APPENDIX A

DESCRIPTION OF RECLAMATION PROJECTS
Colorado-Big Thompson Project

Colorado: Boulder, Grand, Larimer, Logan, Morgan, Sedgwick, Summit, Washington, and Weld Counties

Lower Missouri Region
Bureau of Reclamation

The Colorado-Big Thompson Project 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 system through which multiple benefits are provided to the people.

The project spreads over approximately 250 miles in the State of Colorado. It stores, regulates, and diverts water from the Colorado River on the western slope of the Continental Divide to the eastern slope of the Rocky Mountains. It provides supplemental water for irrigation of about 720,000 acres of land, municipal and industrial use, hydroelectric power, and water-oriented recreation opportunities.

Major features of the project include dams, dikes, reservoirs, powerplants, pumping plants, pipelines, tunnels, transmission lines, substations, and other associated structures.

PLAN

The project diverts approximately 260,000 acre-feet of water annually (310,000 acre-feet maximum) from the Colorado River headwaters on the western slope to the Big Thompson River, a South Platte River tributary on the eastern slope, for distribution to project lands and communities. The Northern Colorado Water Conservancy District apportions the water used for irrigation to more than 120 ditches and 60 reservoirs. Eleven communities receive municipal and industrial water from the project. Electric power produced by six powerplants is marketed by the Western Division of the Pick-Sloan Missouri Basin Program.

The western slope collection system traps runoff from the high mountains and stores, regulates, and conveys the water to the Alva B. Adams Tunnel for diversion under the Continental Divide.

To assure irrigation and power generation under prior rights on the Colorado River, Green Mountain Reservoir was constructed on the Blue River. Spring runoff is stored in this reservoir and later released to meet the requirements of the Colorado River, and to allow diversion of water by the project throughout the year.

Irrigation systems on the Colorado River, above the Blue River confluence, were improved to enable continued use of existing rights. Releases are made from Lake Granby to maintain the Colorado River as a live fishing stream.

The principal storage features are Lake Granby and Granby Dam, located on the Colorado River near Granby. Willow Creek, a tributary below Lake Granby, is diverted by Willow Creek Dam and Canal. Willow Creek Pumping Plant lifts the water 175 feet; it then flows by gravity to Lake Granby.

Granby Pumping Plant lifts the water 125 feet from Lake Granby to Granby Pump Canal. The canal conveys the water 1.8 miles to Shadow Mountain Lake, which also intercepts North Fork flows of the Colorado River. Shadow Mountain Lake connects with Grand Lake to make a single body of water from which diversions flow to the Alva B. Adams Tunnel to begin the journey to the eastern slope.

Emerging from Alva B. Adams Tunnel into the East Portal Reservoir, the water flows across Aspen Creek Valley in a siphon and then under Rams Horn Mountain through a tunnel. At this point, it enters a steel penstock and falls 205 feet to Marys Lake Powerplant. This powerplant is located on the west shore of Marys Lake, which provides afterbay and forebay capacity for re-regulating the flow. Between Marys Lake and Estes Powerplant, on the shore of Lake Estes, the water is conveyed by Prospect Mountain Conduit and Prospect Mountain Tunnel.

Lake Estes, below Estes Powerplant, is formed by Olympus Dam constructed across the Big Thompson River. The afterbay storage in Lake Estes and the forebay storage in Marys Lake enable the Estes Powerplant to meet daily variations in energy demand.

Water from Lake Estes and some Big Thompson River floodwaters are conveyed by Olympus Siphon and Tunnel.
Granby Dam and Reservoir

and Pole Hill Tunnel and Canal to a penstock through which the water drops 815 feet to Pole Hill Powerplant. It is then routed through Pole Hill Powerplant Afterbay, Rattlesnake Tunnel, Pinewood Lake, and Bald Mountain Pressure Tunnel, and dropped 1,055 feet through two penstocks to Flatiron Powerplant. This powerplant discharges into Flatiron Reservoir, which regulates the water for release to the foothills storage and distribution system. The afterbay storage in Flatiron Reservoir and the forebay storage in Pinewood Lake enable Flatiron Powerplant to meet daily power loads.

Southward, the Flatiron reversible pump lifts water from Flatiron Reservoir, a maximum of 297 feet, and delivers it through Carter Lake Pressure Conduit and Tunnel to Carter Lake. When the flow is reversed, the unit acts as a turbine-generator and produces electric energy.

The St. Vrain Supply Canal delivers water from Carter Lake to the Little Thompson River, St. Vrain Creek, and Boulder Creek Supply Canal. The latter delivers water to Boulder Creek and Boulder Reservoir. The South Platte Supply Canal, diverting from Boulder Creek, delivers water to the South Platte River.

Northward, the Charles Hansen Feeder Canal transports water from Flatiron Reservoir to the Big Thompson River and Horsetooth Reservoir. The canal crosses the Big Thompson River in a siphon above the river and highway. Water from the Big Thompson River can be diverted into the canal by Tunnel No. 1, Horsetooth Supply Conduit.

Project water deliveries and Big Thompson River water to be returned to the river are dropped through a chute from the feeder canal ahead of the siphon crossing, or are passed through the Big Thompson Powerplant to convert the available head to electric energy.

Horsetooth Reservoir is west of Fort Collins between two hogback ridges, where Horsetooth Dam closes the gap at one end. Soldier, Dixon, and Spring Canyon Dams and Satanka Dike close the remaining gaps.

An outlet at Soldier Canyon Dam supplies water to Fort Collins, rural water districts, Colorado State University, and the Dixon Feeder Canal for the irrigated area cut off from its water supply by the reservoir.

The principal outlet from Horsetooth Reservoir is through Horsetooth Dam into the Charles Hansen Canal. This canal delivers water to a chute discharging into the Cache la Poudre River and to a siphon crossing the river to supply the Poudre Valley and Reservoir Company Canal. A turnout supplies the Greeley municipal water works. Water is delivered to the river to replace, by exchange, that water diverted upstream of the North Poudre Supply Canal, which conveys it to the North Poudre Ditch.

Green Mountain Dam, Reservoir, and Powerplant

Green Mountain Dam is on the western slope 13 miles southeast of Kremmling on the Blue River, a tributary of the Colorado. This dam provides replacement storage for water diverted by the project to the eastern slope. The dam is an earthfill structure, 309 feet high, with a crest length of 1,150 feet and a volume of 4,360,211 cubic yards. The reservoir has a total capacity of 153,639 acre-feet. The powerplant has two units with a total installed generating capacity of 21,600 kilowatts.
Granby Dam and Lake Granby

Granby Dam is located on the Colorado River about 5.5 miles northeast of Granby. It collects and stores most of the project water supply, including the flow of the Colorado River and water pumped from Willow Creek. The dam is constructed of compacted earthfill, 298 feet high, with a crest length of 861 feet. There are 12,722 feet of auxiliary dikes. The reservoir has a capacity of 539,800 acre-feet. Total volume of the dam is 2,974,000 cubic yards. The dikes have a total volume of 1,739,000 cubic yards.

Willow Creek Dam, Reservoir, and Pumping Plant

Willow Creek Dam is 127 feet high, 1,100 feet long, and constructed of earthfill. There are 3.4 miles of canals with a capacity of 400 cubic feet per second and a pumping plant with two 200-cubic-foot-per-second pumps that lift water 175 feet into Lake Granby. The dam diverts an average of 40,000 acre-feet of water each year from Willow Creek into Lake Granby. The reservoir capacity is 10,600 acre-feet.

Granby Pumping Plant and Pump Canal

Water is pumped from Lake Granby into Shadow Mountain Lake by Granby Pumping Plant and Canal. The pumping plant contains three centrifugal pumps with a total capacity of 600 cubic feet per second at 186-foot head. The pumping lift ranges from 85 to 186 feet according to the water surface elevation in Lake Granby. The water is discharged into a canal which has a capacity of 1,100 cubic feet per second, and conveyed 1.8 miles to Shadow Mountain Lake.

Shadow Mountain Dam and Reservoir

Shadow Mountain Dam, located on the Colorado River below its confluence with the Grand Lake outlet, is an earthfill structure 63 feet high and 3,077 feet long. The reservoir formed by the dam has a total capacity of 18,400 acre-feet and is linked to Grand Lake through a connecting channel. Shadow Mountain Lake receives the water pumped from Lake Granby and also intercepts North Fork flows of the Colorado River. Project water is released from Grand Lake directly into the Alva B. Adams Tunnel, through which it flows to the eastern slope of the Continental Divide.

Alva B. Adams Tunnel

This 9.75-foot-diameter, 13-mile-long tunnel extends from Grand Lake through the Continental Divide to a point 4.5 miles southwest of Estes Park. It has a capacity of 550 cubic feet per second.

East Slope Power System-Upper

The structures of this system convey water 4.3 miles from the east portal of Alva B. Adams Tunnel to the Big Thompson River.

Emerging from the tunnel into the East Portal Reservoir, the water flows across Aspen Creek Valley in a siphon and then under Rams Horn Mountain in a tunnel. At this point, the water enters a steel penstock and falls 205 feet to Marys Lake Powerplant, which has an installed capacity of 8,100 kilowatts. This plant is located on the west shore of Marys Lake, which has been enlarged by diking the small natural basin to provide afterbay and forebay capacity for reregulating the flow. From Marys Lake to Estes Powerplant, the water is dropped 482 feet in a pressure system consisting of Prospect Mountain Conduit and Prospect Mountain Tunnel.

Estes Powerplant contains three generating units served by three 78-inch-diameter penstocks about 0.75 mile long. The installed plant capacity is 45,000 kilowatts when operating under an average net head of 482 feet.

Olympus Dam, a zoned earthfill structure with a concrete overflow spillway, is 70 feet high and has a crest length of 1,951 feet. It impounds Lake Estes on the Big Thompson River and provides regulating capacity for energy purposes. The lake has a total capacity of about 3,100 acre-feet and controls the discharges from Estes Powerplant, river inflow and outflow, and releases of project water to the Lower East Slope Power System.

East Slope Power System-Lower

This system conveys project water from Lake Estes in a southeasterly direction to the Foothills storage and supply
system. Project water released from Lake Estes flows through Olympus Siphon and Tunnel and Pole Hill Tunnel and Canal into Pole Hill Penstock and Powerplant. Water also can be released from Lake Estes to the Big Thompson River. Leaving Pole Hill Powerplant Afterbay, the water enters Rattlesnake Tunnel and flows into Pinewood Lake formed by Rattlesnake Dam. Bald Mountain Tunnel carries the water into the Flatiron Penstocks and Powerplant which discharges into Flatiron Reservoir, where it is stored for irrigation use. Pole Hill Powerplant operates under an average net head of 815 feet with a generating capacity of 33,250 kilowatts.

The Flatiron Powerplant operates under an average net head of 1,055 feet, with a generating capacity of 71,500 kilowatts. The powerplant contains two main power units and a reversible 13,000-horsepower pump-turbine unit which lifts water southward from Flatiron Reservoir to Carter Lake. This unit is capable of discharging a maximum of 370 cubic feet per second into Carter Lake and normally operates on surplus or off-peak power generated by other power units of the project system.

The pumping unit at Flatiron Powerplant pumps from Flatiron Reservoir to Carter Lake through a 1.4-mile-long connecting pressure tunnel. The pumping lift through this tunnel ranges from 200 to 300 feet, depending on the water surface elevation in Carter Lake. During peak load demands on the project system, water can be released from Carter Lake to flow back into Flatiron Reservoir, and at such times the pump-turbine operates in reverse to generate 8,500 kilowatts of power.

Flatiron Dam provides afterbay storage for water discharged from the powerplant. The water then flows by gravity northward through the Charles Hansen Feeder Canal, to and across the Big Thompson River, and on to Horsetooth Reservoir for delivery to the Poudre River, Poudre Valley Canal, and, by exchange, to the North Poudre Supply Canal.

Water pumped southward into Carter Lake is stored for irrigation deliveries to the Little Thompson River, St. Vrain Creek, Boulder Creek, and the South Platte River.

Carter Lake Dam and Reservoir

Carter Lake is one of the two main project storage reservoirs in the East Slope distribution system. Water is stored in this reservoir for delivery to the Little Thompson River, St. Vrain Creek, Boulder Creek, and the South Platte River, for return to Flatiron Reservoir for use in the Big Thompson or Cache la Poudre Valleys, or for power generation.

Carter Lake Reservoir is formed in a natural basin in the foothills by a 214-foot-high earthfill dam and two smaller dams across low saddles in the surrounding hills. The reservoir has a total capacity of 112,230 acre-feet.

St. Vrain Supply Canal

Leading from the Carter Lake outlet, the St. Vrain Supply Canal extends southward 9.8 miles to St. Vrain Creek near Lyons. It consists of an open canal, siphons, tunnels, drops, and flumes designed to convey 625 cubic feet per second of water to the Little Thompson River turnout and 575 cubic feet per second from the turnout to St. Vrain Creek.

Boulder Creek Supply Canal

Boulder Creek Supply Canal begins at the turnout near the end of the St. Vrain Supply Canal, crosses St. Vrain Creek by a siphon, and extends southeasterly 15.7 miles. It discharges into Boulder Creek about 6 miles east of Boulder. The canal has a carrying capacity of 200 cubic feet per second.

Near the lower end of the canal, the city of Boulder constructed Boulder Reservoir to be used for storage and regulation of the city’s water for replacement water carried in the canal. This reservoir was built under an agreement between the city and the Northern Colorado Water Conservancy District. Under the agreement, the reservoir provides 175 cubic feet per second of flow for the South Platte Supply Canal.

South Platte Supply Canal

This canal extends from Boulder Creek generally northeast to the South Platte River, a distance of about 32.2 miles. The capacity of the canal is 230 cubic feet per
Reservoir. The canal has a capacity of 930 cubic feet per second to the Big Thompson River and 550 cubic feet per second to the reservoir. The canal crosses the Big Thompson River and U.S. Highway 34 in a 9-foot-diameter steel siphon. A control structure ahead of the Big Thompson River Siphon provides a means to release irrigation water to the Big Thompson River to bypass surplus water, and to release water to the Big Thompson Powerplant. The Horsetooth Supply Conduit, an important feature of the canal, diverts water from the Big Thompson River about 1 mile upstream from the control structure and delivers it via a tunnel to the Charles Hansen Feeder Canal above the control structure. Diverted water is used for power generation at the Big Thompson Powerplant, or water surplus to the needs of the Big Thompson Valley can be stored in Horsetooth Reservoir. North of the Big Thompson River, the canal passes through four concrete-lined tunnels; the outlet of the last tunnel discharges the water into the Horsetooth Reservoir.

**Big Thompson Powerplant**

The Big Thompson Powerplant is on the Big Thompson River about 9 miles west of Loveland and just downstream from the river crossing of the Charles Hansen Feeder Canal. The plant operates under an effective head of 180 feet and has a generating capacity of 4,500 kilowatts.

**Horsetooth Reservoir**

Horsetooth Reservoir, with a total capacity of about 151,750 acre-feet, furnishes the main supply for the Poudre Valley, where 50 percent of the project water is used. The reservoir is 6.5 miles long, and is formed by four large earthfill dams. Horsetooth Dam closes the northern end of the valley, and Soldier Canyon, Dixon Canyon, and Spring Canyon Dams close natural outlets eroded through the hogback ridge. These dams have heights of 155, 226, 240, and 220 feet, respectively. The dams contain more than 10 million cubic yards of earthfill.

**Charles Hansen and North Poudre Supply Canals**

Outlets at Horsetooth Dam discharge into the Charles Hansen Canal, which is designed to carry a maximum of 1,500 cubic feet per second northward 5.1 miles to the Cache la Poudre River. Project water released into the river at this point is used to supplement the water supply of irrigation systems stemming from the river. It also serves as replenishment for the water taken from the river a few miles upstream by the North Poudre Supply Canal, a 12.5-mile-long canal which carries supplemental water to the North Poudre River. The 0.5-mile, 250-cubic-foot-per-second Windsor Extension Canal takes
part of the Poudre supply across the river to the Poudre Valley Canal, an older waterway that serves a portion of the conservancy district.

The Soldier Canyon Dam outlet supplies water to Colorado State University, to the small Dixon Feeder Canal for the irrigated area cut off from its water supply by Horsetooth Reservoir, to Fort Collins, and to rural water districts.

The Cache la Poudre, Big Thompson, and Little Thompson Rivers, and St. Vrain and Boulder Creeks are tributaries of the South Platte River, through which water imported from the western slope is supplied to the South Platte River Basin system. This supplemental water is used to alleviate the critical shortages that have hampered and restricted the cultivation of fertile lands in the South Platte River Valley.

Power Distribution System

Power transmission facilities include nearly 677 miles of transmission lines, 35 permanent substations, 2 mobile substations, 1 mobile transformer, 22 metering stations, and 6 permanent service shops. With the exception of 3 miles of steel tower construction of 13.1 miles of submarine-type conduit, the transmission circuits are of wood pole H-frame construction. The submarine-type conduit is the connection between eastern and western slope circuits and is in a nitrogen gas-filled pipe suspended from the top of the Alva B. Adams Tunnel.

Project power facilities are interconnected with plants of the North Platte, Kendrick, Riverton, and Shoshone Projects, and are tied into the lines of the Public Service Company of Colorado at five different locations in Colorado. Most of these power features were transferred to the Department of Energy’s (DOE) Western Area Power Administration upon the creation of DOE in 1977.

Early History

In 1870, before statehood was achieved by the Colorado Territory, the Union Colony of 2,000 people was established at Greeley. This marked the inception of cooperative irrigation in the South Platte River Valley and the beginning of an era in which irrigation became important in the economic development of northeastern Colorado.

The Union Colony started with construction of ditches to supply direct flow from the river to 12,000 acres. The venture was so successful that by 1900 the streams were overappropriated and attention was given to development of plains reservoirs to store the spring floods. By 1910, most of the better reservoir sites were used and few other possibilities were apparent, except costly transmountain diversion.

During these years, the increasing demand for agricultural products for a growing population, and the tendency to prepare as large an irrigation system as possible.
to spread the cost of the works, resulted in over-expansion, especially in years of high and adequate runoff. Subnormal or even normal runoff years were critical for much of the area so developed. Water shortages continually plagued the irrigators.

Investigations

The idea of transmountain water diversions had been in existence since 1889, when the Colorado legislature appropriated money to investigate such a proposal. Progressive steps in legislation finally led, in 1922, to the signing of the Colorado River Compact, which apportioned the Colorado River water between the upper and lower basin States. Later, the Boulder Canyon Act provided funds for determining the amount of lands that were or could be irrigated in the Colorado River Basin. A plan was developed whereby Colorado River water could be diverted into watersheds in northeastern Colorado where there was a surplus of irrigable lands and a shortage of water. The upper basin States successfully developed a compact in 1948 prorating the upper basin's share based on the 1922 compact.

Engineering investigations of the Colorado-Big Thompson Project began in 1933, when a preliminary survey to determine the feasibility of a project was undertaken. A favorable report was presented in 1934. In January 1935, the Bureau of Reclamation was allotted funds by the Public Works Administration to make a new study.

Project construction was contingent upon the formation of a conservancy district to contract with the United States Government. Accordingly, the Colorado Water Conservancy Law was passed by the Colorado legislature in 1937. The law contains several unique features. One provides that a conservancy district may be organized by any district court upon petition of a stipulated number of property owners; another recognizes that all who benefit as a result of project development should contribute to its cost and operation in proportion to those benefits.

The Northern Colorado Water Conservancy District was organized in 1937 with boundaries which include large areas of Larimer, Boulder, and Weld Counties, and portions of Morgan, Washington, Logan, and Sedgwick Counties.

Authorization

First construction funds were provided in the Interior Department Appropriation Act of August 9, 1937 (50 Stat. 595). The Secretary's finding of feasibility was approved by the President on December 21, 1937.
Construction

Construction of the project began at Green Mountain Dam during November 1938. The first power was generated at the Green Mountain Powerplant in May 1943; all construction of the dam and powerplant was completed in October 1943. Construction of Granby Dam started in 1941, and of Alva B. Adams Tunnel in the summer of 1940. Work was curtailed during World War II, but not entirely stopped. At the end of the war, the tempo of construction was speeded up. During 1956, all major features were essentially completed except the Big Thompson Powerplant, which was completed in 1959.

Operating Agencies

The Bureau of Reclamation operates all project features on the western slope, including power, storage, and carriage, and all similar works on the eastern slope above the supply canals leading from Carter Lake and Horsetooth Reservoirs. All project works below these two reservoirs are operated and maintained by the Northern Colorado Water Conservancy District.

BENEFITS

Irrigation

The Colorado-Big Thompson Project helps stabilize the agricultural and industrial economy of northeastern Colorado. It is particularly effective each year during late summer months of the irrigation season, and has a tremendous impact throughout the season in drought years.

Principal crops include sugar beets, potatoes, beans, corn, small grains, fruits, alfalfa, vegetables, dairy products, poultry, and eggs. In addition, lambs, hogs, and cattle are fattened from the byproducts of the sugar beets.

Municipal and Industrial Water

Municipal supplies have been an important aspect in the distribution of project water. Originally, nine communities had allotments totaling 44,950 acre-feet. Eleven communities now receive full or supplemental supplies. Each year, as urban population increases, irrigation allotments are transferred to domestic purposes. The dependable availability of water continues to attract a variety of industries.

Hydroelectric Power

From the eastern portal of the Alva B. Adams Tunnel, water descends about 2,800 feet to the foothills. Nearly 500 feet of the head is used for hydroelectric power generation. Gross generation averages 760 million kilowatt-hours, of which 70 million kilowatt-hours are used by project pumps and 690 million kilowatt-hours are marketed to customers in northern Colorado, eastern Wyoming, and western Nebraska. The power produced at the Bureau powerplants is marketed by DOE.

The water and power control center for Reclamation’s reservoirs, powerplants, and transmission lines in Wyoming, Colorado, and western Nebraska is at the project headquarters in Loveland, Colo. This Western Division of the Missouri River Basin is an interconnected system of 15 Reclamation powerplants and 391,750 kilowatts of installed capacity.
Recreation

About two million people visit the manmade lakes annually to enjoy fishing, motor- and sailboating, water skiing, swimming, camping, hiking, and picnicking. Trout, kokanee, bass, walleye, and perch are the principal fish caught in the clear, cool waters. Ice fishing and snowmobiling have become favorite winter sports.

PROJECT DATA

Land Areas (1981)

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Facilities in Operation

| Storage dams | 14 |
| Diverion dams | 7 |
| Canals | 99.1 mi |
| Tunnels | 34.12 mi |
| Pumping plants | 5 |
| Powerplants | 5 |
| Transmission lines | 3.42 mi |
| Substations | 5 |

Climatic Conditions

| Annual precipitation | 15 in |
| Temperature: Maximum | -102 °F |
| Minimum | -41 °F |
| Mean | 48 °F |
| Growing season | 120-150 days |
| Elevation of irrigable area | 3500-5400 ft |

Settlement

| Number of persons served with project water (1981): Farm irrigation service | 10,600 |
| Municipal and other water service | 396,998 |
| Total | 409,598 |

Power Generation

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<th>Estes Powerplant, kWh</th>
<th>Flatiron Powerplant, kWh</th>
<th>Green Mountain Powerplant, kWh</th>
<th>Marys Lake Powerplant, kWh</th>
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</table>

Urban and suburban, residential, commercial, municipal and industrial lands.
ENGINEERING DATA

**Water Supply**

**COLORADO RIVER**

| Drainage area above Shadow Mountain Dam | 187 mi² |
| Annual discharge at Shadow Mountain Lake: | |
| Maximum (1978) | 310,000 acre-ft |
| Minimum (1954) | 63,000 acre-ft |
| Average | 139,800 acre-ft |
| Drainage area between Granby Dam and Shadow Mountain Dam | 124 mi² |
| Annual discharge at Lake Granby: | |
| Maximum (1957) | 369,400 acre-ft |
| Minimum (1954) | 132,000 acre-ft |
| Average | 230,300 acre-ft |

**WILLOW CREEK**

| Drainage area above Willow Creek Dam | 127 mi² |
| Annual discharge at Willow Creek Reservoir: | |
| Maximum (1962) | 102,000 acre-ft |
| Minimum (1961) | 23,600 acre-ft |
| Average | 55,000 acre-ft |

| Estimated average annual diversions (all sources) | 257,700 acre-ft |

**BLUE RIVER**

| Drainage area above Green Mountain Dam | 599 mi² |
| Annual discharge at Green Mountain Reservoir: | |
| Maximum (1957) | 517,900 acre-ft |
| Minimum (1964) | 171,900 acre-ft |
| Average | 345,100 acre-ft |

Storage Facilities

**GREEN MOUNTAIN DAM**

Type: Zoned earthfill
Location: On the Blue River, 13 mi southeast of Kremmling, Colo.
Construction period: 1930-43
Date of closure (first storage): November 16, 1942

Reservoir, Green Mountain:

| Average annual inflow, 1937-76 | 345,100 acre-ft |
| Total capacity to El. 7950 | 153,639 acre-ft |
| Active capacity, El. 7870-7950 | 112,849 acre-ft |
| Surface area | 2,130 acres |

Dimensions:

| Structural height | 309 ft |
| Hydraulic height | 264 ft |
| Top width | 40 ft |
| Maximum base width | 1,688 ft |
| Crest length | 1,150 ft |
| Crest elevation | 7960.0 ft |
| Total volume | 4,360,211 yd³ |

Spillway: Concrete-lined open channel in left abutment controlled by three 25- by 22-ft radial gates.

| Elevation top of gates | 7950.0 ft |
| Crest elevation | 7928.0 ft |
| Capacity at El. 7950 | 25,000 ft³/s |

Outlet works: Concrete-lined tunnel through right abutment enclosing two 8.5-ft diameter steel penstocks leading to powerhouse. An outlet pipe branches from each penstock near the downstream end. Each outlet is controlled by a 44-inch needle valve.

| Capacity at El. 7950 | 1,530 ft³/s |

**GRANBY DAM AND DIES**

Type: Zoned earthfill
Location: On the Colorado River, 6 mi northeast of Granby, Colo. Dikes No. 1, 2, and 4 are continuous and close low areas west of Granby Dam. No. 3 closes a saddle about 1 mi southeast of Granby Dam.
Construction period: 1941-49
Date of closure (first storage): September 14, 1949

Reservoir, Lake Granby:

| Average annual inflow, 1937-76 | 230,300 acre-ft |
| Total capacity to El. 8280 | 539,800 acre-ft |
| Active capacity, El. 8186.9-8280 | 465,368 acre-ft |
| Surface area | 7,260 acres |

Dimensions:

<table>
<thead>
<tr>
<th>Dikes No. 1, 2, and 4</th>
<th>Dike No. 3</th>
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<tr>
<td>Structural height</td>
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<tr>
<td>Hydraulic height</td>
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<tr>
<td>Top width</td>
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<td>Maximum base width</td>
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<td>Crest length</td>
<td>861 ft</td>
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<td>Total volume</td>
<td>2,974,000 yd³</td>
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</table>

Spillway: Concrete-lined open channel at left abutment controlled by two 21- by 20-ft radial gates.

| Elevation top of gates | 8280.0 ft |
| Crest elevation | 8280.0 ft |
| Capacity at El. 8280 | 11,500 ft³/s |

Outlet works: Concrete-lined tunnel through left abutment controlled by one 12-in needle valve and one 30-in hollow-jet valve.

| Capacity at El. 8280 | 435 ft³/s |

Foundation: Granite, schist, and gneiss bedrock with many minor faults.
Special treatment: Cutoff trench and two concrete cutoff walls.

**WILLOW CREEK DAM**

Type: Zoned earthfill
Location: On Willow Creek, 4 mi north of Granby, Colo.
Construction period: 1951-53
Date of closure (first storage): April 2, 1953

Reservoir, Willow Creek:

| Average annual inflow, 1937-76 | 55,000 acre-ft |
| Total capacity to El. 8130 | 10,600 acre-ft |
| Active capacity, El. 8077-8130 | 9,100 acre-ft |
| Surface area | 303 acres |

Dimensions:

| Structural height | 127 ft |
| Hydraulic height | 95 ft |
| Top width | 30 ft |
| Maximum base width | 715 ft |
| Crest length | 1,100 ft |
| Crest elevation | 8140.0 ft |
| Total volume | 392,000 yd³ |
| Spillway: Uncontrolled concrete-lined overflow weir and chute at left abutment. |
| Crest length | 335.3 ft |
| Crest elevation | 8130.0 ft |
| Capacity at El. 8132 | 3,200 ft³/s |
Outlet works:
Diverion: Willow Creek Feeder Canal
headworks at left abutment, controlled by
two 8- by 7-ft radial gates.
Capacity (maximum) ........................................ 400 ft³/s
Outlet: Concrete-lined tunnel through
right abutment, controlled by two 3- by
6.5-ft high-pressure slide gates.
Capacity at El. 8367 ........................................ 2,050 ft³/s
Foundation: Fine-grained siltstones with a
series of lava flows.
Special treatment: Cutoff trench and concrete
cutoff wall.

SHADOW MOUNTAIN DAM AND DIKES

Type: Zoned earthenfill
Location: On Colorado River below its con-
fluence with the Grand Lake outlet. Series
of low dike extend from right abutment of
dam.
Construction period: 1944-46
Date of closure (first storage): 1946
Reservoir, Shadow Mountain and Grand
Lake:
Average annual inflow, 1920-47 .......... 139,800 acre-ft
Total capacity to El. 8367 .......... 18,400 acre-ft
Active capacity, El. 8366-8367* .......... 1,839 acre-ft
Surface area ........................................ 1,852 acres
Dimensions:
Structural height ........................................ 63 ft
Hydraulic height ........................................ 37 ft
Top width ........................................ 30 ft
Maximum base width .................................. 430 ft
Crest length (including dike) .......... 3,077 ft
Crest elevation ........................................ 8375.0 ft
Total volume (including dike) .......... 167,000 yd³
Spillway: Concrete-lined open channel at
right abutment, controlled by two 20- by
20-ft radial gates.
Elevation top of gates ................. 8367.0 ft
Crest elevation ........................................ 8348.0 ft
Capacity at El. 8367 ......................... 10,000 ft³/s
Outlet works: Shluiting outlet only below
spillway floor, controlled by 2.5-ft-square
slide gate at inlet end.
Capacity (maximum) .......................... 50 ft³/s

MARYS LAKE DIKES

Type: Homogeneous earthenfill
Location: Two dike on shoreline of Marys
Lake 2 mi from Estes Park, Colo.
Construction period: 1947-49
Date of closure (first storage): August 1950
Reservoir, Marys Lake:
Total capacity to El. 8340 .............. 900 acre-ft
Active capacity, El. 8025-8040 .......... 547 acre-ft
Surface area ........................................ 42 acres
Dimensions:
Dike No. 1  Dike No. 2
Structural height ........................................ 29 ft  35 ft
Hydraulic height ........................................ 20 ft  25 ft
Top width ........................................ 30 ft  30 ft
Maximum base width ............................ 170 ft  185 ft
Crest length ........................................ 820 ft  950 ft
Crest elevation ........................................ 8050.0 ft  8050.0 ft
Total volume (both dikes) ............ 90,000 yd³
Spillway: None
Outlet works: Concrete intake structure to
Prospect Mountain Conduit through base
of Dike No. 1, controlled by one 12.5-ft-
square fixed-wheel gate.
Capacity (controlled by capacity of conduit) .......... 1,300 ft³/s

OLYMPUS DAM

Type: Zoned earthenfill, concrete overflow
section
Location: On the Big Thompson River,
1.5 miles east of Estes Park, Colo.
Construction period: 1947-49
Date of closure (first storage): November
1948
Reservoir, Lake Estes:
Average annual inflow, 1937-76 .......... 90,300 acre-ft
Total capacity to El. 7475 .......... 3,068 acre-ft
Active capacity, El. 7450.25-7475 .......... 2,659 acre-ft
Surface area ........................................ 185 acres
Dimensions:
Structural height ........................................ 70 ft
Hydraulic height ........................................ 45 ft
Top width ........................................ 30 ft
Maximum base width .................................. 288 ft
Crest length ........................................ 1,951 ft
Crest elevation ........................................ 7481.0 ft
Total volume ........................................ 311,600 yd³
Spillway: Concrete overflow section at south
abutment, controlled by five 20- by 17-ft
radial gates.
Elevation top of gates ................. 7475.0 ft
Crest elevation ........................................ 7460.0 ft
Capacity at El. 7475 ......................... 22,500 ft³/s
Outlet works: Two 18-in pipes through gravity
section, each controlled by a 2.5-ft-square
slide gate.
Diverion: Intake to Olympus Siphon at right
of overflow section controlled by two 6.25-
by 8.0-ft fixed-wheel gates.
Capacity (controlled by capacity of siphon) ... 550 ft³/s
Foundation: Sand, gravel, and cobbles up to
15 ft deep lying over decomposed, frac-
tured and broken granite.
Special treatment: Grout curtain beneath
concrete section.

RATTLESNAKE DAM

Type: Zoned earthenfill
Location: On Rattlesnake Creek, 12 mi
east of Estes Park, Colo.
Construction period: 1951-52
Date of closure (first storage): January 4,
1954
Reservoir, Pinewood:
Total capacity to El. 6580 .............. 2,181 acre-ft
Active capacity, El. 6550-6580 .......... 1,570 acre-ft
Surface area ........................................ 97 acres
Dimensions:
Structural height ........................................ 130 ft
Hydraulic height ........................................ 100 ft
Top width ........................................ 30 ft
Maximum base width .................................. 615 ft
Crest length ........................................ 1,100 ft
Crest elevation ........................................ 6595.0 ft
Total volume ........................................ 432,000 yd³
Spillway: Uncontrolled concrete weir and
concrete-lined chute at right abutment.
Crest length ........................................ 102 ft
Crest elevation ........................................ 6580.0 ft
Capacity at El. 6589 ......................... 10,400 ft³/s
Outlet works: Rrver outlet: Cement-lined, cast-iron pipe
through base of dam controlled by one
16-in gate valve.
Capacity at El. 6589 ......... 23 ft³/s
Diverion outlet: Intake to Bald Mountain
Pressure Tunnel.
Foundation: Generally soft, jointed, decom-
pased or broken schist lying over gneiss.
Special treatment: Grout curtain beneath
cutoff wall.

*One-foot operating range in accordance with Senate Document No. 80.
**FLATIRON DAM**

Type: Zoned earthfill  
Location: On Chimney Hollow Creek 8 mi southwest of Loveland, Colo.  
Construction period: 1951-53  
Date of closure (first storage): January 1954  
Reservoir, Flatiron:  
- Total capacity to El. 5472.8: 760 acre-ft  
- Active capacity, El. 5462-5472.8: 436 acre-ft  
- Surface area: 47 acres  
Dimensions:  
- Structural height: 86 ft  
- Hydraulic height: 55 ft  
- Top width: 30 ft  
- Maximum base width: 455 ft  
- Crest length: 1,725 ft  
- Crest elevation: 5486.0 ft  
- Total volume: 382,000 yd³  
Spillway: Uncontrolled concrete crest and concrete-lined channel at left abutment.  
- Crest elevation: 5472.8 ft  
- Outlet works: Twin-barrel concrete conduit through base of dam near left abutment controlled by two 6.75- by 9.0-ft radial gates.  
- Capacity at El. 5464.8: 930 ft³/s  

**CARTER LAKE DAMS**

Type: Zoned earthfill  
Location: Carter Lake No. 1, the southernmost dam, is at a natural outlet from Carter Lake Basin, 7 mi northwest of Berthoud, Colo. Carter Lake No. 2 is in a saddle on east shoreline of the reservoir. No. 3 is in a saddle on the north shoreline.  
Construction period: 1950-52  
Reservoir, Carter Lake:  
- Total capacity to El. 5759: 112,230 acre-ft  
- Active capacity, El. 5618-5759: 101,022 acre-ft  
- Surface area: 1,140  
Dimensions:  
- Structural height: 214 ft  
- Hydraulic height: 190 ft  
- Top width: 40 ft  
- Maximum base width: 1,320 ft  
- Crest length: 1,235 ft  
- Crest elevation: 5769.0 ft  
- Total volume: 2,547,388 yd³  
Spillway: None  
- Outlet works: Concrete conduit through base of Dam, No. 1, controlled by two 3-ft-square slide gates.  
- Capacity at El. 5763: 1,260 ft³/s  

**HORSETOOTH DAM AND SATANKA DIKE**

Type: Zoned earthfill  
Location: North end of Horsetooth Reservoir. 4 mi northwest of Fort Collins, Colo. Satanka Dike closes saddle on north shoreline, about 800 ft northwest of the dam.  
Construction period: 1940-49  
Date of closure (first storage): January 10, 1951  
Reservoir, Horsetooth:  
- Total capacity to El. 5430: 151,750 acre-ft  
- Active capacity, El. 5270-5430: 143,480 acre-ft  
- Surface area: 1,899 acres  
Dimensions:  
- Structural height: 155 ft  
- Hydraulic height: Offstream  
- Top width: 35 ft  
- Maximum base width: 785 ft  
- Crest length: 1,840 ft  
- Crest elevation: 5440.0 ft  
- Total volume (dam and dike): 1,871,363 yd³  
Spillway: None  
- Outlet works: Concrete conduit through base of dam, controlled by two 72-in hollow-jet valves.  
- Capacity at El. 5430: 2,500 ft³/s  
- Foundation: Limy shales and sandstones overlain with siltly, sandy clay. Special treatment: Cutoff trench and concrete cutoff wall.  

**SOLDIER CANYON DAM**

Type: Zoned earthfill  
Location: East shore of Horsetooth Reservoir, 3.5 mi west of Fort Collins, Colo.  
Construction period: 1946-49  
Dimensions:  
- Structural height: 226 ft  
- Hydraulic height: 203 ft  
- Top width: 40 ft  
- Maximum base width: 1,365 ft  
- Crest length: 1,438 ft  
- Crest elevation: 5440.0 ft  
- Total volume: 3,211,621 yd³  
Spillway: None  
- Outlet works: Concrete-lined, tunnel through right abutment housing 30-in steel pipe, controlled by one 18-in pivot (butterfly) valve.  
- Capacity at El. 5430: 90 ft³/s  
- Foundation: Sandstone and shale. Special treatment: Cutoff trench and concrete cutoff wall.  

**DIXON CANYON DAM**

Type: Zoned earthfill  
Location: East shore of Horsetooth Reservoir, 3 mi southeast of Fort Collins, Colo.  
Construction period: 1946-49  
Dimensions:  
- Structural height: 240 ft  
- Hydraulic height: 215 ft  
- Top width: 40 ft  
- Maximum base width: 1,500 ft  
- Crest length: 1,265 ft  
- Crest elevation: 5440.0 ft  
- Total volume: 2,961,350 yd³  
Spillway: None  
- Outlet works: None  
- Foundation: Sandstone and shale. Special treatment: Cutoff trench and concrete cutoff wall.  

**SPRING CANYON DAM**

Type: Zoned earthfill  
Location: East shore of Horsetooth Reservoir, 4.5 mi southwest of Fort Collins, Colo.  
Construction period: 1940-49  
Dimensions:  
- Structural height: 220 ft  
- Hydraulic height: 198 ft  
- Top width: 40 ft  
- Maximum base width: 1,350 ft  
- Crest length: 1,120 ft
Crest elevation .......................... 5440.0 ft
Total volume ................................ 2,095,240 yd³
Spillway: None
Outlet works: None
Foundation: Sandstone and shale
Special treatment: Cutoff trench and concrete cutoff wall.

**Diversion Facilities**

**WILLow CREEK FOREBAY DAM**
Type: Earth and rockfill
Location: On Willow Creek Feeder Canal, 1 mi west of Granby Reservoir.
Year completed: 1953
Dimensions:
- Structural height: 24 ft
- Hydraulic height: 11 ft
- Crest length: 580 ft
- Crest elevation: 8120.0 ft
- Total volume: 15,000 yd³
- Spillway: Capacity: 450 ft³/s
- Diversion outlet: Forebay connects to pumping plants through 1,500-ft-long channel.
- Capacity: 400 ft³/s

**EAST PORTAL DAM**
Type: Rockfill with concrete corewall
Location: On the Wind River at East Portal of Alva B. Adams Tunnel, 4.5 mi southwest of Estes Park, Colo.
Year completed: 1947
Dimensions:
- Structural height: 76 ft
- Hydraulic height: 10 ft
- Crest length: 245 ft
- Crest elevation: 8265.0 ft
- Spillway: Capacity: 550 ft³/s
- Crest elevation: 8258.3 ft
- Diversion outlet: To Parshall flume section ahead of Aspen Creek Siphon.
- Capacity: 550 ft³/s

**LITTLE HILL CREEK DIVERISON DAM**
Type: Earth and rockfill
Location: On Little Hill Creek above Pole Hill switchyard.
Year completed: 1952
Dimensions:
- Structural height: 43 ft
- Hydraulic height: 33 ft
- Crest length: 220 ft
- Crest elevation: 6640.0 ft
- Volume: 10,000 yd³
- Spillway: None
- Diversion capacity: 550 ft³/s

**SOUTH PLATTE SUPPLY CANAL DIVERSION DAM**
Type: Diversion embankment and concrete overflow structure connected by 885-ft channel
Location: On Boulder Creek about 8 mi east of Boulder, Colo.
Year completed: 1956
Dimensions:
- Crest elevation (embankment): 10.6 ft
- Hydraulic height (embankment): 5 ft
- Crest length (embankment): 64 ft
- Crest length (concrete section): 34 ft
- Crest elevation (embankment): 5052.2 ft
- Spillway: Concrete overflow type
- Capacity: 230 ft³/s

**POLE HILL AFTERBAY DAM**
Type: Earth and rockfill
Location: Below Pole Hill Powerplant, 10.5 mi east of Estes Park, Colo.
Year completed: 1953
Dimensions:
- Structural height: 32 ft
- Hydraulic height: 21 ft
- Crest length: 220 ft
- Crest elevation: 6597.0 ft
- Volume: 6,000 yd³
- Siphon spillway: Capacity: 550 ft³/s
- Crest elevation: 6593.0 ft
- Diversion capacity: 550 ft³/s

**BIG THOMPSON DIVERSION DAM**
Type: Concrete box, combined overflow and grated inlet
Location: On the Big Thompson River, at west portal of Horsetooth Supply Conduit, 8.5 mi west of Loveland, Colo.
Year completed: 1950
Dimensions:
- Structural height: 35 ft
- Hydraulic height: 8 ft
- Crest length: 90 ft
- Crest elevation: 5500.0 ft
- Weir crest length: 50 ft
- Weir crest elevation: 5486.5 ft
- Volume: 1,300 yd³
- Spillway: Overflow
- Diversion capacity: 600 ft³/s

**NORTH Poudre DIVERISON DAM**
Type: Concrete ogee weir
Location: On the Cache la Poudre River about 11 mi northwest of Fort Collins, Colo.
Year completed: 1952
Dimensions:
- Structural height: 24 ft
- Hydraulic height: 6 ft
- Crest length: 200 ft
- Crest elevation: 5439.0 ft
- Weir crest length: 130 ft
- Weir crest elevation: 5428.0 ft
- Volume: 1,300 yd³
- Spillway: Overflow
- Diversion capacity: 250 ft³/s

**Carriage Facilities**

**ELLIOt CREEK FEEDER CANAL**
Location: From Elliot Creek into Green Mountain Reservoir, just above dam.
Construction period: 1943
Length: 1.1 mi
Capacity: 90 ft³/s
Typical maximum section in earth:
- Bottom width: 4 ft
- Side slopes: 1.5:1
- In cut: 2:1
- Water depth: 2 ft
Typical flume section:
- Bottom width: 9.5 ft
- Water depth: 2 ft
- Lining thickness: 6 in
WILLOW CREEK FEEDER CANAL

Location: From Willow Creek Dam generally east to Willow Creek Pumping Plant, then to Granby Reservoir.
Construction period: 1951-53
Length .............................................. 3.4 mi
Capacity .......................................... 400 ft³/s
Typical maximum section in earth:
Bottom width ..................................... 14 ft
Side slopes ........................................ 1.5:1
Water depth ....................................... 6.9 ft
Typical maximum section, concrete lined:
Bottom width ..................................... 5 ft
Side slopes ........................................ 1.5:1
Water depth ....................................... 5.2 ft
Lining thickness ................................... 4 in

GRANBY PUMP CANAL

Location: From Granby Pumping Plant to Shadow Mountain Lake.
Construction period: 1949-50
Length .............................................. 1.8 mi
Capacity .......................................... 1,100 ft³/s
Typical maximum section in earth:
Bottom width ..................................... 20 ft
Side slopes ........................................ 2:1
Water depth ....................................... 10.5 ft
Typical maximum section, gravel lined:
Bottom width ..................................... 20 ft
Side slopes ........................................ 2:1
Water depth ....................................... 10.5 ft
Lining thickness ................................... 3-4.5 in

ALVA B. ADAMS TUNNEL

Location: From Grand Lake east to a point on Wind River about 4.5 mi southwest of Estes Park, Colo.
Construction period: 1940-47
Length .............................................. 13 mi
Capacity .......................................... 550 ft³/s
Cross section: Circular
Diameter .......................................... 9.75 ft
Lining: Concrete

ASPEN CREEK SIPHON

Location: From Parshall flume section at East Portal Reservoir to Rams Horn Tunnel.
Construction period: 1947-48
Length .............................................. 1.3 mi
Capacity .......................................... 550 ft³/s
Diameter .......................................... 10.75 ft

RAMS HORN TUNNEL

Location: End of cut-and-cover flume section from Aspen Creek Siphon northeast to penstock gate structure for Marys Lake Powerplant.
Construction period: 1946-47
Length .............................................. 13 mi
Capacity .......................................... 1,300 ft³/s
Cross section: Horseshoe
Diameter .......................................... 10 ft
Lining: Concrete

PROSPECT MOUNTAIN CONDUIT

Location: From outlet in Marys Lake Dike No. 1 eastward to Prospect Mountain Tunnel.
Description: Reinforced-concrete pressure conduit (covered)
Construction period: 1947-49
Length .............................................. 0.6 mi
Capacity .......................................... 1,300 ft³/s
Diameter .......................................... 12.5 ft

PROSPECT MOUNTAIN PRESSURE TUNNEL

Location: From Prospect Mountain Conduit northeast to surge tank and Estes Powerplant penstock gate structure.
Construction period: 1946-48
Length .............................................. 1.1 mi
Capacity .......................................... 1,300 ft³/s
Cross section: Circular
Diameter .......................................... 12.5 ft
Lining: Concrete

OLYMPUS SIPHON

Location: From Olympus Dam to Olympus Tunnel.
Construction period: 1950
Type: Monolithic concrete pipe
Length .............................................. 0.8 mi
Capacity .......................................... 550 ft³/s
Diameter .......................................... 10.75 ft

OLYMPUS AND POLE HILL TUNNELS

Location: From Olympus Siphon east to Pole Hill Canal. The tunnels are connected by a short length of covered conduit.
Construction period: 1949-52
Length (Olympus, 1.8; Pole Hill, 5.4) .............................................. 7.2 mi
Capacity .......................................... 550 ft³/s
Cross section: Horseshoe
Diameter .......................................... 9.75 ft
Lining: Concrete

POLE HILL CANAL

Location: From end of Pole Hill Tunnel to Pole Hill Powerplant penstock gate structure.
Construction period: 1952
Length .............................................. 0.5 mi
Capacity .......................................... 550 ft³/s
Typical maximum section, concrete lined:
Bottom width ..................................... 7 ft
Side slopes ........................................ 1.25:1
Water depth ....................................... 7.4 ft
Lining thickness ................................... 4 in
Typical maximum section, bench flume:
Bottom width ..................................... 16.3 ft
Water depth ....................................... 7.4 ft
Lining thickness ................................... 8 in

RATTLESNAKE SIPHON AND TUNNEL

Location: From Pole Hill Powerplant Afterbay east to Pinewood Reservoir.
Construction period: 1950-52
Length .............................................. 1.7 mi
(Outlet through dam, 9.75-ft-diameter concrete siphon, 274 ft long, crosses creek bed)
Capacity .......................................... 550 ft³/s
Cross section (tunnel): Horseshoe
Diameter .......................................... 9.75 ft
Lining: Concrete

BALD MOUNTAIN PRESSURE TUNNEL

Location: From Pinewood Reservoir east to surge tank, Flatiron Powerplant penstock gate structure.
COLORADO-BIG THOMPSON PROJECT

Construction period: 1950-52

- Length ........................................... 1.3 mi
- Capacity ........................................ 960 ft³/s
- Cross section: Circular
- Diameter ........................................ 10.5 ft
- Lining: Concrete

CARTER LAKE PRESSURE CONDUIT AND TUNNEL

Location: From Flatiron Powerplant southeast to Carter Lake Reservoir.

- Construction period: 1950-52
- Length ........................................... 1.4 mi
- Capacity ........................................ 550 ft³/s
- Cross section: Circular
- Diameter ........................................ 8 ft
- Lining: Concrete

FLATIRON CANAL

Location: Connection between Flatiron Power and Pumping Plant afterbay pool and the Flatiron Reservoir.

- Construction period: 1951-53
- Length ........................................... 0.3 mi
- Capacity ........................................ 960 ft³/s
- Typical maximum section:
  - Bottom width .................................. 20 ft
  - Side slopes .................................... 1.5:1
  - Water depth .................................. 18.8 ft

ST. VRAIN SUPPLY CANAL

Location: From Carter Lake Reservoir at Dam No. 1 south to St. Vrain Creek near Lyons, Colo.

- Construction period: 1952-54
- Length ........................................... 9.8 mi
- Capacity ........................................ 625 ft³/s
- Typical maximum, concrete lined:
  - Bottom width .................................. 7 ft
  - Side slopes .................................... 1.25:1
  - Water depth .................................. 6 ft
  - Lining thickness .............................. 4 in
  - Typical maximum section in earth:
    - Bottom width .................................. 20 ft
    - Side slopes .................................... 1.5:1
    - Water depth .................................. 7.4 ft

BOULDER CREEK SUPPLY CANAL

Location: From turnout near end of St. Vrain Supply Canal generally south to Boulder Creek about 6 mi east of Boulder, Colo. Boulder (municipal) Reservoir on canal line used as carrier.

- Construction period: 1953-55
- Length ........................................... 15.7 mi
- Capacity ........................................ 200 ft³/s
- Typical maximum section in earth:
  - Bottom width .................................. 12 ft
  - Side slopes .................................... 1.5:1
  - Water depth .................................. 4.6 ft
  - Typical maximum section in rock:
    - Bottom width .................................. 12 ft
    - Side slopes .................................... 0.5:1
    - Water depth .................................. 4.3 ft
  - Typical maximum section, compacted earth lined:
    - Bottom width .................................. 12 ft
    - Side slopes .................................... 1.5:1
    - Water depth .................................. 4.6 ft
    - Lining thickness .............................. 3 ft

SOUTH PLATTE SUPPLY CANAL

Location: From Boulder Creek about 8 mi east of Boulder, Colo., generally northeast to vicinity of Fort Lupton, Colo. Coal Ridge Waste Lake on canal line and used as carrier.

- Construction period: 1954-56
- Length ........................................... 32.2 mi
- Capacity ........................................ 230 ft³/s
- Typical maximum section in earth:
  - Bottom width .................................. 20 ft
  - Side slopes .................................... 2:1
  - Water depth .................................. 3.2 ft

CHARLES HANSEN FEEDER CANAL

Location: From Flatiron Reservoir generally north to Horsetooth Reservoir—Flatiron section to Big Thompson turnout; Horsetooth section to reservoir.

- Construction period: 1949-53
- Length ........................................... 3.8 mi
- Horsetooth section ................................ 9.4 mi
- Typical maximum section, concrete lined:
  - Flariron ................................ 930 ft³/s
  - Horsetooth ................................ 550 ft³/s
  - Bottom width .................................. 13 ft
  - Side slopes .................................... 1.25:1
  - Water depth .................................. 8.8 ft
  - Lining thickness .............................. 4 in
  - Typical maximum section in rock:
    - Bottom width .................................. 15 ft
    - Side slopes .................................... 1:1
    - Water depth .................................. 8.1 ft

DIXON FEEDER CANAL

Location: From Soldier Canyon Dam to College Lake and Dixon Canyon Reservoir.

- Construction period: 1950
- Length ........................................... 3 mi
- Capacity ........................................ 8 ft³/s
- Typical maximum section in earth:
  - Bottom width .................................. 3 ft
  - Side slopes .................................... 1.5:1
  - Water depth .................................. 1 ft

CHARLES HANSEN CANAL

Location: From Horsetooth Dam generally north to Cache la Poudre River.

- Construction period: 1959-52
- Length ........................................... 5.1 mi
- Capacity ........................................ 1,500 ft³/s
- Typical maximum section in earth:
  - Bottom width .................................. 32 ft
  - Side slopes .................................... 1.5:1
  - Water depth .................................. 10.8 ft
  - Typical maximum section, concrete lined:
    - Bottom width .................................. 12 ft
    - Side slopes .................................... 1.25:1
    - Water depth .................................. 7.2 ft
    - Lining thickness .............................. 4 in

WINDSOR EXTENSION CANAL

Location: From Charles Hansen Canal near the Cache la Poudre River to existing Poudre Valley Canal.

- Construction period: 1952
- Length ........................................... 0.5 mi
- Capacity ........................................ 250 ft³/s
**Colorado-Big Thompson Project**

Typical maximum section, concrete bench
flume:
- **Width**: 8 ft
- **Water depth**: 5 ft
- **Wall thickness**: 8 in

**Total maximum section, concrete lined**:
- **Bottom width**: 7 ft
- **Side slopes**: 1.25:1
- **Water depth**: 5.6 ft
- **Lining thickness**: 4 in

**NORTH PoudRE SUPPLY CANAL**

Location: From North Poudre Diversion Dam on the Cache la Poudre River about 11 mi northwest of Fort Collins, generally northeast.

Construction period: 1951-53
- **Length**: 12.5 mi
- **Capacity**: 250 ft²/s

**Typical maximum section in earth**:
- **Bottom width**: 12 ft
- **Side slopes**: 1.5:1
- **Water depth**: 5.6 ft

**Typical maximum section in rock**:
- **Bottom width**: 14 ft
- **Side slopes**: 0.5:1
- **Water depth**: 5.6 ft

**Pumping Plants³**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Number of units</th>
<th>Total capacity, ft³/s</th>
<th>Total dynamic head, ft</th>
<th>Total horse-power</th>
</tr>
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<tbody>
<tr>
<td>Granby</td>
<td>3</td>
<td>600</td>
<td>186</td>
<td>18,000</td>
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<tr>
<td>Willow Creek</td>
<td>2</td>
<td>400</td>
<td>175</td>
<td>10,000</td>
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<tr>
<td>Flapiron</td>
<td>1†</td>
<td>370</td>
<td>240</td>
<td>13,000</td>
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</table>

³There are 12 small pumping units installed on the project in the Kremmling area. They have capacities of 2 to 12 ft³/s, with a total capacity of 91 ft³/s. Total dynamic heads range from 5.5 to 17 ft, and the installed horse-power ranges from 7.5 to 20.

⁴The unit may be operated in reverse as a generating unit (8,500-kW capacity) to utilize water released back to Flapiron Reservoir from Carter Lake for redistribution via Charles Hansen Canal, or for power purposes only.

**Power Facilities**

**GREEN MOUNTAIN POWERPLANT**

Location: At right side, toe of Green Mountain Dam.
- Year of initial operation: 1943
- **Nameplate capacity**: 21,600 kW
- **Number and capacity of generators**: (2) 10,800 kW
- **Maximum head**: 261 ft

**MARYS LAKE POWERPLANT**

Location: At western shore of Marys Lake, 2.5 mi southwest of Estes Park, Colo.
- Year of initial operation: 1951
- **Nameplate capacity**: 8,100 kW
- **Number of generators**: 1
- **Maximum head**: 210 ft

**ESTES POWERPLANT**

Location: At the upper end of Lake Estes near Estes Park, Colo.
- Year of initial operation: 1950
- **Nameplate capacity**: 45,000 kW

<table>
<thead>
<tr>
<th>Designation</th>
<th>Capacity kWh</th>
<th>Circuit miles</th>
<th>Year placed in service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beaver Creek—Limon</td>
<td>15,000</td>
<td>572</td>
<td></td>
</tr>
</tbody>
</table>
| **POLE HILL POWERPLANT**
| Location: In Little Hell Canyon, 10 mi east of Estes Park, Colo.
- Year of initial operation: 1954
- **Nameplate capacity**: 33,250 kW
- **Number of generators**: 1
- **Maximum head**: 940 ft

**FLATIRON POWERPLANT**

Location: In Chimney Hollow, 10 mi west of Loveland, Colo.
- Year of initial operation: 1954
- **Nameplate capacity**: 71,500 kW
- **Number of generators**: 2
  - 31,500 kW
  - 8,500 kW
- **Maximum head**: 1,118 ft

**BIG THOMPSON POWERPLANT**

Location: On the Big Thompson River 9 mi west of Loveland, Colo.
- Year of initial operation: 1959
- **Nameplate capacity**: 4,500 kW
- **Maximum head**: 183.5 ft

**SUBSTATIONS AND SWITCHYARDS**

- Substations and switchyards: 5
- Project also operates two mobile substations and one mobile transformer
- Total capacity of transformers: 143,437 kVA

**TRANSMISSION LINES**

- Total number of lines: 1
- Total circuit miles: 3.42

<table>
<thead>
<tr>
<th>Designation</th>
<th>Capacity kV</th>
<th>Circuit miles</th>
<th>Year placed in service</th>
</tr>
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<tbody>
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<td>Beaver Creek—Akron</td>
<td>115</td>
<td>22.18</td>
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<td>YWEDA Otis Tap</td>
<td>115</td>
<td>17.12</td>
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<td>8.19</td>
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<td>Yuma Tap—Eckley Tap</td>
<td>115</td>
<td>10.07</td>
<td>1951</td>
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<td>Eearly Tap—Tri-State's Wray Tap</td>
<td>115</td>
<td>13.97</td>
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<td>Tri-State's Wray Tap—Wray Tap</td>
<td>115</td>
<td>2.14</td>
<td>1951</td>
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<td>Yuma Tap—Yuma (Colo.)</td>
<td>115</td>
<td>0.84</td>
<td>1953</td>
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</table>

**CHEYENNE—FLATIRON**

- Tap near Ault—PV REA Black Hollow Tap: 115, 5.13, 1952
- PV REA Black Hollow Tap—Timnath Tap: 115, 5.43, 1952
- Timnath Tap—Poudre Station 400: 115, 4.06, 1952
- Poudre Station 400—P.S. Co. Ft. Collins: 115, 1.00, 1952
- P.S. Co. Ft. Collins—Drake Road Tap: 115, 1.10, 1952
- Drake Road Tap—T.S. Horseshoe Tap: 115, 3.80, 1952
- T.S. Horsetooth Tap—Flatiron: 115, 11.87, 1952
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<thead>
<tr>
<th>Designation</th>
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<th>Circuit miles</th>
<th>Year placed in service</th>
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<td>Erie—Brighton</td>
<td>115</td>
<td>6.10</td>
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<td>Brighton—Hoyt</td>
<td>115</td>
<td>40.42</td>
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<tr>
<td>Hoyt—Morgan Co.REA Adena Tap</td>
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<td>14.95</td>
<td>1952</td>
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<td>Morgan Co. REA Adena Tap—Beaver Creek</td>
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<td>17.01</td>
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<td>Hoyt—Wiggins</td>
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<td>115</td>
<td>16.28</td>
<td>1939</td>
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<td>Estes—Marys Lake</td>
<td>115</td>
<td>3.11</td>
<td>1951</td>
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<td>Estes—Pole Hill</td>
<td>115</td>
<td>10.29</td>
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<td>Flatiron—Kodak</td>
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<td>Flatiron—PV REA Carter Lake Tap</td>
<td>115</td>
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<td>Loveland Tap—Derby Hill</td>
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<td>Green Mountain—Summit</td>
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<td>115</td>
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<td>Kodak—Weld</td>
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<td>Kodak—PV REA Kodak East Tap</td>
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<td>Weld—Beaver Creek</td>
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<td>PV REA Kersey Tap—Prospect Valley Tap</td>
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<td>Estes—Granby PP</td>
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<td>Troublesome Tap—Wm Fork Tap (Denver)</td>
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<td>Sterling—Fleming</td>
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<td>Fleming—Crocket Tap</td>
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<td>Crook Tap—Haxtun</td>
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<td>Haxtun—Holyoke</td>
<td>24.9</td>
<td>1.60</td>
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<td>Granby—Granby Dam (Station Service)</td>
<td>13.8</td>
<td>4.32</td>
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<td>Flatiron—Big Thompson</td>
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<td>4.87</td>
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<td>Troublesome—Colo. River Improvement</td>
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<td>10.00</td>
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<td>Estes—Marys Lake</td>
<td>6.9</td>
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* Bureau of Reclamation retained control of this transmission line, all other lines transferred to DOE in 1977.
EMBANKMENT EXPLANATION

1. Impervious, selected clay, sand and gravel composition-rolled into 6-inch compacted layers.
2. Semi-pervious, selected clay, sand and gravel-graded in contrast to outer slopes-rolled into 6-inch compacted layers.
3. Pervious-selected sand and gravel composition-rolled into 6-inch compacted layers.

GENERAL PLAN

SECTION IN RIVER CHANNEL

OUTLET TUNNEL PROFILE

PROFILE ON E OF SPILLWAY

RESERVOIR AREA IN THOUSANDS OF ACRES

RESERVOIR CAPACITY IN THOUSANDS OF 10,000 FEET

OUTLET DISCHARGE IN HUNDREDS OF C.C. FEET

DISSERON DISCHARGE IN THOUSANDS OF SEC. FEET

AREA-CAPACITY-DISCHARGE CURVES

Granby Dam, Plan and Sections
EMBANKMENT EXPLANATION
1) Selected clay, sand, and gravel compacted by
   ramming rollers to 6-inch layers.
2) Selected sand, gravel, and cobbles, compacted by
   crawler type tractors to 12-inch layers.

PROFILE OF PUMP CANAL HEADWORKS

PROFILE ON E OUTLET WORKS

PROFILE ON E AUXILIARY SPILLWAY STRUCTURE
Shadow Mountain Dam, Plan and Sections
RESERVOIR CAPACITY

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<th>CAPACITY (ACRE-FT)</th>
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MAXIMUM SECTION OF DIKES

Marys Lake, Plan and Section of Dikes
Colorado-Big Thompson Project

PLAN

UPSTREAM ELEVATION

SECTION THRU SPILLWAY APRON

MAXIMUM SPILLWAY SECTION

SECTION THRU CANAL INTAKE AND SIPHON

MAXIMUM EMBANKMENT SECTION

Olympus Dam, Plan and Sections
GENERAL PLAN

PROFILE ON E OF OUTLET WORKS

PROFILE ON E OF SPILLWAY

EMBANKMENT EXPLANATION

1. Selected clay, sand and gravel compacted by tamping rollers to 6-inch layers.
2a. Selected rock fines compacted by crawler type tractors to 12-inch layers.
2c. Composite fill.
4. Selected clay, sand, gravel, and rock fragments compacted by tamping rollers to 12-inch layers.

Rattlesnake Dam, Plan and Sections
Flatiron Dam, Plan and Sections
EMBANKMENT EXPLANATION

1. Impervious material of clay, sand and gravel compacted by rollers to 6" layers.
2. Rock fines compacted to 12" layers by crawler type tractors.
3. Rock fill increasing in coarseness toward outer slope.

PROFILE ALONG AND OUTLET WORKS

MAXIMUM SECTION DAM No. 1

MAXIMUM SECTION DAM No. 2

MAXIMUM SECTION DAM No. 3

Carter Lake Dams, Plan and Sections
Horsetooth Dam, Plan and Sections
EMBANKMENT EXPLANATION

1. Imperious material of clay, sand, and gravel, graduated in coarseness toward outer slopes, compacted in 6" layers.
2. Rock fines compacted in 12" layers.
3. Perious material of sand, gravel, and cobbles, compacted in 12" layers.
4. Rockfill graduated in coarseness toward outer slopes.

Soldier Canyon Dam, Plan and Sections
**Embarkment Explanation**

1. Impervious material of clay, sand and gravel, graduated in coarseness toward outer slopes, compacted in 6” layers.
2. Semipervious sand and gravel compacted in 12” layers.
3. Rock fines compacted in 12” layers.
4. Rockfill graduated in coarseness toward outer slope.

**Maximum Section**

**Profile Along E of Cutoff Wall**

Dixon Canyon Dam, Plan and Sections
EMBANKMENT EXPLANATION

1. Impervious material of clay, sand and gravel graduated in coarseness toward outer slopes, compacted in 8" layers.
2. Semipervious sand and gravel compacted in 12" layers.
3. Rock fines compacted in 12" layers.
4. Rockfill graduated in coarseness toward outer slope.

MAXIMUM SECTION

PROFILE ALONG E OF CUT-OFF WALL
North Poudre Diversion Dam, Plan and Sections
Green Mountain Powerplant, Plan and Sections
Marys Lake Powerplant, Plan and Sections
Estes Powerplant, Plan and Section
Pole Hill Powerplant, Plan and Sections
Flatiron Power and Pumping Plant, Plan and Section
Big Thompson Powerplant, Plan and Sections
TRANVERSE SECTION

Granby Pumping Plant, Plan and Section
PLAN - MOTOR FLOOR

TRANSVERSE SECTION THRU PUMP

Willow Creek Pumping Plant, Plan and Section