100
SCALE OF MILES

MAP NO. X-700-121

JUNE 1, 1976

B-2: LAP GROSS GENERATION LESS PUMPING FOR WATER YEAR 2017



B-3: MOST PROBABLE INFLOW PROJECTED LAP GROSS GENERATION LESS PUMPING FOR WATER YEAR 2019

