CITY OF Grand Junction COLORADO

**Purchasing Division**

# ADDENDUM NO. 1

**DATE:** May 2, 2018
**FROM:** City of Grand Junction Purchasing Division
**TO:** All Offerors
**RE:** Professional Services for Water Supply Modeling for City of Grand Junction RFP-4524-18-DH

Offerors responding to the above referenced solicitation are hereby instructed that the requirements have been clarified, modified, superseded and supplemented as to this date as hereinafter described.

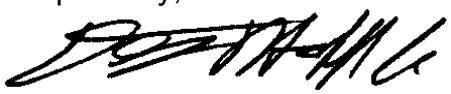
Please make note of the following clarifications:

1. Are there any current flow-measuring stations operated by any entity on Kannah, N. Fork Kannah, or Whitewater Creeks other than the historic USGS gage on Kannah Creek?
    1. The USGS operates "JUNLRGCO" and "KANJUNCO", both are accessible from the USGS website. These two sites replaced the historic Kannah Creek station that washed out in 1983.
2. Do you have elevation-area-capacity data for your reservoirs? Or actual storage capacity vs decreed storage capacity data so we can accurately simulate storage capabilities in a system operational model?
    2. Yes, we have elevations and reservoir capacity tables for all of our reservoirs.
3. Have any watershed runoff analyses been conducted for Kannah, N. Fork Kannah, or Whitewater Creeks?
    3. No
4. We didn't see any exchanges listed in the water rights table, so I want to confirm that you don't currently have any exchanges that we will need to account for in a system operational model.
    4. We do not have any exchanges
5. There are a number of irrigation rights in your portfolio. Should we consider that these rights will be maintained as irrigation rights or will we need to consider the potential for some/all of these rights to be changed to municipal use relative to evaluating firm future water supplies versus demands?
    5. You should consider the potential for all of these rights to be changed to municipal rights junior to the irrigation right, we have already done this on many of our reservoirs.
6. Are the simulations to be run with the operational model of the Grand Junction system going to limited to just estimating firm yield in this scope of work? I want to confirm that the "Additional Tasks" listed on page 17 are not part of this scope of work.
    6. For this initial scope of work, we would just like to run the simulation for firm yield. However, we want the model to have the capability to be able to be used for other scenarios listed in Additional Tasks. These scenarios would be part of a future phase of work.
8) Is there a specific budget set aside for this work?
    Yes
9) Is there a limit on the number of pages related to the response to the RFP?
    No

The original solicitation for the project noted above is amended as noted.

All other conditions of subject remain the same.

Respectfully,



Duane Hoff Jr., Senior Buyer
City of Grand Junction, Colorado

# Summary of Water Supply System
# City of Grand Junction

Prepared for:

**City of Grand Junction**

Prepared by:

**Gregory K. Sullivan, P.E.**

**Heidi Welsh, P.H.**


**April 2018**

SWE Spronk Water Engineers, Inc.

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## 1.0 INTRODUCTION

The City of Grand Junction ("City") is located in the Grand Valley on the Western Slope of the Colorado Rocky Mountains at the confluence of the Colorado River and the Gunnison River. The City delivers treated water to two service areas from two water treatment plants. The main service area is located in the largely developed downtown area of Grand Junction as shown on **Figure 1-1** ("City Service Area") and is supplied from the Grand Junction Water Treatment Plant ("Grand Junction WTP"). The City also provides non-potable irrigation water to certain parks, golf courses, a cemetery, and other open spaces within the City Service Area. The other service area is located in the Kannah Creek basin southeast of town ("Kannah Creek Service Area") and is supplied from the Kannah Creek Treatment Plant ("KCWTP").

Most of the City's raw water supply is obtained by diversions from Kannah Creek, the North Fork of Kannah Creek, and Whitewater Creek (all tributaries of the Gunnison River) with headwaters on the Grand Mesa east of the City. The City owns all or portions of 17 small reservoirs located on or near the top of the Grand Mesa ("Upper Grand Mesa Reservoirs") that are filled from snowmelt. The City also owns Juniata Reservoir and Purdy Mesa Reservoir located below the Grand Mesa that are used to manage and integrate the City's direct flow diversions and Upper Grand Mesa Reservoir supplies.

Raw water is delivered to the Grand Junction WTP from Kannah Creek through two pipelines known as the Kannah Creek Flowline and the Purdy Mesa Flowline. Raw water is delivered to the KC WTP from the Purdy Mesa Flowline. The City also owns the Somerville Pipeline that conveys water from Whitewater Creek to the Kannah Creek Flowline.

The City has decreed water rights for all of its direct flow diversions and water storage reservoirs. Some of these water rights were adjudicated by the City and others were acquired as part of the City's acquisition of several large ranches in the Grand Mesa area. In addition, the City acquired one of its most important and reliable water rights through a condemnation action in the early 1900s. The points of diversion for the City's water rights and other major facilities are shown on **Figure 1-3**.

Spronk Water Engineers, Inc. ("SWE") was retained by the City of Grand Junction to review the City's water supply system and operations, and to prepare an inventory of the City's water rights and water supply. This work has included obtaining and summarizing the following information (with the source listed in parentheses):

- Water right decrees (Water Court)
- Agreements (City)
- Water right tabulations (Colorado Division of Water Resources ["CDWR"])
- Diversion records (CDWR)
- Water rights accounting (City)
- Streamflow records (US Geological Survey ["USGS"] and CDWR)
- Shapefiles and other spatial data (City and others)

In October 2017, SWE conducted a site visit to observe the City's water facilities and to interview the City's operations staff. Since then, we have had several telephone conversations to obtain additional information regarding the City's water supply operations and water use records.

This report is organized in sections as follows:

- Section 2 describes the Grand Junction service areas.
- Section 3 summarizes the City's water sources, water facilities, and water rights.
- Section 4 provides an overview of the City's water supply operations.
- Section 5 describes the water rights accounting for the City's Kannah Creek operations.
- Section 6 provides additional information regarding the City's water supplies.

## 2.0 MUNICIPAL WATER SERVICE AREAS

The main City Service Area covers approximately nine square miles as shown in **Figure 2-1**. Potable water service is provided to total of 9,900 taps consisting of residential, commercial, and government water users. Non-potable water service is provided to a several parks, golf courses, and other open spaces.

The main City Service Area is surrounded by the much larger service area of the Ute Water District that extends east past the City of Palisade and west past the Town of Fruita. Because of this, it is unlikely that the City Service Area will be expanded in the future, and any increases in water use with the City Service Area would likely occur only through development of undeveloped areas and/or redevelopment of existing areas. Other municipal water providers in the Grand Valley include the Clifton Water District and the Palisade Water District. The City has emergency treated water interconnects with the Ute Water District and the Clifton Water District.

The Kannah Creek service area encompasses approximately 13 square miles as shown in **Figure 2.1**. Potable water service is provided to approximately 167 taps in this largely rural area. Increased water use in the Kannah Creek Service Area is possible if and when the area develops further, development density increases, and/or the service area is expanded.

## 3.0 WATER SOURCES, FACILITIES, AND WATER RIGHTS

The City has three main sources of water including the Grand Mesa, Gunnison River, and Colorado River sources. The Grand Mesa sources include water that originates from tributaries of the Gunnison River; namely Kannah Creek, North Fork Kannah Creek, and Whitewater Creek. Water diverted from these tributaries comprise the primary source of raw water for treatment and delivery to the City's municipal water customers. The Gunnison River and Colorado River sources are currently used for non-potable irrigation in the City, but are also available to supplement the Grand Mesa sources, particularly if the City's water demands increase in the future.

Descriptions of the water facilities and water rights for the Grand Mesa, Gunnison River, and Colorado River sources follows.

### 3.1 Grand Mesa Facilities and Water Rights

The City of Grand Junction was incorporated in 1882, and the original water supply for the City was obtained from the nearby Colorado River and Gunnison River. However, due to water quality concerns, the City initiated efforts in the early 1900s to import water from the more distant, but cleaner, watersheds of the Grand Mesa. This effort resulted in completion of the 22-mile Kannah Creek Flowline in 1912 to import water diverted from Kannah Creek to the City Service Area.

By the time the City commenced its efforts to develop a water supply from the Grand Mesa, the existing senior irrigation water rights on Kannah Creek had appropriated much of the available flow, particularly during the non-runoff period. As a result, a condemnation action was initiated that eventually resulted in the City securing the most senior water right on Kannah Creek in the amount of 7.81 cubic feet per second ("cfs"), known as the "Paramount Water Right." The existing Kannah Creek irrigation water users were compensated in the condemnation proceedings for the fair market value of their lost water supply yield. The Paramount Water Right is available to the City for year-round diversion for municipal water uses at the Kannah Creek Flowline (a.k.a. Grand Junction Flowline) point of diversion shown on **Figure 3-1**.

Between 1954 and 1987, the City purchased several irrigated ranches in the Kannah Creek and Whitewater Creek basins, including the associated direct flow and storage water rights. The City changed some of these irrigation water rights in Water Court to municipal use, and these changes resulted in volume limits and other conditions that limited use of the changed water rights to the historical use. The City realized it could get more yield from the Grand Mesa tributaries by adjudicating new junior municipal rights and then foregoing use of its more senior irrigation water rights to free up yield to the junior municipal water rights. The City manages the Grand Mesa ranches and

associated water right to use water as needed for municipal use, and to lease the portion that it does not need for continued irrigation use.

### 3.1.1 Grand Mesa Diversion Facilities and Water Rights

The City's diversion facilities for the Grand Mesa sources include ditches and flowlines used for reservoir filling, irrigation, and municipal uses, as well as four shallow wells used for domestic and stock uses. The points of diversion for the City's diversion facilities are shown on **Figure 1-3**, and the associated direct flow water rights are summarized in **Table 3-1**. This section provides an overview description of the Cities Grand Mesa diversion facilities and water rights organized by water source (Kannah Creek, North Fork Kannah Creek, and Whitewater Creek).

The City's Kannah Creek diversion facilities include the following:

- Kannah Creek Flowline– Delivers water to storage in the Lower Grand Mesa reservoirs, conveys water to Grand Junction WTP, and delivers irrigation water to ranches.
- Juniata Ditch[1] – Delivers irrigation water to ranches.
- Juniata Ditch Enlarged – Delivers water to storage in Juniata Reservoir and delivers irrigation water to ranches.
- Kannah Creek Highline Ditch – Delivers irrigation water to ranches and could be used to convey water to Juniata Reservoir and for municipal use if necessary.
- Bolen, Anderson, and Jacobs ("BA&J") Ditch and Enlargement – Conveys water from Kannah Creek reservoirs to North Fork Kannah Creek reservoirs.
- Deep Creek Reservoir No. 2 Supply Ditch – Conveys water to Deep Creek Reservoir No. 2.
- Anderson Well and Berry Well – Provides domestic water supply to several residences.

The City owns several senior water rights on Kannah Creek, including the Paramount Water Right discussed above, and several irrigation water rights obtained as part of its ranch acquisitions. However, there are other downstream senior water rights owned by others that compete for the available supply. The City adjudicated a second water right for the Kannah Creek Flowline for 3.91 cfs with a 1929 priority date. While this priority is relatively junior compared to other Kannah Creek irrigation water rights, it is second in priority behind the Paramount Water Right during the non-irrigation season.

[1] The City owns the most senior Juniata Ditch water right (1.37 cfs) has three points of diversion including the Juniata Ditch Enlargement, Kannah Creek Highline Ditch, and Secret Ditch.

The City's Kannah Creek irrigation water rights are decreed to the Kannah Creek Highline Ditch, the Juniata Ditch, and the Juniata Ditch Enlargement shown on **Figure 3-1**. The City changed its portion of the Kannah Creek Highline Ditch to allow for municipal use and storage. The original irrigation water rights in the Juniata Ditch and Juniata Ditch Enlarged have not been changed to municipal use. A new junior water right for municipal use water obtained by the City for the Juniata Ditch Enlarged in the amount of 129 cfs.

The City's North Fork Kannah Creek diversion facilities include the following:

- City Ditch – Fills Juniata Reservoir.
- Bauer Ditch – Delivers irrigation water to ranches.
- Laurent Ditch – Delivers irrigation water to ranches.
- Anderson No. 4 Ditch – Use and status of this water right is unknown.
- Purdy Mesa Spring – Use of this water right is unknown.

Diversions from the North Fork Kannah Creek for municipal use are made through the City Ditch to Juniata Reservoir, while diversions for irrigation of the City's ranches are made through the Bauer and Laurent Ditches. Because the City owns all of the water rights on the North Fork, it can choose which water rights to use for irrigation and municipal uses.

The City's Whitewater Creek diversion facilities include the following:

- Brandon Ditch – Delivers irrigation water to the Somerville Ranch and downstream users, and raw water to the Grand Junction WTP via the Somerville Pipeline.
- Somerville Ranch Irrigation System – Irrigation and stock water uses on the Somerville Ranch.
- Somerville Well Nos. 1 and 2 – Domestic and stock water uses on the Somerville Ranch.

The City owns irrigation water rights totaling 33.4 cfs and a junior municipal water right for 15 cfs that the City may divert at the Brandon Ditch. The City can free up yield to the junior municipal water right by limiting use of the senior irrigation water rights. There are other downstream senior irrigation water rights that may call out the City's municipal diversion.

### 3.1.2 Grand Mesa Storage Facilities and Water Rights

The City's Grand Mesa storage system includes the numerous small reservoirs located on or near the top of the Grand Mesa that are used primarily to store snowmelt runoff ("Upper Grand Mesa Reservoirs"), and two lower elevation reservoirs that are used to regulate the City's raw water municipal supply ("Juniata Reservoir System"). The locations of the reservoirs are shown in **Figure 1-3**. The storage capacity owned by the City is summarized in **Table 3-3**, and totals 5,544 acre-feet in the Upper Grand Mesa Reservoirs and 7,950 acre-feet in the Juniata Reservoir System. The storage water rights for the City's Grand Mesa reservoirs are summarized in **Table 3-2**.

The Upper Grand Mesa Reservoirs are operated to capture snowmelt runoff in the spring for subsequent municipal use after treatment and for irrigation use on the City's ranches. The Upper Grand Mesa storage reservoirs consist of the following (grouped by drainage basin). The City owns all of the reservoir except where noted in parentheses.

- Kannah Creek Upper Grand Mesa Reservoirs
  - Anderson Reservoir No. 1
  - Anderson Reservoir No. 2
  - Hallenbeck No. 2 Reservoir (a.k.a. Raber Click Reservoir)
  - Deep Creek Reservoir No. 2 (19.4%)
  - Carson Lake
  - Dry Creek Reservoir (a.k.a. Chambers Reservoir) (33.3%)
  - Flowing Park Reservoir
  - Grand Mesa Reservoir No. 1[2]
  - Grand Mesa Reservoir No. 6 (5.4%)
  - Grand Mesa Reservoir No. 8 (5.4%)
  - Grand Mesa Reservoir No. 9 (5.4%)
  - Scales Lake No. 1 (5.4%)
  - Scales Lake No. 3 (5.4%)
- North Fork Kannah Creek Upper Grand Mesa Reservoirs
  - Anderson Reservoir No. 6
  - Bolen Reservoir
  - BA&J Reservoir No. 2

[2] The City intends to file for 559 acre-feet water right in Grand Mesa Reservoir No. 1 for municipal uses.

- Whitewater Creek Upper Grand Mesa Reservoirs
  - Somerville Reservoir[3]
  - Guild Reservoir[4]

The Juniata Reservoir System includes the Juniata Reservoir and the Purdy Mesa Reservoir (a.k.a., Hallenbeck No. 1 Reservoir) that are used as raw water operational storage. Juniata Reservoir is the largest reservoir owned by the City and has been enlarged several times over the years. It is primarily used to deliver water to the Grand Junction WTP and the Purdy Mesa WTP. Purdy Mesa Reservoir has a conditional municipal storage water right, but it is primarily used to provide irrigation water to the City's ranches.

The City also owns Purdy Mesa Reservoir No. 2 and Reeder Reservoirs that are located further downstream, but these facilities are not able to deliver water directly for treatment and municipal use because they are downstream of the intakes of the City's flowlines.

## 3.2 Gunnison River Water Rights

The City has one diversion facility on the Gunnison River known as the Gunnison River Pipeline. Water is diverted into the Gunnison River Pipeline through a large pump station at the Redlands Canal Diversion Dam as shown on **Figure 1-3**. The Gunnison River Pipeline was previously used to meet peak summer demands when the City's demands were greater than they are today. The City currently has a project underway that would enable conveyance of Gunnison River Pipeline water to the cemetery and Los Colonias Park.

The City has a decreed water right for the Gunnison River Pipeline for 120 cfs with an appropriation date of 1957. A total of 18.6 cfs of this right has been made absolute and the remaining 101.4 cfs is conditional.

## 3.3 Colorado River Water Rights

The City's Colorado River sources are currently used for supply various non-potable water for irrigation of parks, golf courses, and open spaces. The Colorado River sources are also available as a potential backup municipal water supply, but this would require construction of a treatment and conveyance system. The Colorado River facilities are

[3] The original Somerville Reservoir storage water right was for 837 acre-feet. The City transferred its Cliff Lake Reservoir water right (70.8 acre-feet) to Somerville Reservoir. In 1993, the City made absolute an additional 66 acre-feet of storage in Somerville Reservoir, of which the City retained 22 acre-feet and 44 acre-feet was conveyed to opposers.

[4] The City acquired Guild Reservoir as part of the Somerville Ranch acquisition but does not currently utilize it. The conditional portion of the Guild Reservoir storage water right was abandoned by a 1984 court order.

shown on **Figure 1-3**, and the Colorado River water rights are summarized in **Table 3-1** and **Table 3-2**.

The City's Colorado River diversion facilities include the following:

- Colorado River Pipeline
- 22 Road Pump Station
- Redlands Tailrace
- Ridges Pumping Station
- Grand Valley Canals (Parks Dept)
- Redlands Canal (Parks Dept)
- Highland Park Lateral Ditch (Parks Dept)

The City's Colorado River storage water facilities include the following.

- Ridges Pond No. 1 (aka Duck Pond)
- Ridges Pond No. 2
- Ridges Pond No. 3 (aka Shadow Lake)

In the 1950s, the City obtained a conditional water right for 120 cfs for the proposed Colorado River Pipeline to pump water from the Colorado River for municipal and other uses. Additional points of diversion were later decreed and there currently are five proposed points of diversion located between Palisade and the confluence with the Gunnison Rivers as shown in **Figure 1-3**. In the late 1970s, 20 cfs of the Colorado River Pipeline water was conveyed to the Clifton Water District and another 20 cfs to the Water Development Company. The City still owns the remaining 80 cfs of the Colorado River Pipeline water right, of which 6.96 cfs have been made absolute and the remaining 73.04 cfs remain conditional.

In 1979, the City obtained a water right to pump 40 cfs of Colorado River water and treated effluent discharge from the Persigo Wastewater Treatment Plant ("WWTP") for irrigation, municipal, domestic, replacement, and exchange purposes at the 22 Road Pump Station. A total of 1.5 cfs of this water right was made absolute based on irrigation use at the City's Nursery. In 2011, the remaining 38.5 cfs was abandoned.

The Redlands Canal is owned by the Redlands Water and Power Company and diverts water from the Gunnison River just upstream from the confluence with the Colorado River for hydropower production. A tailrace conveys the water to the Colorado River after the hydropower production and the City has a water right for 50 cfs for water in the tailrace, of which 18 cfs is absolute and 32 cfs remains conditional. The Redlands Tailrace water right is used at the Connected Lakes State Park for irrigation and for recreation and wildlife uses associated with various ponds.

The City also owns the Ridges Pumping Station water right that is diverted from the Redlands Canal tailrace for nonpotable irrigation of the Redlands Mesa Golf Course and in the Ridges subdivision.

Finally, the City also owns shares in several irrigation companies that operate irrigation canals in the Grand Valley. These include shares in the Grand Valley Canal Company, Redlands Canal, and Highland Park Lateral and Ditch Company. Water is allocated to the shareholders pro-rata based on their share ownership, these supplies are managed by the City Parks Department for non-potable irrigation of parks and open space around the City.

# 4.0 WATER SYSTEM OPERATION

A schematic diagram illustrating the City's water facilities and linkages between them is provided in **Figure 4-1**. The raw water supply that is treated is delivered to customers in its two service areas is derived primary from the City's Grand Mesa water sources on Kannah Creek, North Fork Kannah Creek, and Whitewater Creek. Water from these sources is provided by direct flow diversions from the creeks and stored water releases from the Juniata Reservoir System. Raw water is delivered through the Kannah Creek Flowline and the Purdy Mesa Flowline to the Grand Junction WTP for treatment and delivery to customers in the main City Service Area. Water from Whitewater Creek is delivered to the Grand Junction WTP via the Somerville Pipeline that connects to the Kannah Creek Flowline prior to delivery to the WTP. Raw water is conveyed from Juniata Reservoir through the Purdy Mesa Flowline to the Kannah Creek WTP for treatment and delivery to rural water users in the Kannah Creek Service Area.

The City operates its Upper Grand Mesa Reservoirs to store snowmelt runoff. Water is released from the Upper Grand Mesa Reservoirs in the late summer and early fall for delivery to the City and for storage in the Juniata Reservoir System. The City typically leases portions of its Grand Mesa water supply for irrigation of its ranches. The amount of water made available for lease is dependent on the water supply conditions and the storage contents in City's reservoirs.

At the end of the irrigation season, water is moved as needed from the Upper Grand Mesa Reservoirs to the Juniata Reservoir System to create space to capture snowmelt runoff the following spring. The City typically maintains approximately 1,800 - 2000 acre-feet of carryover storage in the Upper Grand Mesa Reservoirs going into the winter as a hedge against possible low snowpack accumulation.

In the winter months, the City diverts from Kannah Creek and North Fork Kannah Creek under its year-around municipal water rights for treatment and delivery to its customers. Water available in excess of the City's immediate needs is stored in the Juniata Reservoir System.

Additional details regarding the operation of the City's Grand Mesa Water system are provided below. In addition, there is also discussion of the City's Gunnison River and Colorado River supplies that are currently used for nonpotable irrigation of parks and open spaces.

## 4.1 Grand Mesa Operations

Operation of the City's Grand Mesa water system is divided into descriptions of the Upper Grand Mesa facilities and the Lower Grand Mesa facilities as follows.

### 4.1.1 Upper Grand Mesa Operations

The City operates its Upper Grand Mesa Reservoirs on Kannah Creek and its tributaries largely as a single system, although there are distinct operations for each reservoir. These reservoirs are referred to herein as the Upper Kannah Creek Reservoirs. The Somerville Reservoir on Whitewater Creek is operated separately from the Upper Kannah Creek Reservoirs because it is not connected to the Juniata Reservoir System. The Upper Grand Mesa Reservoirs are shown on **Figure 1-3** and **Figure 4-1.**

Some of the Upper Kannah Creek Reservoirs are located on-channel on Kannah Creek and the others are located on the tributaries to Kannah Creek. Most of the reservoirs are filled by snowmelt runoff that accrues directly to the reservoirs. There are also two feeder ditches that convey water to storage. The BA&J Ditch and Enlargement conveys water from the Anderson No. 1 and Anderson No. 2 Reservoirs in the Kannah Creek basin to the Bolen and BA&J Reservoirs in the North Fork Kannah Creek basin. The Deep Creek Reservoir #2 Supply Ditch is used to deliver water to the Deep Creek Reservoir No. 2.

During the winter, the Upper Kannah Creek Reservoirs are inoperable due to the snowpack accumulation on the Grand Mesa and are accessible only by snowmobile. In the spring, when the snowpack begins melting, water accumulates by gravity in storage. The Upper Kannah Creek Reservoirs fill in most years, but only partially fill in drought years (e.g., 2002, 2007, 2012, 2013).

On or before April 1, based on the snowpack and storage system contents, the City elects which of its Kannah Creek Reservoirs will be used for municipal purposes and which reservoirs will be used for irrigation purposes. Changes to these elections can be made after April 1 with approval of the Water Commissioner. In low snow years, the City may elect to not make any reservoir water available for irrigation lease.

During the irrigation season, the Division Engineer provides the City with a combined weekly evaporation charge for the water the City has in storage in all of its reservoirs. This figure represents the volume by which the City's storage should have declined by evaporation. The City is required to release water from storage if necessary to ensure the reservoir storage declines by the evaporation volume, and these releases can be made from any reservoir. The total annual evaporation charge is approximately 500 acre-feet per year.

Releases from the Upper Kannah Creek Reservoirs typically begin in July after the runoff season and continue through October. As described above, the City typically attempts to keep 1,800 to 2,000 acre-feet of water in storage in the Upper Kannah Creek Reservoirs at the end of October for carryover to the next spring. If there is more than

this amount in storage, then the additional amount is released during October and diverted to storage in the Juniata Reservoir System.

Somerville Reservoir is located on Whitewater Creek and it is operated to supplement the supply available from the City's direct flow water rights diverted though the Brandon Ditch. Releases from the reservoir are typically made during the late summer and early fall. Releases from Somerville Reservoir can be delivered to the Grand Junction WTP via the Somerville Pipeline (which connects to the Kannah Creek Flowline).
Lower Grand Mesa Operations

The City's Lower Grand Mesa facilities are located in the Kannah Creek and North Fork Kannah Creek basins and include the Juniata Reservoir System as on **Figure 3-1**. The Lower Grand Mesa operations also include the operation of the City's facilities in the Whitewater Creek basin.

Water is delivered to storage in the Juniata Reservoir System by direct flow diversions and releases from the Upper Grand Mesa Reservoirs via the Kannah Creek Flowline, the Juniata Enlarged Ditch, and the City Ditch. Diversions though the Kannah Creek Flowline occur year-round. The Juniata Ditch Enlarged diverts from Kannah Creek only during the irrigation season. The City Ditch diverts direct flow and storage water from North Fork Kannah Creek to storage in Juniata Reservoir primarily during the non-irrigation season (November – March).

In addition to delivering water to the Juniata Reservoir System, diversions at the Kannah Creek Flowline and the Juniata Ditch Enlarged are also used locally for agricultural irrigation. Diversions from Kannah Creek through the Kannah Creek Highline Ditch and Juniata Ditch are used solely for agricultural irrigation, although the City does have a municipal right on the Highline Ditch. On North Fork Kannah Creek, agricultural irrigation water leased to local users is diverted at the Bauer Ditch and Laurent Ditch under the City's direct flow water rights and from releases from the Upper Grand Mesa Reservoirs.

Water is supplied to the Grand Junction WTP by direct flow diversions via the Kannah Creek Flowline and by releases from Juniata Reservoir via the Purdy Mesa Flowline. The Kannah Creek WTP is supplied by water delivered through the Purdy Mesa Flowline. Water can be transferred from Juniata Reservoir to Purdy Mesa Reservoir Water from Purdy Mesa Reservoir can also be delivered to the Grand Junction WTP using the Purdy Mesa Flowline, however in recent years the City has been using Purdy Mesa Reservoir exclusively for its agricultural irrigation leases.

The Anderson Well and the Berry Well are used to supply domestic water to two single family homes that formerly were supplied directly from taps on the Kannah Creek

Flowline. The City augments out-of-priority depletions from the pumping of these wells with releases to Kannah Creek from the Kannah Creek Flowline.

The City also owns Reeder Reservoir and Purdy Mesa Reservoir No. 2 in the lower Kannah Creek basin. These reservoirs cannot currently provide water for municipal use because they are located downstream and unable to deliver water into the Kannah Creek Flowline and Purdy Mesa Flowline.

## 4.2 Gunnison River Operations

The City can pump water from the Gunnison River to the Grand Junction WTP at the pump station for the Gunnison River Pipeline at the Redlands Mesa Canal heading. When the City's summer municipal demands were greater than they are now, the Gunnison River Pipeline was regularly used to meet peak summer demands.

The City currently has a project underway that would enable conveyance of non-potable irrigation water to the cemetery and Los Colonias Park. The Gunnison River water is typically high in turbidity and the Grand Junction WTP is not currently equipped to treat this water. However, the Gunnison River Pipeline remains available to meet future increases in peak summer demands provided that the turbidity can be managed and treated.

## 4.3 Colorado River Operations

As described above, the City's Colorado River sources are currently used to provide nonpotable irrigation water to various parks and open spaces. These sources are also available as a backup municipal water supply.

The City has five points of diversion for its Colorado River Pipeline water right. The No. 4 Diversion is used by the Clifton Water District to divert water to the Clifton WTP. The City has plans to further develop the No. 5 Diversion that is located near the Western Colorado Botanic Gardens and proposed Las Colonias Park.

The Redlands Tailrace water right is currently being used to supply water to the Connected Lakes State Park for recreation and wildlife purposes. Colorado Parks and Wildlife operates the Redlands Tailrace diversion[5].

The Ridges Pump Station is used to pump water from the Redlands Canal for nonpotable irrigation of the Redlands Mesa Golf Course and parks and open space in the Ridges subdivision. Operational storage for this system is provided in Ridges Pond No. 3 (a.k.a.

[5] According to the City, the City and Colorado Parks and Wildlife have entered into a 40-year memorandum of understanding agreement for Colorado Parks and Wildlife to use the Redlands Tailrace water right and the Connected Lakes Park.

Shadow Lake), which has a capacity of approximately 30 acre-feet. The City also owns two other ponds in the Ridges subdivision (Ridges Pond Nos. 1 and 2) that are not currently in irrigation use.

## 4.4 Water Treatment Plants

### 4.4.1 Grand Junction Water Treatment Plant

Most of the raw water treated at the Grand Junction WTP comes from Juniata Reservoir through the Purdy Mesa Flowline. The remaining portion is supplied though the Kannah Creek Flowline and Somerville Pipeline. The Gunnison River Pipeline is another potential source if the Gunnison River turbidity can be managed and treated.

The monthly production of the Grand Junction WTP is summarized in **Table 4-1** and the annual production is shown in **Figure 4-2**. Annual treated water production from 1989 – 2017 averaged 6,300 acre-feet per year, but production has declined to 5,300 acre-feet during the last five years (2013 – 2017). The maximum annual production was 8,100 acre-feet in 1994.

The City's total water sales are summarized **Table 4-2** and **Figure 4-3**. The difference between total water production and total water sales represents the system loss. System loss includes physical loss (leaks and unbilled water use) and paper loss (meter inaccuracy and accounting/billing discrepancies). The annual system loss is shown in **Figure 4-4** and averaged approximately 12 percent from 1989 – 2017. A graph of the monthly water production, water sales, and system loss percentage is shown in **Figure 4-5.**

The monthly total water sales from 1989 – 2017 are shown on **Figure 4-6**. The monthly water use follows a bell-shaped curve that is typical of municipal systems with significant seasonal irrigation demands. The irrigation use typically commences in March and goes through October. Peak demands typically occur in June and July. The winter use is relatively flat from November to February. The decline in the City's water use is evidenced by comparison of the average monthly use during 1989 – 2007 (black line) against the average during the past 10 years from 2008 – 2017 (red line).

The City also provided monthly water use by customer class for 2012 – 2014, and these data are summarized in **Figure 4-7**.

### 4.4.2 Kannah Creek Water Treatment Plant

Water is delivered to the Kannah Creek WTP via The Purdy Mesa Flowline from Juniata Reservoir. The Kannah Creek WTP is a small facility providing water mostly for indoor domestic use with some lawn irrigation and other outdoor uses. The monthly and

annual Kannah Creek WTP production is shown in **Table 4-3** for 2008 – 2017. Average annual production for the Kannah Creek WTP has averaged 44 acre-feet per year.

## 4.5 Nonpotable Irrigation Systems

The available records of annual nonpotable irrigation water use provided by the City are summarized in **Table 4-4**. The nonpotable irrigation water use records include diversions to a cemetery located near the Grand Junction WTP, diversions for irrigation taps supplied from the Purdy Mesa Flowline, and diversions at Ridges Pump Station on the Redlands Canal Tailrace.

The City Parks Department supplies irrigation water to several parks with deliveries from irrigation canals (Grand Valley canals, Redlands Canal, and the Highland Park Lateral Ditch). Water use for three parks irrigated with Grand Valley water are metered and the annual usage from 2013 – 2017 is provided in **Table 4-4**. There are no delivery records for the other parks.

## 4.6 Wastewater Treatment

Grand Junction's wastewater is treated at the Persigo WWTP, which is a regional plant that also treats water from Clifton Water District and the Ute Water District service areas. Information provided by the manager of the Persigo WWTP indicates that wastewater influent to plant is distributed by source as follows:

- 5% Clifton (Clifton has its own WWTP as well)
- 30% City of Grand Junction
- 65% Ute Water District

Discharge records for the Persigo WWTP were downloaded from the U.S. Environmental Protection Agency website. Monthly discharges from August 2012 to July 2017 are summarized **Table 4-5**, and the annual discharged during this period averaged approximately 9,600 acre-feet per year.

## 4.7 Ranch Operations and Leases

Annual summaries of reservoir operations and irrigation water leases from 1994 – 2017 were provided by City and this information is tabulated in **Table 4-6**.

Detailed annual ranch irrigation water use data was provided for the Somerville, Anderson, Hollenbeck (a.k.a. Hallenbeck), and Click Ranches for the 2012, 2014, and 2016 irrigation seasons, and these data are summarized in **Table 4-7**. For 2012, the records only included the irrigation water use from the reservoirs and there were no records of direct flow diversions to the ranches. Annual irrigation use totaled approximately 4,750 acre-feet in 2014 and 5,400 acre-feet in 2016.

## 5.0 WATER USE ACCOUNTING

The City performs daily water use accounting for its Kannah Creek and Whitewater Creek operations for monthly submittal to the Division Engineer. The accounting includes tracking of diversions for municipal use under each water right, diversions to and from storage in the Juniata Reservoir system, and the end of month contents of each reservoir.

A monthly summary of accounting data from November 2010 to September 2017 is provided in **Table 5-1**. Monthly averages and water year totals are shown at the bottom of the table. Graphs of the monthly Kannah Creek Flowline diversions and water uses are shown on **Figure 5-1**. A graph of the monthly diversions by source to the Grand Junction WTP is provided on **Figure 5-2**. Monthly diversions to and from Juniata Reservoir, as well as the end-of-month storage contents are plotted on **Figure 5-3**. Monthly diversions to and from Purdy Mesa Reservoir and the end-of-month storage contents are plotted on **Figure 5-4**.

The end of month reservoir storage contents for all of the City's reservoirs are summarized in **Table 5-2** for the period from November 2010 to September 2017. The end-of-month storage contents for the reservoirs are plotted on **Figure 5-5**. A more detailed plot of the end-of-month contents of the Upper Kannah Creek Reservoirs is provided on **Figure 5-6**.

# 6.0 OTHER WATER SUPPLY INFORMATION

## 6.1 Grand Mesa Reservoir Attributes

SWE compiled information on reservoir capacities, watershed areas, and yield estimates for City's Grand Mesa facilities. **Figure 6-1** shows the contributing watersheds for each of the Grand Mesa Reservoirs and for certain of the City's ditches. The Grand Mesa Reservoirs Nos. 8 and 9 and Scales Lakes Nos. 1 and 3 were combined together since the City only owns 5.4% of the capacity of these reservoirs. **Table 6-1** summarizes various attributes of and the estimated inflow from snowmelt for each of the Grand Mesa Reservoirs. The snowmelt inflow is based on the sum of the estimated Nov – May inflow tabulated by the USGS for its Streamstats assessment and should be considered approximate. These estimates have not been compared to historical reservoir yield or other flow data.

The potential fill efficiency and evaporation efficiency were computed for each reservoir. The potential fill efficiency is an indicator of the relative likelihood of reservoir fill during the runoff season and was computed as the estimated November - May inflow divided by the reservoir capacity. Evaporation efficiency is a measure of the storage capacity relative to the reservoir surface area and was computed as the reservoir capacity divided by the surface area when full. A shallow reservoir with a large surface area will have more evaporation per volume of storage than a deep reservoir with a small surface area.

The potential fill efficiency and evaporation efficiency for each reservoir were plotted against one another in **Figure 6-2**. The higher the reservoir plots on the vertical scale, the more likely it is to fill. The further to left the reservoir plots, the more efficient the reservoir is from an evaporation standpoint. By these measures, Carson Reservoir is the mostly likely reservoir to fill and is the most evaporation efficient. Bolen Reservoir is the least likely to fill and Chambers Reservoir is the least evaporation efficient. The data in **Figure 6-2** should be considered preliminary and approximate, are generally useful for relative comparison of the City's reservoirs. More detailed hydrologic analysis could be applied to refine these results.

## 6.2 Snow Data

There are two NRCS Snotel sites located near the Grand Mesa Reservoirs. In addition, the City collects and maintains its own snow depth and water content measurements collected manually each winter. The locations of the Snotel sites and the City's snow course sites are shown on **Figure 1-2**. The City uses the snowpack data to help assess the potential snowmelt runoff and reservoir yield each year. This information helps the City estimate how much water it can safely lease for irrigation use each year.

**Tables 6-2 and 6-3** summarize the April 1 and May 1 snow water equivalent values for each Snotel and City snow course sites. The Snotel data are compiled on a daily timestep and the first of the month values are shown in the tables. The City snow course data are measured on a particular day near the end of the month for which the data are reported. For example, the April snow course measurements are typically measured in late April or early May. Therefore, the April snow course data shown in **Table 6-2 and 6-3** are reported as May 1 data to be most comparable with the Snotel data. The maximum monthly snow water equivalent typically occurs in mid-April, but the maximum can occur earlier or later depending on the year. **Table 6-4** summarizes the maximum monthly snow water equivalent for each year.

## 6.3 Annual River Flows

Daily streamflow records were compiled for various stream gages on Kannah Creek, the Gunnison River, and the Colorado River. The locations of the stream gages are shown on **Figure 1-2**. Descriptions of the flow records are provided below.

**Figure 6-3** is a graph of several annual (water year) flow time series data for Kannah Creek. The current stream gage, Kannah Creek at the Juniata Enlarged Diversion, has been in place since September 1991. This gage is downstream of the City's diversion and represents the flow that remains in the creek after the City's diversions. A plot of the annual flows of this gage from 1992 – 2016 is shown as the orange line in **Figure 6-3**. The total flow in Kannah Creek can be computed by adding the records of the City's Kannah Creek diversions to the flow at the current gage (this process is described in more detail below) and the resulting total Kannah Creek flow for 1992 – 2016 is shown as the blue line in **Figure 6-3**.

Records are also available from January 1917 – 1982 for the Kannah Creek at Whitewater gage that was located upstream of the City's diversion facilities. The annual flows for this discontinued gage are shown as the grey line in **Figure 6-3**. The annual Whitewater gage flows for 1918 – 1982 and the annual computed total Kannah Creek flow for 1992 – 2016 both average approximately 20,000 acre-feet per year. The annual Kannah Creek flow at the Juniata Enlarged Diversion below the City's diversion facilities averages approximately 8,000 acre-feet per year.

**Figure 6-4** shows the annual Gunnison River discharge for the gage near Grand Junction from 1897 – 2016 and the gage below the Redlands Canal diversion from 2004 – 2016. This chart also shows the Redlands Canal diversions from the Gunnison River from 1935[6] – 1957 and 1990 – 2016. The flow of the Gunnison River near Grand Junction averaged

[6] Records for the Redlands Canal diversions date back to 1930, but the data are incomplete for each water year from 1930 – 1934.

1.7 million acre-feet per year while the flow at the gage below the Redlands Canal diversion averages 1.1 million acre-feet per year.

**Figure 6-5** plots the annual Colorado River flows at three locations; near Palisade (1903 – 1933)[7], near Cameo (1934 – 2016), and below the Grand Valley diversion near Palisade (1991 - 2016). The average Colorado River flow at the Cameo gage has averaged 2.8 million acre-feet per year while the flow at the gage below the Grand Valley diversions has averaged 2.2 million acre-feet per year.

## 6.4 Kannah Creek Flow Records

The total flow of Kannah Creek that is physically available at the Grand Junction points of diversion can be computed by summing the records for the current Kannah Creek gage and the City's diversions that occur just upstream of the gage as follows:

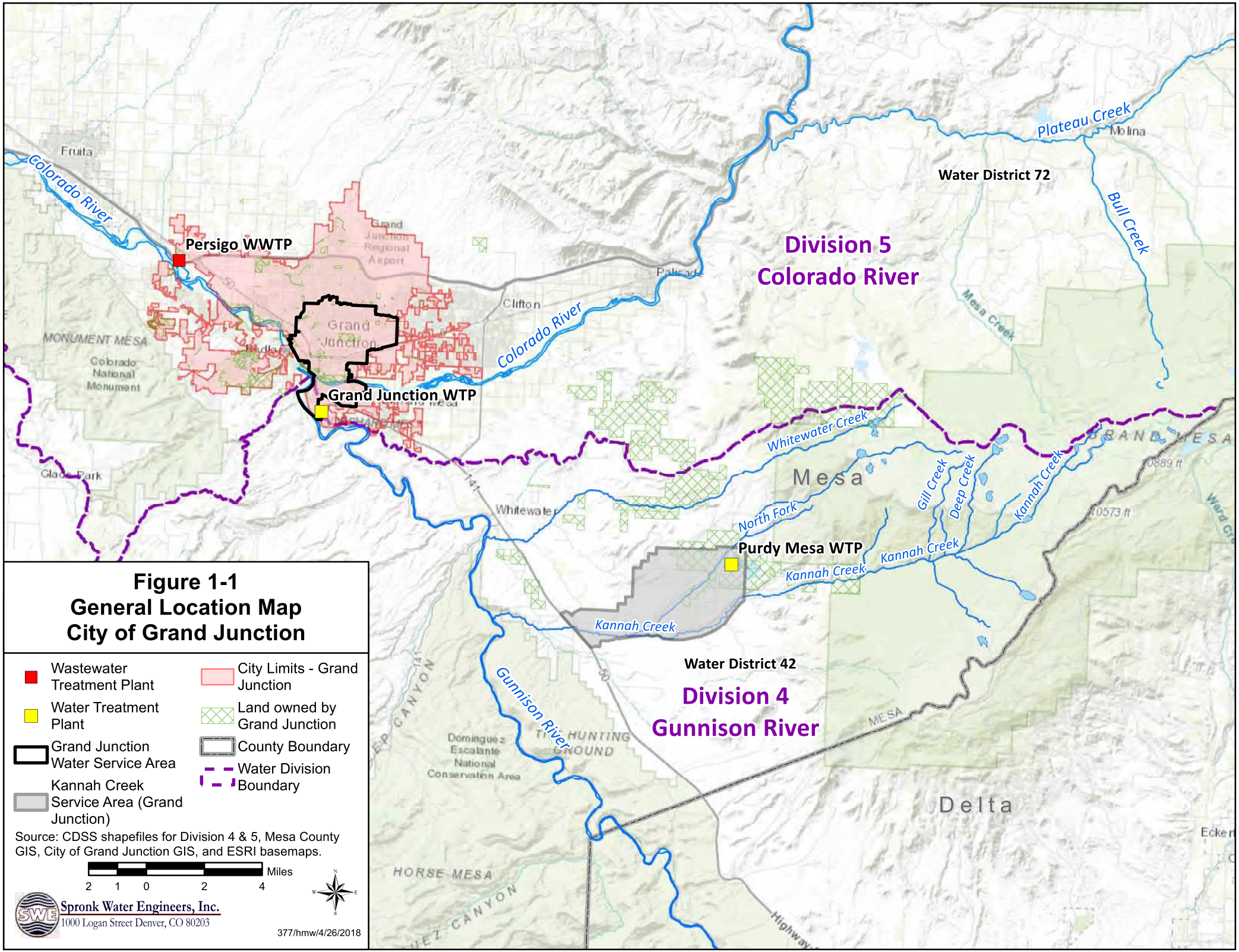
- Kannah Creek at Juniata Enlarged streamflow
- Kannah Creek Flowline diversions
- Kannah Creek Highline Ditch diversions
- Juniata Ditch Enlarged diversions

The locations of the stream gage and diversion points are shown on **Figure 3-1.** The total daily Kannah Creek flows were computed from 1992 – 2015, except for November 1997 to October 1998. The computed annual Kannah Creek flows are shown in the stacked bar chart on **Figure 6-6** with the different colored bars representing the various flow components. The annual flows averaged 20,600 acre-feet and ranged from 11,400 acre-feet in 2002 to 28,500 acre-feet in 2011.

The daily flows for an average year (2004), dry year (2002), and wet year (2011) are shown on **Figure 6-7**. The total computed Kannah Creek flow and the monthly flows of the various components are summarized in **Tables 6-5a – 6-5e.**

[7] Records for the Colorado River near Palisade gage date back to April 1902.

# FIGURES




## Figure 1-1
## General Location Map
## City of Grand Junction

- Wastewater Treatment Plant
- Water Treatment Plant
- Grand Junction Water Service Area
- Kannah Creek Service Area (Grand Junction)
- City Limits - Grand Junction
- Land owned by Grand Junction
- County Boundary
- Water Division Boundary

Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, City of Grand Junction GIS, and ESRI basemaps.

2 1 0 2 4 Miles

Spronk Water Engineers, Inc.
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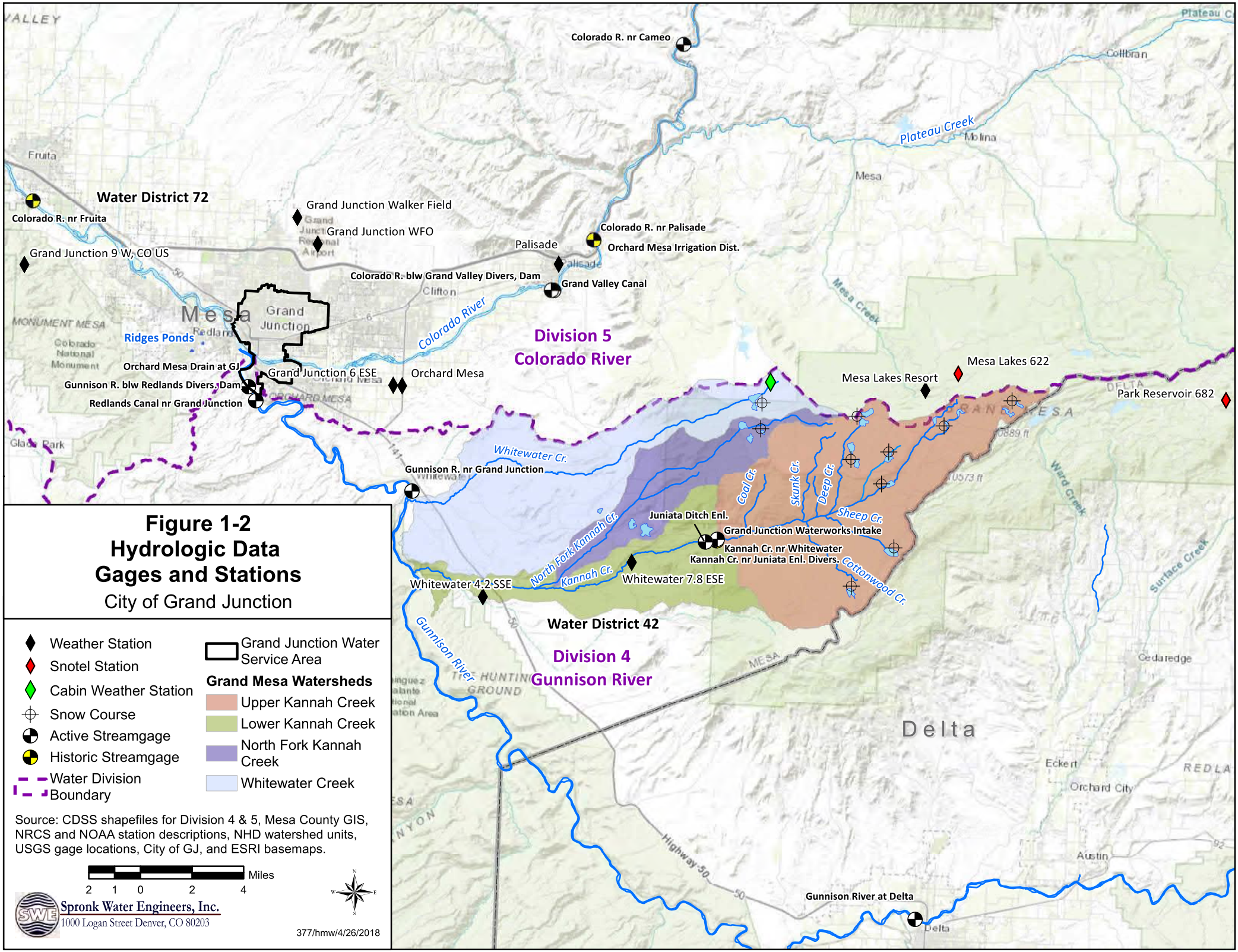


# Figure 1-2
# Hydrologic Data
# Gages and Stations
City of Grand Junction

- Weather Station
- Snotel Station
- Cabin Weather Station
- Snow Course
- Active Streamgage
- Historic Streamgage
- Water Division Boundary
- Grand Junction Water Service Area

**Grand Mesa Watersheds**

- Upper Kannah Creek
- Lower Kannah Creek
- North Fork Kannah Creek
- Whitewater Creek

Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, NRCS and NOAA station descriptions, NHD watershed units, USGS gage locations, City of GJ, and ESRI basemaps.

2 1 0 2 4 Miles

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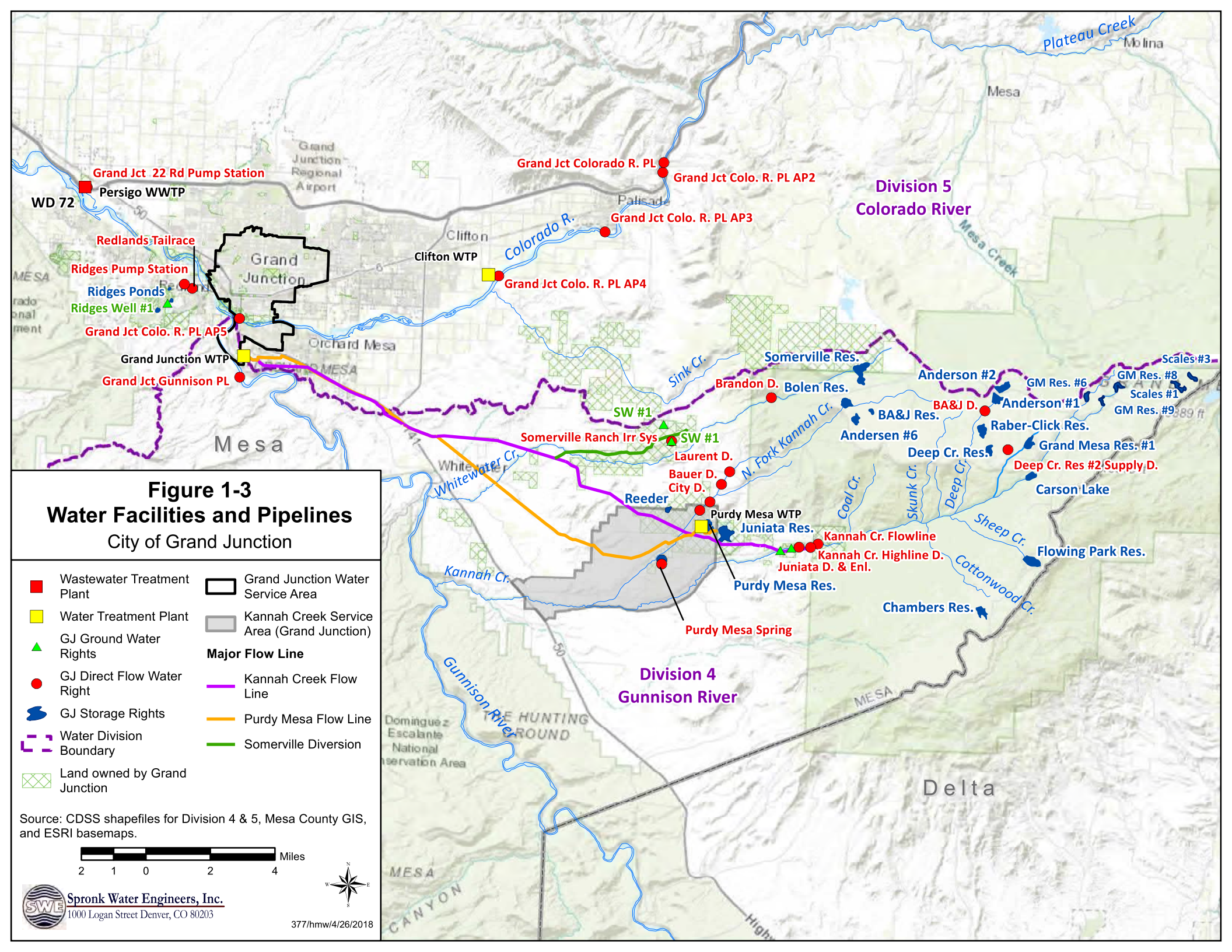


# Figure 1-3
# Water Facilities and Pipelines
City of Grand Junction

- Wastewater Treatment Plant
- Water Treatment Plant
- GJ Ground Water Rights
- GJ Direct Flow Water Right
- GJ Storage Rights
- Water Division Boundary
- Land owned by Grand Junction
- Grand Junction Water Service Area
- Kannah Creek Service Area (Grand Junction)

**Major Flow Line**

- Kannah Creek Flow Line
- Purdy Mesa Flow Line
- Somerville Diversion

Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, and ESRI basemaps.

2 1 0 2 4 Miles

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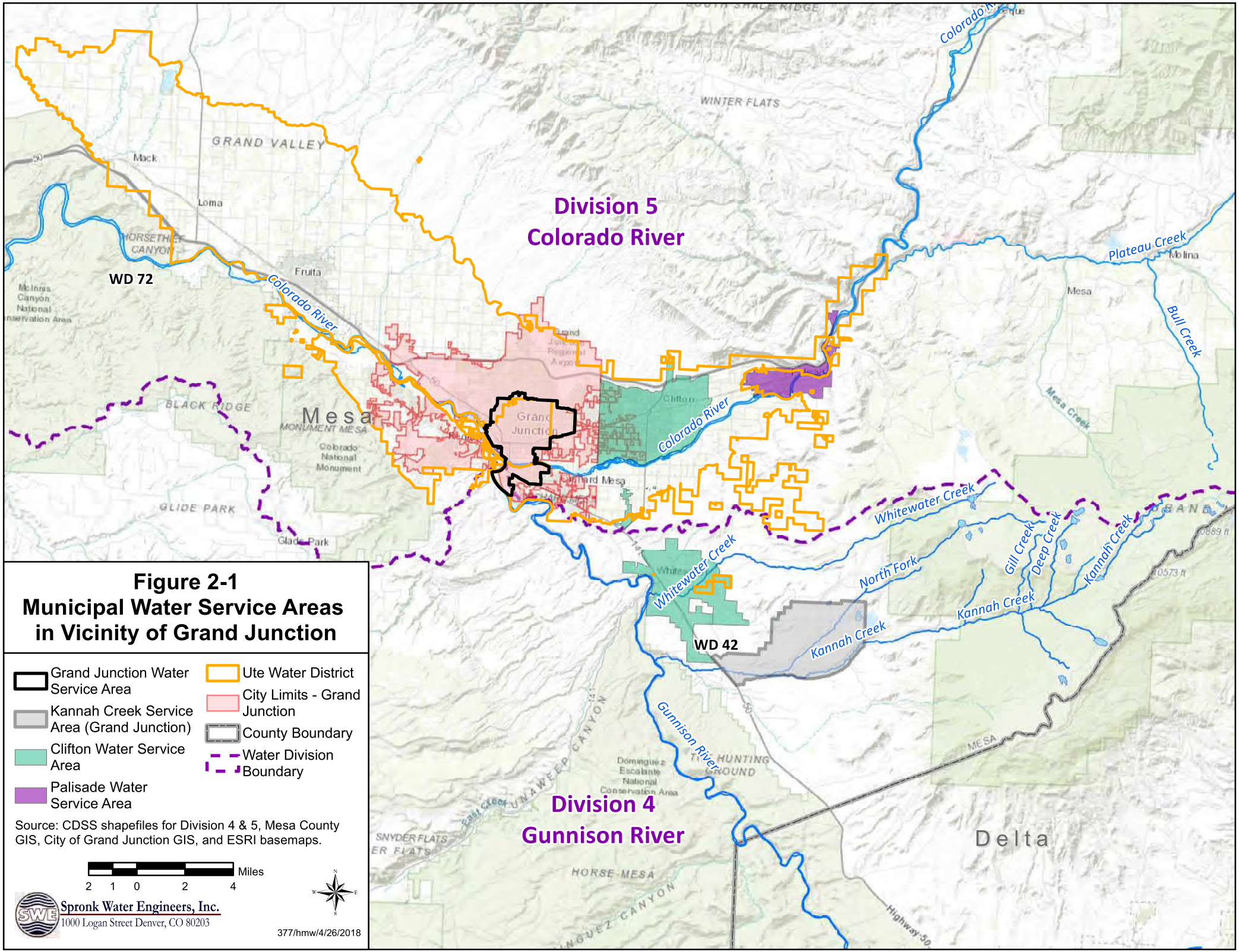


# Figure 2-1
# Municipal Water Service Areas in Vicinity of Grand Junction

- Grand Junction Water Service Area
- Kannah Creek Service Area (Grand Junction)
- Clifton Water Service Area
- Palisade Water Service Area
- Ute Water District
- City Limits - Grand Junction
- County Boundary
- Water Division Boundary

Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, City of Grand Junction GIS, and ESRI basemaps.

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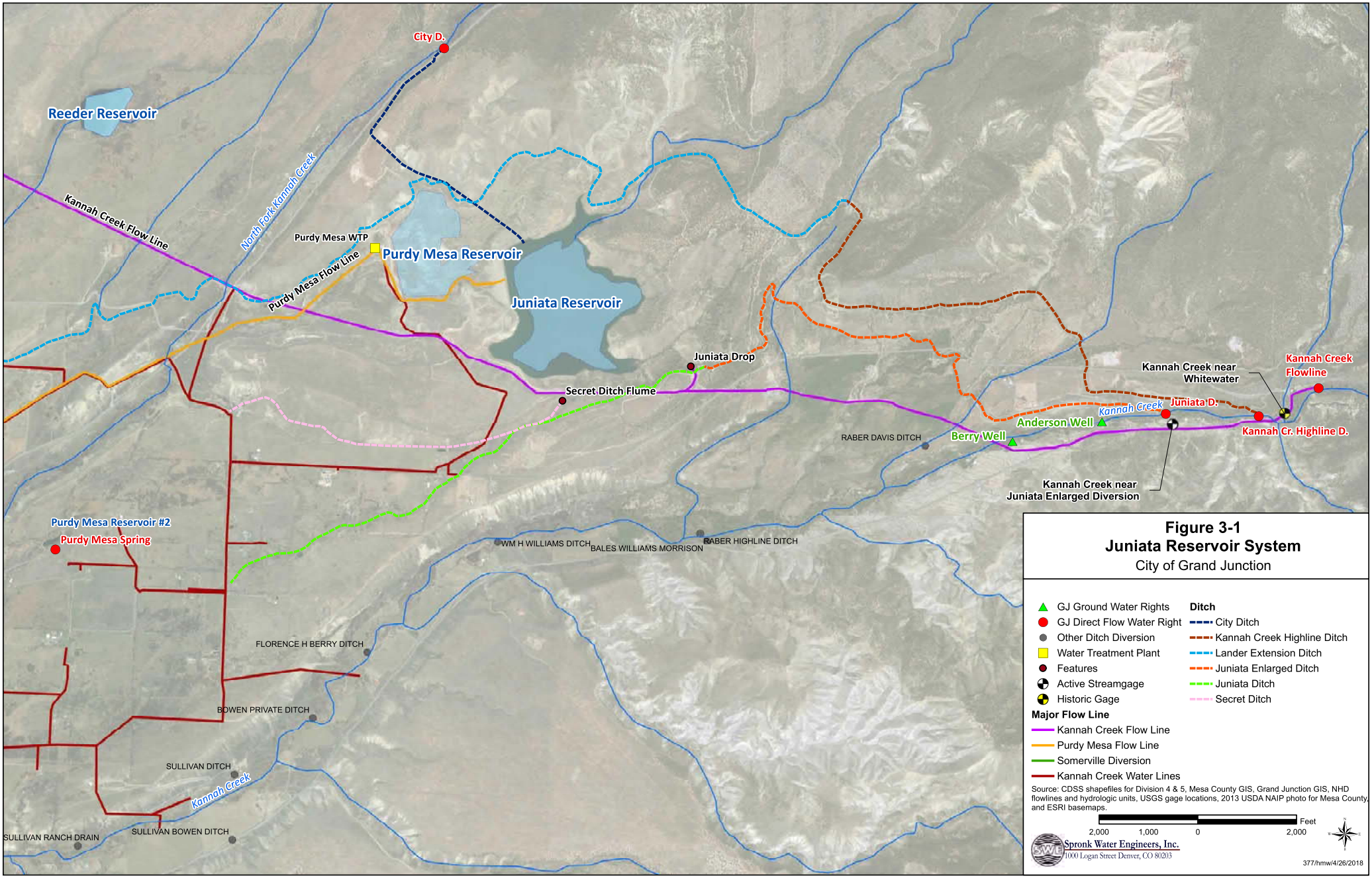


# Figure 3-1
# Juniata Reservoir System
City of Grand Junction

- GJ Ground Water Rights
- GJ Direct Flow Water Right
- Other Ditch Diversion
- Water Treatment Plant
- Features
- Active Streamgage
- Historic Gage

**Ditch**
- City Ditch
- Kannah Creek Highline Ditch
- Lander Extension Ditch
- Juniata Enlarged Ditch
- Juniata Ditch
- Secret Ditch

**Major Flow Line**
- Kannah Creek Flow Line
- Purdy Mesa Flow Line
- Somerville Diversion
- Kannah Creek Water Lines

Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, Grand Junction GIS, NHD flowlines and hydrologic units, USGS gage locations, 2013 USDA NAIP photo for Mesa County, and ESRI basemaps.

2,000 1,000 0 2,000 Feet

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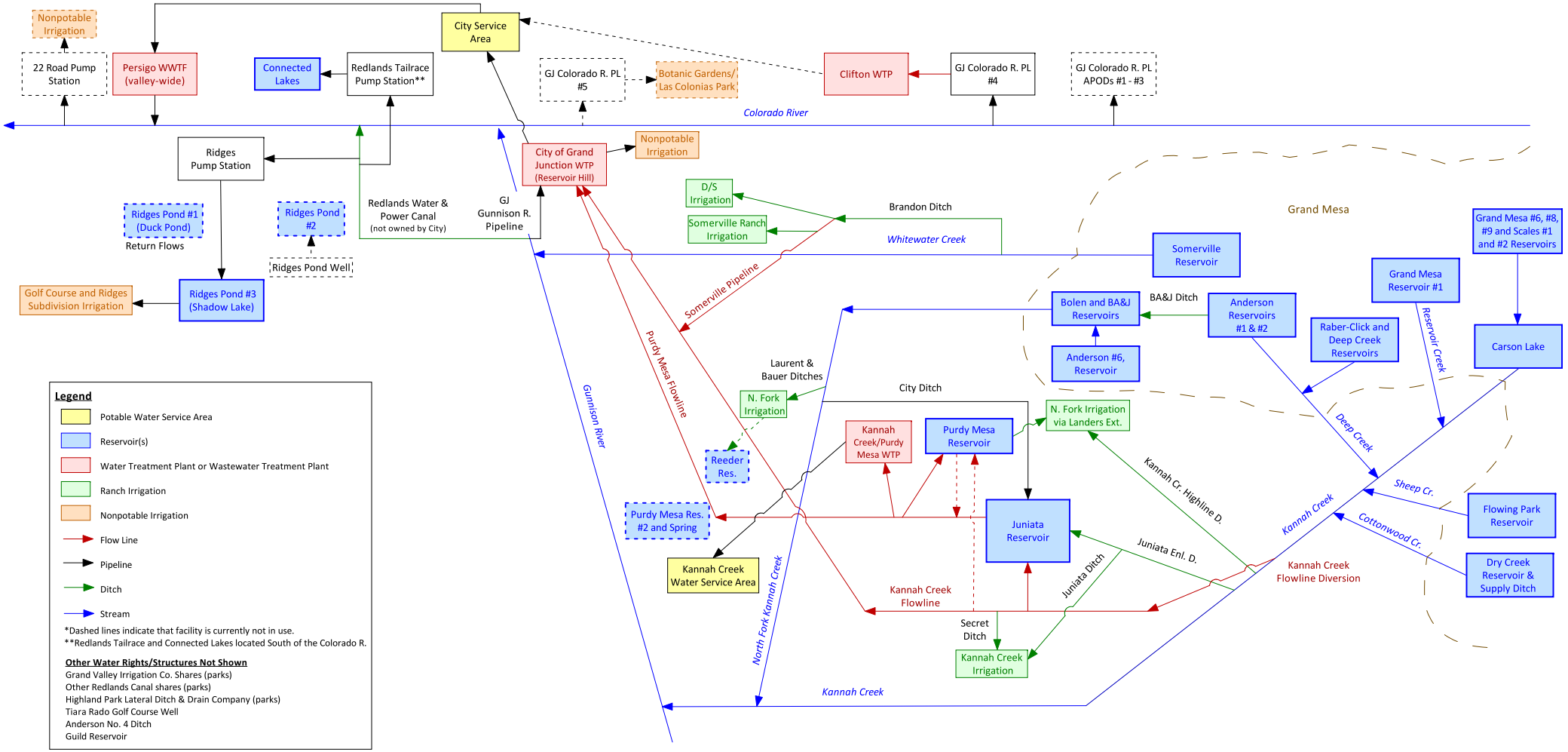
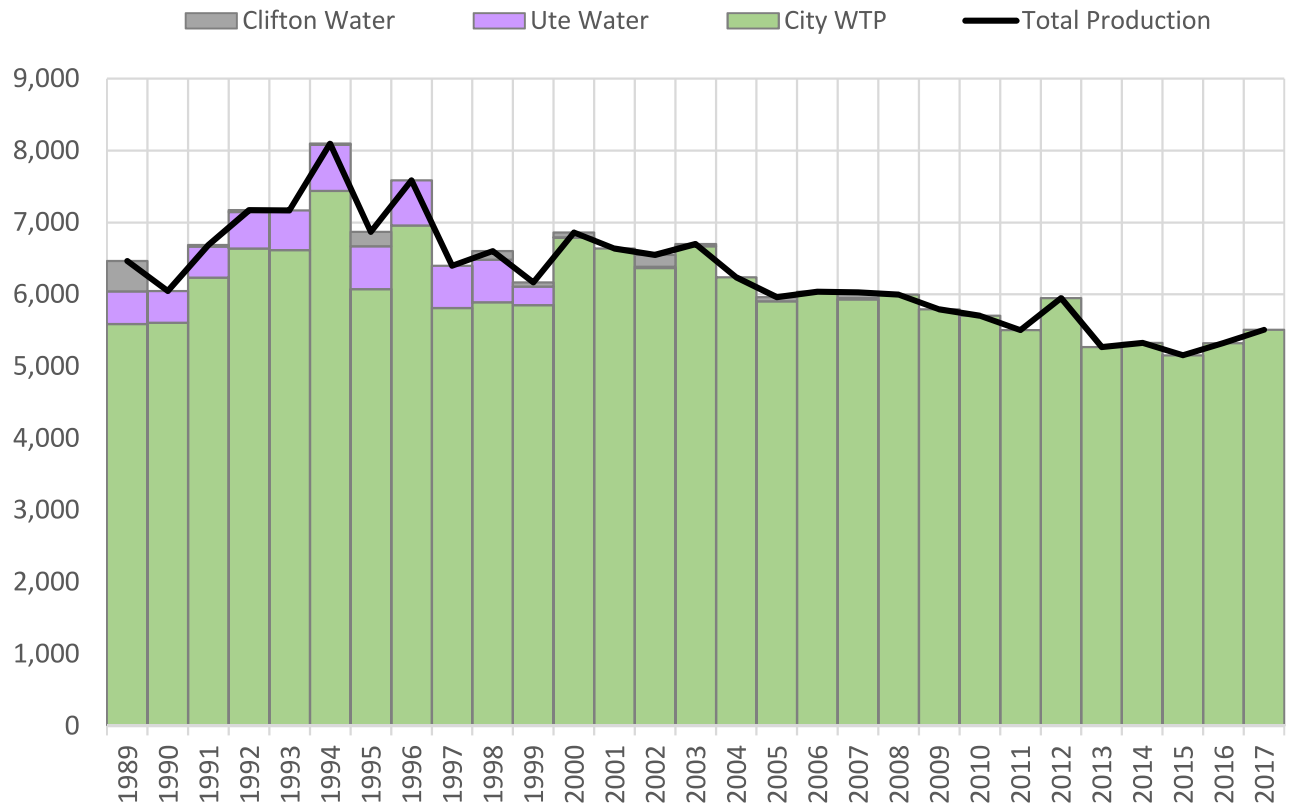
**Figure 4-1**
**Schematic Diagram**
**Grand Junction Water Distribution System**
***Not to Scale***



## Figure 4-2

## Annual Total Water Production
## City of Grand Junction
### 1989 - 2017
### (acre-feet)

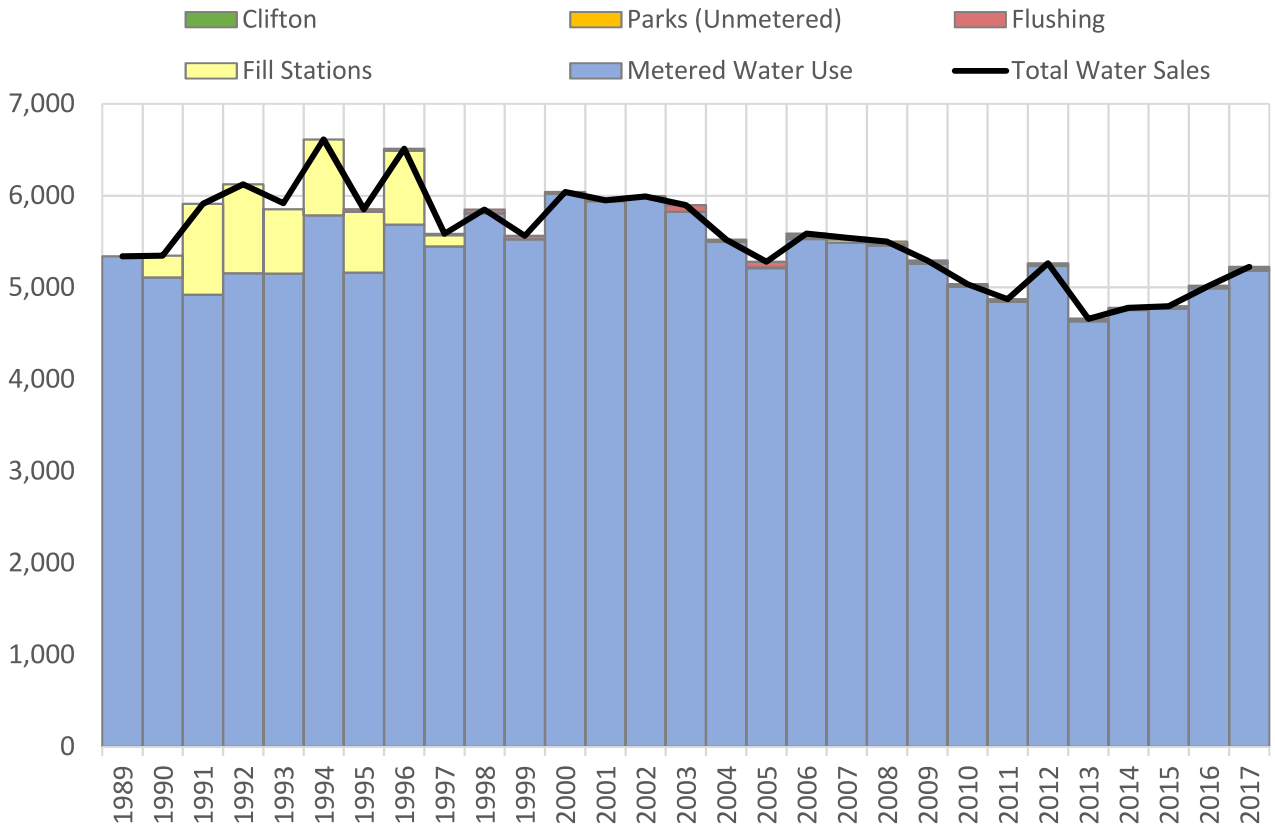



**Notes:**

Total water production from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

## Figure 4-3

## Annual Total Water Sales
## City of Grand Junction
### 1989 - 2017
### (acre-feet)

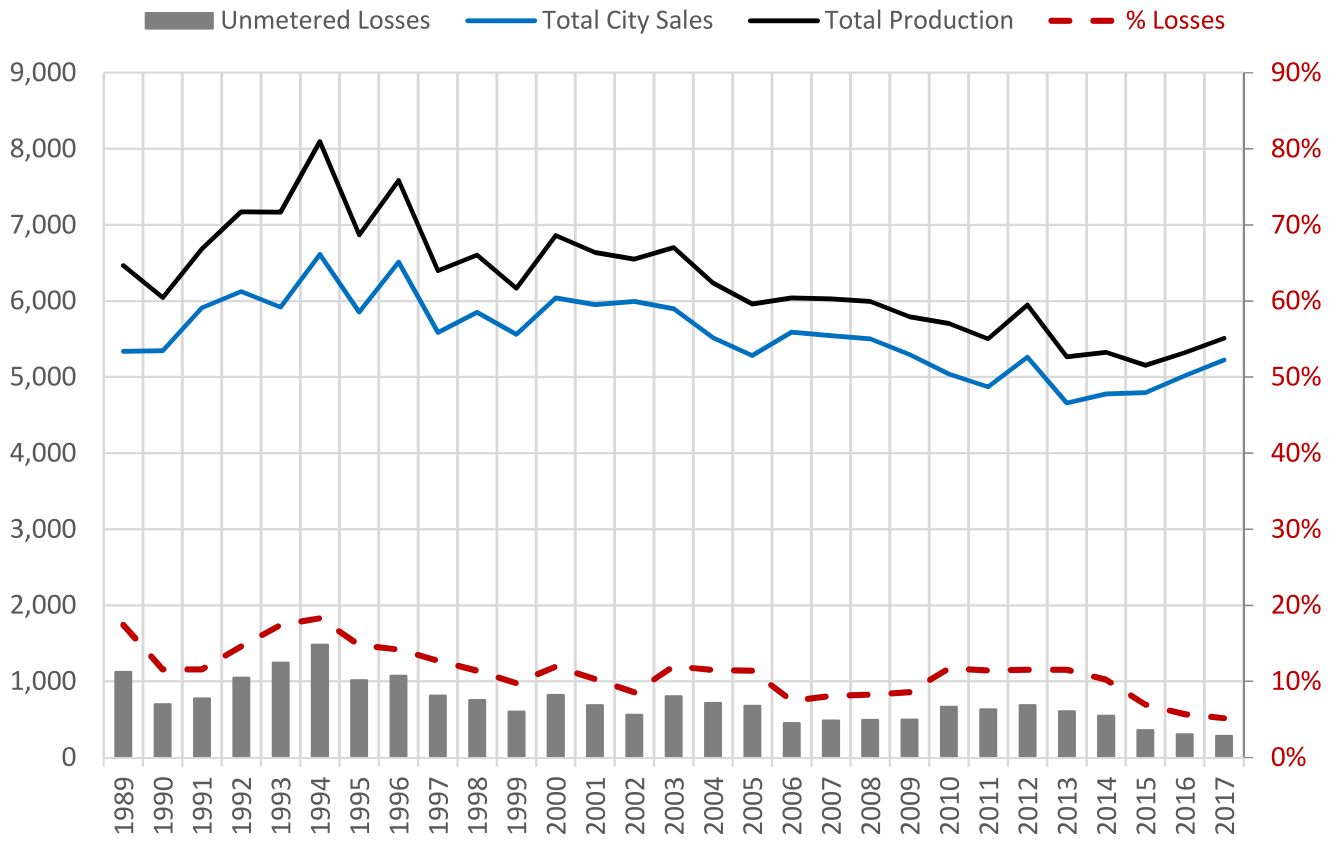



**Notes:**

Total sales including metered, flushing, parks, fill stations, and water to Clifton from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

## Figure 4-4

## Annual Total Water Production, Water Sales, and Unmetered Losses
## City of Grand Junction
### 1989 - 2017
### (acre-feet)

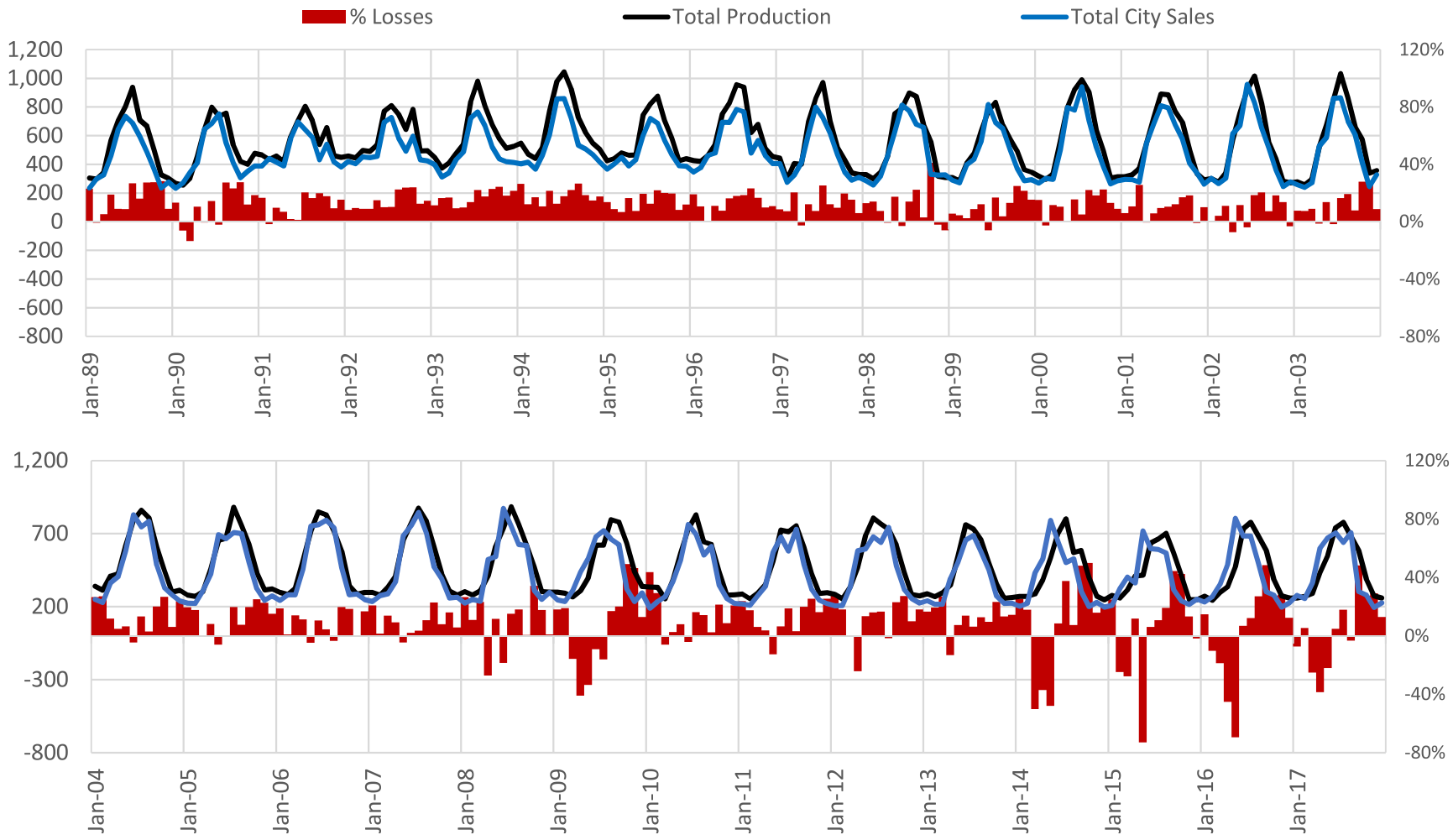



**Notes:**

Total water production and sales from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

## Figure 4-5

## Monthly Water Production, Water Sales, and Unmetered Losses
## City of Grand Junction
### (acre-feet)

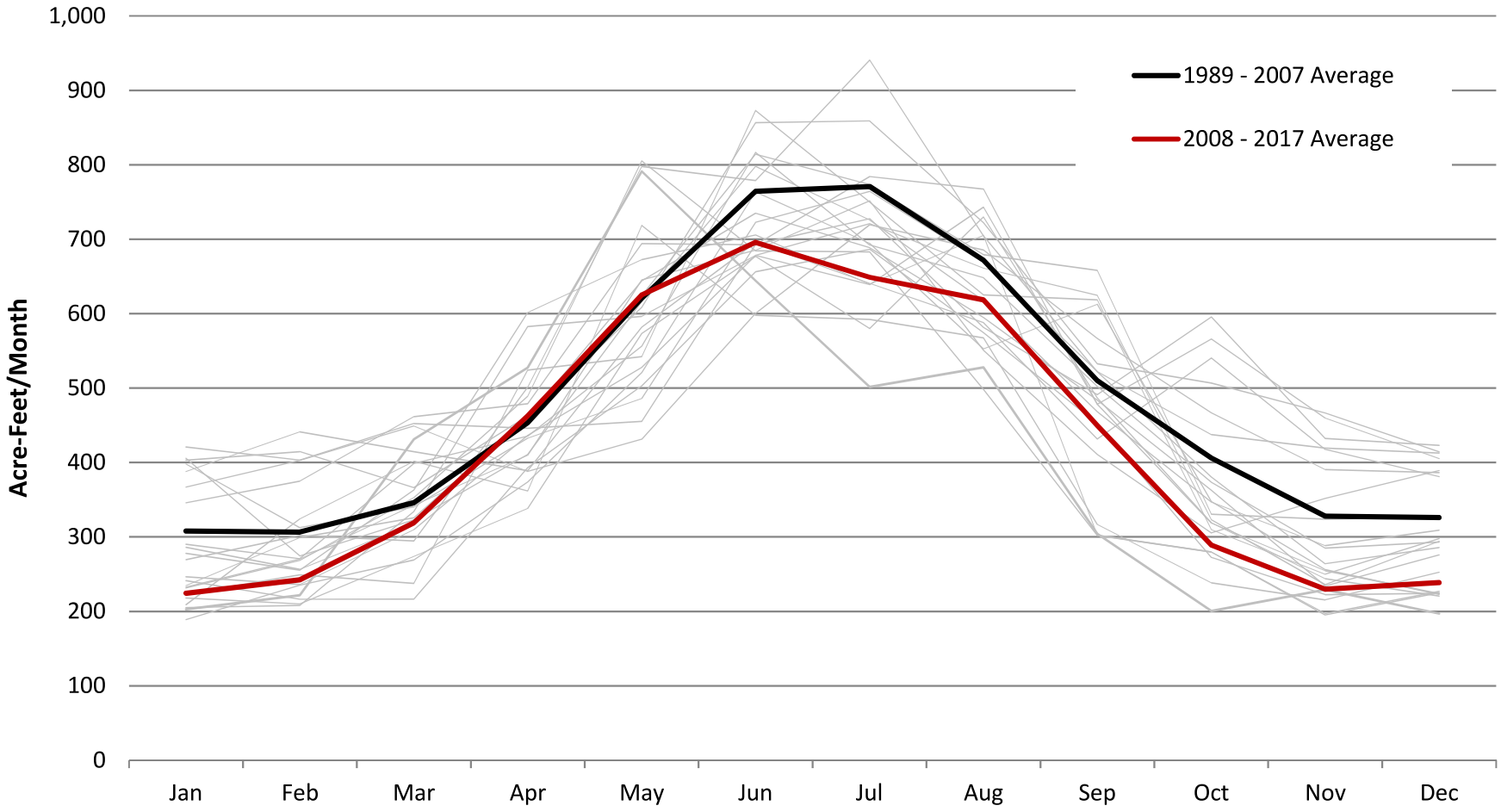



**Notes:**

Total water production and sales from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

## Figure 4-6

## Total Monthly Water Sales
## City of Grand Junction
### 1989 - 2017

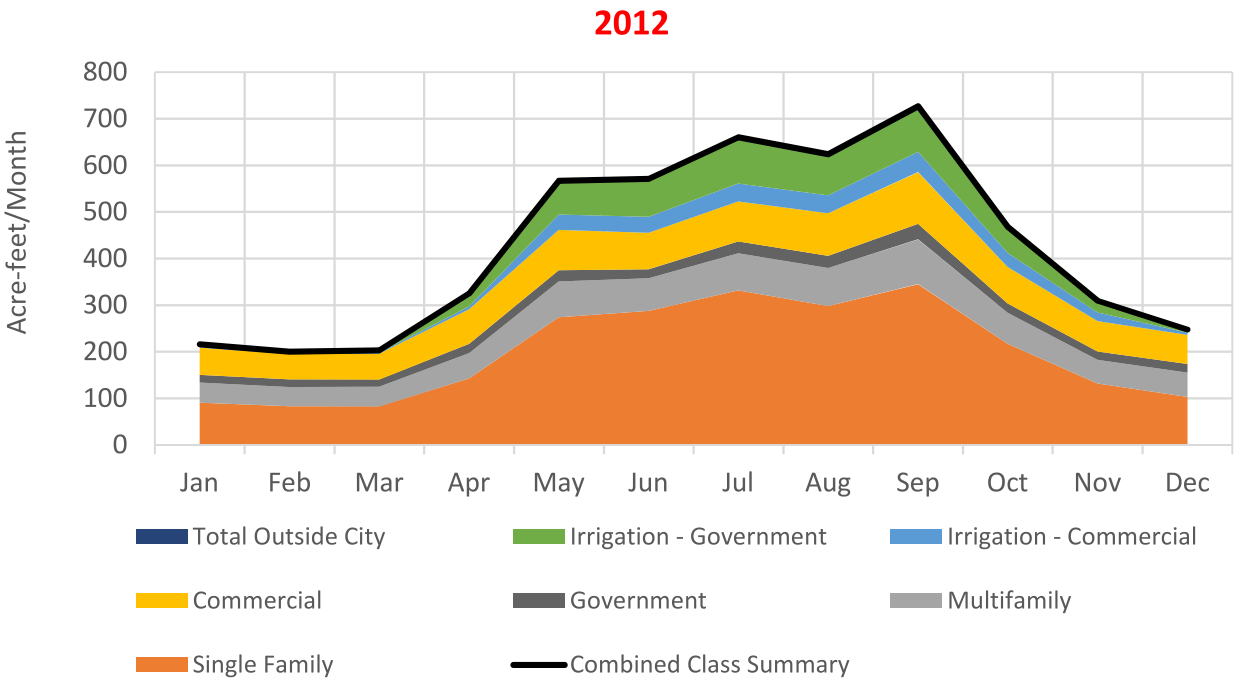


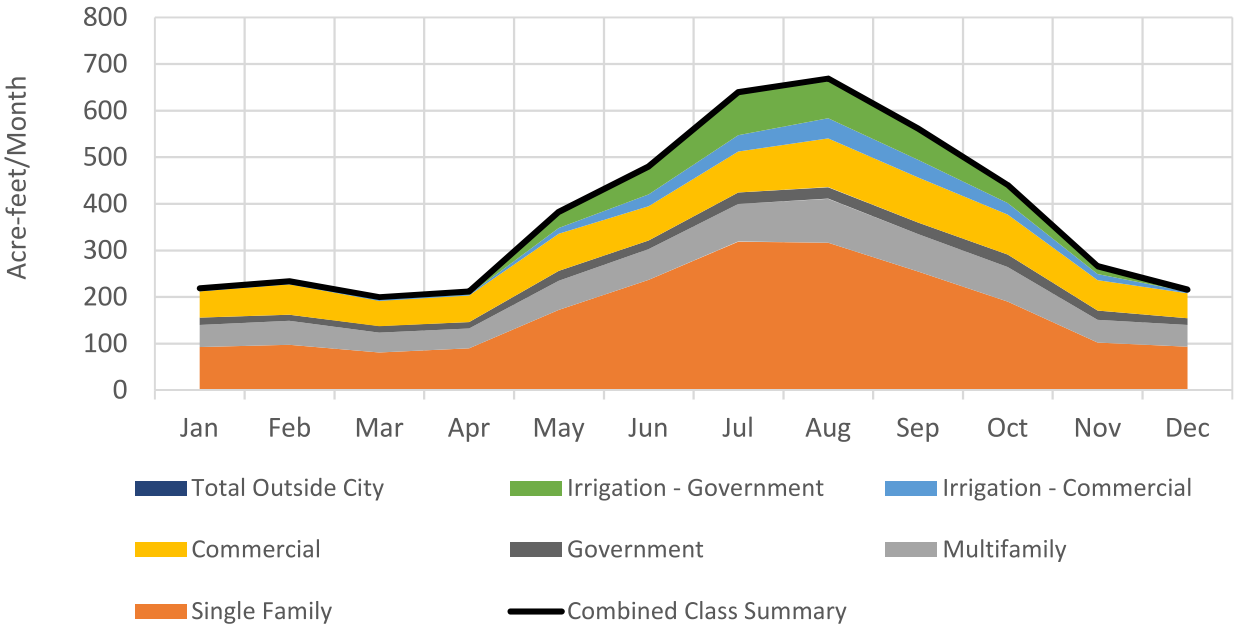

**Notes:**

Total sales including metered, flushing, parks, fill stations, and water to Clifton from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

**Figure 4-7**

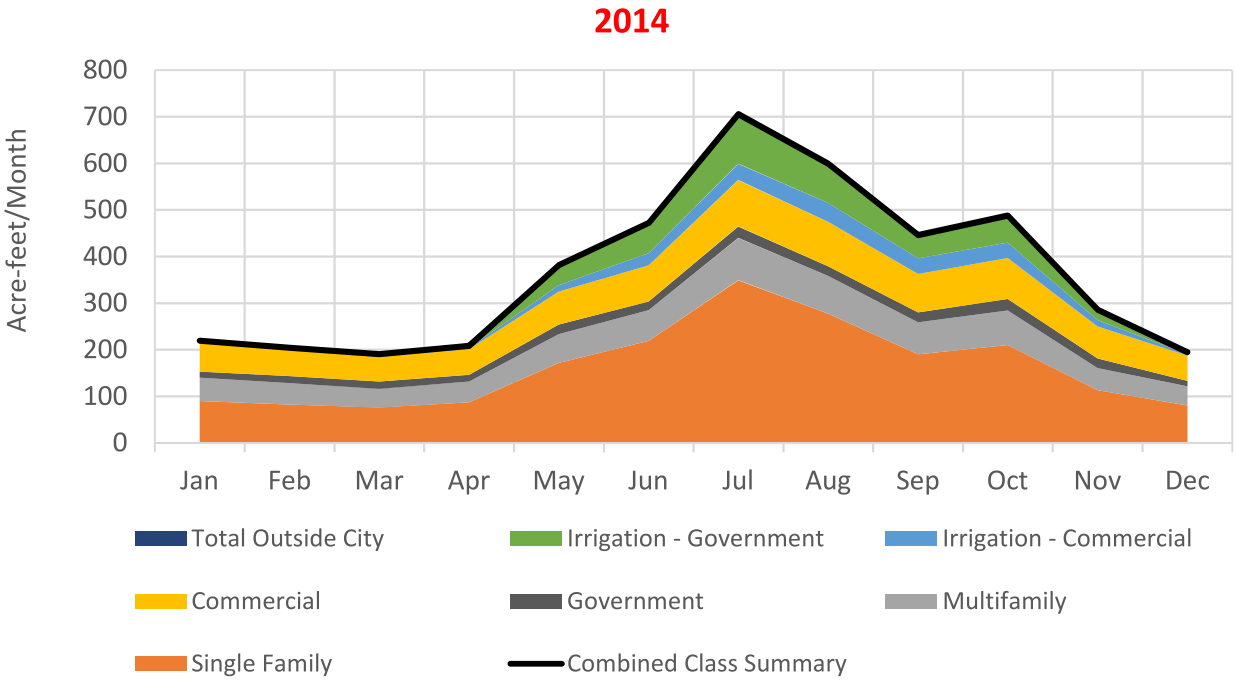
**Monthly Water Use by Customer Class**
**City of Grand Junction**
**2012 - 2014**

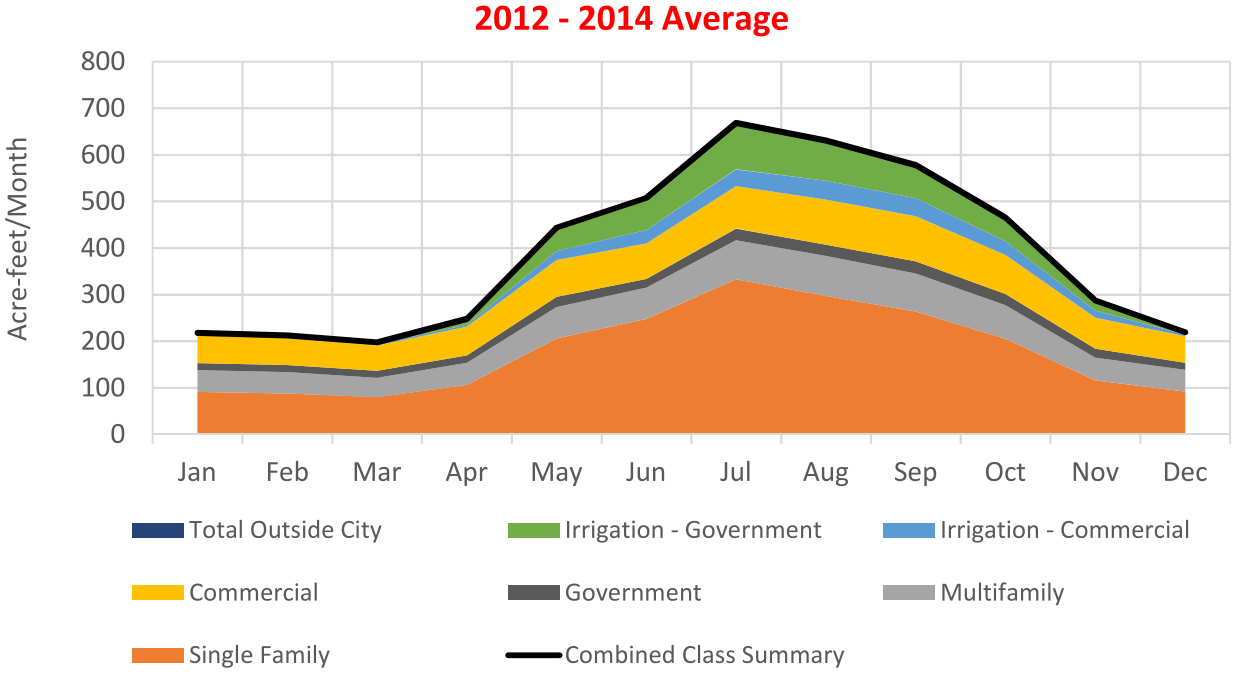


## Figure 4-7

## Monthly Water Use by Customer Class
## City of Grand Junction
## 2012 - 2014



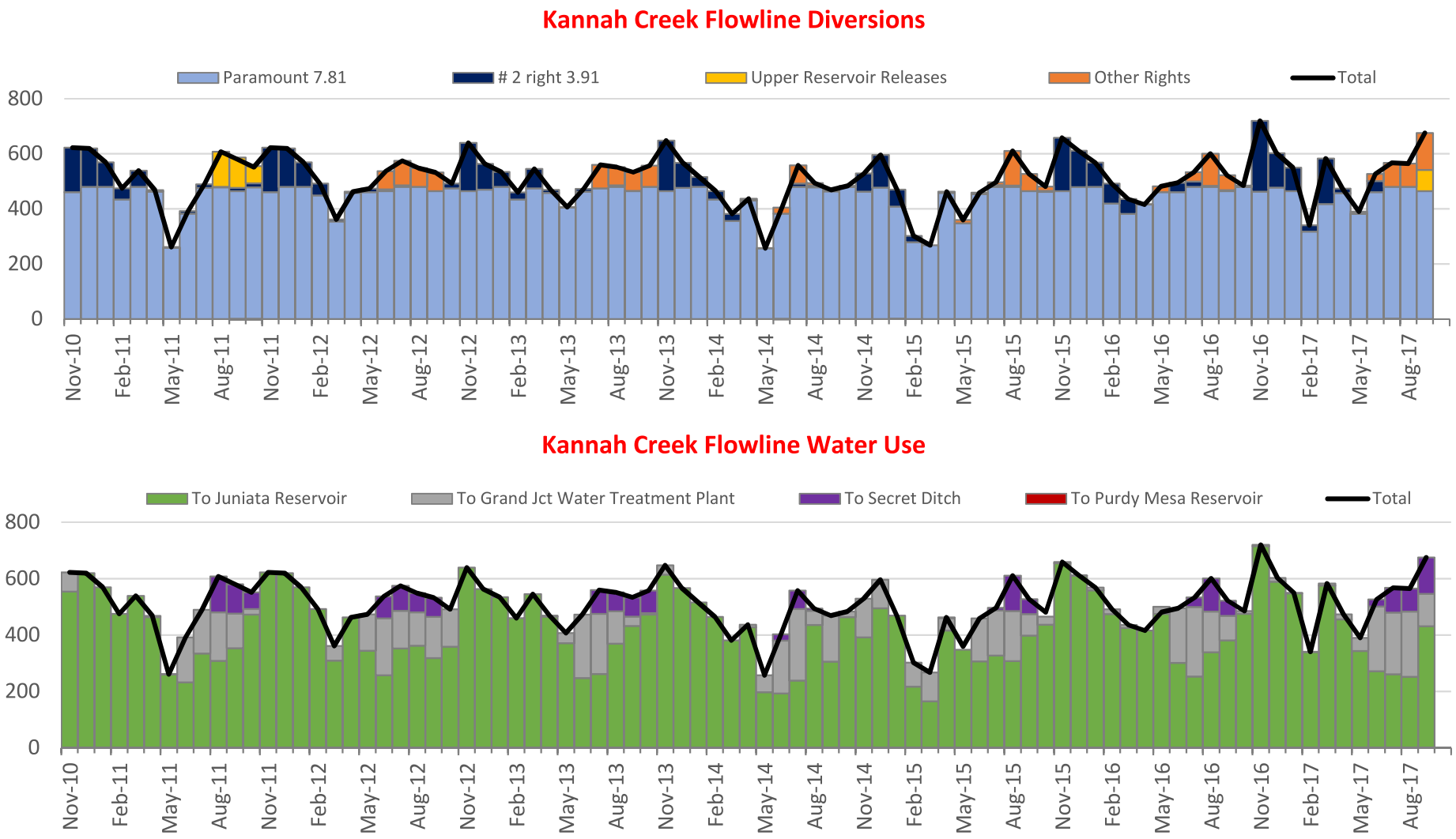




**Notes:**

Data from spreadsheet provided by the City of Grand Junction ("Grand Junction Water Model Update 10.11.16.xlsx").

**Figure 5-1**

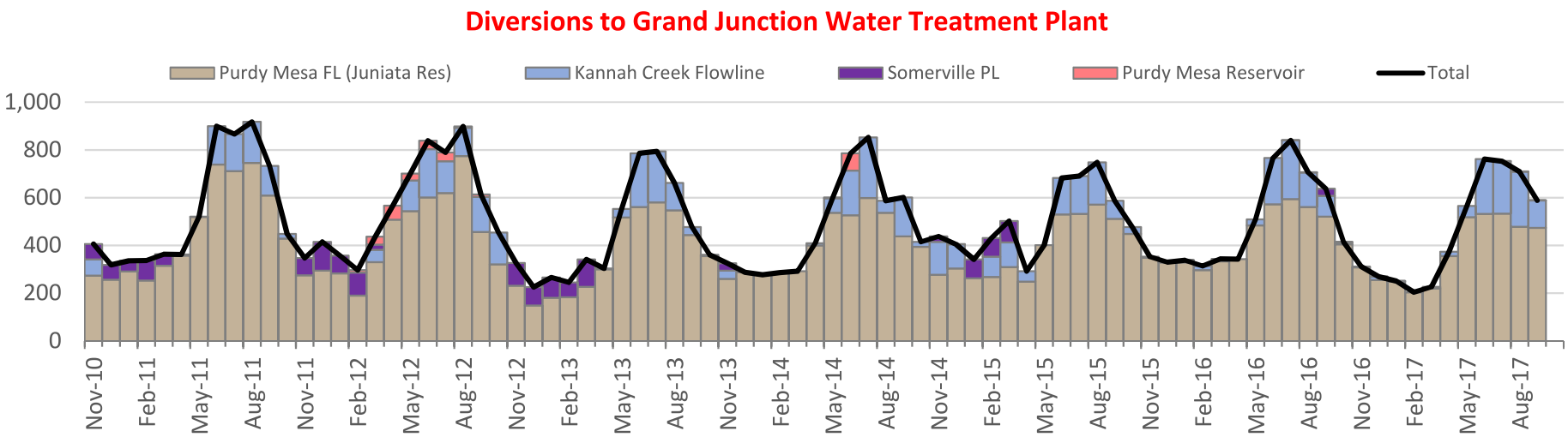
**Grand Junction Water Accounting Records**
**Nov 2010 - Sep 2017**
**(acre-feet)**




**Notes:** City of Grand Junction daily accounting records provided by the City of Grand Junction ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

**Figure 5-2**

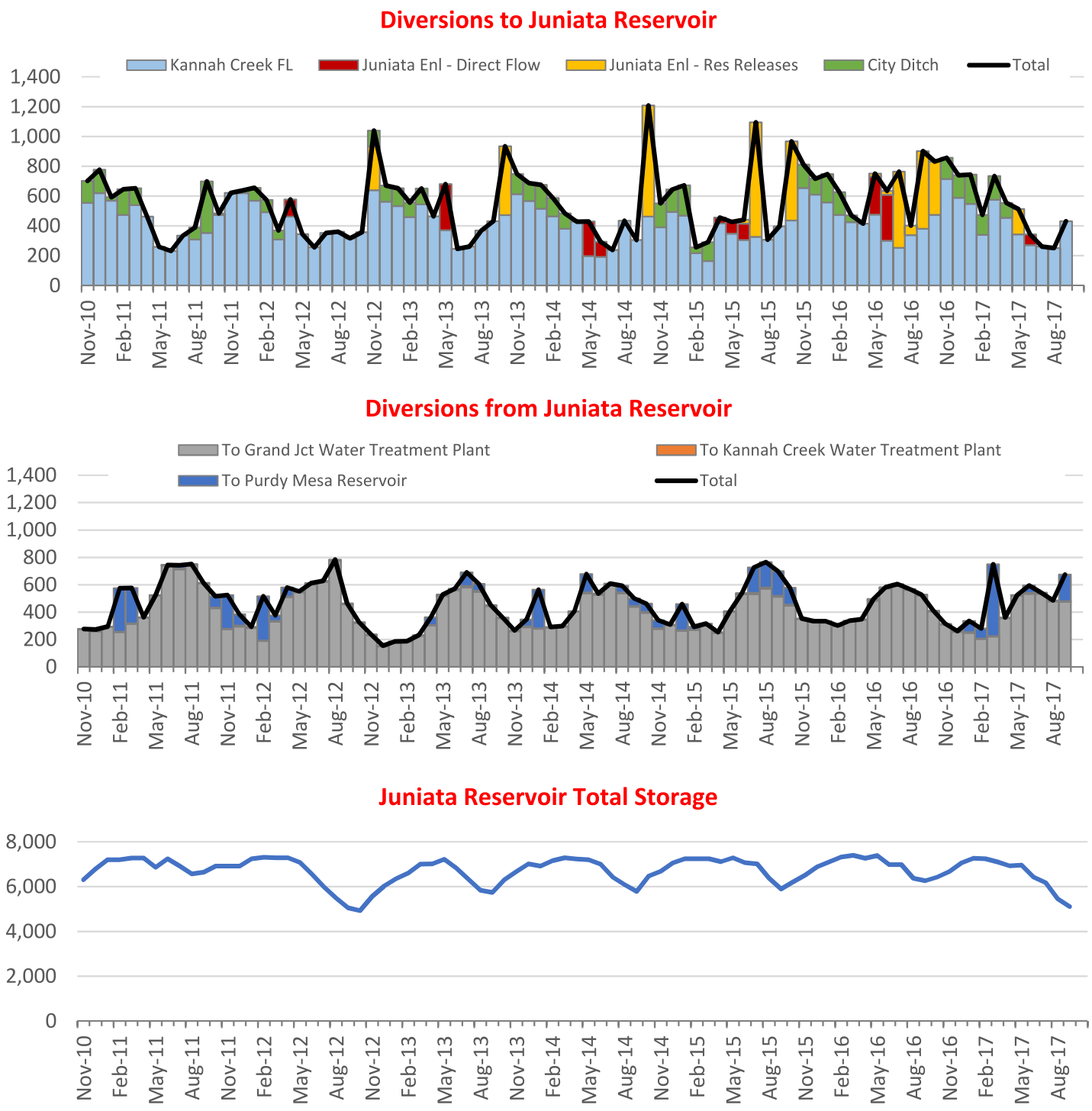
**Grand Junction Water Accounting Records**
**Nov 2010 - Sep 2017**
**(acre-feet)**




**Notes:** City of Grand Junction daily accounting records provided by the City of Grand Junction ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

**Figure 5-3**

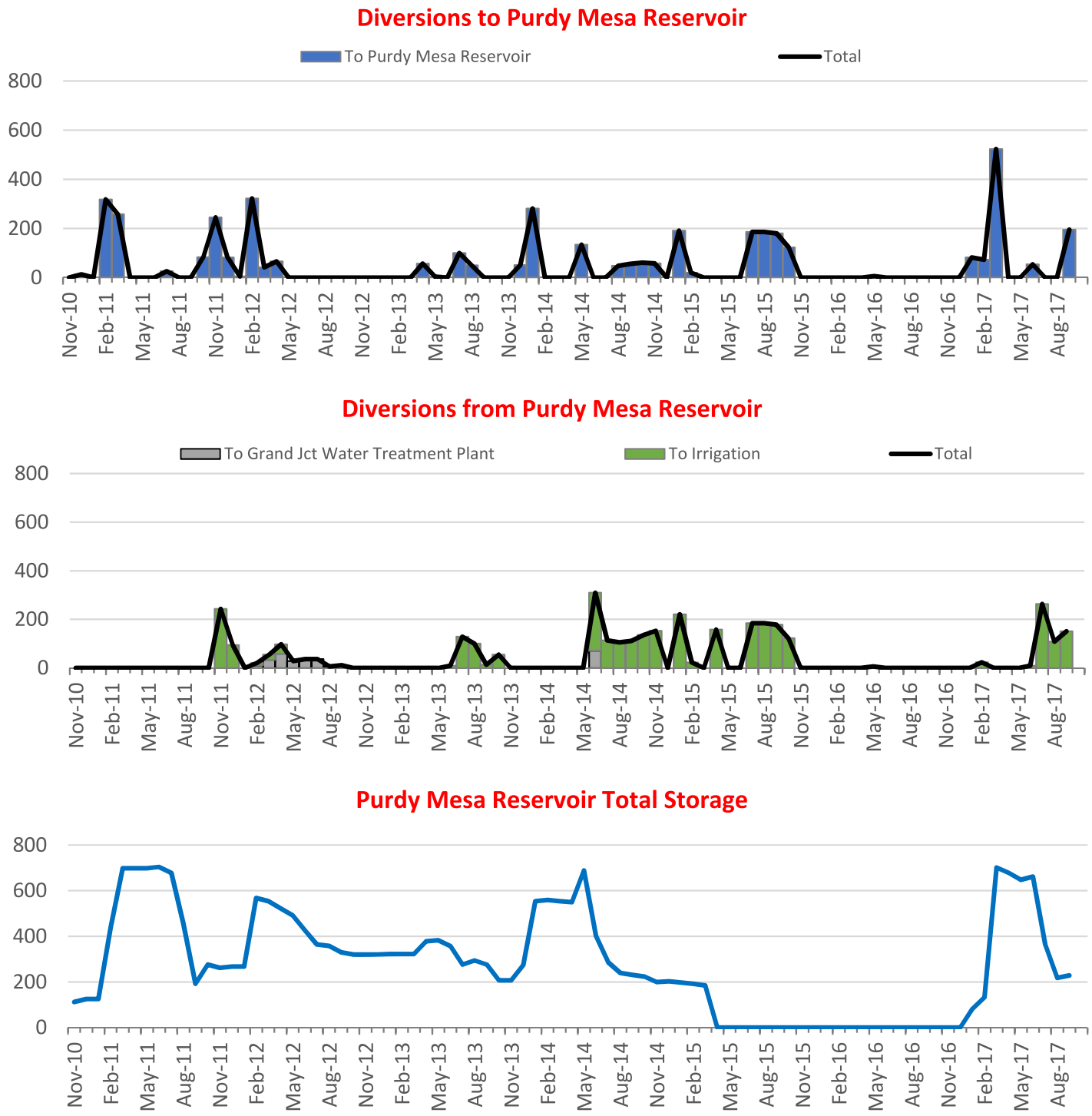
**Grand Junction Water Accounting Records**
**Nov 2010 - Sep 2017**
**(acre-feet)**




**Notes:** City of Grand Junction daily accounting records provided by the City ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

**Figure 5-4**

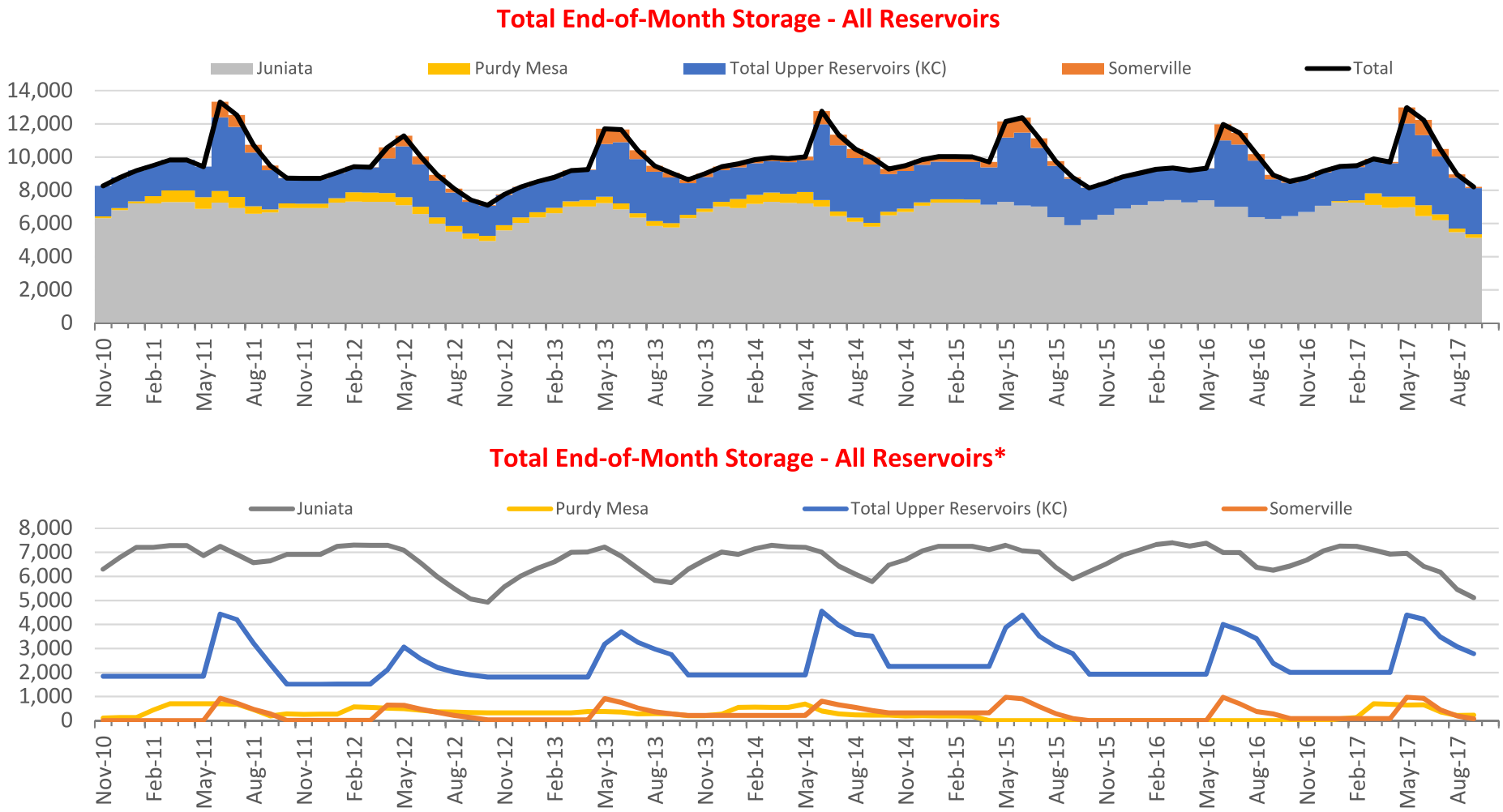
**Grand Junction Water Accounting Records**
**Nov 2010 - Sep 2017**
**(acre-feet)**




**Notes:** City of Grand Junction daily accounting records provided by the City ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

**Figure 5-5**

**Grand Junction Water Accounting Records**
**Nov 2010 - Sep 2017**
**(acre-feet)**

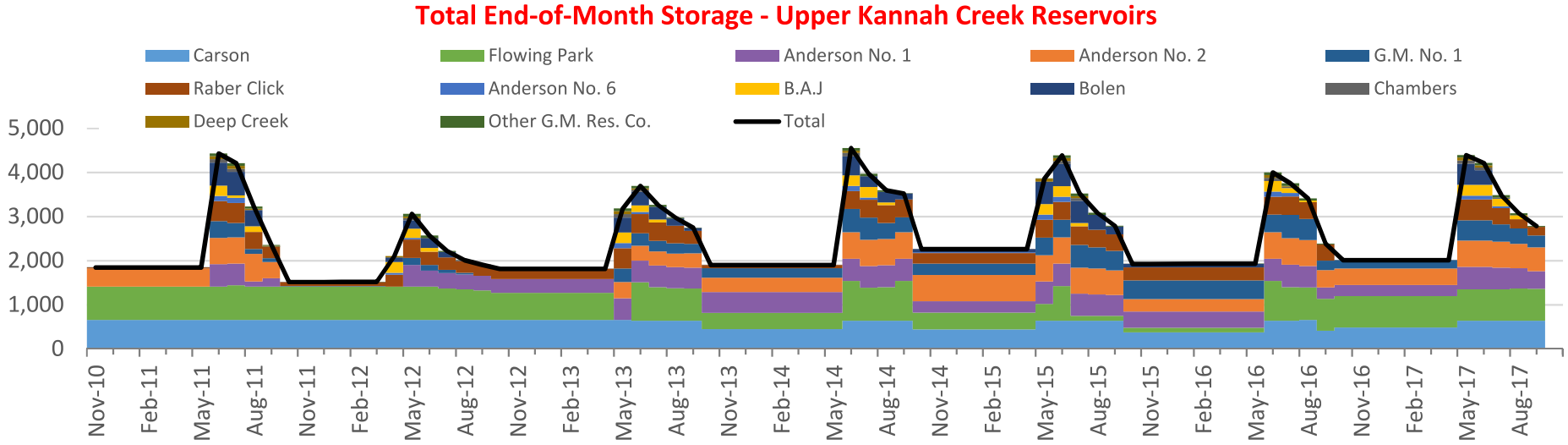


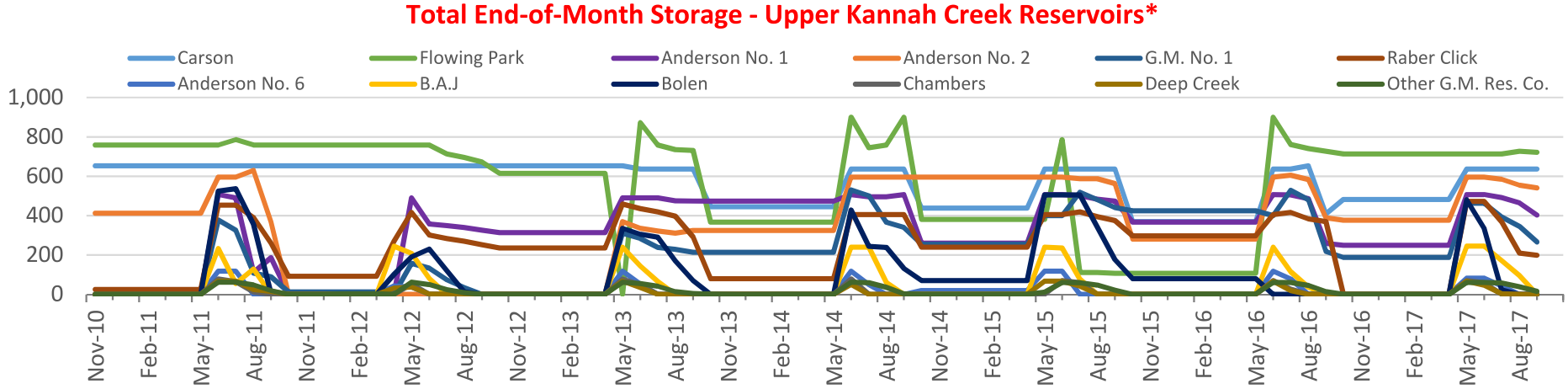

*Different scale than upper chart.

**Notes:** City of Grand Junction daily accounting records provided by the City ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

**Figure 5-6**

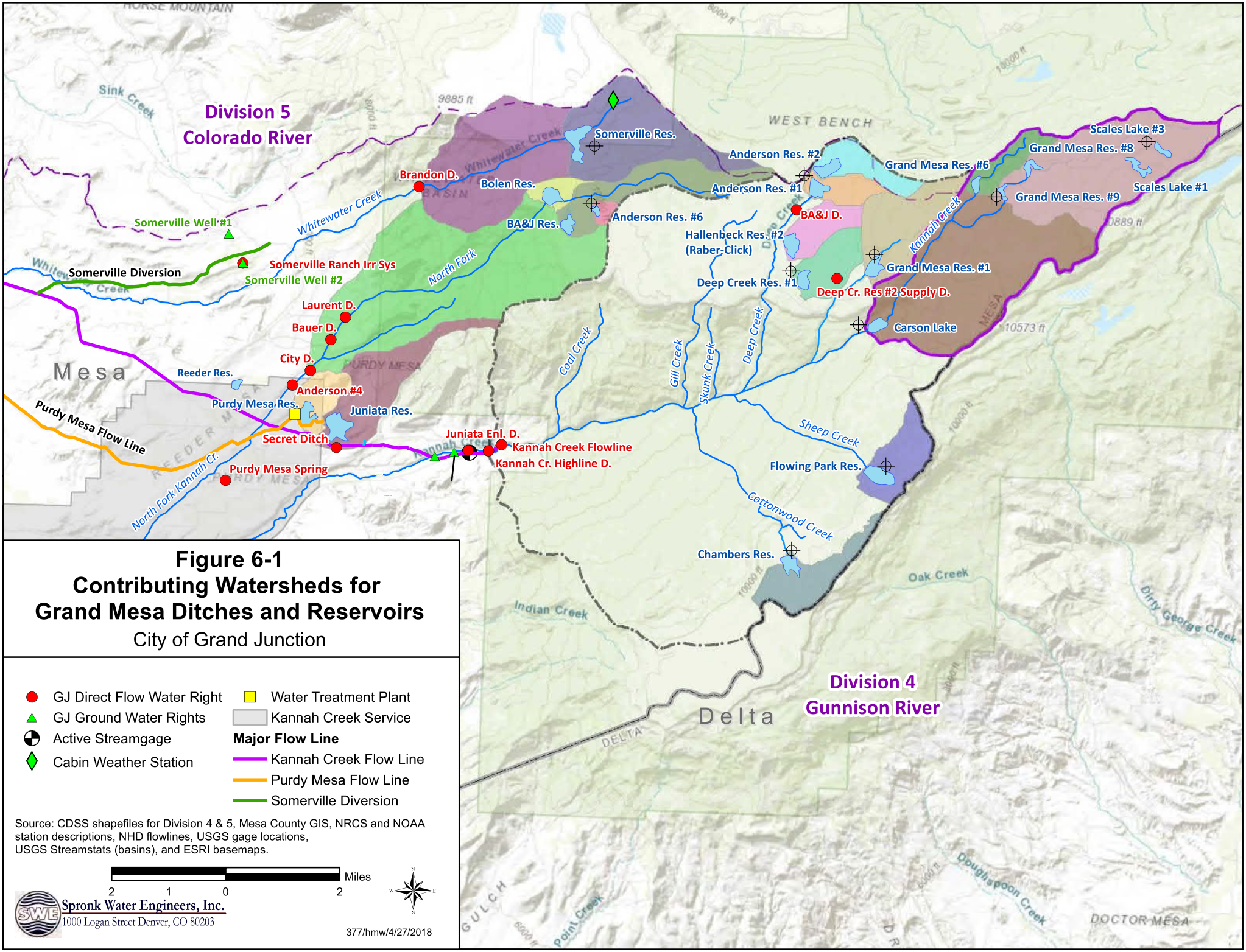
**Grand Junction Water Accounting Records**
**Nov 2010 - Sep 2017**
**(acre-feet)**




*Different scale than upper chart.

**Notes:** City of Grand Junction daily accounting records provided by the City ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").




# Figure 6-1
# Contributing Watersheds for Grand Mesa Ditches and Reservoirs

City of Grand Junction

- GJ Direct Flow Water Right
- GJ Ground Water Rights
- Active Streamgage
- Cabin Weather Station
- Water Treatment Plant
- Kannah Creek Service

**Major Flow Line**

- Kannah Creek Flow Line
- Purdy Mesa Flow Line
- Somerville Diversion

Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, NRCS and NOAA station descriptions, NHD flowlines, USGS gage locations, USGS Streamstats (basins), and ESRI basemaps.

2 1 0 2 Miles

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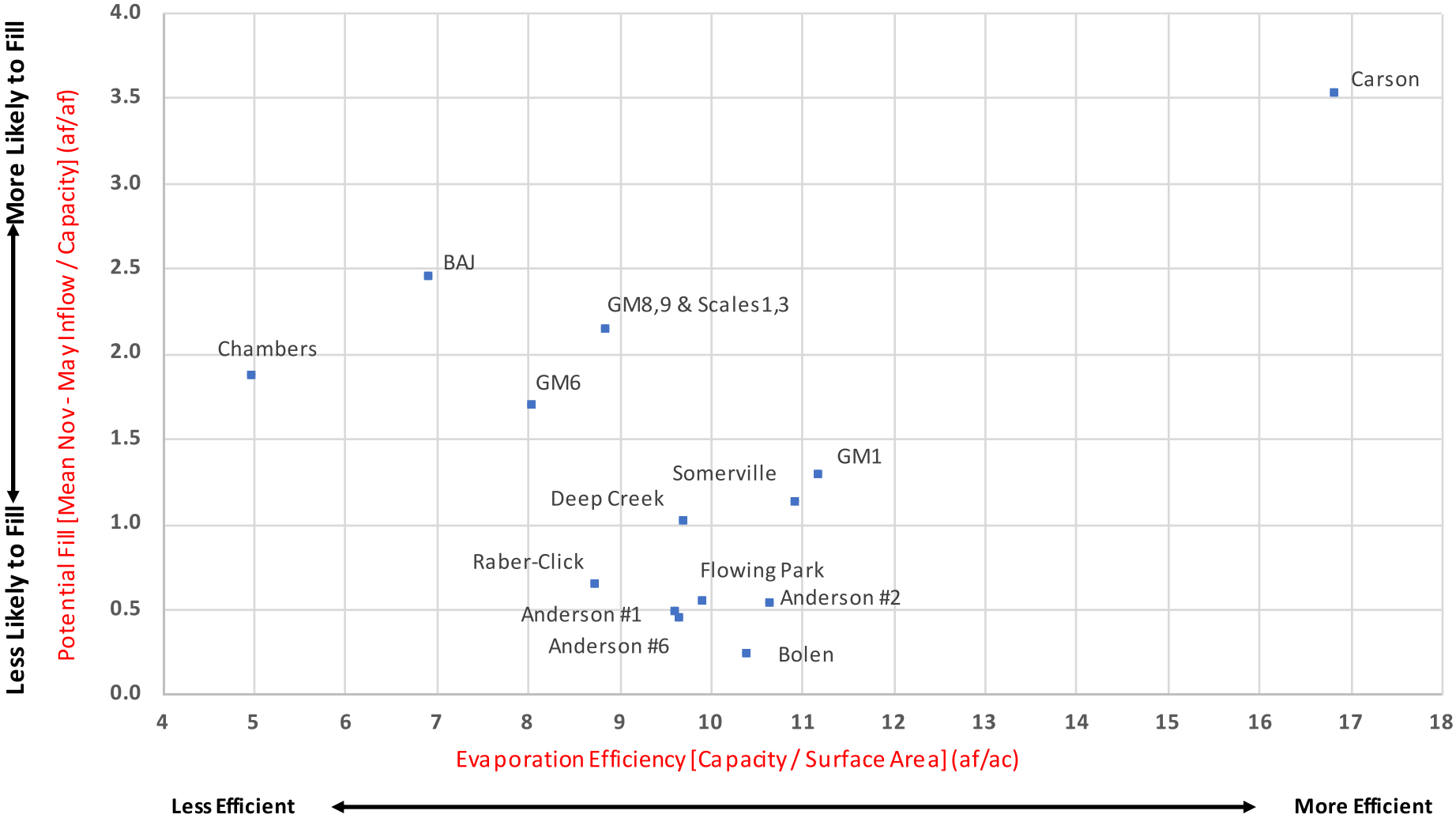
1000 Logan Street Denver, CO 80203

377/hmw/4/27/2018

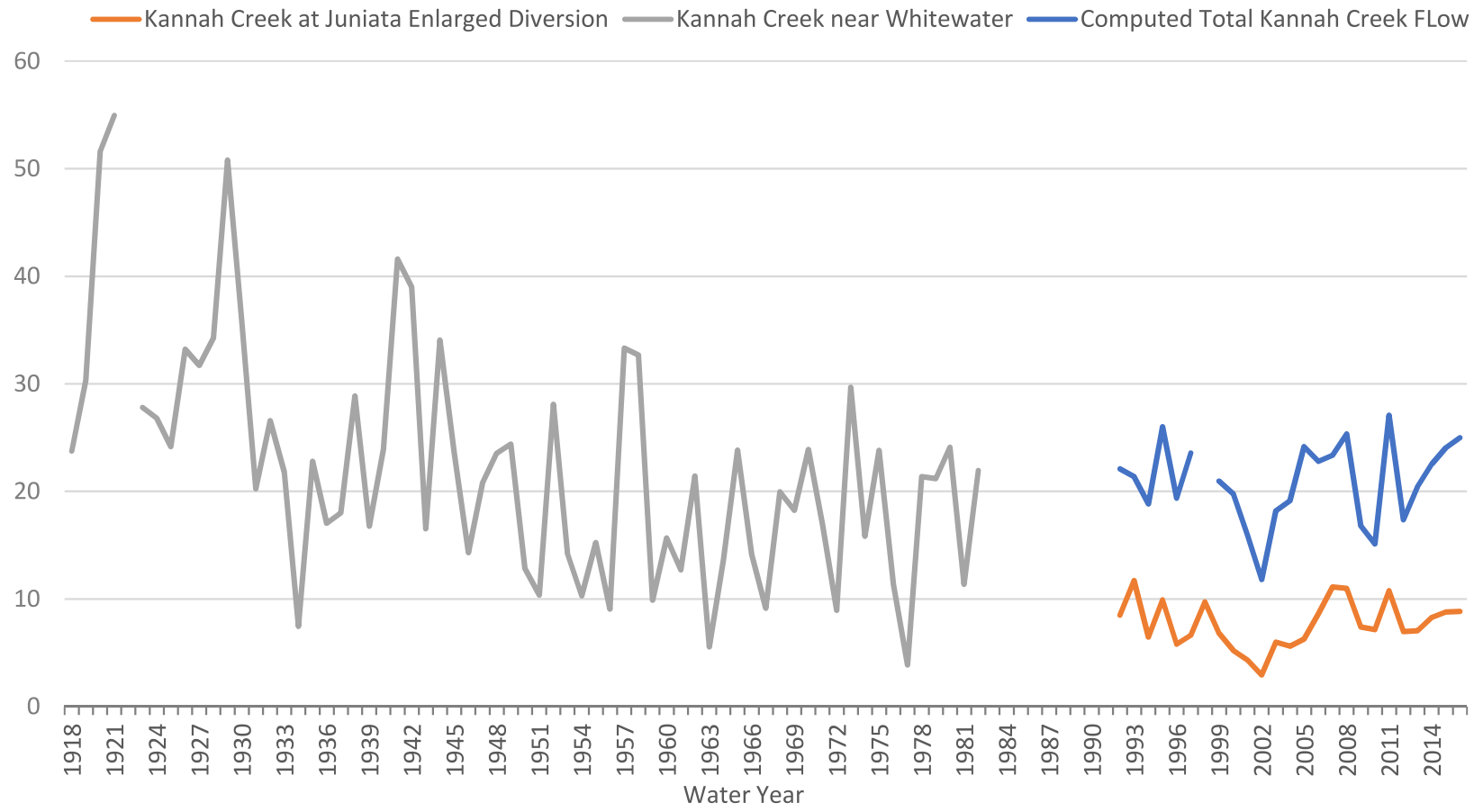
**Figure 6-2**
**Potential Fill vs. Evaporation Efficiency**
**Upper Grand Mesa Reservoirs**
**City of Grand Junction**




**Notes:**

(1) Average Nov - May Inflow obtained from USGS Streamstats.

**Figure 6-3**
**Annual Flow**
**Kannah Creek**
**Water Years 1918 - 2016**
**(1,000 acre-feet)**

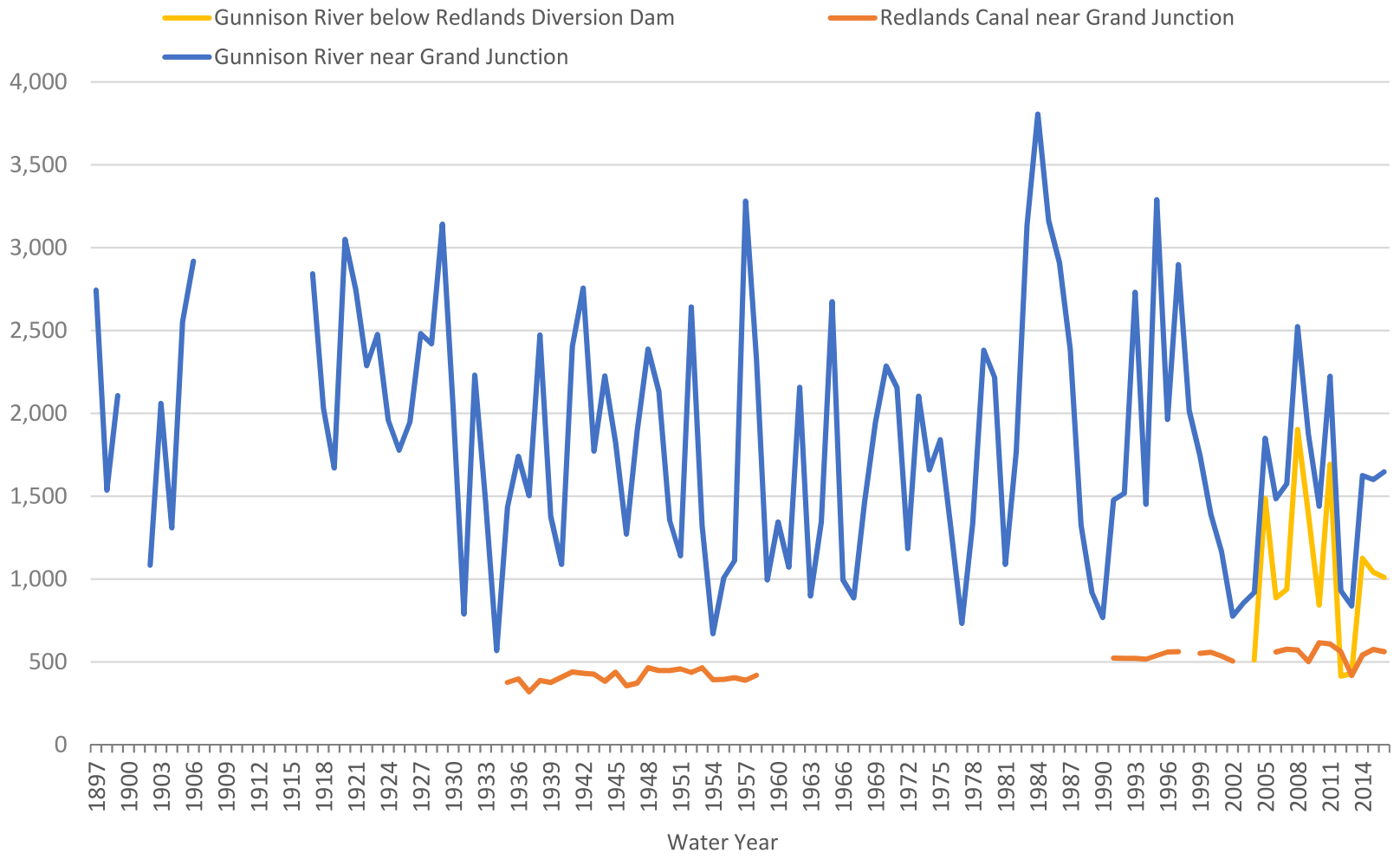



**Notes:**

Streamflow and diversion records from CDWR CDSS database.

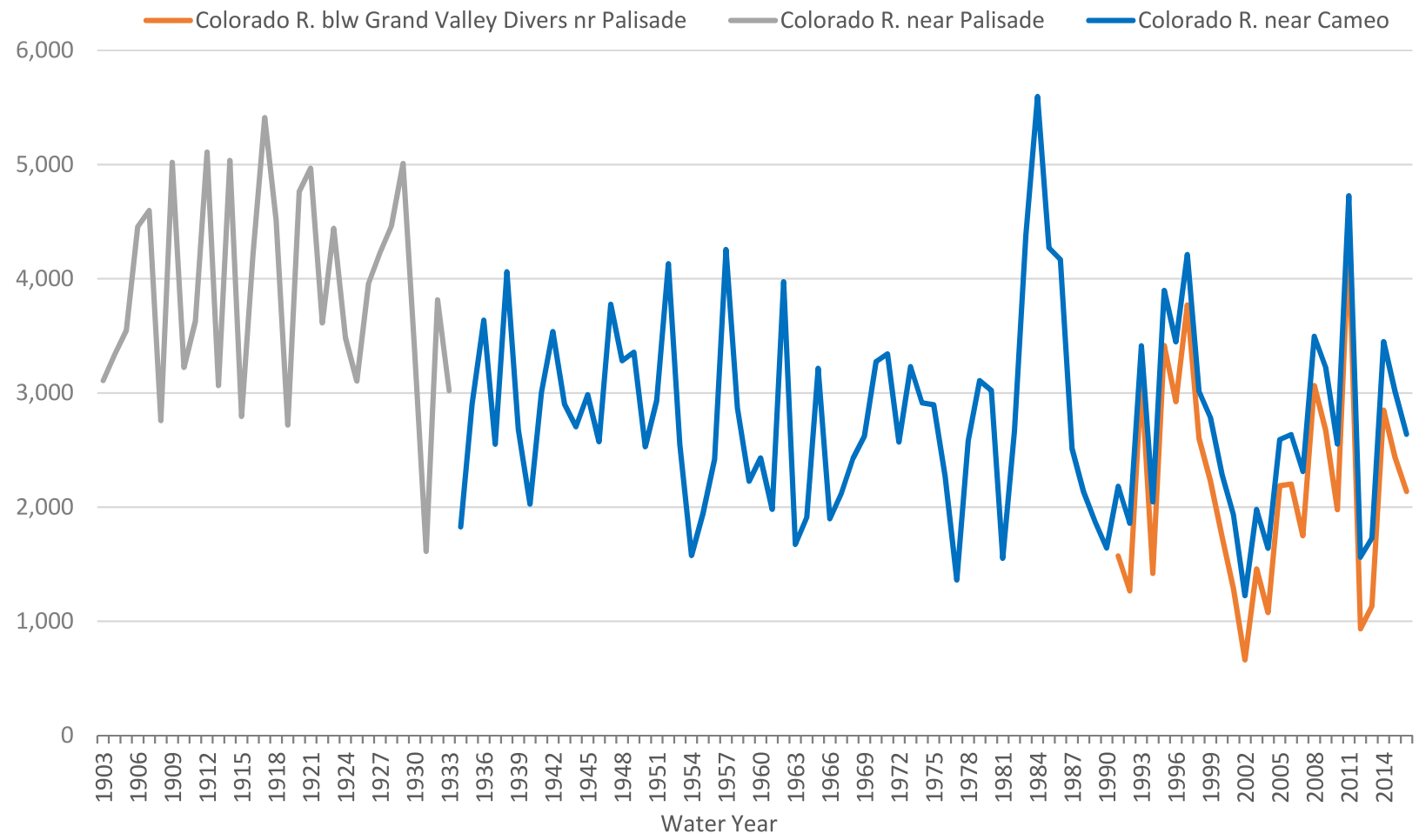
Kannah Creek flow computed from 1992 - 2015 (missing data in 1997-1998) as the sum of the diverisons (Kannah Cr. Highline, Juniata Ditch Enl., and GJ Flowline) plus the Kannah Creek near Juniata Enl. Gage.

**Figure 6-4**
**Annual Flow**
**Gunnison River and Redlands Canal**
**Water Years 1897 - 2016**
**(1,000 acre-feet)**




**Notes:**
Streamflow and diversion records for CDWR CDSS database.

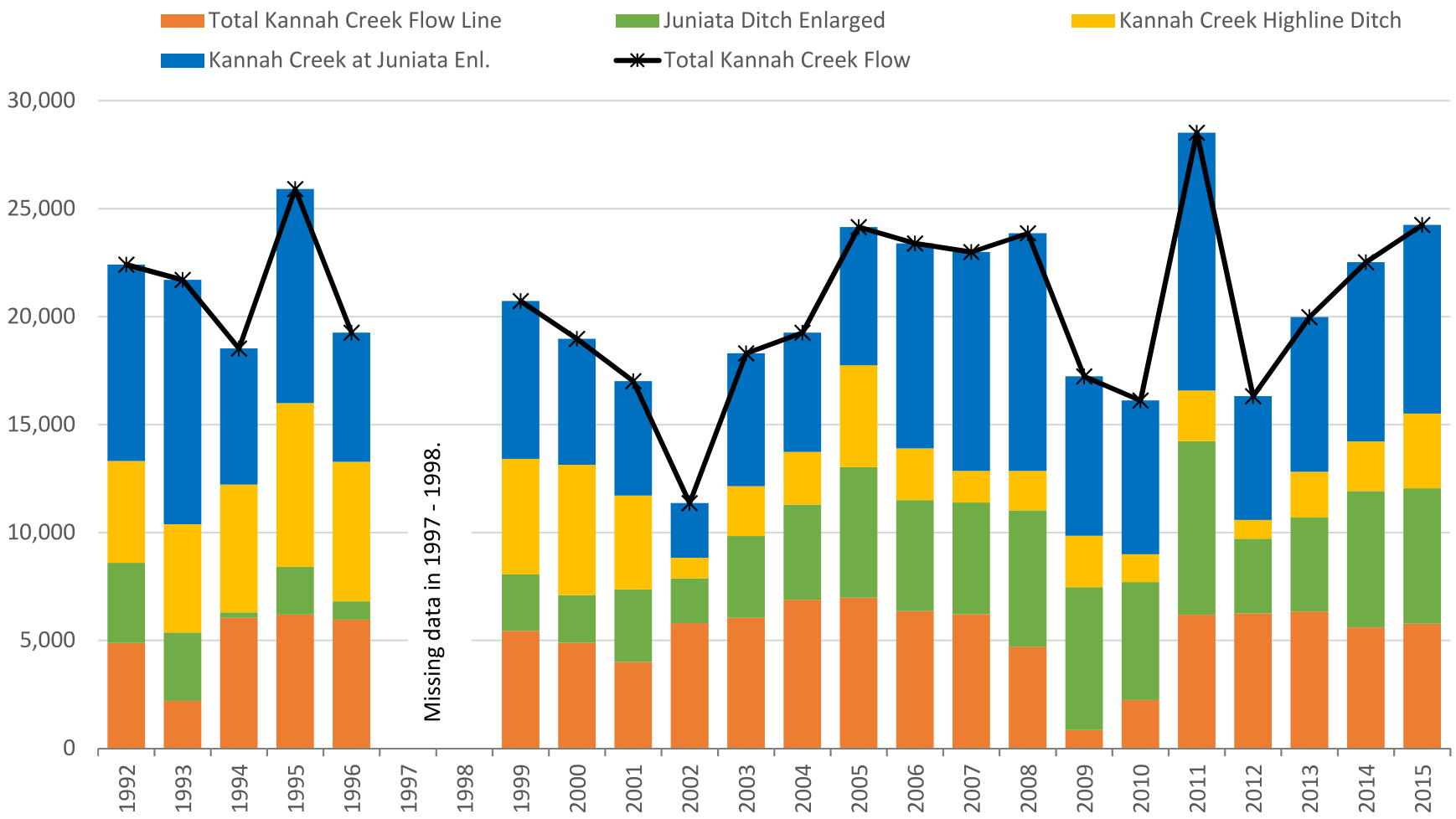
**Figure 6-5**
**Annual Flow**
**Colorado River**
**Water Years 1903 - 2016**
**(1,000 acre-feet)**




**Notes:**
Streamflow records from CDWR CDSS database.

## Figure 6-6

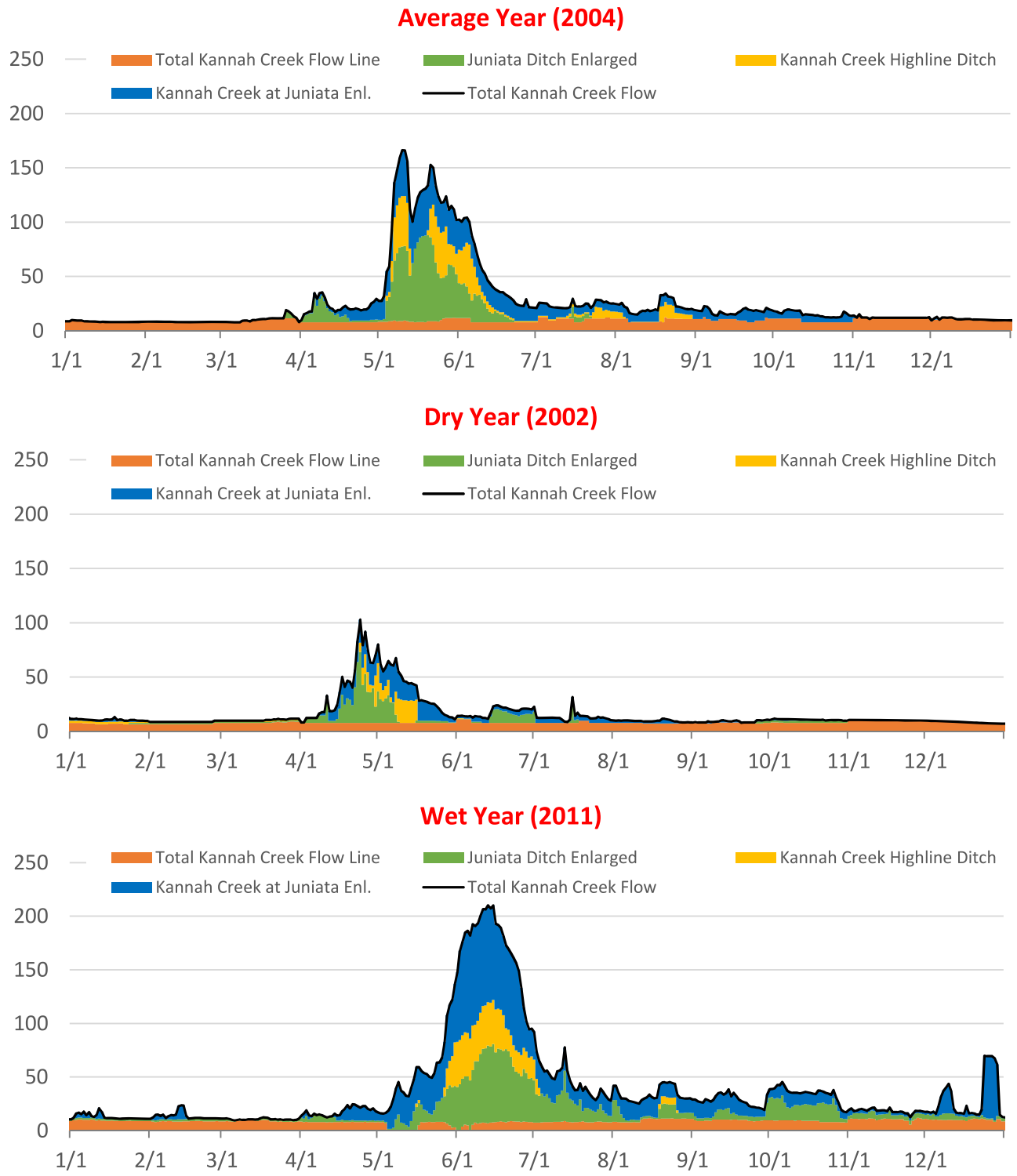
## Computed Annual Total Kannah Creek Flow
## 1992 - 2015
**(acre-feet/year)**




Source: Daily streamflow and diversion records from the Colorado Department of Water Resources (CDSS).

**Figure 6-7**

**Computed Daily Total Kannah Creek Flow**
**Average, Dry, and Wet Years**
**(cfs)**




Notes: Daily streamflow and diversion records from theColorado Department of Water Resources (CDSS).

# TABLES

# Table 3-1
## Summary of Direct Flow Water Rights
## City of Grand Junction

| | ID | Water Right Name | Total CFS | (1) GJ CFS | (2) Use | (3) Approp Year | Comments | Acquisition |
|---|---|---|---|---|---|---|---|---|
| | | **North Fork Kannah Creek** | | | | | | |
| | 504 | Bauer Ditch and Enl. | 13.18 | 13.18 | I | 1910 | Original water right (1.96 cfs) TT City Ditch | Anderson |
| | | | 1.00 | 1.00 | DS | 1916 | Combined max 1 cfs with Laurent Ditch | |
| | 554 | Laurent Ditch | 33.72 | 33.72 | I | 1921 | 15.32 cfs with approp. date (1919) | Anderson |
| | | | 1.00 | 1.00 | DS | 1916 | Combined max 1 cfs with Bauer Ditch | |
| | 512 | City Ditch | 10.97 | 10.97 | IM | 1888 | TF other senior ditches fr Anderson Acq.; can be stored in Juniata Res. system and Purdy Mesa Res. | Anderson |
| | | | 22.80 | 22.80 | M | 1989 | Absolute; 4.2 cfs of original 27 cfs abandoned | |
| | 554 | Anderson No. 4 Ditch | 0.29 | 0.29 | I | 1889 | Status and use of this water right is unknown. | Anderson |
| | 732 | Purdy Mesa Spring | 0.20 | 0.20 | IM | 1985 | Conditional municipal uses; downslope from City's pipelines | |
| (4) | | **Kannah Creek** | | | | | | |
| | 506 | BA&J Ditch and Enl. | 29.39 | 29.39 | I | 1922 | 1st priority (9.594 cfs) approp. 1901; Direct flow irrigation or storage in (BA&J Res. #2, Bolen Res. and/or Anderson #6 Res.); diverts from N. Fork Kannah drainage as well | Anderson |
| (5) | | | 29.39 | 29.39 | IMD | 1993 | City has data to file for absolute | |
| | 573 | Deep Cr Res #2 Sup D | 20.00 | 20.00 | I | 1906 | | Clark, Davis |
| (6) | 513 | KC Flowline - Paramount | 7.81 | 7.81 | M | 1881 | Year-round use with storage | |
| | | KC Flowline - 2nd Right | 3.91 | 3.91 | M | 1929 | Direct use and storage in Purdy Mesa Res. | |
| (7) | 529 | Kannah Cr. Highline Ditch | 49.11 | 18.00 | IM | 1908 | Changed to allow municipal use and storage; monthly vol. limits; APOD Juniata Ditch rights. | Hallenbeck, Raber, Click |
| | | | 18.79 | 6.90 | I | 1939 | | |
| | 748 | Juniata Ditch | 1.37 | 1.37 | I | 1884 | 3 APODs (Juniata Enl., Kannah Cr. Highline, & Secret Ditch) | Hallenbeck |
| | | | 21.25 | 0.64 | I | 1888 | TT Kannah Cr. Highline Ditch | |
| | | | 2.00 | 0.06 | IDS | 1884 | Cannot be used for storage | |
| | 528 | Juniata Ditch Enl. | 54.00 | 39.00 | I | 1939 | Irr. and to storage in Purdy Mesa | Hallenbeck |
| | | | 75.00 | 75.00 | I | 1953 | Irr. and to storage in Juniata Res. Enl. | |
| (5) | | | 129.00 | 129.00 | M | 1994 | Made absolute (1999) | |
| | 5035 | Anderson Well | 0.04 | 0.04 | D | 2010 | Aug. source is GJ Flowline | |
| | 5034 | Berry Well | 0.04 | 0.04 | D | 2010 | Aug. source is GJ Flowline | |
| | | **Whitewater Creek** | | | | | | |
| | 509 | Brandon Ditch | 33.40 | 33.40 | I | 1940 | 4.8 cfs from senior priorities TT ditch; 3.8 cfs enl. (1900 approp.); 24.8 cfs 2nd enl. (1940 approp.) | Somerville |
| (8) | | | 15.00 | 15.00 | M | 1985 | 7.63 cfs abs. and 7.37 cond. | |
| | 622 | Somerville Ranch Irr. Sys. | 3.00 | 3.00 | IS | 1882 | Springs used on 1,000 acre ranch; 1970 adj. date | Somerville |
| | 5010 | Somerville Well No. 1 | 0.22 | 0.22 | DS | 1964 | | Somerville |
| | 5011 | Somerville Well No. 2 | 0.44 | 0.44 | DS | 1964 | | Somerville |
| | | **Gunnison River** | | | | | | |
| | 520 | Gunnison R. Pipeline | 120.00 | 120.00 | M | 1957 | 18.6 cfs abs. and 101.4 cfs cond. | |
| | | **Colorado River** | | | | | | |
| | 1368 | Redlands Tailrace | 50.00 | 50.00 | IM | 1977 | 18 cfs abs. and 32 cfs cond.; water source is tailrace of Redlands Canal from Gunnison R.; currently used at Connected Lakes Park | |
| | 644 | Colorado R. Pipeline | 120.00 | 80.00 | MD | 1947 | 5 points of diversion; 6.96 cfs abs. | |
| | 1367 | 22 Road Pump Station | 1.50 | 1.50 | IMD | 1976 | 38.5 cfs of original 40 cfs abandoned | |
| | 5086 | Ridges Well No. 1 | 0.08 | 0.08 | M | 1978 | Absolute | |
| (9) | 1501 | Ridges Pumping Station | 6.53 | 6.53 | M | 1964 | Absolute; TF Bridges to Gardner to Ridges Pumping Station; 8.47 cfs of original 15 cfs abandoned | |
| | | | 10.00 | 10.00 | M | 1973 | Conditional; APOD diverts from Redlands Power Canal (Gunnison | |
| (10) | 645 | Grand Valley Canal | ___ | ___ | I | ___ | City owns 517 shares out of____ total shares (___%) | |
| (10) | ___ | Redlands Canal | ___ | ___ | I | ___ | City owns 197 shares out of____ total shares (___%) | |
| (10) | ___ | Highland Park Lateral D. | ___ | ___ | I | ___ | City owns 18.445 shares out of ___ total shares (___%) | |

**Notes:**

Decreed for municipal uses

(1) Water right volume owned by the City of Grand Junction.

(2) I – Irrigation, M – Municipal, D – Domestic, S – Stock.

(3) Year of appropriation date or latest year with multiple water rights (see comments).

(4) Excludes domestic ground water rights (Anderson Well and Berry Well).

(5) The City may forego diversions without risk of abandonment under senior irrigations rights for municipal use.

(6) Kannah Creek Flowline; structure also known as Grand Junction Flowline and Water Works.

(7) Grand Junction owns 1,474.5 shares out of 4,000 shares.
Decreed for filling and refilling Grand Junction storage facilities and for municipal and augmentation uses (Case No. 85CW199).

(9) Original water right was 100 cfs; 79.47 cfs abandoned and 14 cfs transferred to Orchard Mesa Irrigation District.

(10) City shares used by Parks Depy. for irrigation of parks, golf courses, and a fire station. Detailed water right and share information not provided by the Parks Dept.

## Table 3-2
## Summary of Storage Water Rights
## City of Grand Junction

| | ID | Water Right Name | (1) Total (AF) | (2) Cap. (AF) | (3) GJ (AF) | (4) GJ Cap. (AF) | (5) Use | (6) Approp. Date | Comment | Acquisition |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **North Fork Kannah Creek** | | | | | | | | |
| (7) | 3630 | Anderson Reservoir No. 6 | 57.3 | 118.0 | 57.3 | 118.0 | IM | 1928 | | Anderson |
| (8) | | | 118.0 | | 118.0 | | M | 1993 | | |
| (7) | 3603 | Bolen Reservoir | 535.7 | 521.0 | 535.7 | 521.0 | IM | 1949 | First 383.3 af has 1911 approp. date | Anderson |
| (8) | | | 521.0 | | 521.0 | | M | 1993 | | |
| (7) | 3602 | Bolen A&J Reservoir No. 2 | 293.0 | 240.0 | 293.0 | 240.0 | IM | 1949 | First 11.1 af has 1911 approp. date | Anderson |
| (8) | | | 240.0 | | 240.0 | | M | 1993 | | |
| | 3618 | Hallenbeck #1 Reservoir | 863.1 | 659.0 | 863.1 | 659.0 | I | 1939 | | Hallenbeck |
| (8) | | (aka Purdy Mesa Reservoir) | 659.0 | | 659.0 | | M | 1993 | Conditional | |
| (9) | 3620 | Juniata Reservoir & Enl. | 6,869.7 | 7,291.4 | 6,869.7 | 7,291.4 | I | 1911-1967 | 1st 400.094 af (1911 approp.); 1st enl. 2,313 af (1953 approp); 2nd enl. 4,156.6 af (1967 approp.) | Hallenbeck, Raber, Click |
| (8) | | | 3,213.4 | | 3,213.4 | | M | 1993-1994 | 919 af abs (1993 approp./2002 adj. date); 1,794.4 af + 412.8 af abs + 87.2 af cond. (1994 approp.) | |
| | 3661 | Reeder Reservoir | 179.7 | | 179.7 | | I | 1889 | Abandoned municipal conditional right (700 af) in 2010; filled by Bauer D. (N Fork Kannah); located below City's transmission lines. | Anderson |
| | | **Kannah Creek** | | | | | | | | |
| (7) | 3600 | Anderson Reservoir No. 1 | 466.0 | 506.0 | 466.0 | 506.0 | IM | 1911 | | Anderson |
| (8) | | | 506.0 | | 506.0 | | M | 1993 | Includes 38 af TF Raber Click Res. | |
| (7) | 3601 | Anderson Reservoir No. 2 | 568.4 | 595.0 | 568.4 | 595.0 | IM | 1928 | | Anderson |
| (8) | | | 595.0 | | 595.0 | | M | 1993 | | |
| (10) | 3619 | Hallenbeck #2 Reservoir | 526.1 | 459.0 | 526.1 | 459.0 | IM | 1923 | 459 af changed to add municipal uses | Hallenbeck, |
| (8) | | (aka Raber Click Reservoir) | 459.0 | | 459.0 | | M | 1993 | Original 1993 cond. water right was 503 af; 38 af TT Anderson #1; 5.68 af dismissed | Raber, Click |
| | 3606 | Deep Creek Reservoir No. 2 | 350.0 | 353.6 | 66.5 | 67.2 | I | 1906 | City owns 19.4% | Clark, Davis |
| | 3604 | Carson Lake | 637.0 | 637.4 | 637.0 | 637.4 | M | 1946 | Original right 1,000 af - abandoned 363 af cond. | Hallenbeck |
| | 3607 | Dry Creek Reservoir (aka Chambers Res.) | 600.0 | 236.4 | 200.0 | 78.8 | I | 1903 | City owns 33%; total water right for 600 af; reservoir only holds 200 af | |
| | 3608 | Flowing Park Reservoir | 782.2 | 772.2 | 782.2 | 772.2 | IM | 1911 | Added irrigated lands in Div. 5 (96CW271) | |
| | 3692 | Purdy Mesa Reservoir No. 2 | 2.5 | | 2.5 | | IM | 1955 | Conditional municipal use; downslope from City's transmission lines; dam needs work | |
| (11) | 3614 | Grand Mesa Reservoir No. 1 | 780.0 | 559.4 | 559.0 | 400.9 | I | 1887 | City owns 100%; 221 af abandoned in 2001; need to file for 2017 municipal right | |
| (12) | 3615 | Grand Mesa Reservoir No. 6 | 76.2 | 171.9 | 4.1 | 9.3 | I | 1904 | Grand Mesa Reservoir Co./City owns 5.4% | |
| (12) | 3616 | Grand Mesa Reservoir No. 8 | 382.0 | 378.9 | 20.6 | 20.5 | I | 1901 | Grand Mesa Reservoir Co./City owns 5.4% | |
| (12) | 3617 | Grand Mesa Reservoir No. 9 | 332.0 | 153.3 | 17.9 | 8.3 | I | 1904 | Grand Mesa Reservoir Co./City owns 5.4% | |
| (12) | 3623 | Scales Lake No. 1 | 215.0 | 202.7 | 11.6 | 10.9 | I | 1891 | Grand Mesa Reservoir Co./City owns 5.4% | |
| (12) | 3624 | Scales Lake No. 3 | 145.0 | 128.8 | 7.8 | 7.0 | I | 1892 | Grand Mesa Reservoir Co./City owns 5.4% | |
| | | **Whitewater Creek** | | | | | | | | |
| | 3625 | Somerville Reservoir #1 | 973.8 | 658.6 | 929.8 | 658.6 | I | 1993 | 1st 70.8 af (1894 approp. - TF Cliff Lake Res.); 1st enl. 837 af (1945 approp); 2nd enl. 66 af (1993 approp.); 66 af split (GJ owns 1/3) | Somerville |
| (8) | | | 973.0 | | 973.0 | | M | 1993 | Conditional | |
| | 3692 | Guild Reservoir | 82.6 | | 82.6 | | I | 1955 | Not used by City; Cond. portion abandoned (ref. 84CW93); located in Water Div. 5 (ref. 92CW62) | Somerville |
| | | **Colorado River** | | | | | | | | |
| | 3941 | Ridges Ponds No. 1 | 4.5 | | 4.5 | | M | 1978 | aka Duck Pond | |
| | 3937 | Ridges Ponds No. 2 | 2.3 | | 2.3 | | M | 1978 | | |
| | 3938 | Ridges Ponds No. 3 | 32.5 | *32.5* | 32.5 | *32.5* | M | 1978 | aka Shadow Lake | |
| | | **Total Capacity:** | | **14,675** | | **13,093** | | | | |

**Notes:**

Decreed for municipal uses

(1) Total water right volume.
(2) Reservoir capacity from decrees or 1991 report or capacity estimated equal to decreed volume in italic and grey text.
(3) Water right volume owned by the City of Grand Junction.
(4) City of Grand Junction share of the reservoir capacity.
(5) I – Irrigation, M - Municipal
(6) Year of appropriation date or latest year with multiple water rights (see comments).
(7) Water right changed to permit storage in Purdy Mesa and Juniata Reservoirs, continued irrigation at historic place of use, and the use, re-use and successive use of the water for all municipal purposes within the Grand Junction's service area; 5.7% return flow obligation to Kannah Creek.
(8) The City may forego diversions without risk of abandonment under senior irrigations rights for municipal use. No return flow obligation under this priority.
(9) Includes first and second enlargement values (3435.41 af and 5946.7 af) that were made absolute, the remaining volumes were dismissed.
(10) Water right changed to permit continued irrigation at historic place of use, and the use, re-use and successive use of the water for all municipal purposes within the Grand Junction's service area; 5.7% return flow obligation to Kannah Creek.
(11) City traded shares in company to have all Grand Mesa Reservoir Company shares in this reservoir.
(12) Owned by Grand Mesa Reservoir Company; City of Grand Junction owns 5.4%

## Table 3-3

## Capacities of Major Facilities
## City of Grand Junction

| | Structure | (1) Storage Capacity (af) | (2) City Owns (%) | (3) City Storage (af) | (4) Capacity (MGD) |
|---|---|---|---|---|---|
| | **Upper Grand Mesa Reservoirs** | | | | |
| | Kannah Creek | 5,110 | 72% | 3,692 | |
| | North Fork Kannah Creek | 879 | 100% | 879 | |
| | Whitewater Creek | 973 | 100% | 973 | |
| | **Total** | **6,962** | **80%** | **5,544** | |
| | **Lower Grand Mesa Reservoirs** | | | | |
| | Juniata Reservoir | 7,291 | 100% | 7,291 | |
| | Purdy Mesa Reservoir | 659 | 100% | 659 | |
| | **Total** | **7,950** | **100%** | **7,950** | |
| | **Ridges Ponds** | | | | |
| | Shadow Lake | 30 | 100% | 30 | |
| | **Flow Line Capacities** | | | | |
| | Kannah Creek Flowline | | | | 5 |
| | Purdy Mesa Flowline | | | | 7 |
| (5) | Somerville Pipeline | | | | |
| | **Water Treatment Plant Capacities** | | | | |
| | Grand Junction WTP | | | 12 MG | 16 |
| (5) | Kannah Creek WTP | | | | |

**Notes:**

(1) Storage capacity from Grand Junction water accounting records and City of Grand Junction GIS mapping.

(2) Amount of reservoir capacity owned by Grand Junction from Grand Junction water accounting records and Slade Connell.

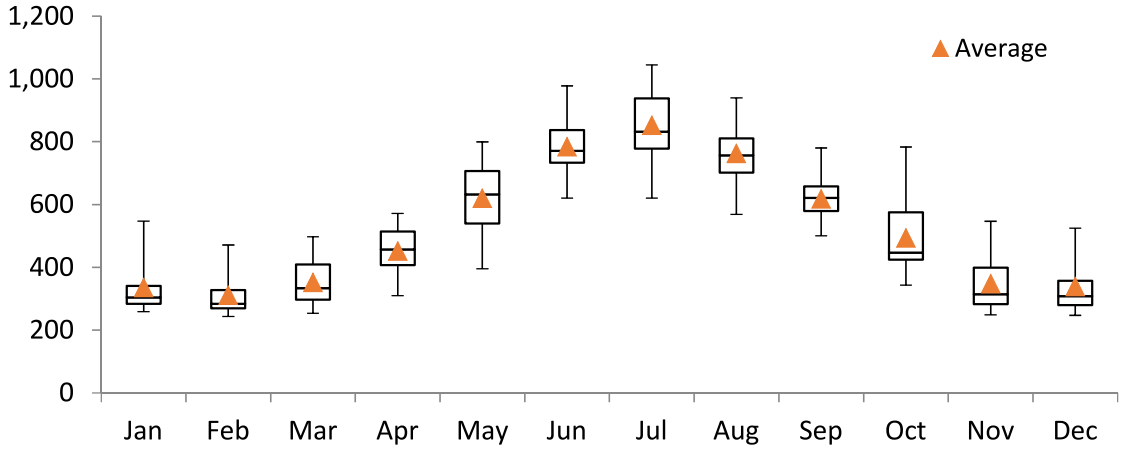
(3) (1) x (2).

(4) Information provided by City in Request for Proposal RFP-4524-18-DH.

(5) Have not yet received information on capacities for these facilities.

**Table 4-1**
**Monthly Total Water Production**
**City of Grand Junction**
**(acre-feet)**

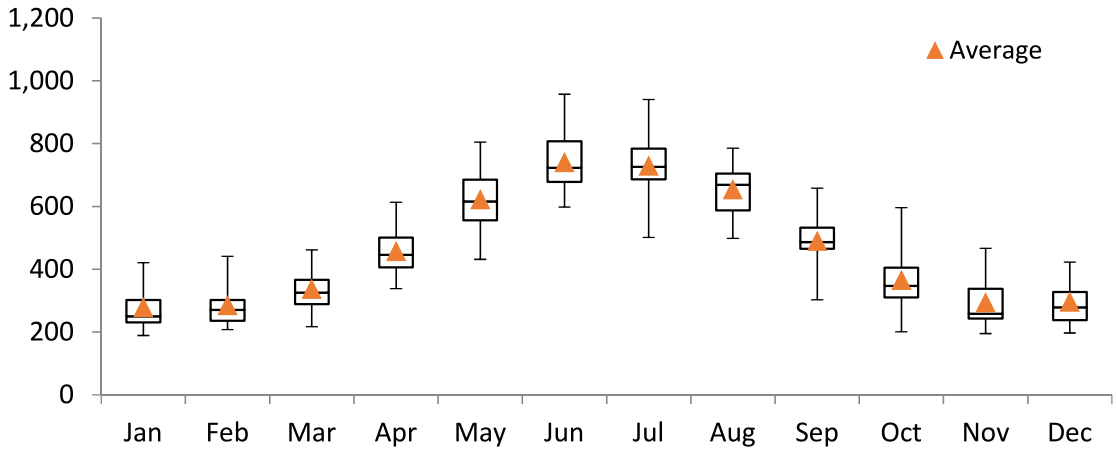
| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | 305 | 296 | 343 | 567 | 707 | 805 | 938 | 709 | 666 | 499 | 326 | 303 | 6,464 |
| 1990 | 268 | 254 | 302 | 457 | 641 | 800 | 735 | 757 | 535 | 421 | 399 | 477 | 6,045 |
| 1991 | 465 | 433 | 459 | 418 | 593 | 705 | 805 | 703 | 539 | 657 | 460 | 449 | 6,685 |
| 1992 | 459 | 445 | 497 | 489 | 535 | 771 | 810 | 748 | 644 | 783 | 494 | 495 | 7,170 |
| 1993 | 448 | 374 | 409 | 477 | 539 | 837 | 980 | 811 | 677 | 578 | 512 | 525 | 7,166 |
| 1994 | 547 | 471 | 441 | 518 | 774 | 978 | 1,045 | 926 | 725 | 621 | 547 | 502 | 8,095 |
| 1995 | 425 | 441 | 481 | 464 | 465 | 745 | 821 | 876 | 707 | 581 | 425 | 438 | 6,870 |
| 1996 | 426 | 420 | 461 | 539 | 751 | 827 | 956 | 940 | 622 | 679 | 510 | 454 | 7,585 |
| 1997 | 443 | 296 | 405 | 400 | 700 | 862 | 971 | 702 | 518 | 431 | 340 | 329 | 6,396 |
| 1998 | 328 | 298 | 343 | 454 | 755 | 791 | 898 | 873 | 678 | 560 | 317 | 309 | 6,603 |
| 1999 | 307 | 283 | 409 | 477 | 632 | 770 | 832 | 672 | 577 | 496 | 363 | 346 | 6,165 |
| 2000 | 317 | 294 | 333 | 559 | 799 | 921 | 989 | 904 | 639 | 491 | 303 | 313 | 6,862 |
| 2001 | 314 | 327 | 371 | 544 | 724 | 891 | 884 | 768 | 693 | 496 | 334 | 290 | 6,636 |
| 2002 | 301 | 276 | 340 | 571 | 758 | 921 | 1,017 | 821 | 556 | 439 | 282 | 270 | 6,551 |
| 2003 | 278 | 257 | 296 | 519 | 679 | 847 | 1,032 | 866 | 658 | 575 | 337 | 357 | 6,700 |
| 2004 | 341 | 312 | 410 | 426 | 620 | 792 | 860 | 810 | 607 | 447 | 300 | 312 | 6,237 |
| 2005 | 279 | 270 | 304 | 458 | 653 | 666 | 881 | 756 | 626 | 432 | 314 | 322 | 5,962 |
| 2006 | 298 | 283 | 326 | 514 | 719 | 850 | 829 | 716 | 579 | 343 | 285 | 298 | 6,039 |
| 2007 | 297 | 280 | 335 | 407 | 655 | 769 | 875 | 788 | 610 | 425 | 307 | 280 | 6,029 |
| 2008 | 304 | 279 | 309 | 412 | 613 | 736 | 884 | 763 | 622 | 471 | 303 | 300 | 5,996 |
| 2009 | 300 | 291 | 267 | 309 | 395 | 620 | 621 | 796 | 780 | 634 | 439 | 338 | 5,791 |
| 2010 | 334 | 332 | 254 | 384 | 566 | 732 | 828 | 644 | 627 | 441 | 280 | 281 | 5,704 |
| 2011 | 286 | 254 | 292 | 351 | 509 | 723 | 713 | 753 | 607 | 428 | 291 | 295 | 5,502 |
| 2012 | 284 | 253 | 334 | 469 | 688 | 806 | 766 | 731 | 621 | 438 | 283 | 273 | 5,946 |
| 2013 | 289 | 268 | 296 | 347 | 543 | 760 | 732 | 658 | 500 | 355 | 257 | 262 | 5,267 |
| 2014 | 271 | 269 | 287 | 385 | 534 | 704 | 802 | 569 | 584 | 400 | 272 | 247 | 5,324 |
| 2015 | 278 | 260 | 314 | 410 | 415 | 636 | 663 | 701 | 569 | 412 | 248 | 248 | 5,154 |
| 2016 | 271 | 243 | 297 | 337 | 475 | 734 | 778 | 683 | 584 | 386 | 275 | 259 | 5,320 |
| 2017 | 259 | 270 | 290 | 434 | 551 | 741 | 778 | 683 | 584 | 386 | 275 | 259 | 5,509 |
| Avg | 335 | 311 | 352 | 452 | 620 | 784 | 852 | 763 | 618 | 493 | 348 | 339 | 6,268 |




**Notes:**
Total water production from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

**Table 4-2**
**Monthly Total Water Sales**
**City of Grand Junction**
**(acre-feet)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1989 | 235 | 299 | 326 | 460 | 644 | 735 | 689 | 595 | 484 | 363 | 234 | 276 | 5,339 |
| 1990 | 232 | 270 | 343 | 410 | 645 | 685 | 752 | 551 | 411 | 305 | 352 | 389 | 5,345 |
| 1991 | 388 | 441 | 415 | 389 | 582 | 696 | 641 | 588 | 432 | 540 | 417 | 381 | 5,910 |
| 1992 | 421 | 403 | 453 | 446 | 455 | 693 | 728 | 582 | 491 | 596 | 433 | 423 | 6,123 |
| 1993 | 398 | 313 | 341 | 433 | 486 | 723 | 764 | 669 | 522 | 438 | 419 | 413 | 5,918 |
| 1994 | 403 | 415 | 366 | 463 | 609 | 857 | 859 | 722 | 533 | 507 | 466 | 414 | 6,613 |
| 1995 | 367 | 403 | 449 | 388 | 431 | 600 | 719 | 685 | 567 | 467 | 390 | 387 | 5,853 |
| 1996 | 346 | 375 | 462 | 479 | 694 | 693 | 784 | 767 | 478 | 566 | 460 | 405 | 6,509 |
| 1997 | 406 | 275 | 323 | 411 | 616 | 798 | 726 | 618 | 468 | 347 | 288 | 309 | 5,584 |
| 1998 | 286 | 256 | 318 | 457 | 624 | 814 | 773 | 679 | 658 | 330 | 324 | 327 | 5,849 |
| 1999 | 290 | 271 | 399 | 435 | 556 | 817 | 692 | 648 | 502 | 374 | 285 | 293 | 5,562 |
| 2000 | 269 | 302 | 295 | 501 | 798 | 779 | 941 | 704 | 522 | 381 | 264 | 286 | 6,041 |
| 2001 | 295 | 293 | 276 | 548 | 683 | 808 | 793 | 676 | 575 | 405 | 338 | 261 | 5,951 |
| 2002 | 302 | 265 | 303 | 614 | 671 | 957 | 830 | 654 | 516 | 359 | 244 | 279 | 5,992 |
| 2003 | 257 | 238 | 270 | 526 | 587 | 861 | 864 | 700 | 606 | 414 | 245 | 326 | 5,896 |
| 2004 | 251 | 228 | 362 | 406 | 580 | 828 | 746 | 785 | 486 | 328 | 282 | 238 | 5,520 |
| 2005 | 225 | 222 | 306 | 421 | 692 | 665 | 708 | 699 | 503 | 324 | 243 | 274 | 5,282 |
| 2006 | 242 | 281 | 280 | 457 | 753 | 761 | 793 | 742 | 465 | 280 | 287 | 248 | 5,588 |
| 2007 | 235 | 275 | 289 | 370 | 685 | 753 | 845 | 704 | 471 | 392 | 258 | 264 | 5,542 |
| 2008 | 223 | 249 | 237 | 524 | 542 | 873 | 750 | 625 | 619 | 310 | 250 | 298 | 5,501 |
| 2009 | 247 | 236 | 310 | 437 | 528 | 678 | 721 | 661 | 625 | 323 | 236 | 294 | 5,295 |
| 2010 | 189 | 235 | 269 | 374 | 521 | 763 | 695 | 553 | 613 | 347 | 256 | 223 | 5,037 |
| 2011 | 218 | 210 | 274 | 338 | 574 | 677 | 580 | 730 | 487 | 319 | 244 | 221 | 4,871 |
| 2012 | 205 | 208 | 334 | 583 | 596 | 678 | 639 | 743 | 478 | 319 | 255 | 224 | 5,262 |
| 2013 | 241 | 216 | 217 | 393 | 503 | 656 | 687 | 575 | 452 | 272 | 223 | 224 | 4,659 |
| 2014 | 203 | 222 | 431 | 528 | 791 | 644 | 501 | 528 | 304 | 200 | 229 | 197 | 4,778 |
| 2015 | 209 | 324 | 402 | 362 | 719 | 598 | 592 | 568 | 317 | 238 | 216 | 252 | 4,795 |
| 2016 | 231 | 268 | 353 | 489 | 805 | 685 | 683 | 498 | 302 | 280 | 197 | 227 | 5,018 |
| 2017 | 278 | 255 | 363 | 602 | 673 | 706 | 640 | 705 | 303 | 280 | 195 | 225 | 5,224 |
| Avg | 279 | 284 | 337 | 457 | 622 | 741 | 729 | 654 | 489 | 366 | 294 | 296 | 5,547 |

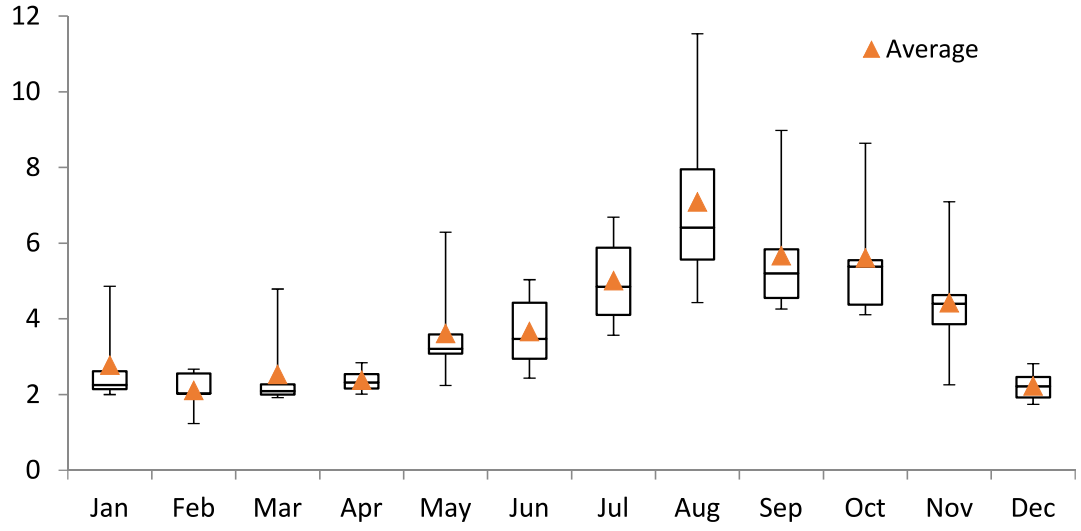



**Notes:**
Total sales including metered, flushing, parks, fill stations, and water to Clifton from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

# Table 4-3

## Monthly Production
## Kannah Creek Water Treatment Plant
### 2008 - 2017
### (acre-feet)

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Avg | Avg | Max | Min |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | | | | | | | | | 4.5 | | 4.3 | 2.5 | | | 4.5 | 2.5 |
| 2009 | 2.1 | 2.6 | 2.1 | 2.3 | 3.1 | 4.4 | 3.9 | 7.2 | 5.9 | 5.4 | 3.7 | 2.4 | 45.1 | 3.8 | 7.2 | 2.1 |
| 2010 | 2.0 | 2.7 | 2.0 | 2.0 | 3.3 | 3.5 | 5.0 | 8.2 | 4.3 | 4.4 | 4.7 | 2.1 | 43.9 | 3.7 | 8.2 | 2.0 |
| 2011 | 4.9 | | 4.8 | | 6.3 | | 6.2 | 4.4 | 4.8 | 8.6 | | 1.7 | | | 8.6 | 1.7 |
| 2015 | | 2.0 | 2.1 | 2.2 | 3.7 | 2.4 | 3.6 | 5.6 | 9.0 | | 4.5 | 1.9 | | | 9.0 | 1.9 |
| 2016 | 2.6 | 1.2 | 1.9 | 2.5 | 2.2 | 2.9 | 6.7 | 11.5 | | 5.6 | 7.1 | | | | 11.5 | 1.2 |
| 2017 | 2.2 | 2.0 | 2.3 | 2.8 | 3.1 | 5.0 | 4.7 | 5.6 | 5.6 | 4.1 | 2.3 | 2.8 | 42.6 | 3.6 | 5.6 | 2.0 |
| Avg | 2.8 | 2.1 | 2.5 | 2.4 | 3.6 | 3.7 | 5.0 | 7.1 | 5.7 | 5.6 | 4.4 | 2.2 | 43.9 | 3.7 | 7.8 | 1.9 |
| Max | 4.9 | 2.7 | 4.8 | 2.8 | 6.3 | 5.0 | 6.7 | 11.5 | 9.0 | 8.6 | 7.1 | 2.8 | | 3.8 | 11.5 | 2.5 |
| Min | 2.0 | 1.2 | 1.9 | 2.0 | 2.2 | 2.4 | 3.6 | 4.4 | 4.3 | 4.1 | 2.3 | 1.7 | | 3.6 | 4.5 | 1.2 |




**Notes:**

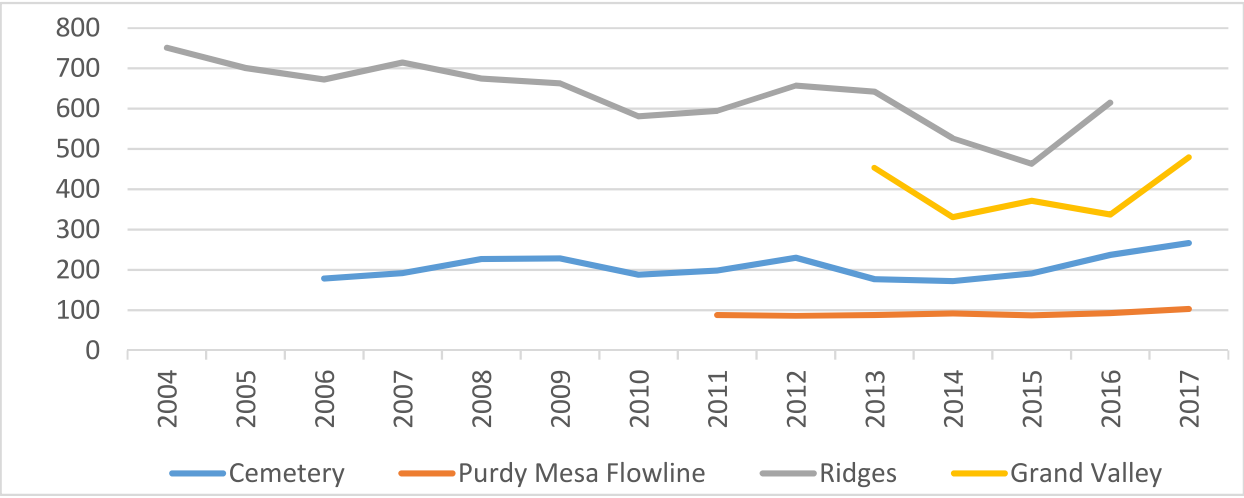
Gray cells indicate missing data. Mark is checking on these.

Data provided by the City of Grand Junction (folder: KC_consumption).

# Table 4-4

## Annual Nonpotable Irrigation Water Use
## City of Grand Junction
### 2004 - 2017
### (acre-feet/year)

| Year | (1) Cemetery | (1) Purdy Mesa Flowline | (2) Ridges | (3) Grand Valley |
|---|---|---|---|---|
| 2004 | | | 751 | |
| 2005 | | | 701 | |
| 2006 | 179 | | 672 | |
| 2007 | 192 | | 714 | |
| 2008 | 227 | | 674 | |
| 2009 | 229 | | 663 | |
| 2010 | 188 | | 581 | |
| 2011 | 199 | 88 | 595 | |
| 2012 | 230 | 86 | 657 | |
| 2013 | 176 | 88 | 642 | 453 |
| 2014 | 172 | 92 | 526 | 331 |
| 2015 | 191 | 87 | 463 | 371 |
| 2016 | 237 | 92 | 616 | 337 |
| 2017 | 266 | 103 | | 479 |
| Avg | 207 | 91 | 635 | 394 |
| Max | 266 | 103 | 751 | 479 |
| Min | 172 | 86 | 463 | 331 |




**Notes:**

(1) Data provided by City of Grand Junction (from spreadsheet "Raw Water Usage.xlsx").

(2) Data provided by City of Grand Junction (from spreadsheets for Ridges; i.e., "Ridges usage 2016.xlsx").

(3) Metered water use only include 3 out of the 4 parks irrigated with Grand Valley water.
Data provided by City of Grand Junction (from spreadsheet "2018 Water Share Information.xlsx").

# Table 4-5

## Monthly Total Discharge
## Persigo Wastewater Treatment Plant
### August 2012 - July 2017
### (values in acre-feet)

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | | | | | | | | 866 | 847 | 866 | 810 | 733 | |
| 2013 | 752 | 679 | 752 | 727 | 809 | 819 | 856 | 866 | *899* | 932 | 801 | 771 | 9,662 |
| 2014 | 723 | 636 | 761 | 718 | 780 | 801 | 828 | 885 | 893 | 866 | 801 | 752 | 9,443 |
| 2015 | 733 | 679 | 733 | 672 | 780 | 801 | 856 | 904 | 819 | 856 | 819 | 799 | 9,451 |
| 2016 | 761 | 703 | *711* | 718 | 780 | 810 | 847 | 875 | 884 | 904 | 856 | 818 | 9,667 |
| 2017 | 799 | 730 | 780 | 767 | 817 | 847 | | | | | | | |
| Avg | 753 | 685 | 747 | 720 | 793 | 816 | 847 | 879 | 868 | 885 | 818 | 774 | 9,556 |

**Notes:**

Gray cells indicate missing data. Filled in data for September 2013 and March 2016.

Data downloaded from EPA (ref. permit no. CW0040053)

Wastewater treatment plant for entire valley (treats water from Grand Junction, Clifton, and Ute Water District users).

## Table 4-6

## Annual Ranch Irrigation Water Use Leases and Reservoir Storage
## 1994 - 2017

| Year | (1) April 1, SWE (% Avg) | (2) May or June Storage Total (af) | Purdy Mesa June 1 Storage (af) | Juniata June 1 Storage (af) | (3) Reservoir Releases to Leases (af) | (4) Total Direct Flows to Leases (af) | (5) Total Leases (af) | (6) Upper Reservoirs Carryover Storage (af) | (7) Upper Reservoirs Max Storage (af) |
|---|---|---|---|---|---|---|---|---|---|
| 1994 | 85% | | | | 2,086 | | | 1,632 | |
| 1995 | 158% | | | | 1,940 | | | 1,180 | |
| 1996 | 96% | | | | 2,531 | | | 1,527 | |
| 1997 | 122% | | | | 2,445 | | | 939 | |
| 1998 | 109% | | | | 2,546 | | | 1,772 | |
| 1999 | 41% | 11,655 | 518 | 6,803 | 2,282 | | | 1,557 | 4,595 |
| 2000 | 111% | 12,263 | 639 | 6,782 | 2,288 | | | 1,669 | 4,842 |
| 2001 | 74% | 11,546 | 652 | 6,716 | 2,363 | | | 911 | 4,178 |
| 2002 | 54% | 7,993 | 585 | 5,310 | 378 | | | 1,261 | 1,931 |
| 2003 | 86% | 12,525 | 545 | 6,868 | 2,457 | | | 1,060 | 5,112 |
| 2004 | 99% | 12,524 | 715 | 6,860 | 2,437 | | | 1,207 | 4,949 |
| 2005 | 143% | 12,838 | 699 | 6,868 | 2,500 | | | 2,361 | 5,271 |
| 2006 | 95% | 12,228 | 709 | 6,819 | 2,502 | | | 2,361 | 4,700 |
| 2007 | 65% | 11,350 | 577 | 6,819 | 2,502 | | | 1,904 | 4,221 |
| 2008 | 172% | 12,288 | 543 | 6,866 | 2,199 | 4,933 | 7,132 | 2,009 | 5,158 |
| 2009 | 122% | 12,727 | 612 | 6,868 | 2,261 | 4,681 | 6,942 | 2,207 | 5,337 |
| 2010 | 125% | | 540 | 7,306 | 2,261 | 4,332 | 6,593 | 1,256 | |
| 2011 | 113% | 13,279 | 704 | 7,246 | 2,294 | 5,419 | 7,713 | 1,848 | 5,329 |
| 2012 | 60% | 11,088 | 492 | 7,083 | 1,428 | 3,211 | 4,639 | 1,504 | 3,513 |
| 2013 | 88% | 11,358 | 382 | 7,216 | 1,774 | 3,800 | 5,574 | 1,817 | 4,140 |
| 2014 | 71% | 12,197 | 688 | 7,201 | 1,573 | 4,334 | 5,907 | 1,690 | 4,796 |
| 2015 | 71% | 12,137 | 0 | 7,291 | 1,597 | 4,746 | 6,343 | 2,006 | 5,068 |
| 2016 | 82% | 11,735 | 0 | 7,382 | 1,357 | 5,444 | 6,801 | 1,503 | 5,068 |
| 2017 | 101% | 12,686 | 648 | 6,960 | 2,013 | 4,634 | 6,647 | 1,821 | 4,854 |
| **Avg** | **98%** | **11,912** | **539** | **6,909** | **2,084** | **4,553** | **6,429** | **1,625** | **4,615** |
| **Max** | **172%** | **13,279** | **715** | **7,382** | **2,546** | **5,444** | **7,713** | **2,361** | **5,337** |
| **Min** | **41%** | **7,993** | **0** | **5,310** | **378** | **3,211** | **4,639** | **911** | **1,931** |

**Notes:**

Data provided by City ("Irrigation Flow to Leases Historical 040218.xlsx").

(1) Average snow water equivalent from all City snow course sites.

(2) Maximum total storage of the City's reservoirs in the Grand Mesa basins.

(3) Total reservoir water leased to ranches for irrigation water uses.

(4) Total direct flow water leased to ranches for irrigation water uses.

(5) (3) + (4).

(6) Reservoir storage water that is held over at end of prior years' irrigation season (i.e., October 31 storage).

(7) Reported maximum storage at end of runoff season from records. Note that releases may have been made prior to the reporting of maximum storage. These releases have not been added back into these storage totals.

# Table 4-7

## Annual Ranch Irrigation Water Use
### 2012, 2014, and 2016
### (acre-feet/year)

| | | 2012 | 2014 | 2016 |
|---|---|---|---|---|
| | **Somerville Ranch (Whitewater Creek)** | | | |
| | Reservoir Water | 603.7 | 395.4 | 674.0 |
| (1) | Direct Flow | | 1,000.0 | 1,896.0 |
| | **Total Used** | **603.7** | **1,395.4** | **2,570.0** |
| | **Anderson Ranch (North Fork Kannah Creek)** | | | |
| | Anderson Reservoir No. 6 | 37.3 | | |
| | BA&J Reservoir | 206.0 | | |
| | Total Anderson No. 6 and BA&J | 243.3 | 237.7 | 358.0 |
| | Bolen Reservoir | | 488.7 | - |
| | Anderson Reservoir No. 1 | 450.0 | | |
| | **Total Reservoir Water** | **693.3** | **726.4** | **358.0** |
| | Forbes Davidson used | (4.2) | | |
| (1) | Direct Flow | | 952.5 | 715.0 |
| | **Total Used** | **689.1** | **1,678.9** | **1,073.0** |
| | **Hollenbeck Ranch (Kannah Creek)** | | | |
| | Reservoir Water | 300.0 | 350.0 | 200.0 |
| | #2 water right 1.37 CFS 7 months | 582.3 | 582.3 | 582.3 |
| | Juniata Shares (19) | 1.5 | 1.5 | 1.5 |
| | Pat Bonnells Reservoir water | 49.0 | | |
| (2) | Direct Flow | | 332.9 | 110.0 |
| | Kannah Creek Highline to Ashley Ditch | | 104.9 | 400.0 |
| | **Total used** | **932.8** | **1,371.6** | **1,293.8** |
| | **Click Ranch (Kannah Creek)** | | | |
| | Reservoir Water | 75.0 | 125.0 | 125.0 |
| | Kannah Creek Highline Canal | 103.1 | 174.9 | 382.0 |
| | **Total Used** | **178.1** | **299.9** | **507.0** |
| (1),(3) | **Total Used - All Ranches** | **2,403.7** | **4,745.9** | **5,443.8** |

**Notes:**

(1) No record of direct flow to individual ranches in 2012.

(2) 2012 water use included Kannah Creek free river diversions in addition to the 932.76 af. Data provided by City of Grand Junction ("Usage Year 2012.docx", "Usage Year 2014.docx", and "Usage Year 2016.docx").

(3) Total water used from all ranches.

# Table 5-1
## Monthly Grand Junction Water Accounting Records
### Water Years 2010 - 2017
### (acre-feet)

| Date | Kannah Creek Flowline | | | | | | | | Purdy Mesa Flowline (From Juniata Res. Storage) | | Somerville Pipeline (Brandon Ditch) | Juniata Ditch Enlarged (To Juniata Res.) | City Ditch | Juniata Reservoir | Purdy Mesa Reservoir | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Kannah Creek Intake Flows | | | | | | | | | | | | | | | |
| | Total | Paramount 7.81 | # 2 right 3.91 | Upper Res. Releases | To Secret Ditch | To Juniata Reservoir | To Purdy Mesa Reservoir | To Grand Junction WTP | To Grand Junction WTP | To Kannah Creek WTP | To Grand Junction WTP | Upper Res. Releases | To Juniata Reservoir | To Purdy Mesa Reservoir | To Grand Jct WTP | To Irrigation |
| 1-Nov-10 | 622.3 | 460.4 | 161.9 | 0.0 | 0.0 | 554.1 | 0.0 | 68.2 | 273.8 | 3.1 | 63.9 | 0.0 | 148.3 | 0.0 | 0.0 | 0.0 |
| 1-Dec-10 | 619.5 | 480.2 | 139.3 | 0.0 | 0.0 | 619.5 | 0.0 | 0.0 | 256.1 | 3.2 | 62.8 | 0.0 | 158.5 | 13.0 | 0.0 | 0.0 |
| 1-Jan-11 | 569.5 | 480.2 | 89.3 | 0.0 | 0.0 | 569.5 | 0.0 | 0.0 | 291.5 | 3.3 | 44.1 | 0.0 | 22.5 | 0.0 | 0.0 | 0.0 |
| 1-Feb-11 | 474.9 | 433.8 | 41.2 | 0.0 | 0.0 | 474.9 | 0.0 | 0.0 | 253.3 | 3.5 | 83.2 | 0.0 | 170.8 | 317.7 | 0.0 | 0.0 |
| 1-Mar-11 | 539.2 | 480.2 | 59.1 | 0.0 | 0.0 | 539.2 | 0.0 | 0.0 | 314.7 | 3.4 | 48.9 | 0.0 | 114.3 | 257.6 | 0.0 | 0.0 |
| 1-Apr-11 | 468.5 | 462.9 | 5.6 | 0.0 | 0.0 | 463.6 | 0.0 | 4.8 | 358.0 | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-May-11 | 261.0 | 258.6 | 2.4 | 0.0 | 0.0 | 259.9 | 0.0 | 1.1 | 519.8 | 4.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Jun-11 | 392.3 | 382.6 | 9.6 | 0.0 | 0.0 | 232.0 | 0.0 | 160.3 | 739.0 | 5.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| 1-Jul-11 | 489.2 | 476.6 | 12.6 | 0.0 | 0.0 | 334.5 | 0.0 | 154.7 | 711.9 | 4.7 | 0.0 | 0.0 | 0.0 | 25.7 | 0.0 | 0.0 |
| 1-Aug-11 | 608.0 | 478.2 | 2.2 | 127.6 | 127.6 | 308.6 | 0.0 | 171.8 | 746.0 | 4.9 | 0.0 | 0.0 | 80.0 | 0.0 | 0.0 | 0.0 |
| 1-Sep-11 | 580.4 | 464.7 | 11.2 | 110.7 | 104.4 | 353.0 | 0.0 | 123.0 | 609.8 | 4.7 | 0.0 | 0.0 | 346.3 | 0.0 | 0.0 | 0.0 |
| 1-Oct-11 | 551.7 | 478.7 | 14.0 | 62.4 | 59.1 | 472.3 | 0.0 | 20.4 | 428.4 | 4.5 | 0.0 | 0.0 | 11.9 | 83.0 | 0.0 | 0.0 |
| 1-Nov-11 | 622.3 | 460.4 | 161.9 | 0.0 | 0.0 | 622.3 | 0.0 | 0.0 | 274.7 | 4.1 | 73.2 | 0.0 | 0.0 | 244.9 | 0.0 | 243.7 |
| 1-Dec-11 | 619.5 | 480.2 | 139.3 | 0.0 | 0.0 | 619.5 | 0.0 | 0.0 | 294.4 | 7.8 | 120.9 | 0.0 | 18.5 | 81.4 | 0.0 | 94.9 |
| 1-Jan-12 | 569.5 | 480.2 | 89.3 | 0.0 | 0.0 | 569.5 | 0.0 | 0.0 | 283.0 | 4.3 | 74.8 | 0.0 | 85.9 | 5.1 | 0.0 | 0.0 |
| 1-Feb-12 | 491.9 | 449.2 | 42.7 | 0.0 | 0.0 | 491.9 | 0.0 | 0.0 | 189.5 | 3.7 | 96.9 | 0.0 | 81.7 | 322.0 | 10.4 | 10.0 |
| 1-Mar-12 | 361.2 | 353.9 | 7.3 | 0.0 | 0.0 | 309.4 | 0.0 | 51.8 | 330.3 | 4.1 | 21.1 | 0.0 | 60.5 | 41.6 | 33.8 | 21.1 |
| 1-Apr-12 | 462.8 | 457.7 | 5.1 | 0.0 | 0.0 | 462.8 | 0.0 | 0.0 | 508.2 | 5.7 | 0.0 | 0.0 | 0.0 | 65.3 | 58.6 | 38.8 |
| 1-May-12 | 473.7 | 461.0 | 12.7 | 0.0 | 0.0 | 344.4 | 0.0 | 129.3 | 543.7 | 7.6 | 0.0 | 0.0 | 0.0 | 0.0 | 28.5 | 0.0 |
| 1-Jun-12 | 536.7 | 464.7 | 5.7 | 0.0 | 77.7 | 257.3 | 0.0 | 201.7 | 601.0 | 10.4 | 0.0 | 0.0 | 0.0 | 0.0 | 36.6 | 0.0 |
| 1-Jul-12 | 574.4 | 480.2 | 5.5 | 0.0 | 88.7 | 352.6 | 0.0 | 133.1 | 620.1 | 8.5 | 0.0 | 0.0 | 0.0 | 0.0 | 36.3 | 0.0 |
| 1-Aug-12 | 548.5 | 480.2 | 0.0 | 0.0 | 68.3 | 361.9 | 0.0 | 118.3 | 774.5 | 9.3 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 | 0.0 |
| 1-Sep-12 | 532.6 | 464.6 | 0.0 | 0.0 | 68.0 | 317.9 | 0.0 | 146.7 | 456.4 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 11.3 | 0.0 |
| 1-Oct-12 | 491.7 | 474.2 | 17.4 | 0.0 | 0.0 | 358.6 | 0.0 | 133.1 | 320.7 | 5.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Nov-12 | 639.7 | 464.7 | 174.9 | 0.0 | 0.0 | 639.7 | 0.0 | 0.0 | 231.8 | 4.6 | 94.7 | 292.8 | 107.6 | 0.0 | 0.0 | 0.0 |
| 1-Dec-12 | 563.5 | 470.0 | 93.4 | 0.0 | 0.0 | 563.5 | 0.0 | 0.0 | 149.2 | 4.6 | 76.7 | 0.0 | 107.3 | 0.0 | 0.0 | 0.0 |
| 1-Jan-13 | 534.0 | 480.2 | 53.8 | 0.0 | 0.0 | 534.0 | 0.0 | 0.0 | 181.2 | 4.5 | 84.4 | 0.0 | 118.8 | 0.0 | 0.0 | 0.0 |
| 1-Feb-13 | 459.9 | 433.8 | 26.1 | 0.0 | 0.0 | 459.9 | 0.0 | 0.0 | 183.1 | 4.4 | 61.7 | 0.0 | 96.2 | 0.0 | 0.0 | 0.0 |
| 1-Mar-13 | 545.5 | 474.5 | 71.0 | 0.0 | 0.0 | 545.5 | 0.0 | 0.0 | 226.9 | 4.6 | 114.1 | 0.0 | 106.5 | 0.0 | 0.0 | 0.0 |
| 1-Apr-13 | 468.9 | 457.6 | 11.4 | 0.0 | 0.0 | 465.2 | 0.0 | 3.7 | 300.5 | 5.1 | 0.0 | 0.0 | 0.0 | 56.9 | 0.0 | 0.0 |
| 1-May-13 | 406.9 | 405.0 | 1.9 | 0.0 | 0.0 | 371.4 | 0.0 | 35.5 | 517.7 | 7.0 | 0.0 | 0.0 | 0.0 | 4.0 | 0.0 | 0.0 |
| 1-Jun-13 | 472.4 | 462.7 | 9.8 | 0.0 | 0.0 | 247.1 | 0.0 | 225.4 | 561.0 | 9.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 8.9 |
| 1-Jul-13 | 559.8 | 474.9 | 0.0 | 0.0 | 84.5 | 262.0 | 0.0 | 213.3 | 580.5 | 10.4 | 0.0 | 0.0 | 0.0 | 99.9 | 0.0 | 128.6 |
| 1-Aug-13 | 551.3 | 480.2 | 5.2 | 0.0 | 67.3 | 369.5 | 0.0 | 114.5 | 547.3 | 9.6 | 0.0 | 0.0 | 0.0 | 49.9 | 0.0 | 100.8 |
| 1-Sep-13 | 533.3 | 464.6 | 0.9 | 0.0 | 67.8 | 432.0 | 0.0 | 33.5 | 443.7 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.8 |
| 1-Oct-13 | 557.7 | 480.2 | 0.0 | 0.0 | 79.9 | 472.3 | 0.0 | 5.5 | 355.3 | 5.2 | 0.0 | 462.6 | 0.0 | 0.0 | 0.0 | 54.9 |

# Table 5-1
## Monthly Grand Junction Water Accounting Records
### Water Years 2010 - 2017
### (acre-feet)

| Date | Kannah Creek Flowline | | | | | | | | Purdy Mesa Flowline (From Juniata Res. Storage) | | Somerville Pipeline (Brandon Ditch) | Juniata Ditch Enlarged (To Juniata Res.) | City Ditch | Juniata Reservoir | Purdy Mesa Reservoir | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Kannah Creek Intake Flows | | | | | | | | | | | | | | | |
| | Total | Paramount 7.81 | # 2 right 3.91 | Upper Res. Releases | To Secret Ditch | To Juniata Reservoir | To Purdy Mesa Reservoir | To Grand Junction WTP | To Grand Junction WTP | To Kannah Creek WTP | To Grand Junction WTP | Upper Res. Releases | To Juniata Reservoir | To Purdy Mesa Reservoir | To Grand Jct WTP | To Irrigation |
| 1-Nov-13 | 647.7 | 464.7 | 183.0 | 0.0 | 0.0 | 614.0 | 0.0 | 33.7 | 260.4 | 4.7 | 31.6 | 0.0 | 133.2 | 0.0 | 0.0 | 0.0 |
| 1-Dec-13 | 567.0 | 476.5 | 90.5 | 0.0 | 0.0 | 567.0 | 0.0 | 0.0 | 288.2 | 7.7 | 0.0 | 0.0 | 120.8 | 50.6 | 0.0 | 0.0 |
| 1-Jan-14 | 515.5 | 480.2 | 35.2 | 0.0 | 0.0 | 515.5 | 0.0 | 0.0 | 277.5 | 5.0 | 0.0 | 0.0 | 160.0 | 280.6 | 0.0 | 0.0 |
| 1-Feb-14 | 464.2 | 433.8 | 30.4 | 0.0 | 0.0 | 464.2 | 0.0 | 0.0 | 286.2 | 4.8 | 0.0 | 0.0 | 123.0 | 0.0 | 0.0 | 0.0 |
| 1-Mar-14 | 381.5 | 355.8 | 25.7 | 0.0 | 0.0 | 381.5 | 0.0 | 0.0 | 292.4 | 5.8 | 0.0 | 0.0 | 103.4 | 0.0 | 0.0 | 0.0 |
| 1-Apr-14 | 436.8 | 430.8 | 6.1 | 0.0 | 0.0 | 427.8 | 0.0 | 9.0 | 400.7 | 6.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-May-14 | 257.0 | 256.4 | 0.6 | 0.0 | 0.0 | 197.0 | 0.0 | 60.0 | 537.3 | 7.3 | 3.7 | 0.0 | 0.0 | 133.6 | 0.0 | 0.0 |
| 1-Jun-14 | 402.4 | 382.5 | 2.7 | 0.0 | 22.6 | 192.6 | 0.0 | 187.2 | 527.0 | 8.8 | 0.0 | 0.0 | 0.0 | 0.0 | 71.4 | 238.3 |
| 1-Jul-14 | 558.0 | 480.2 | 11.7 | 0.0 | 66.1 | 238.1 | 0.0 | 253.8 | 598.4 | 9.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 113.6 |
| 1-Aug-14 | 493.9 | 478.4 | 7.5 | 0.0 | 8.0 | 435.6 | 0.0 | 50.3 | 537.3 | 6.8 | 0.0 | 0.0 | 0.0 | 48.2 | 0.0 | 105.3 |
| 1-Sep-14 | 469.3 | 463.9 | 5.4 | 0.0 | 0.0 | 305.9 | 0.0 | 163.4 | 438.3 | 6.6 | 0.0 | 0.0 | 0.0 | 55.5 | 0.0 | 112.1 |
| 1-Oct-14 | 483.5 | 478.9 | 4.5 | 0.0 | 0.0 | 463.2 | 0.0 | 20.3 | 395.0 | 5.6 | 0.0 | 745.0 | 0.0 | 60.7 | 0.0 | 136.4 |
| 1-Nov-14 | 529.2 | 462.4 | 66.8 | 0.0 | 0.0 | 391.4 | 0.0 | 137.8 | 277.1 | 5.3 | 23.4 | 0.0 | 160.0 | 57.7 | 0.0 | 152.7 |
| 1-Dec-14 | 596.2 | 477.4 | 118.8 | 0.0 | 0.0 | 494.7 | 0.0 | 101.5 | 303.2 | 5.1 | 0.0 | 0.0 | 149.4 | 0.0 | 0.0 | 0.0 |
| 1-Jan-15 | 469.4 | 408.1 | 61.9 | 0.0 | 0.0 | 469.4 | 0.0 | 0.0 | 262.4 | 4.4 | 79.4 | 0.0 | 203.3 | 190.8 | 0.0 | 221.0 |
| 1-Feb-15 | 302.0 | 279.3 | 22.7 | 0.0 | 0.0 | 216.9 | 0.0 | 85.1 | 268.6 | 4.0 | 78.0 | 0.0 | 39.2 | 19.5 | 0.0 | 22.8 |
| 1-Mar-15 | 267.5 | 267.5 | 0.0 | 0.0 | 0.0 | 165.1 | 0.0 | 102.4 | 310.0 | 5.0 | 90.2 | 0.0 | 125.6 | 0.0 | 0.0 | 0.0 |
| 1-Apr-15 | 463.0 | 458.4 | 0.0 | 0.0 | 2.7 | 416.2 | 0.0 | 44.1 | 248.1 | 5.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 158.4 |
| 1-May-15 | 359.4 | 347.5 | 0.0 | 0.0 | 0.0 | 347.8 | 0.0 | 0.0 | 401.9 | 4.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Jun-15 | 459.3 | 453.8 | 5.5 | 0.0 | 0.0 | 306.2 | 0.0 | 153.0 | 530.0 | 8.1 | 0.0 | 26.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Jul-15 | 496.5 | 480.3 | 6.5 | 0.0 | 10.1 | 327.6 | 0.0 | 158.9 | 532.2 | 7.7 | 0.0 | 767.6 | 0.0 | 185.8 | 0.0 | 184.7 |
| 1-Aug-15 | 610.2 | 480.2 | 4.7 | 0.0 | 125.3 | 307.6 | 0.0 | 177.3 | 571.4 | 8.9 | 0.0 | 0.0 | 0.0 | 185.8 | 0.0 | 184.7 |
| 1-Sep-15 | 526.9 | 464.3 | 0.0 | 0.0 | 52.7 | 398.1 | 0.0 | 76.1 | 511.5 | 7.5 | 0.0 | 0.0 | 0.0 | 179.8 | 0.0 | 178.7 |
| 1-Oct-15 | 480.8 | 462.0 | 3.2 | 0.0 | 0.0 | 436.5 | 0.0 | 28.7 | 448.3 | 7.4 | 0.0 | 531.5 | 0.0 | 122.8 | 0.0 | 123.0 |
| 1-Nov-15 | 658.7 | 464.7 | 194.0 | 0.0 | 0.0 | 654.4 | 0.0 | 4.4 | 349.1 | 4.1 | 0.0 | 0.0 | 157.1 | 0.0 | 0.0 | 0.0 |
| 1-Dec-15 | 611.4 | 479.5 | 132.0 | 0.0 | 0.0 | 610.7 | 0.0 | 0.7 | 329.0 | 4.3 | 0.0 | 0.0 | 106.7 | 0.0 | 0.0 | 0.0 |
| 1-Jan-16 | 568.1 | 480.2 | 87.8 | 0.0 | 0.0 | 558.6 | 0.0 | 9.5 | 328.8 | 4.1 | 0.0 | 0.0 | 189.8 | 0.0 | 0.0 | 0.0 |
| 1-Feb-16 | 491.7 | 419.8 | 71.9 | 0.0 | 0.0 | 474.5 | 0.0 | 17.2 | 296.6 | 4.0 | 0.0 | 0.0 | 152.3 | 0.0 | 0.0 | 0.0 |
| 1-Mar-16 | 435.8 | 381.7 | 54.1 | 0.0 | 0.0 | 425.3 | 0.0 | 10.5 | 333.3 | 4.5 | 0.0 | 0.0 | 46.5 | 0.0 | 0.0 | 0.0 |
| 1-Apr-16 | 416.0 | 415.4 | 0.6 | 0.0 | 0.0 | 416.0 | 0.0 | 0.0 | 343.2 | 4.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-May-16 | 481.8 | 460.7 | 0.0 | 0.0 | 0.0 | 475.5 | 0.0 | 25.1 | 483.7 | 5.6 | 0.0 | 19.8 | 0.0 | 6.0 | 0.0 | 6.0 |
| 1-Jun-16 | 494.8 | 460.6 | 34.3 | 0.0 | 0.0 | 301.0 | 0.0 | 193.9 | 572.9 | 8.1 | 0.0 | 26.8 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Jul-16 | 533.6 | 480.0 | 19.3 | 0.0 | 34.3 | 253.1 | 0.0 | 246.2 | 594.0 | 10.2 | 0.0 | 510.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Aug-16 | 600.7 | 480.2 | 3.5 | 0.0 | 117.0 | 338.9 | 0.0 | 144.7 | 561.1 | 8.3 | 0.0 | 62.7 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Sep-16 | 522.1 | 464.4 | 3.6 | 0.0 | 54.1 | 380.7 | 0.0 | 87.3 | 521.0 | 7.4 | 29.4 | 520.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Oct-16 | 484.8 | 479.3 | 5.5 | 0.0 | 0.0 | 475.0 | 0.0 | 9.8 | 404.3 | 5.9 | 0.0 | 356.2 | 0.0 | 0.0 | 0.0 | 0.0 |

# Table 5-1
## Monthly Grand Junction Water Accounting Records
### Water Years 2010 - 2017
### (acre-feet)

| Date | Kannah Creek Flowline | | | | | | | | Purdy Mesa Flowline (From Juniata Res. Storage) | | Somerville Pipeline (Brandon Ditch) | Juniata Ditch Enlarged (To Juniata Res.) | City Ditch | Juniata Reservoir | Purdy Mesa Reservoir | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Kannah Creek Intake Flows | | | | | | | | | | | | | | | |
| | Total | Paramount 7.81 | # 2 right 3.91 | Upper Res. Releases | To Secret Ditch | To Juniata Reservoir | To Purdy Mesa Reservoir | To Grand Junction WTP | To Grand Junction WTP | To Kannah Creek WTP | To Grand Junction WTP | Upper Res. Releases | To Juniata Reservoir | To Purdy Mesa Reservoir | To Grand Jct WTP | To Irrigation |
| 1-Nov-16 | 719.8 | 462.5 | 257.3 | 0.0 | 0.0 | 715.4 | 0.0 | 4.4 | 307.8 | 5.4 | 0.0 | 0.0 | 142.3 | 0.0 | 0.0 | 0.0 |
| 1-Dec-16 | 602.5 | 477.2 | 125.3 | 0.0 | 0.0 | 588.7 | 0.0 | 13.9 | 255.5 | 5.6 | 0.0 | 0.0 | 150.7 | 0.0 | 0.0 | 0.0 |
| 1-Jan-17 | 549.5 | 464.3 | 85.2 | 0.0 | 0.0 | 547.6 | 0.0 | 1.9 | 248.7 | 3.9 | 0.0 | 0.0 | 197.5 | 81.9 | 0.0 | 0.0 |
| 1-Feb-17 | 340.4 | 317.1 | 23.3 | 0.0 | 0.0 | 339.6 | 0.0 | 0.8 | 203.3 | 3.5 | 0.0 | 0.0 | 135.3 | 72.8 | 0.0 | 23.8 |
| 1-Mar-17 | 582.8 | 417.5 | 165.2 | 0.0 | 0.0 | 575.9 | 0.0 | 6.8 | 220.3 | 4.8 | 0.0 | 0.0 | 158.8 | 523.3 | 0.0 | 0.0 |
| 1-Apr-17 | 473.8 | 457.3 | 16.5 | 0.0 | 0.0 | 455.2 | 0.0 | 18.7 | 355.3 | 5.5 | 0.0 | 0.0 | 99.8 | 0.0 | 0.0 | 0.0 |
| 1-May-17 | 390.2 | 381.9 | 1.4 | 0.0 | 0.0 | 343.0 | 0.0 | 47.2 | 518.9 | 6.3 | 0.0 | 170.6 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1-Jun-17 | 526.6 | 460.4 | 41.0 | 0.0 | 25.2 | 272.0 | 0.0 | 229.4 | 532.5 | 7.7 | 0.0 | 0.0 | 0.0 | 53.9 | 0.0 | 8.9 |
| 1-Jul-17 | 567.2 | 480.2 | 0.0 | 0.0 | 87.1 | 261.3 | 0.0 | 218.8 | 533.7 | 9.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 263.6 |
| 1-Aug-17 | 564.5 | 480.2 | 0.0 | 0.0 | 81.5 | 252.1 | 0.0 | 230.9 | 478.1 | 6.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 108.7 |
| 1-Sep-17 | 675.3 | 464.7 | 0.0 | 76.7 | 129.6 | 431.4 | 0.0 | 114.4 | 474.3 | 5.4 | 0.1 | 0.0 | 0.0 | 195.0 | 0.0 | 151.0 |
| 1-Oct-17 | | | | | | | | | | | | | | | | |
| **Month** | **Monthly Averages** | | | | | | | | | | | | | | | |
| Nov | 634.2 | 462.8 | 171.4 | 0.0 | 0.0 | 598.8 | 0.0 | 35.5 | 282.1 | 4.5 | 41.0 | 41.8 | 121.2 | 43.2 | 0.0 | 56.6 |
| Dec | 597.1 | 477.3 | 119.8 | 0.0 | 0.0 | 580.5 | 0.0 | 16.6 | 267.9 | 5.5 | 37.2 | 0.0 | 116.0 | 20.7 | 0.0 | 13.6 |
| Jan | 539.4 | 467.6 | 71.8 | 0.0 | 0.0 | 537.7 | 0.0 | 1.6 | 267.6 | 4.2 | 40.4 | 0.0 | 139.7 | 79.8 | 0.0 | 31.6 |
| Feb | 432.2 | 395.2 | 36.9 | 0.0 | 0.0 | 417.4 | 0.0 | 14.7 | 240.1 | 4.0 | 45.7 | 0.0 | 114.1 | 104.6 | 1.5 | 8.1 |
| Mar | 444.8 | 390.2 | 54.6 | 0.0 | 0.0 | 420.3 | 0.0 | 24.5 | 289.7 | 4.6 | 39.2 | 0.0 | 102.2 | 117.5 | 4.8 | 3.0 |
| Apr | 455.7 | 448.6 | 6.5 | 0.0 | 0.4 | 443.8 | 0.0 | 11.5 | 359.2 | 5.1 | 0.0 | 0.0 | 14.3 | 17.5 | 8.4 | 28.2 |
| May | 375.7 | 367.3 | 2.7 | 0.0 | 0.0 | 334.2 | 0.0 | 42.6 | 503.3 | 6.2 | 0.5 | 27.2 | 0.0 | 20.5 | 4.1 | 0.9 |
| Jun | 469.2 | 438.2 | 14.7 | 0.0 | 17.9 | 258.3 | 0.0 | 193.0 | 580.5 | 8.3 | 0.0 | 7.7 | 0.0 | 7.7 | 15.4 | 36.6 |
| Jul | 539.8 | 478.9 | 7.9 | 0.0 | 53.0 | 289.9 | 0.0 | 197.0 | 595.8 | 8.6 | 0.0 | 182.6 | 0.0 | 44.5 | 5.2 | 98.6 |
| Aug | 568.2 | 479.7 | 3.3 | 18.2 | 85.0 | 339.2 | 0.0 | 144.0 | 602.2 | 7.8 | 0.0 | 9.0 | 11.4 | 40.6 | 0.9 | 71.4 |
| Sep | 548.6 | 464.5 | 3.0 | 26.8 | 68.1 | 374.1 | 0.0 | 106.3 | 493.6 | 6.7 | 4.2 | 74.4 | 49.5 | 61.5 | 1.6 | 65.1 |
| Oct | 508.4 | 475.6 | 7.4 | 10.4 | 23.2 | 446.3 | 0.0 | 36.3 | 392.0 | 5.7 | 0.0 | 349.2 | 2.0 | 44.4 | 0.0 | 52.4 |
| **Water Year** | **Water Year Totals** | | | | | | | | | | | | | | | |
| 2011 | 6,177 | 5,337 | 548 | 301 | 291 | 5,181 | - | 704 | 5,502 | 48 | 303 | - | 1,053 | 697 | - | - |
| 2012 | 6,285 | 5,507 | 487 | - | 303 | 5,068 | - | 914 | 5,196 | 79 | 387 | - | 247 | 760 | 221 | 408 |
| 2013 | 6,293 | 5,548 | 448 | - | 300 | 5,362 | - | 631 | 4,278 | 77 | 432 | 755 | 536 | 211 | - | 307 |
| 2014 | 5,677 | 5,182 | 398 | - | 97 | 4,802 | - | 778 | 4,839 | 78 | 35 | 745 | 640 | 629 | 71 | 706 |
| 2015 | 5,560 | 5,041 | 290 | - | 191 | 4,278 | - | 1,065 | 4,665 | 74 | 271 | 1,326 | 678 | 942 | - | 1,226 |
| 2016 | 6,300 | 5,467 | 607 | - | 205 | 5,364 | - | 749 | 5,117 | 71 | 29 | 1,497 | 652 | 6 | - | 6 |
| 2017 | 5,993 | 4,863 | 715 | 77 | 323 | 4,782 | - | 887 | 4,128 | 64 | 0 | 171 | 884 | 927 | - | 556 |

**Notes:** City of Grand Junction daily accounting records provided by the City of Grand Junciton ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

# Table 5-2
## End-of-Month Reservoir Storage
## Grand Junction Water Accounting Records
### Water Years 2010 - 2017
### (acre-feet)

| Date | Anderson No. 1 | Anderson No. 2 | Anderson No. 6 | B.A.J | Bolen | Carson | Flowing Park | Raber Click | Chambers | Deep Creek | G.M. No. 1 | (1) Other G.M. Res. Co. | (2) Total Upper Reservoirs | Purdy Mesa | Juniata | Total Lower Reservoirs | Total | Somerville | Total w/Somerville |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov-10 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 112 | 6,303 | 6,415 | 8,263 | - | 8,263 |
| Dec-10 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 125 | 6,789 | 6,914 | 8,762 | - | 8,762 |
| Jan-11 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 125 | 7,201 | 7,327 | 9,175 | - | 9,175 |
| Feb-11 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 439 | 7,201 | 7,640 | 9,488 | - | 9,488 |
| Mar-11 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 699 | 7,276 | 7,975 | 9,823 | - | 9,823 |
| Apr-11 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 699 | 7,276 | 7,975 | 9,823 | - | 9,823 |
| May-11 | - | 412 | - | - | - | 653 | 759 | 24 | 0 | - | - | - | 1,848 | 699 | 6,866 | 7,565 | 9,413 | - | 9,413 |
| Jun-11 | 507 | 596 | 118 | 233 | 524 | 653 | 759 | 454 | 78 | 67 | 379 | 62 | 4,429 | 704 | 7,246 | 7,950 | 12,380 | 934 | 13,313 |
| Jul-11 | 490 | 596 | 118 | 55 | 537 | 653 | 786 | 454 | 65 | 67 | 326 | 61 | 4,208 | 678 | 6,913 | 7,590 | 11,798 | 720 | 12,517 |
| Aug-11 | 112 | 630 | - | 129 | 357 | 653 | 759 | 390 | 13 | 25 | 109 | 48 | 3,224 | 455 | 6,572 | 7,027 | 10,251 | 478 | 10,729 |
| Sep-11 | 187 | 367 | - | - | 4 | 653 | 759 | 261 | 0 | 15 | 89 | 19 | 2,353 | 193 | 6,644 | 6,837 | 9,190 | 286 | 9,476 |
| Oct-11 | - | - | - | - | - | 653 | 759 | 91 | 0 | - | 13 | - | 1,516 | 277 | 6,913 | 7,189 | 8,705 | 15 | 8,721 |
| Nov-11 | - | - | - | - | - | 653 | 759 | 91 | 0 | - | 13 | - | 1,516 | 262 | 6,913 | 7,175 | 8,691 | 15 | 8,706 |
| Dec-11 | - | - | - | - | - | 653 | 759 | 91 | 0 | - | 13 | - | 1,516 | 268 | 6,913 | 7,180 | 8,696 | 15 | 8,712 |
| Jan-12 | - | - | - | - | - | 653 | 759 | 91 | 0 | - | 13 | 2 | 1,519 | 268 | 7,246 | 7,514 | 9,033 | 15 | 9,048 |
| Feb-12 | - | - | - | - | - | 653 | 759 | 91 | 0 | - | 13 | 2 | 1,519 | 568 | 7,306 | 7,875 | 9,393 | 15 | 9,409 |
| Mar-12 | - | - | - | - | - | 653 | 759 | 91 | 0 | - | 13 | 2 | 1,519 | 554 | 7,291 | 7,846 | 9,364 | 15 | 9,380 |
| Apr-12 | - | - | 43 | 245 | 101 | 653 | 759 | 270 | 0 | 32 | - | - | 2,102 | 522 | 7,291 | 7,814 | 9,915 | 652 | 10,568 |
| May-12 | 490 | - | 37 | 209 | 191 | 653 | 759 | 416 | 53 | 37 | 158 | 61 | 3,064 | 492 | 7,083 | 7,575 | 10,639 | 641 | 11,280 |
| Jun-12 | 358 | - | - | 81 | 230 | 653 | 759 | 301 | 0 | 2 | 133 | 50 | 2,568 | 427 | 6,558 | 6,985 | 9,553 | 476 | 10,029 |
| Jul-12 | 349 | - | - | - | 121 | 653 | 713 | 283 | 0 | - | 74 | 24 | 2,217 | 364 | 5,983 | 6,348 | 8,565 | 351 | 8,916 |
| Aug-12 | 340 | - | - | - | 13 | 653 | 695 | 270 | 0 | - | 35 | 9 | 2,014 | 358 | 5,486 | 5,844 | 7,858 | 222 | 8,079 |
| Sep-12 | 327 | - | - | - | - | 653 | 673 | 252 | 0 | - | - | - | 1,904 | 330 | 5,055 | 5,386 | 7,290 | 127 | 7,418 |
| Oct-12 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 321 | 4,924 | 5,245 | 7,062 | 36 | 7,098 |
| Nov-12 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 321 | 5,565 | 5,886 | 7,703 | 36 | 7,739 |
| Dec-12 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 321 | 6,024 | 6,345 | 8,162 | 36 | 8,198 |
| Jan-13 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 322 | 6,345 | 6,667 | 8,484 | 36 | 8,520 |
| Feb-13 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 322 | 6,601 | 6,923 | 8,741 | 36 | 8,777 |
| Mar-13 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 322 | 7,001 | 7,323 | 9,140 | 36 | 9,176 |
| Apr-13 | 314 | - | - | - | - | 653 | 616 | 235 | 0 | - | - | - | 1,817 | 379 | 7,014 | 7,393 | 9,211 | 36 | 9,246 |
| May-13 | 490 | 370 | 118 | 240 | 335 | 653 | - | 459 | 78 | 67 | 309 | 62 | 3,181 | 382 | 7,216 | 7,599 | 10,780 | 922 | 11,702 |
| Jun-13 | 490 | 336 | 53 | 144 | 305 | 637 | 872 | 435 | 49 | 35 | 284 | 55 | 3,695 | 357 | 6,835 | 7,191 | 10,887 | 759 | 11,645 |
| Jul-13 | 490 | 322 | - | 64 | 290 | 637 | 759 | 419 | 0 | - | 238 | 41 | 3,261 | 277 | 6,331 | 6,607 | 9,868 | 529 | 10,397 |
| Aug-13 | 476 | 311 | - | - | 171 | 637 | 736 | 398 | 0 | - | 229 | 14 | 2,973 | 295 | 5,833 | 6,128 | 9,101 | 367 | 9,468 |
| Sep-13 | 473 | 325 | - | - | 71 | 637 | 731 | 292 | 0 | - | 214 | 4 | 2,748 | 277 | 5,739 | 6,015 | 8,763 | 279 | 9,042 |
| Oct-13 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 208 | 6,303 | 6,510 | 8,414 | 216 | 8,629 |

# Table 5-2
## End-of-Month Reservoir Storage
## Grand Junction Water Accounting Records
### Water Years 2010 - 2017
### (acre-feet)

| Date | Anderson No. 1 | Anderson No. 2 | Anderson No. 6 | B.A.J | Bolen | Carson | Flowing Park | Raber Click | Chambers | Deep Creek | G.M. No. 1 | (1) Other G.M. Res. Co. | (2) Total Upper Reservoirs | Purdy Mesa | Juniata | Total Lower Reservoirs | Total | Somerville | Total w/Somerville |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov-13 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 208 | 6,673 | 6,881 | 8,784 | 216 | 9,000 |
| Dec-13 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 273 | 7,014 | 7,288 | 9,191 | 216 | 9,407 |
| Jan-14 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 554 | 6,913 | 7,467 | 9,370 | 216 | 9,586 |
| Feb-14 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 559 | 7,157 | 7,716 | 9,619 | 216 | 9,835 |
| Mar-14 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 554 | 7,291 | 7,846 | 9,749 | 216 | 9,965 |
| Apr-14 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 550 | 7,231 | 7,781 | 9,684 | 216 | 9,900 |
| May-14 | 473 | 325 | - | - | - | 446 | 367 | 79 | 0 | - | 214 | - | 1,904 | 688 | 7,201 | 7,890 | 9,793 | 216 | 10,009 |
| Jun-14 | 507 | 596 | 118 | 240 | 428 | 637 | 900 | 405 | 78 | 51 | 531 | 62 | 4,555 | 401 | 7,001 | 7,401 | 11,956 | 807 | 12,763 |
| Jul-14 | 496 | 596 | 49 | 240 | 243 | 637 | 745 | 405 | 0 | - | 501 | 60 | 3,973 | 286 | 6,430 | 6,716 | 10,688 | 655 | 11,343 |
| Aug-14 | 496 | 596 | - | 60 | 239 | 637 | 759 | 405 | 0 | - | 365 | 36 | 3,594 | 239 | 6,093 | 6,332 | 9,926 | 554 | 10,480 |
| Sep-14 | 507 | 596 | - | - | 132 | 637 | 900 | 405 | 0 | - | 340 | 3 | 3,521 | 231 | 5,786 | 6,017 | 9,538 | 422 | 9,960 |
| Oct-14 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | 223 | 6,472 | 6,695 | 8,956 | 324 | 9,279 |
| Nov-14 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | 200 | 6,687 | 6,887 | 9,148 | 324 | 9,471 |
| Dec-14 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | 203 | 7,056 | 7,258 | 9,518 | 324 | 9,842 |
| Jan-15 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | 198 | 7,246 | 7,444 | 9,704 | 324 | 10,027 |
| Feb-15 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | 193 | 7,246 | 7,439 | 9,699 | 324 | 10,022 |
| Mar-15 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | 184 | 7,246 | 7,431 | 9,691 | 324 | 10,014 |
| Apr-15 | 260 | 596 | 19 | - | 71 | 439 | 381 | 240 | 0 | - | 254 | - | 2,260 | - | 7,112 | 7,112 | 9,372 | 324 | 9,696 |
| May-15 | 507 | 596 | 118 | 240 | 505 | 637 | 381 | 405 | 0 | 67 | 400 | 11 | 3,868 | - | 7,291 | 7,291 | 11,160 | 973 | 12,132 |
| Jun-15 | 507 | 596 | 118 | 235 | 505 | 637 | 786 | 405 | 71 | 67 | 400 | 60 | 4,388 | - | 7,070 | 7,070 | 11,458 | 903 | 12,361 |
| Jul-15 | 501 | 588 | - | 76 | 505 | 637 | 112 | 419 | 59 | 42 | 519 | 60 | 3,519 | - | 7,014 | 7,014 | 10,534 | 583 | 11,116 |
| Aug-15 | 484 | 588 | - | - | 341 | 637 | 112 | 395 | 0 | 1 | 480 | 46 | 3,085 | - | 6,373 | 6,373 | 9,458 | 290 | 9,747 |
| Sep-15 | 473 | 563 | - | - | 177 | 637 | 107 | 375 | 0 | - | 441 | 21 | 2,794 | - | 5,887 | 5,887 | 8,681 | 89 | 8,770 |
| Oct-15 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | - | 1,926 | - | 6,204 | 6,204 | 8,131 | 4 | 8,134 |
| Nov-15 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | - | 1,926 | - | 6,515 | 6,515 | 8,441 | 4 | 8,445 |
| Dec-15 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | - | 1,926 | - | 6,881 | 6,881 | 8,808 | 4 | 8,811 |
| Jan-16 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | 2 | 1,928 | - | 7,097 | 7,097 | 9,025 | 4 | 9,029 |
| Feb-16 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | 2 | 1,928 | - | 7,321 | 7,321 | 9,250 | 4 | 9,254 |
| Mar-16 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | 2 | 1,928 | - | 7,397 | 7,397 | 9,325 | 4 | 9,329 |
| Apr-16 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | 2 | 1,928 | - | 7,261 | 7,261 | 9,190 | 4 | 9,193 |
| May-16 | 367 | 281 | - | - | 79 | 370 | 107 | 297 | 0 | - | 425 | 2 | 1,928 | - | 7,382 | 7,382 | 9,310 | 4 | 9,314 |
| Jun-16 | 507 | 596 | 118 | 240 | - | 637 | 900 | 405 | 71 | 67 | 400 | 60 | 4,002 | - | 6,987 | 6,987 | 10,989 | 973 | 11,962 |
| Jul-16 | 505 | 605 | 78 | 115 | - | 637 | 762 | 416 | 26 | 20 | 529 | 60 | 3,753 | - | 6,987 | 6,987 | 10,740 | 704 | 11,444 |
| Aug-16 | 486 | 584 | - | 37 | - | 653 | 740 | 383 | 0 | - | 480 | 46 | 3,408 | - | 6,373 | 6,373 | 9,781 | 383 | 10,165 |
| Sep-16 | 259 | 389 | - | - | - | 408 | 727 | 370 | 0 | - | 218 | 14 | 2,384 | - | 6,260 | 6,260 | 8,644 | 278 | 8,922 |
| Oct-16 | 250 | 376 | - | - | - | 482 | 713 | - | 0 | - | 188 | - | 2,009 | - | 6,430 | 6,430 | 8,438 | 83 | 8,522 |

# Table 5-2
## End-of-Month Reservoir Storage
## Grand Junction Water Accounting Records
### Water Years 2010 - 2017
### (acre-feet)

| Date | Anderson No. 1 | Anderson No. 2 | Anderson No. 6 | B.A.J | Bolen | Carson | Flowing Park | Raber Click | Chambers | Deep Creek | G.M. No. 1 | (1) Other G.M. Res. Co. | (2) Total Upper Reservoirs | Purdy Mesa | Juniata | Total Lower Reservoirs | Total | Somerville | Total w/Somerville |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nov-16 | 250 | 376 | - | - | - | 482 | 713 | - | 0 | - | 188 | - | 2,009 | - | 6,673 | 6,673 | 8,682 | 83 | 8,765 |
| Dec-16 | 250 | 376 | - | - | - | 482 | 713 | - | 0 | - | 188 | - | 2,009 | - | 7,056 | 7,056 | 9,064 | 83 | 9,148 |
| Jan-17 | 250 | 376 | - | - | - | 482 | 713 | - | 0 | - | 188 | - | 2,009 | 82 | 7,261 | 7,343 | 9,351 | 83 | 9,435 |
| Feb-17 | 250 | 376 | - | - | - | 482 | 713 | - | - | - | 188 | - | 2,009 | 133 | 7,246 | 7,380 | 9,388 | 83 | 9,471 |
| Mar-17 | 250 | 376 | - | - | - | 482 | 713 | - | 0 | - | 188 | - | 2,009 | 701 | 7,097 | 7,798 | 9,807 | 83 | 9,890 |
| Apr-17 | 250 | 376 | - | - | - | 482 | 713 | - | 0 | - | 188 | - | 2,009 | 678 | 6,928 | 7,606 | 9,614 | 83 | 9,698 |
| May-17 | 507 | 596 | 83 | 245 | 481 | 637 | 713 | 472 | 71 | 67 | 463 | 60 | 4,395 | 648 | 6,960 | 7,607 | 12,003 | 973 | 12,976 |
| Jun-17 | 507 | 596 | 83 | 245 | 335 | 637 | 713 | 472 | 59 | 47 | 463 | 60 | 4,218 | 662 | 6,423 | 7,085 | 11,302 | 926 | 12,228 |
| Jul-17 | 492 | 585 | 43 | 171 | 22 | 637 | 713 | 369 | 0 | 4 | 393 | 58 | 3,487 | 364 | 6,177 | 6,541 | 10,029 | 453 | 10,482 |
| Aug-17 | 464 | 554 | - | 96 | - | 637 | 727 | 209 | 0 | - | 345 | 39 | 3,071 | 218 | 5,460 | 5,678 | 8,749 | 190 | 8,938 |
| Sep-17 | 402 | 541 | - | - | - | 637 | 722 | 199 | 0 | - | 266 | 16 | 2,783 | 228 | 5,112 | 5,340 | 8,124 | 73 | 8,196 |
| Oct-17 | | | | | | | | | | | | | | | | | | | |
| **Month** | **Monthly Average End-of-Month Storage** | | | | | | | | | | | | | | | | | | |
| Nov | 237.8 | 284.4 | 2.8 | 0.0 | 21.4 | 527.9 | 528.7 | 138.1 | 0.0 | 0.0 | 156.2 | 0.0 | 1897.2 | 157.5 | 6475.6 | 6633.1 | 8530.3 | 96.8 | 8627.0 |
| Dec | 237.8 | 284.4 | 2.8 | 0.0 | 21.4 | 527.9 | 528.7 | 138.1 | 0.0 | 0.0 | 156.2 | 0.0 | 1897.2 | 169.9 | 6819.0 | 6989.0 | 8886.2 | 96.8 | 8982.9 |
| Jan | 237.8 | 284.4 | 2.8 | 0.0 | 21.4 | 527.9 | 528.7 | 138.1 | 0.0 | 0.0 | 156.2 | 0.7 | 1897.9 | 221.2 | 7044.2 | 7265.4 | 9163.3 | 96.8 | 9260.1 |
| Feb | 237.8 | 284.4 | 2.8 | 0.0 | 21.4 | 527.9 | 528.7 | 138.1 | 0.0 | 0.0 | 156.2 | 0.7 | 1897.9 | 316.3 | 7154.2 | 7470.5 | 9368.4 | 96.8 | 9465.1 |
| Mar | 237.8 | 284.4 | 2.8 | 0.0 | 21.4 | 527.9 | 528.7 | 138.1 | 0.0 | 0.0 | 156.2 | 0.7 | 1897.9 | 430.8 | 7228.5 | 7659.3 | 9557.2 | 96.8 | 9653.9 |
| Apr | 237.8 | 284.4 | 8.8 | 35.0 | 35.8 | 527.9 | 528.7 | 163.6 | 0.0 | 4.5 | 154.3 | 0.3 | 1981.2 | 403.9 | 7159.3 | 7563.1 | 9544.3 | 187.7 | 9732.0 |
| May | 404.9 | 368.7 | 50.8 | 133.4 | 227.4 | 578.5 | 440.7 | 307.6 | 28.8 | 34.1 | 281.1 | 28.1 | 2884.2 | 415.6 | 7142.8 | 7558.3 | 10442.5 | 532.5 | 10975.0 |
| Jun | 483.3 | 473.9 | 86.7 | 202.5 | 332.6 | 641.8 | 812.7 | 411.2 | 58.0 | 48.2 | 369.8 | 58.5 | 3979.3 | 364.4 | 6874.1 | 7238.5 | 11217.8 | 825.2 | 12043.0 |
| Jul | 474.6 | 470.3 | 41.2 | 103.1 | 245.6 | 641.8 | 655.6 | 395.1 | 21.5 | 19.0 | 368.5 | 52.1 | 3488.4 | 281.2 | 6547.8 | 6829.0 | 10317.4 | 570.6 | 10888.1 |
| Aug | 408.0 | 466.2 | 0.0 | 46.0 | 159.9 | 644.0 | 646.7 | 350.1 | 1.8 | 3.8 | 291.9 | 34.0 | 3052.6 | 223.4 | 6027.3 | 6250.7 | 9303.3 | 354.9 | 9658.2 |
| Sep | 375.6 | 397.2 | 0.0 | 0.0 | 54.8 | 609.0 | 659.8 | 307.8 | 0.0 | 2.1 | 223.9 | 10.9 | 2641.1 | 179.8 | 5783.3 | 5963.2 | 8604.3 | 222.0 | 8826.3 |
| Oct | 277.4 | 263.2 | 3.2 | 0.0 | 25.0 | 507.1 | 490.3 | 157.0 | 0.0 | 0.0 | 182.2 | 0.0 | 1905.4 | 171.3 | 6207.7 | 6378.9 | 8284.3 | 112.9 | 8397.2 |

**Notes:**

(1) Accounting records state that City owns 2.4%. Actual ownership is 5.4% (Documents from Slade on 10/13/2017 and on City Maps). Records adjusted here to be 5.4% (not 2.4%).

(2) Grand Mesa Reservoir No. 1 storage not added into total after WY 2011 in the accounting records. This reservoir is added in this total in the above table.

City of Grand Junction daily accounting records provided by the City of Grand Junciton ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

# Table 6-1
## Summary of Watershed Characteristics for Grand Mesa Reservoirs and Ditches
## City of Grand Junction

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| **Structure** | **Storage Capacity (af)** | **City Owns (%)** | **City Storage (af)** | **Watershed Area (acres)** | **Average Nov - May Inflow (af)** | **Reservoir Water Surface Area (ac)** | **Nov-May Inflow Divided by Watershed Area (af/ac)** | **Capacity Divided by Surface Area (af/ac)** | **Nov-May Inflow Divided by Capacity (af/af)** |
| **Upper Reservoirs - Kannah Creek** | | | | | | | | | |
| GM 8, 9 and Scales 1, 3 | 864 | 5.4% | 47 | 2,911 | 1,850 | 97 | 0.64 | 8.9 | 2.1 |
| Grand Mesa Res. No. 6 | 172 | 5.4% | 9 | 453 | 292 | 21 | 0.64 | 8.1 | 1.7 |
| Grand Mesa Res. No. 1 | 559 | 100% | 559 | 1,203 | 718 | 50 | 0.60 | 11.2 | 1.3 |
| Anderson Res. No. 1 | 468 | 100% | 468 | 378 | 225 | 49 | 0.59 | 9.6 | 0.5 |
| Anderson Res. No. 2 | 595 | 100% | 595 | 546 | 313 | 56 | 0.57 | 10.7 | 0.5 |
| Raber-Click | 459 | 100% | 459 | 526 | 294 | 52 | 0.56 | 8.7 | 0.6 |
| Deep Creek Res. No. 2 | 354 | 19.4% | 69 | 620 | 360 | 36 | 0.58 | 9.7 | 1.0 |
| Flowing Park Res. | 772 | 100% | 772 | 752 | 418 | 78 | 0.56 | 9.9 | 0.5 |
| Chambers Res. | 229 | 33.3% | 76 | 804 | 427 | 46 | 0.53 | 5.0 | 1.9 |
| Carson Lake | 637 | 100% | 637 | 3,945 | 2,247 | 38 | 0.57 | 16.8 | 3.5 |
| **Upper Reservoirs - North Fork Kannah Creek** | | | | | | | | | |
| Anderson Res. No. 6 | 118 | 100% | 118 | 91 | 52 | 12 | 0.57 | 9.7 | 0.4 |
| Bolen Res. | 521 | 100% | 521 | 234 | 122 | 50 | 0.52 | 10.4 | 0.2 |
| BAJ Reservoir | 240 | 100% | 240 | 1,106 | 589 | 35 | 0.53 | 6.9 | 2.5 |
| **Upper Reservoir - Whitewater Creek** | | | | | | | | | |
| Somerville Res. | 973 | 100% | 973 | 2,037 | 1,098 | 89 | 0.54 | 10.9 | 1.1 |
| **Lower Reservoirs** | | | | | | | | | |
| Juniata Res. | 7,291 | 100% | 7,291 | 1,325 | 75 | 96 | 0.06 | 75.8 | 0.0 |
| Purdy Mesa Res. | 659 | 100% | 659 | 445 | 16 | 53 | 0.04 | 12.5 | 0.0 |

**Notes:**

(1) Storage capacity from Grand Junction water accounting records and City of Grand Junction GIS mapping.

(2) Amount of reservoir capacity owned by Grand Junction from Grand Junction water accounting records and Slade Connell.

(3) (1) x (2).

(4) Computed acreage using USGS Streamstats program and GIS.

(5) Estimated average Nov - May inflow computed as the sum of the monthly average flow from USGS Streamstats.

(6) Approximate full reservoir surface area from GIS coverage (not provided in elevation-capacity curves).

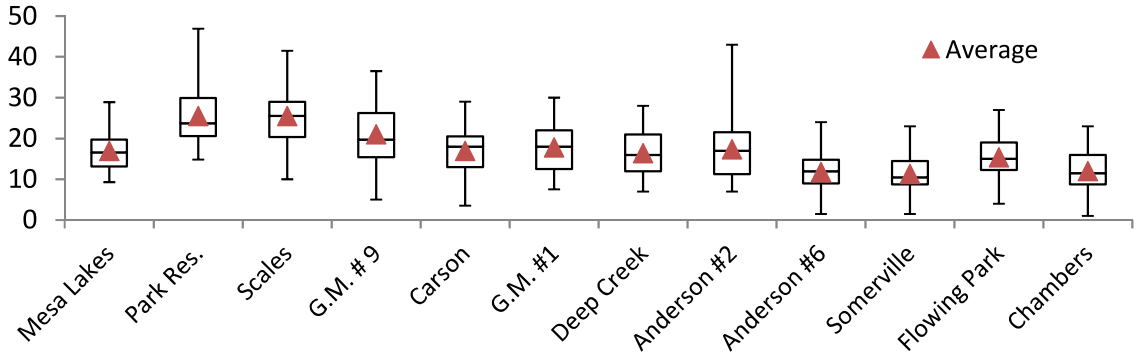
(7) (5) / (4).

(8) (1) / (6).

(9) (5) / (1).

## Table 6-2
## April 1 Snow Water Equivalent at Snotel and Snow Course Sites
## 1990 - 2017
## (inches)

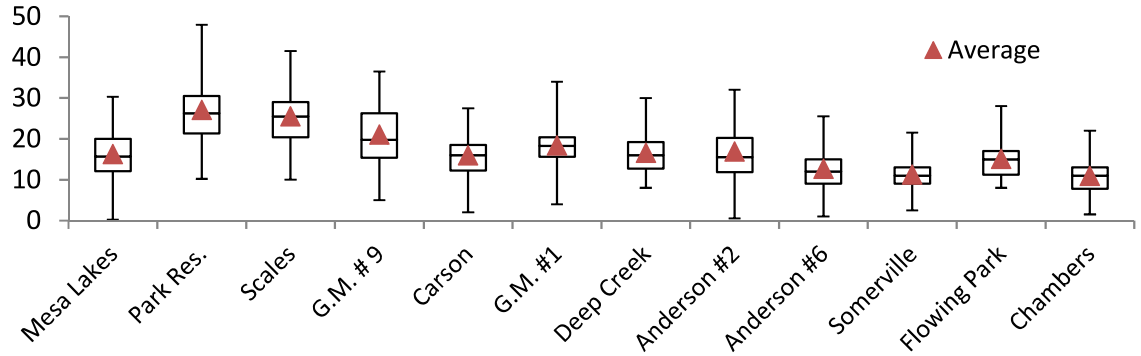
| | Snotel | | Snow Course Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Mesa Lakes | Park Res. | Scales | G.M. # 9 | Carson | G.M. #1 | Deep Creek | Anderson #2 | Anderson #6 | Somerville | Flowing Park | Chambers | Avg | Max | Min |
| 1990 | 11.0 | 19.7 | 22.0 | 18.0 | 3.5 | 8.5 | 8.0 | 7.0 | 3.5 | 3.5 | 8.0 | 4.5 | 9.8 | 22.0 | 3.5 |
| 1991 | 17.5 | 26.8 | 21.0 | 19.5 | 13.0 | 16.0 | 7.0 | 18.0 | 13.0 | 10.0 | 14.0 | 13.0 | 15.7 | 26.8 | 7.0 |
| 1992 | 21.2 | 24.3 | 20.5 | 14.0 | 23.0 | 24.0 | 21.5 | 23.0 | 16.0 | 16.0 | 19.0 | 18.0 | 20.0 | 24.3 | 14.0 |
| 1993 | 28.9 | 42.0 | 36.5 | 36.5 | 19.0 | 30.0 | 23.0 | 25.5 | 24.0 | 18.0 | 21.0 | 16.0 | 26.7 | 42.0 | 16.0 |
| 1994 | 17.0 | 21.6 | 23.0 | 14.5 | 10.5 | 13.0 | 16.0 | 11.0 | 15.5 | 9.0 | 15.0 | 9.5 | 14.6 | 23.0 | 9.0 |
| 1995 | 24.1 | 33.8 | 29.0 | 30.0 | 29.0 | 24.0 | 28.0 | 23.0 | 20.0 | 23.0 | 27.0 | 23.0 | 26.2 | 33.8 | 20.0 |
| 1996 | 20.2 | 23.6 | 28.0 | 21.0 | 17.0 | 18.0 | 15.0 | 17.0 | 9.0 | 10.0 | 16.0 | 12.0 | 17.2 | 28.0 | 9.0 |
| 1997 | 22.0 | 33.6 | 25.0 | 28.0 | 21.0 | 23.0 | 20.0 | 18.5 | 18.0 | 15.0 | 19.0 | 16.0 | 21.6 | 33.6 | 15.0 |
| 1998 | 17.9 | 30.3 | 26.0 | 23.0 | 20.0 | 19.0 | 21.0 | 17.0 | 14.0 | 16.0 | 15.0 | 12.0 | 19.3 | 30.3 | 12.0 |
| 1999 | 11.3 | 20.7 | 20.0 | 18.0 | 7.0 | 10.0 | 8.0 | 8.0 | 1.5 | 1.5 | 4.0 | 1.0 | 9.3 | 20.7 | 1.0 |
| 2000 | 15.2 | 21.8 | 18.0 | 15.0 | 22.0 | 20.0 | 20.5 | 18.0 | 14.0 | 14.0 | 17.0 | 15.0 | 17.5 | 22.0 | 14.0 |
| 2001 | 13.2 | 18.1 | 19.0 | 15.0 | 13.0 | 14.5 | 13.0 | 10.5 | 9.0 | 8.5 | 16.5 | 10.0 | 13.4 | 19.0 | 8.5 |
| 2002 | 9.3 | 15.5 | 10.0 | 5.0 | 9.5 | 12.0 | 11.5 | 8.0 | 5.0 | 4.5 | 8.0 | 6.5 | 8.7 | 15.5 | 4.5 |
| 2003 | 16.9 | 22.7 | 20.0 | 15.5 | 15.0 | 16.5 | 14.0 | 16.0 | 12.0 | 12.5 | 12.5 | 11.5 | 15.4 | 22.7 | 11.5 |
| 2004 | 16.1 | 23.0 | 27.0 | 21.0 | 14.0 | 20.0 | 18.5 | 18.0 | 9.0 | 10.0 | 13.0 | 11.0 | 16.7 | 27.0 | 9.0 |
| 2005 | 28.7 | 46.9 | 28.0 | 25.0 | 29.0 | 28.0 | 23.0 | 23.0 | 15.0 | 15.0 | 19.0 | 16.0 | 24.7 | 46.9 | 15.0 |
| 2006 | 15.8 | 23.6 | 19.0 | 18.0 | 13.5 | 16.0 | 16.0 | 16.0 | 14.0 | 13.5 | 14.5 | 11.5 | 16.0 | 23.6 | 11.5 |
| 2007 | 12.1 | 16.5 | | | 11.0 | 7.5 | 12.0 | 11.0 | 5.0 | 6.0 | 10.5 | 7.0 | 9.9 | 16.5 | 5.0 |
| 2008 | 19.6 | 32.0 | 41.5 | 31.0 | 25.0 | 29.0 | 23.0 | 43.0 | 18.0 | 17.0 | 24.0 | 18.0 | 26.8 | 43.0 | 17.0 |
| 2009 | 16.6 | 24.3 | 30.0 | 20.0 | 21.0 | 18.5 | 21.0 | 20.0 | 14.5 | 14.0 | 20.5 | 17.5 | 19.8 | 30.0 | 14.0 |
| 2010 | 15.4 | 23.8 | 31.0 | 26.0 | 19.0 | 21.0 | 19.0 | 25.0 | 12.0 | 12.0 | 24.0 | 17.0 | 20.4 | 31.0 | 12.0 |
| 2011 | 20.8 | 35.8 | 37.0 | 33.0 | 18.0 | 23.0 | 21.0 | 24.0 | 10.5 | 10.5 | 18.0 | 8.0 | 21.6 | 37.0 | 8.0 |
| 2012 | 12.0 | 20.1 | | | 9.0 | 9.0 | 9.0 | 8.0 | 6.0 | 6.0 | 7.0 | 8.0 | 9.4 | 20.1 | 6.0 |
| 2013 | 13.0 | 16.5 | 23.0 | 14.0 | 18.0 | 18.0 | 12.0 | 15.0 | 9.0 | 9.0 | 14.5 | 13.0 | 14.6 | 23.0 | 9.0 |
| 2014 | 14.1 | 25.7 | 28.0 | 16.0 | 19.0 | 9.0 | 11.5 | 11.5 | 9.5 | 9.5 | 12.0 | 6.0 | 14.3 | 28.0 | 6.0 |
| 2015 | 9.5 | 14.8 | | | | | | | | | | | 12.2 | 14.8 | 9.5 |
| 2016 | 16.6 | 25.9 | 29.0 | 27.0 | 18.0 | 10.5 | 13.5 | 13.5 | 11.0 | 11.0 | 10.0 | 11.5 | 16.5 | 29.0 | 10.0 |
| 2017 | 18.1 | 29.8 | | | 19.5 | 21.0 | 15.0 | 19.0 | 8.5 | 8.5 | 16.0 | 11.5 | 16.7 | 29.8 | 8.5 |
| Avg | 16.9 | 25.5 | 25.5 | 21.0 | 16.9 | 17.7 | 16.3 | 17.3 | 11.7 | 11.2 | 15.4 | 12.0 | 17.3 | 25.5 | 11.2 |
| Max | 28.9 | 46.9 | 41.5 | 36.5 | 29.0 | 30.0 | 28.0 | 43.0 | 24.0 | 23.0 | 27.0 | 23.0 | 31.7 | 46.9 | 23.0 |
| Min | 9.3 | 14.8 | 10.0 | 5.0 | 3.5 | 7.5 | 7.0 | 7.0 | 1.5 | 1.5 | 4.0 | 1.0 | 6.0 | 14.8 | 1.0 |




**Source:**
Snotel data for April 1 downloaded from NRCS National Water & Climate Center (https://www.wcc.nrcs.usda.gov/index.html).
Snow course data provided by the City of Grand Junction ("SNOW2017.xlsx"). Values for the end of March measurements that are made in the beginning of April.

# Table 6-3
## May 1 Snow Water Equivalent at Snotel and Snow Course Sites
## 1990 - 2017
## (inches)

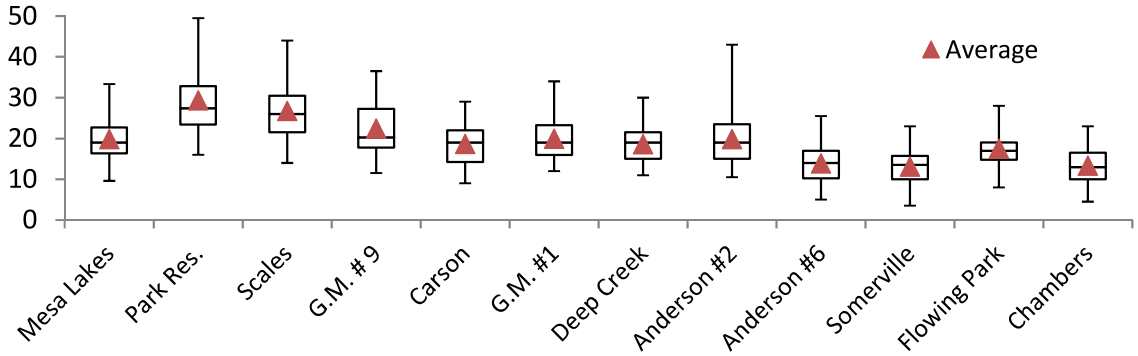
| | Snotel | | Snow Course Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Mesa Lakes | Park Res. | Scales | G.M. # 9 | Carson | G.M. #1 | Deep Creek | Anderson #2 | Anderson #6 | Somerville | Flowing Park | Chambers | Avg | Max | Min |
| 1990 | 12.2 | 22.8 | 22.0 | 18.0 | 9.0 | 12.0 | 11.0 | 11.5 | 1.0 | 2.5 | 8.0 | 1.5 | 11.0 | 22.8 | 1.0 |
| 1991 | 19.9 | 28.8 | 21.0 | 19.5 | 16.0 | 16.0 | 16.0 | 19.5 | 20.0 | 12.5 | 18.0 | 13.0 | 18.4 | 28.8 | 12.5 |
| 1992 | 14.2 | 20.5 | 20.5 | 14.0 | 13.0 | 11.0 | 9.0 | 9.5 | 7.5 | 9.0 | | | 12.8 | 20.5 | 7.5 |
| 1993 | 30.3 | 47.9 | 36.5 | 36.5 | 27.5 | 21.5 | 27.5 | 32.0 | 25.5 | 21.5 | 28.0 | 21.5 | 29.7 | 47.9 | 21.5 |
| 1994 | 18.3 | 26.8 | 23.0 | 14.5 | 9.5 | 14.5 | 14.0 | 11.5 | 11.0 | 9.0 | 9.5 | 8.0 | 14.1 | 26.8 | 8.0 |
| 1995 | 26.6 | 38.3 | 29.0 | 30.0 | 23.0 | 25.0 | 30.0 | 29.0 | 24.0 | 21.0 | 27.0 | 22.0 | 27.1 | 38.3 | 21.0 |
| 1996 | 20.3 | 26.2 | 28.0 | 21.0 | 17.0 | 19.0 | 17.0 | 20.0 | 13.0 | 11.0 | 12.0 | 9.0 | 17.8 | 28.0 | 9.0 |
| 1997 | 23.5 | 39.6 | 25.0 | 28.0 | 19.0 | 20.0 | 19.0 | 17.0 | 13.0 | 11.0 | 17.0 | 11.0 | 20.3 | 39.6 | 11.0 |
| 1998 | 24.4 | 36.0 | 26.0 | 23.0 | 19.0 | 19.0 | 22.0 | 17.0 | 20.0 | 12.0 | 19.0 | 15.5 | 21.1 | 36.0 | 12.0 |
| 1999 | 17.1 | 29.2 | 20.0 | 18.0 | 12.0 | 16.0 | 14.0 | 12.0 | 7.0 | 8.0 | 16.0 | 7.0 | 14.7 | 29.2 | 7.0 |
| 2000 | 8.2 | 18.8 | 18.0 | 15.0 | 12.0 | 12.0 | 15.0 | 10.0 | | | 9.0 | 6.0 | 12.4 | 18.8 | 6.0 |
| 2001 | 11.6 | 21.6 | 19.0 | 15.0 | | 16.5 | 12.0 | 14.0 | 5.0 | 6.0 | 11.0 | | 13.2 | 21.6 | 5.0 |
| 2002 | 0.2 | 10.2 | 10.0 | 5.0 | 2.0 | 4.0 | | 0.5 | | | | | 4.6 | 10.2 | 0.2 |
| 2003 | 14.8 | 23.4 | 20.0 | 15.5 | 13.0 | 14.0 | 11.0 | 14.5 | 8.0 | 8.5 | 11.0 | 9.0 | 13.6 | 23.4 | 8.0 |
| 2004 | 19.5 | 27.2 | 27.0 | 21.0 | 17.0 | 22.5 | 19.0 | 18.0 | 11.0 | 12.0 | 15.5 | 13.0 | 18.6 | 27.2 | 11.0 |
| 2005 | 28.1 | 44.5 | 28.0 | 25.0 | 25.0 | 24.0 | 20.0 | 21.0 | 13.0 | 13.0 | 17.0 | 14.0 | 22.7 | 44.5 | 13.0 |
| 2006 | 10.8 | 22.7 | 19.0 | 18.0 | 12.0 | 16.0 | 14.0 | 12.0 | 12.0 | 5.0 | 13.0 | 5.0 | 13.3 | 22.7 | 5.0 |
| 2007 | 7.3 | 16.2 | | | | | | | | | | | 11.8 | 16.2 | 7.3 |
| 2008 | 19.5 | 34.4 | 41.5 | 31.0 | 18.0 | 34.0 | 17.0 | 28.0 | 15.5 | 16.0 | 18.0 | 11.0 | 23.7 | 41.5 | 11.0 |
| 2009 | 14.1 | 25.7 | 30.0 | 20.0 | 15.0 | 18.0 | 17.5 | 15.0 | | | 16.0 | | 19.0 | 30.0 | 14.1 |
| 2010 | 12.8 | 26.4 | 31.0 | 26.0 | 17.0 | 20.0 | 8.0 | 16.0 | 12.0 | 12.0 | 15.0 | 10.0 | 17.2 | 31.0 | 8.0 |
| 2011 | 27.0 | 40.9 | 37.0 | 33.0 | 23.0 | 29.0 | 24.0 | 27.0 | 15.0 | 15.0 | 15.0 | 13.0 | 24.9 | 40.9 | 13.0 |
| 2012 | 3.6 | 15.1 | | | | | | | | | | | 9.4 | 15.1 | 3.6 |
| 2013 | 13.8 | 20.2 | 23.0 | 14.0 | 16.0 | 18.0 | 13.5 | 15.0 | 9.5 | 9.5 | 13.0 | 11.0 | 14.7 | 23.0 | 9.5 |
| 2014 | 12.5 | 23.0 | 28.0 | 16.0 | 12.5 | 19.5 | 10.0 | 9.0 | 9.0 | 9.0 | 10.0 | 6.0 | 13.7 | 28.0 | 6.0 |
| 2015 | 9.5 | 14.0 | | | | | | | | | | | 11.8 | 14.0 | 9.5 |
| 2016 | 18.8 | 27.6 | 29.0 | 27.0 | 18.0 | 18.5 | 19.5 | 25.5 | 13.0 | 13.0 | 14.0 | 11.0 | 19.6 | 29.0 | 11.0 |
| 2017 | 16.6 | 29.1 | | | | | | | | | | | 22.9 | 29.1 | 16.6 |
| Avg | 16.3 | 27.0 | 25.5 | 21.0 | 15.9 | 18.3 | 16.5 | 16.9 | 12.6 | 11.3 | 15.1 | 10.9 | 17.3 | 27.0 | 10.9 |
| Max | 30.3 | 47.9 | 41.5 | 36.5 | 27.5 | 34.0 | 30.0 | 32.0 | 25.5 | 21.5 | 28.0 | 22.0 | 31.4 | 47.9 | 21.5 |
| Min | 0.2 | 10.2 | 10.0 | 5.0 | 2.0 | 4.0 | 8.0 | 0.5 | 1.0 | 2.5 | 8.0 | 1.5 | 4.4 | 10.2 | 0.2 |




**Source:**
Snotel data for May 1 downloaded from NRCS National Water & Climate Center (https://www.wcc.nrcs.usda.gov/index.html).
Snow course data provided by the City of Grand Junction ("SNOW2017.xlsx"). Values for the end of April measurements that are made in the beginning of May.

# Table 6-4
## Maximum Snow Water Equivalent at Snotel and Snow Course Sites
## 1990 - 2017
## (inches)

| | Snotel | | Snow Course Sites | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Mesa Lakes | Park Res. | Scales | G.M. # 9 | Carson | G.M. #1 | Deep Creek | Anderson #2 | Anderson #6 | Somerville | Flowing Park | Chambers | Avg | Max | Min |
| 1990 | 13.1 | 23.1 | 22.0 | 18.0 | 9.0 | 12.0 | 11.0 | 11.5 | 5.0 | 3.5 | 8.0 | 4.5 | 11.7 | 23.1 | 3.5 |
| 1991 | 20.2 | 28.8 | 23.5 | 19.5 | 16.0 | 16.0 | 16.0 | 19.5 | 20.0 | 12.5 | 18.0 | 13.0 | 18.6 | 28.8 | 12.5 |
| 1992 | 21.2 | 24.4 | 23.0 | 18.0 | 23.0 | 24.0 | 21.5 | 23.0 | 16.0 | 16.0 | 19.0 | 18.0 | 20.6 | 24.4 | 16.0 |
| 1993 | 33.3 | 49.5 | 36.5 | 36.5 | 27.5 | 30.0 | 27.5 | 32.0 | 25.5 | 21.5 | 28.0 | 21.5 | 30.8 | 49.5 | 21.5 |
| 1994 | 19.4 | 27.3 | 23.0 | 17.0 | 13.0 | 14.5 | 16.0 | 12.5 | 15.5 | 9.0 | 15.0 | 9.5 | 16.0 | 27.3 | 9.0 |
| 1995 | 33.3 | 45.8 | 32.0 | 30.0 | 29.0 | 25.0 | 30.0 | 29.0 | 24.0 | 23.0 | 27.0 | 23.0 | 29.3 | 45.8 | 23.0 |
| 1996 | 22.5 | 26.6 | 28.0 | 21.0 | 17.0 | 19.0 | 17.0 | 20.0 | 14.0 | 12.0 | 17.0 | 12.0 | 18.8 | 28.0 | 12.0 |
| 1997 | 26.2 | 40.8 | 26.0 | 28.0 | 21.0 | 23.0 | 20.0 | 19.0 | 18.0 | 16.0 | 19.0 | 16.0 | 22.8 | 40.8 | 16.0 |
| 1998 | 25.5 | 36.2 | 26.0 | 23.0 | 20.0 | 19.0 | 22.0 | 17.0 | 20.0 | 16.0 | 19.0 | 15.5 | 21.6 | 36.2 | 15.5 |
| 1999 | 18.8 | 31.9 | 20.0 | 18.0 | 12.0 | 16.0 | 14.0 | 12.0 | 7.0 | 8.0 | 16.0 | 7.0 | 15.1 | 31.9 | 7.0 |
| 2000 | 15.4 | 22.1 | 20.0 | 19.0 | 22.0 | 20.0 | 20.5 | 18.0 | 14.0 | 14.0 | 17.0 | 15.0 | 18.1 | 22.1 | 14.0 |
| 2001 | 16.7 | 23.5 | 19.0 | 15.0 | 13.0 | 16.5 | 13.0 | 14.0 | 9.0 | 8.5 | 16.5 | 10.0 | 14.6 | 23.5 | 8.5 |
| 2002 | 9.6 | 16.0 | 14.0 | 11.5 | 9.5 | 12.0 | 11.5 | 10.5 | 6.0 | 5.0 | 10.5 | 7.0 | 10.3 | 16.0 | 5.0 |
| 2003 | 18.4 | 25.4 | 20.0 | 15.5 | 15.0 | 16.5 | 14.0 | 16.0 | 12.0 | 12.5 | 12.5 | 11.5 | 15.8 | 25.4 | 11.5 |
| 2004 | 19.9 | 27.7 | 27.0 | 23.0 | 22.0 | 23.5 | 21.5 | 22.0 | 13.0 | 13.5 | 18.0 | 14.5 | 20.5 | 27.7 | 13.0 |
| 2005 | 30.2 | 48.9 | 36.0 | 28.0 | 29.0 | 28.0 | 23.0 | 24.0 | 20.0 | 20.0 | 22.0 | 20.0 | 27.4 | 48.9 | 20.0 |
| 2006 | 17.9 | 26.8 | 20.0 | 19.0 | 13.5 | 16.0 | 16.0 | 16.0 | 14.0 | 13.5 | 14.5 | 11.5 | 16.6 | 26.8 | 11.5 |
| 2007 | 13.0 | 18.3 | | | 18.0 | 12.5 | 12.0 | 13.0 | 7.5 | 7.5 | 11.0 | 7.0 | 12.0 | 18.3 | 7.0 |
| 2008 | 23.3 | 35.7 | 44.0 | 35.0 | 25.0 | 34.0 | 23.0 | 43.0 | 18.0 | 17.0 | 24.0 | 18.0 | 28.3 | 44.0 | 17.0 |
| 2009 | 19.2 | 28.3 | 30.0 | 23.0 | 21.0 | 18.5 | 21.0 | 20.0 | 16.0 | 15.5 | 20.5 | 17.5 | 20.9 | 30.0 | 15.5 |
| 2010 | 16.9 | 27.6 | 32.0 | 27.0 | 19.0 | 21.0 | 19.0 | 25.0 | 12.0 | 12.0 | 24.0 | 17.0 | 21.0 | 32.0 | 12.0 |
| 2011 | 27.1 | 41.3 | 37.0 | 33.0 | 23.0 | 29.0 | 24.0 | 27.0 | 15.0 | 15.0 | 18.0 | 13.0 | 25.2 | 41.3 | 13.0 |
| 2012 | 12.7 | 20.1 | | | 12.0 | 13.0 | 12.0 | 12.0 | 7.0 | 7.0 | 10.0 | 10.0 | 11.6 | 20.1 | 7.0 |
| 2013 | 17.1 | 20.7 | 24.0 | 15.0 | 18.0 | 18.0 | 18.0 | 17.0 | 9.5 | 15.0 | 17.0 | 13.0 | 16.9 | 24.0 | 9.5 |
| 2014 | 15.1 | 26.5 | 28.0 | 17.0 | 19.0 | 19.5 | 17.0 | 17.0 | 11.0 | 15.0 | 17.0 | 9.0 | 17.6 | 28.0 | 9.0 |
| 2015 | 10.6 | 17.3 | | | | | | | | | | | 14.0 | 17.3 | 10.6 |
| 2016 | 20.1 | 28.5 | 29.0 | 27.0 | 18.0 | 18.5 | 19.5 | 25.5 | 13.0 | 13.0 | 14.0 | 11.5 | 19.8 | 29.0 | 11.5 |
| 2017 | 18.9 | 30.6 | | | 19.5 | 21.0 | 20.0 | 20.0 | 11.0 | 11.0 | 19.0 | 13.0 | 18.4 | 30.6 | 11.0 |
| Avg | 19.8 | 29.3 | 26.7 | 22.4 | 18.7 | 19.9 | 18.5 | 19.8 | 13.8 | 13.1 | 17.5 | 13.3 | 19.4 | 29.3 | 13.1 |
| Max | 33.3 | 49.5 | 44.0 | 36.5 | 29.0 | 34.0 | 30.0 | 43.0 | 25.5 | 23.0 | 28.0 | 23.0 | 33.2 | 49.5 | 23.0 |
| Min | 9.6 | 16.0 | 14.0 | 11.5 | 9.0 | 12.0 | 11.0 | 10.5 | 5.0 | 3.5 | 8.0 | 4.5 | 9.6 | 16.0 | 3.5 |

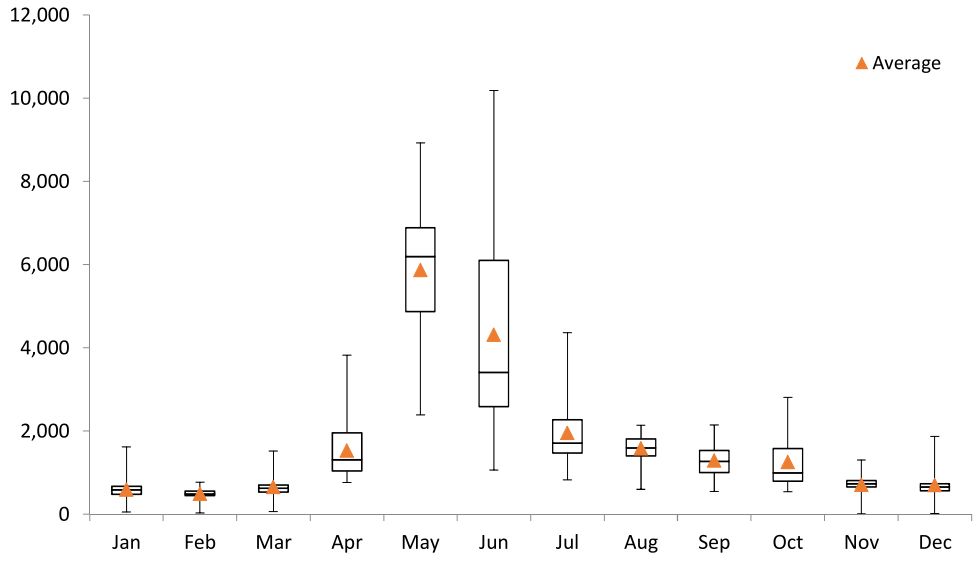



**Source:**
Snotel data downloaded from NRCS National Water & Climate Center (https://www.wcc.nrcs.usda.gov/index.html).
Snow course data provided by the City of Grand Junction ("SNOW2017.xlsx")
Excluded years with no measurements made in the beginning of April.

## Table 6-5a

### Monthly Flow
### Total Kannah Creek Flow
**1992 - 2016**
**(cfs)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 480 | 449 | 480 | 1,674 | 8,928 | 3,319 | 1,754 | 1,727 | 1,300 | 926 | 631 | 733 | 22,401 |
| 1993 | 389 | 256 | 390 | 1,050 | 4,932 | 6,242 | 2,516 | 1,806 | 1,390 | 1,037 | 974 | 713 | 21,696 |
| 1994 | 656 | 659 | 777 | 1,421 | 6,067 | 2,628 | 1,641 | 1,460 | 912 | 931 | 661 | 708 | 18,521 |
| 1995 | 667 | 612 | 685 | 761 | 3,959 | 8,143 | 4,358 | 2,135 | 2,051 | 1,256 | 645 | 637 | 25,911 |
| 1996 | 637 | 449 | 590 | 1,282 | 5,737 | 3,490 | 1,866 | 1,994 | 1,110 | 932 | 658 | 511 | 19,255 |
| 1997 | 523 | 454 | 657 | 999 | 6,662 | 4,708 | 2,147 | 2,108 | 2,144 | 2,010 | | | |
| 1998 | | | | | | | | | | | 963 | 599 | |
| 1999 | 477 | 350 | 401 | 1,011 | 4,793 | 4,951 | 2,341 | 2,036 | 1,618 | 1,393 | 799 | 542 | 20,714 |
| 2000 | 524 | 527 | 753 | 2,179 | 6,817 | 2,318 | 1,823 | 1,664 | 1,023 | 845 | 8 | 479 | 18,961 |
| 2001 | 509 | 460 | 528 | 1,160 | 6,933 | 1,898 | 1,406 | 1,067 | 852 | 622 | 725 | 847 | 17,006 |
| 2002 | 657 | 489 | 642 | 2,365 | 2,385 | 1,059 | 824 | 595 | 547 | 663 | 614 | 523 | 11,362 |
| 2003 | 444 | 423 | 532 | 987 | 7,189 | 3,249 | 1,458 | 1,204 | 783 | 776 | 674 | 579 | 18,299 |
| 2004 | 518 | 468 | 650 | 1,327 | 7,058 | 2,994 | 1,477 | 1,365 | 1,073 | 950 | 722 | 653 | 19,256 |
| 2005 | 613 | 473 | 408 | 2,174 | 4,896 | 6,748 | 2,832 | 1,827 | 1,670 | 1,154 | 751 | 597 | 24,144 |
| 2006 | 427 | 525 | 589 | 1,956 | 8,162 | 2,248 | 1,655 | 1,783 | 1,294 | 2,806 | 728 | 1,214 | 23,387 |
| 2007 | 1,617 | 768 | 1,054 | 2,318 | 7,473 | 2,447 | 1,646 | 1,559 | 1,288 | 1,242 | 768 | 812 | 22,991 |
| 2008 | 596 | 515 | 587 | 1,200 | 5,813 | 8,698 | 2,247 | 1,804 | 1,499 | 802 | 88 | 12 | 23,859 |
| 2009 | 49 | 28 | 1,515 | 1,045 | 6,273 | 3,241 | 1,305 | 1,517 | 1,193 | 534 | 147 | 389 | 17,236 |
| 2010 | 146 | 214 | 60 | 1,007 | 4,652 | 4,067 | 1,444 | 1,415 | 937 | 642 | 824 | 711 | 16,119 |
| 2011 | 798 | 761 | 654 | 1,058 | 3,261 | 10,184 | 2,912 | 2,088 | 1,695 | 2,139 | 1,099 | 1,865 | 28,512 |
| 2012 | 739 | 735 | 912 | 3,821 | 3,161 | 1,475 | 1,167 | 912 | 750 | 724 | 1,301 | 617 | 16,315 |
| 2013 | 575 | 497 | 572 | 883 | 6,869 | 2,899 | 1,623 | 1,183 | 1,097 | 2,310 | 737 | 723 | 19,968 |
| 2014 | 717 | 532 | 609 | 1,957 | 6,409 | 4,226 | 1,662 | 1,630 | 1,293 | 2,033 | 770 | 675 | 22,513 |
| 2015 | 674 | 427 | 638 | 1,460 | 6,215 | 6,096 | 2,462 | 1,542 | 1,253 | 1,831 | 842 | 804 | 24,242 |
| 2016 | 748 | 668 | 816 | 1,595 | 6,172 | 6,128 | 2,198 | 1,459 | 2,080 | 1,488 | | | |
| Avg | 591 | 489 | 646 | 1,529 | 5,867 | 4,311 | 1,949 | 1,578 | 1,286 | 1,252 | 701 | 693 | 20,576 |
| Max | 1,617 | 768 | 1,515 | 3,821 | 8,928 | 10,184 | 4,358 | 2,135 | 2,144 | 2,806 | 1,301 | 1,865 | 28,512 |
| Min | 49 | 28 | 60 | 761 | 2,385 | 1,059 | 824 | 595 | 547 | 534 | 8 | 12 | 11,362 |

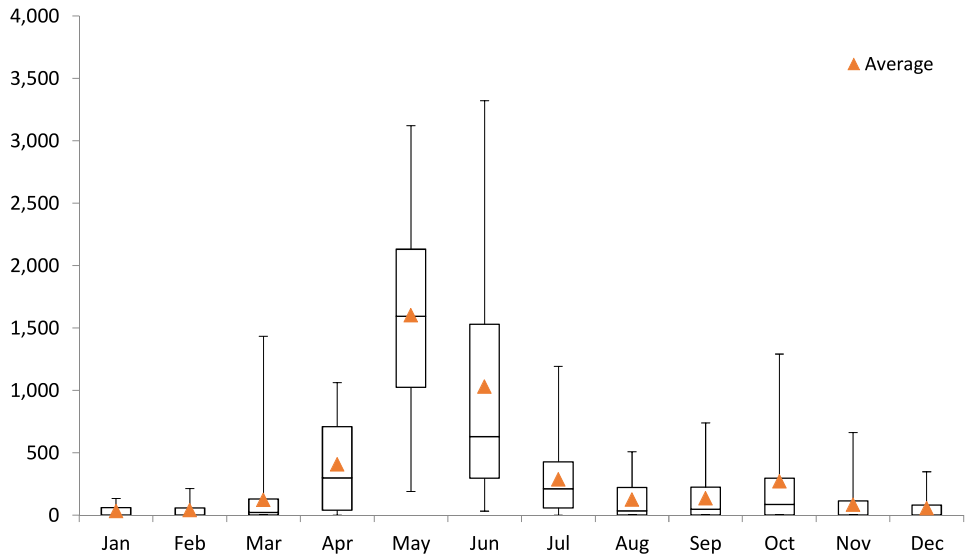



**Notes:** Streamflow and diversion records from CDWR CDSS database.
Kannah Creek flow computed as the sum of the diversions (Kannah Cr. Highline, Juniata Ditch Enl., and KC Flowline) plus the Kannah Creek near Juniata Enl. Gage.
Gray highlighted cells indicate that there are missing data in the month/year.

## Table 6-5b

### Monthly Diversion
### Juniata Ditch Enlarged
**1992 - 2016**
**(cfs)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 0 | 0 | 0 | 26 | 2,121 | 511 | 340 | 447 | 218 | 43 | 0 | 0 | 3,707 |
| 1993 | 0 | 0 | 0 | 42 | 705 | 1,975 | 440 | 0 | 0 | 0 | 0 | 0 | 3,162 |
| 1994 | 0 | 0 | 0 | 0 | 189 | 32 | 0 | 31 | 0 | 0 | 0 | 0 | 252 |
| 1995 | 0 | 0 | 0 | 0 | 556 | 1,237 | 422 | 0 | 0 | 0 | 0 | 0 | 2,215 |
| 1996 | 0 | 0 | 0 | 0 | 625 | 221 | 0 | 0 | 0 | 0 | 0 | 0 | 846 |
| 1997 | 0 | 0 | 0 | 0 | 1,175 | 190 | 0 | 0 | 284 | 0 | | | |
| 1998 | | | | | | | | | | | 0 | 0 | |
| 1999 | 0 | 0 | 0 | 22 | 1,495 | 522 | 0 | 0 | 0 | 170 | 284 | 125 | 2,618 |
| 2000 | 109 | 137 | 295 | 439 | 1,155 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 2,196 |
| 2001 | 0 | 0 | 0 | 165 | 2,512 | 161 | 212 | 177 | 65 | 67 | 0 | 0 | 3,359 |
| 2002 | 16 | 56 | 61 | 1,039 | 380 | 321 | 74 | 0 | 18 | 112 | 0 | 0 | 2,077 |
| 2003 | 7 | 17 | 18 | 120 | 2,905 | 376 | 324 | 14 | 0 | 0 | 0 | 0 | 3,780 |
| 2004 | 0 | 0 | 42 | 437 | 3,121 | 716 | 86 | 0 | 0 | 0 | 0 | 0 | 4,401 |
| 2005 | 0 | 0 | 0 | 928 | 1,875 | 2,389 | 809 | 40 | 0 | 0 | 0 | 0 | 6,040 |
| 2006 | 0 | 0 | 0 | 861 | 2,484 | 501 | 71 | 134 | 131 | 955 | 0 | 0 | 5,137 |
| 2007 | 0 | 0 | 37 | 993 | 2,513 | 640 | 293 | 213 | 123 | 116 | 101 | 151 | 5,180 |
| 2008 | 0 | 0 | 13 | 413 | 1,571 | 3,142 | 489 | 276 | 314 | 106 | 0 | 0 | 6,324 |
| 2009 | 0 | 0 | 1,434 | 710 | 1,387 | 1,315 | 207 | 507 | 441 | 142 | 128 | 347 | 6,618 |
| 2010 | 80 | 212 | 60 | 709 | 1,614 | 1,494 | 272 | 370 | 208 | 254 | 107 | 84 | 5,462 |
| 2011 | 101 | 119 | 110 | 185 | 836 | 3,321 | 1,193 | 426 | 314 | 940 | 285 | 217 | 8,048 |
| 2012 | 122 | 119 | 181 | 1,062 | 1,086 | 128 | 12 | 0 | 0 | 34 | 662 | 54 | 3,459 |
| 2013 | 41 | 37 | 26 | 131 | 1,865 | 617 | 134 | 39 | 30 | 1,291 | 68 | 75 | 4,355 |
| 2014 | 57 | 51 | 211 | 656 | 2,159 | 1,375 | 158 | 245 | 236 | 977 | 121 | 65 | 6,311 |
| 2015 | 65 | 59 | 220 | 155 | 2,064 | 1,632 | 840 | 2 | 124 | 837 | 138 | 139 | 6,275 |
| 2016 | 134 | 117 | 228 | 654 | 2,042 | 1,832 | 511 | 63 | 739 | 416 | | | |
| Avg | 30 | 38 | 122 | 406 | 1,601 | 1,029 | 287 | 124 | 135 | 269 | 82 | 55 | 4,174 |
| Max | 134 | 212 | 1,434 | 1,062 | 3,121 | 3,321 | 1,193 | 507 | 739 | 1,291 | 662 | 347 | 8,048 |
| Min | 0 | 0 | 0 | 0 | 189 | 32 | 0 | 0 | 0 | 0 | 0 | 0 | 252 |




**Notes:** Diversion records from CDWR CDSS database.
Gray highlighted cells indicate that there are missing data in the month/year.

## Table 6-5c

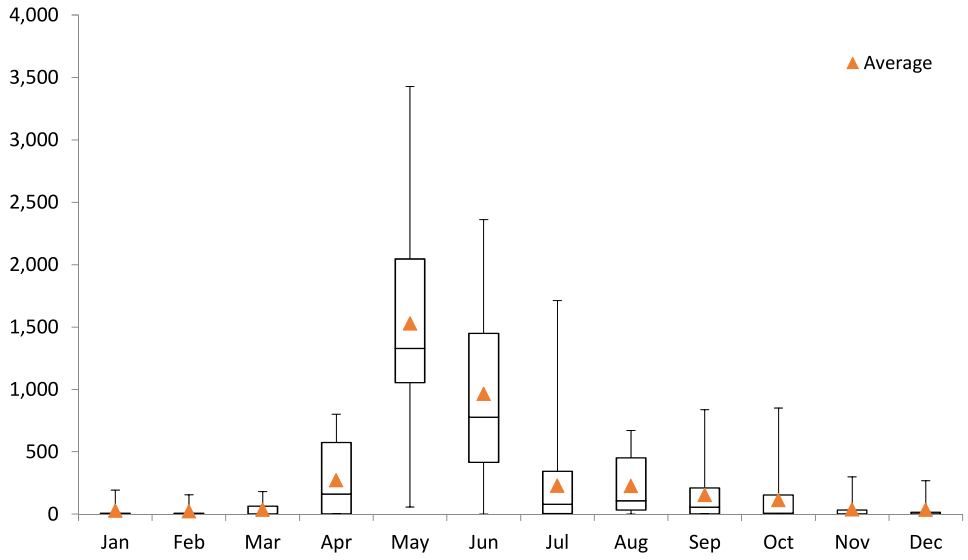
### Monthly Diversion

### Kannah Creek Highline Ditch

**1992 - 2016**

**(cfs)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 0 | 0 | 0 | 692 | 2,984 | 474 | 0 | 0 | 0 | 0 | 298 | 267 | 4,715 |
| 1993 | 192 | 134 | 123 | 606 | 737 | 1,450 | 313 | 507 | 356 | 220 | 200 | 184 | 5,023 |
| 1994 | 176 | 154 | 180 | 628 | 2,608 | 859 | 452 | 464 | 144 | 43 | 79 | 135 | 5,923 |
| 1995 | 123 | 116 | 133 | 195 | 1,296 | 2,183 | 1,710 | 616 | 836 | 363 | 0 | 0 | 7,573 |
| 1996 | 0 | 0 | 0 | 731 | 2,792 | 1,446 | 434 | 669 | 170 | 152 | 72 | 0 | 6,466 |
| 1997 | 0 | 0 | 143 | 562 | 2,770 | 2,262 | 452 | 498 | 450 | 850 | | | |
| 1998 | | | | | | | | | | | 37 | 0 | |
| 1999 | 0 | 0 | 22 | 125 | 1,136 | 2,359 | 454 | 446 | 408 | 337 | 26 | 29 | 5,342 |
| 2000 | 28 | 26 | 92 | 800 | 3,427 | 423 | 508 | 469 | 148 | 91 | 0 | 39 | 6,051 |
| 2001 | 50 | 46 | 63 | 242 | 2,504 | 317 | 190 | 210 | 324 | 157 | 118 | 122 | 4,344 |
| 2002 | 107 | 56 | 61 | 196 | 532 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 953 |
| 2003 | 0 | 0 | 0 | 8 | 1,209 | 877 | 59 | 120 | 18 | 27 | 0 | 0 | 2,318 |
| 2004 | 0 | 0 | 0 | 0 | 1,339 | 640 | 209 | 267 | 0 | 0 | 0 | 0 | 2,454 |
| 2005 | 0 | 0 | 0 | 422 | 1,188 | 1,774 | 286 | 342 | 423 | 282 | 0 | 0 | 4,718 |
| 2006 | 0 | 0 | 0 | 322 | 1,313 | 151 | 81 | 399 | 128 | 0 | 0 | 0 | 2,394 |
| 2007 | 0 | 0 | 0 | 119 | 1,347 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,466 |
| 2008 | 0 | 0 | 0 | 0 | 563 | 1,116 | 74 | 63 | 0 | 0 | 0 | 0 | 1,815 |
| 2009 | 0 | 0 | 0 | 0 | 1,765 | 495 | 7 | 68 | 30 | 11 | 0 | 0 | 2,377 |
| 2010 | 0 | 0 | 0 | 0 | 800 | 388 | 20 | 38 | 55 | 0 | 0 | 0 | 1,301 |
| 2011 | 0 | 0 | 0 | 0 | 250 | 1,915 | 81 | 91 | 0 | 0 | 0 | 0 | 2,337 |
| 2012 | 0 | 0 | 0 | 739 | 56 | 0 | 75 | 6 | 0 | 0 | 0 | 0 | 876 |
| 2013 | 0 | 0 | 0 | 0 | 1,477 | 526 | 0 | 0 | 0 | 127 | 0 | 0 | 2,129 |
| 2014 | 0 | 0 | 0 | 107 | 1,385 | 691 | 76 | 16 | 26 | 0 | 0 | 0 | 2,301 |
| 2015 | 0 | 0 | 0 | 2 | 1,892 | 1,417 | 0 | 87 | 55 | 0 | 0 | 0 | 3,453 |
| 2016 | 0 | 0 | 0 | 0 | 1,310 | 1,347 | 0 | 42 | 121 | 0 | | | |
| Avg | 28 | 22 | 34 | 271 | 1,528 | 963 | 228 | 226 | 154 | 111 | 36 | 34 | 3,469 |
| Max | 192 | 154 | 180 | 800 | 3,427 | 2,359 | 1,710 | 669 | 836 | 850 | 298 | 267 | 7,573 |
| Min | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 876 |




**Notes:** Diversion records from CDWR CDSS database.
Gray highlighted cells indicate that there are missing data in the month/year.

## Table 6-5d

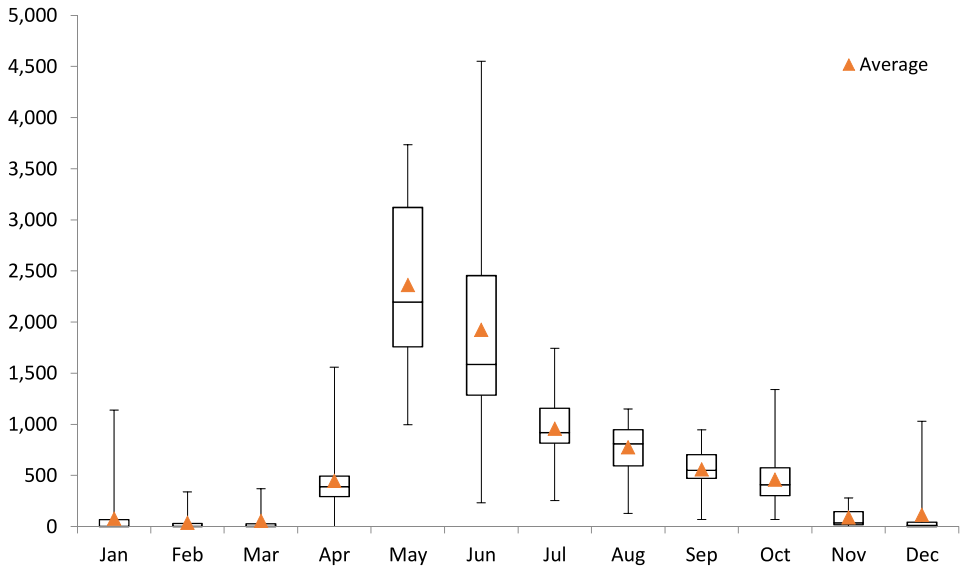
### Monthly Streamflow

### Kannah Creek at Juniata Enl.

**1992 - 2016**

**(cfs)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 0 | 0 | 0 | 492 | 3,337 | 1,861 | 918 | 800 | 619 | 403 | 279 | 387 | 9,097 |
| 1993 | 128 | 90 | 202 | 316 | 3,424 | 2,633 | 1,451 | 1,149 | 921 | 748 | 249 | 0 | 11,311 |
| 1994 | 0 | 0 | 76 | 329 | 2,723 | 1,272 | 706 | 484 | 304 | 408 | 0 | 0 | 6,302 |
| 1995 | 0 | 0 | 0 | 96 | 1,626 | 4,243 | 1,743 | 1,041 | 750 | 412 | 17 | 0 | 9,928 |
| 1996 | 0 | 0 | 0 | 248 | 1,806 | 1,354 | 951 | 844 | 475 | 300 | 0 | 0 | 5,979 |
| 1997 | 0 | 0 | 0 | 0 | 2,185 | 1,821 | 1,215 | 1,130 | 946 | 680 | 273 | 0 | 8,250 |
| 1998 | 0 | 0 | 0 | 292 | 3,301 | 2,785 | 1,402 | 1,061 | 753 | 480 | 258 | 0 | 10,332 |
| 1999 | 0 | 0 | 0 | 389 | 1,640 | 1,585 | 1,407 | 1,111 | 745 | 407 | 25 | 0 | 7,310 |
| 2000 | 0 | 0 | 0 | 476 | 1,755 | 1,350 | 835 | 715 | 412 | 275 | 8 | 0 | 5,825 |
| 2001 | 0 | 0 | 6 | 310 | 1,458 | 1,177 | 773 | 554 | 341 | 273 | 149 | 258 | 5,299 |
| 2002 | 99 | 0 | 19 | 666 | 993 | 230 | 252 | 129 | 68 | 67 | 13 | 0 | 2,537 |
| 2003 | 0 | 0 | 2 | 394 | 2,568 | 1,532 | 447 | 505 | 336 | 251 | 105 | 13 | 6,153 |
| 2004 | 0 | 0 | 0 | 426 | 2,035 | 1,134 | 520 | 503 | 472 | 395 | 27 | 10 | 5,520 |
| 2005 | 0 | 0 | 0 | 391 | 1,290 | 1,968 | 905 | 810 | 533 | 391 | 111 | 8 | 6,407 |
| 2006 | 0 | 2 | 0 | 268 | 3,734 | 1,030 | 819 | 741 | 571 | 1,340 | 144 | 844 | 9,492 |
| 2007 | 1,138 | 338 | 328 | 741 | 3,123 | 1,321 | 934 | 848 | 701 | 644 | 12 | 12 | 10,140 |
| 2008 | 3 | 0 | 5 | 355 | 3,363 | 3,960 | 1,157 | 945 | 689 | 476 | 49 | 12 | 11,014 |
| 2009 | 49 | 28 | 25 | 312 | 3,121 | 1,351 | 920 | 732 | 500 | 299 | 19 | 37 | 7,394 |
| 2010 | 67 | 2 | 0 | 272 | 2,194 | 2,052 | 814 | 884 | 484 | 325 | 27 | 5 | 7,123 |
| 2011 | 124 | 164 | 1 | 401 | 1,909 | 4,550 | 1,149 | 963 | 806 | 659 | 191 | 1,028 | 11,944 |
| 2012 | 48 | 124 | 369 | 1,557 | 1,546 | 811 | 506 | 357 | 217 | 198 | 0 | 0 | 5,734 |
| 2013 | 0 | 0 | 0 | 286 | 3,121 | 1,284 | 902 | 593 | 530 | 334 | 21 | 80 | 7,152 |
| 2014 | 145 | 17 | 16 | 757 | 2,596 | 1,750 | 873 | 876 | 564 | 572 | 120 | 14 | 8,300 |
| 2015 | 74 | 66 | 151 | 842 | 1,897 | 2,587 | 1,125 | 843 | 547 | 513 | 45 | 53 | 8,743 |
| 2016 | 46 | 59 | 152 | 514 | 2,319 | 2,454 | 1,155 | 755 | 699 | 587 | | | |
| Avg | 77 | 36 | 54 | 445 | 2,363 | 1,924 | 955 | 775 | 559 | 457 | 89 | 115 | 7,804 |
| Max | 1,138 | 338 | 369 | 1,557 | 3,734 | 4,550 | 1,743 | 1,149 | 946 | 1,340 | 279 | 1,028 | 11,944 |
| Min | 0 | 0 | 0 | 0 | 993 | 230 | 252 | 129 | 68 | 67 | 0 | 0 | 2,537 |

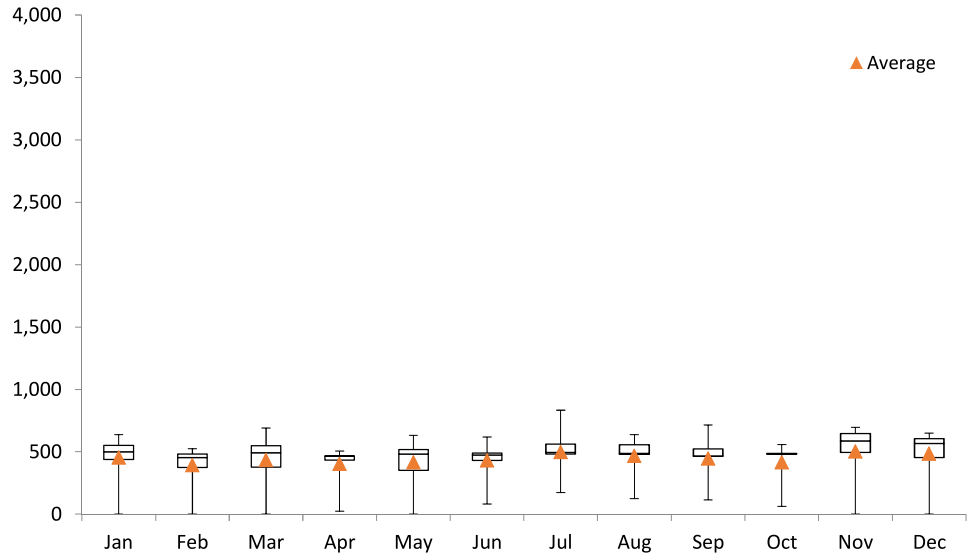



**Notes:** Streamflow records from CDWR CDSS database.
Gray highlighted cells indicate that there are missing data for a majority of the month.

## Table 6-5e

### Monthly Diversion
### Kannah Creek Flowline
**1992 - 2016**
**(cfs)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Ann |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1992 | 480 | 449 | 480 | 464 | 486 | 472 | 496 | 479 | 463 | 480 | 54 | 79 | 4,882 |
| 1993 | 69 | 31 | 65 | 85 | 66 | 184 | 313 | 149 | 114 | 70 | 525 | 529 | 2,200 |
| 1994 | 480 | 504 | 521 | 465 | 547 | 465 | 482 | 480 | 465 | 480 | 583 | 572 | 6,044 |
| 1995 | 544 | 496 | 553 | 471 | 482 | 480 | 483 | 478 | 465 | 480 | 627 | 637 | 6,195 |
| 1996 | 637 | 449 | 590 | 303 | 515 | 469 | 480 | 480 | 465 | 480 | 586 | 511 | 5,965 |
| 1997 | 523 | 454 | 514 | 438 | 532 | 435 | 481 | 480 | 465 | 480 | | | |
| 1998 | | | | | | | | | | | 668 | 599 | |
| 1999 | 477 | 350 | 379 | 474 | 522 | 485 | 480 | 480 | 465 | 479 | 465 | 388 | 5,445 |
| 2000 | 388 | 363 | 366 | 465 | 480 | 484 | 480 | 480 | 463 | 480 | 0 | 440 | 4,889 |
| 2001 | 459 | 414 | 459 | 444 | 459 | 243 | 230 | 125 | 121 | 125 | 458 | 467 | 4,005 |
| 2002 | 435 | 378 | 500 | 465 | 480 | 506 | 497 | 466 | 461 | 483 | 601 | 523 | 5,795 |
| 2003 | 438 | 406 | 511 | 465 | 507 | 465 | 628 | 566 | 430 | 498 | 569 | 566 | 6,048 |
| 2004 | 518 | 468 | 608 | 465 | 564 | 504 | 663 | 595 | 602 | 555 | 695 | 643 | 6,881 |
| 2005 | 613 | 473 | 408 | 433 | 543 | 618 | 832 | 636 | 714 | 480 | 640 | 589 | 6,979 |
| 2006 | 427 | 523 | 589 | 505 | 630 | 566 | 684 | 510 | 465 | 511 | 584 | 370 | 6,364 |
| 2007 | 479 | 430 | 689 | 465 | 489 | 486 | 420 | 497 | 464 | 482 | 654 | 648 | 6,205 |
| 2008 | 593 | 515 | 569 | 432 | 316 | 481 | 527 | 520 | 496 | 220 | 39 | 0 | 4,706 |
| 2009 | 0 | 0 | 55 | 23 | 0 | 80 | 171 | 209 | 221 | 82 | 0 | 5 | 847 |
| 2010 | 0 | 0 | 0 | 26 | 44 | 133 | 339 | 124 | 191 | 63 | 691 | 623 | 2,233 |
| 2011 | 573 | 478 | 543 | 472 | 266 | 397 | 489 | 608 | 575 | 540 | 622 | 620 | 6,183 |
| 2012 | 570 | 492 | 361 | 463 | 474 | 537 | 574 | 548 | 533 | 492 | 640 | 563 | 6,246 |
| 2013 | 534 | 460 | 545 | 466 | 407 | 472 | 587 | 551 | 537 | 558 | 648 | 567 | 6,332 |
| 2014 | 515 | 464 | 382 | 437 | 268 | 410 | 556 | 494 | 467 | 483 | 529 | 596 | 5,601 |
| 2015 | 535 | 302 | 268 | 460 | 362 | 459 | 497 | 610 | 527 | 481 | 659 | 611 | 5,770 |
| 2016 | 568 | 492 | 436 | 426 | 501 | 494 | 532 | 600 | 522 | 485 | | | |
| Avg | 452 | 391 | 433 | 400 | 414 | 430 | 497 | 465 | 445 | 415 | 501 | 485 | 5,264 |
| Max | 637 | 523 | 689 | 505 | 630 | 618 | 832 | 636 | 714 | 558 | 695 | 648 | 6,979 |
| Min | 0 | 0 | 0 | 23 | 0 | 80 | 171 | 124 | 114 | 63 | 0 | 0 | 847 |




**Notes:** Diversion records from CDWR CDSS database (structure named Grand Junction Flowline and Water Works).
Gray highlighted cells indicate that there are missing data for a majority of the month.