CITY OF Grand Junction COLORADO

LETTER OF INTENT

Date: May 29, 2018

Company: DiNatale Water Consultants

Project: Professional Services for Water Supply Modeling for City of Grand Junction (RFP-4524-18-DH)

Based upon review of the proposals received, and interviews held, for Professional Services for Water Supply Modeling for City of Grand Junction (RFP-4524-18-DH), your company has been selected as the preferred proposer of this solicitation process. It is the intent of the City of Grand Junction to award the aforementioned contract to your company as is listed in the RFP documents and your proposal response.

This contract must be approved by the City Manager prior to award and a contract being issued.

Please feel free to contact me with any questions at 970-244-1545.

Thank you and Best Regards

Duane Hoff Jr., Senior Buyer

CITY OF GRAND JUNCTION, COLORADO

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CONTRACT

This CONTRACT made and entered into this 18th day of June, 2018 by and between the **City of Grand Junction, Colorado,** a government entity in the County of Mesa, State of Colorado, hereinafter in the Contract Documents referred to as the "Owner" and **DiNatale Water Consultants, Inc.** hereinafter in the Contract Documents referred to as the "Firm."

WITNESSETH:

WHEREAS, the Owner advertised that sealed Responses would be received for furnishing all labor, supplies, materials, and everything necessary and required for the Project described by the Contract Documents and known as **Professional Services for Water Supply Modeling for City of Grand Junction RFP-4524-18-DH**.

WHEREAS, the Contract has been awarded to the above named Firm by the Owner, and said Firm is now ready, willing and able to perform the Services in accordance with the Contract Documents;

NOW, THEREFORE, in consideration of the compensation to be paid the Firm, the mutual covenants hereinafter set forth and subject to the terms hereinafter stated, it is mutually covenanted and agreed as follows:

ARTICLE 1

Contract Documents: It is agreed by the parties hereto that the following list of instruments, drawings, and documents which are attached hereto, bound herewith, or incorporated herein by reference constitute and shall be referred to either as the "Contract Documents" or the "Contract", and all of said instruments, drawings, and documents taken together as a whole constitute the Contract between the parties hereto, and they are fully a part of this agreement as if they were set out verbatim and in full herein:

The order of contract document governance shall be as follows:

a. The body of this contract agreement
b. Solicitation Documents for the Project; **Professional Services for Water Supply Modeling for City of Grand Junction;**
c. Firms Response to the Solicitation
d. Services Change Requests (directing that changed services to be performed);

ARTICLE 2

Definitions: The clauses provided in the Solicitation apply to the terms used in the Contract and all the Contract Documents.

ARTICLE 3

Contract Services: The Firm agrees to furnish all labor, supplies, materials, and all that is necessary and required to complete the tasks associated with the Services described, set forth, shown, and included in the Contract Documents as indicated in the Solicitation Document.

ARTICLE 4

Contract Price and Payment Procedures: The Firm shall accept as full and complete compensation for the performance and completion of all of the Services specified in the Contract Documents, the not to exceed price of **Thirty Thousand Nine Hundred Ninety Three and 00/100 Dollars ($30,993.00).** If this Contract contains unit price pay items, the Contract Price shall be adjusted in accordance with the actual quantities of items completed and accepted by the Owner at the unit prices quoted in the Solicitation Response. The amount of the Contract Price is and has heretofore been appropriated by the Grand Junction City Council for the use and benefit of this Project. The Contract Price shall not be modified except by Change Order or other written directive of the Owner. The Owner shall not issue a Change Order or other written directive which requires additional services to be performed, which services causes the aggregate amount payable under this Contract to exceed the amount appropriated for this Project, unless and until the Owner provides Firm written assurance that lawful appropriations to cover the costs of the additional services have been made.

Unless otherwise provided in the Solicitation, monthly partial payments shall be made as the Services progresses. Applications for partial and Final Payment shall be prepared by the Firm and approved by the Owner in accordance with the Solicitation.

ARTICLE 5

Contract Binding: The Owner and the Firm each binds itself, its partners, successors, assigns and legal representatives to the other party hereto in respect to all covenants, agreements and obligations contained in the Contract Documents. The Contract Documents constitute the entire agreement between the Owner and Firm and may only be altered, amended or repealed by a duly executed written instrument. Neither the Owner nor the Firm shall, without the prior written consent of the other, assign or sublet in whole or in part its interest under any of the Contract Documents and specifically, the Firm shall not assign any moneys due or to become due without the prior written consent of the Owner.

ARTICLE 6

Severability: If any part, portion or provision of the Contract shall be found or declared null, void or unenforceable for any reason whatsoever by any court of competent jurisdiction or any governmental agency having the authority thereover, only such part, portion or provision shall be effected thereby and all other parts, portions and provisions of the Contract shall remain in full force and effect.

IN WITNESS WHEREOF, City of Grand Junction, Colorado, has caused this Contract to be subscribed and sealed and attested in its behalf; and the Firm has signed this Contract the day and the year first mentioned herein.

The Contract is executed in two counterparts.

CITY OF GRAND JUNCTION, COLORADO

DocuSigned by:
By: Duane Hoff Jr., Senior Buyer – City of Grand Junction 6/18/2018 | 14:01 MDT
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Duane Hoff Jr., Senior Buyer Date

DiNatale Water Consultants, Inc.

DocuSigned by:
By: Kelly DiNatale 6/18/2018 | 13:32 MDT
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Kelly DiNatale President Date

CITY OF Grand Junction COLORADO

PROPOSAL

Water Supply Modeling for City of Grand Junction

DiNatale WATER CONSULTANTS

dinatalewater.com

CONTENTS

SECTION A Cover Letter

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

May 10, 2018

RE: Request for Proposal Number RFP-4524-18-DH
Professional Services for Water Supply Modeling for City of Grand Junction

Dear Mr. Hoff,

DiNatale Water Consultants is pleased to present this proposal for the City of Grand Junction Water Supply Modeling Project (Request for Proposal number RFP-4524-18-DH). We look forward to collaborating with the City to develop a water supply model that is able to determine the City's current firm yield and be flexible enough to grow with the City and consider a variety of future water supply planning scenarios. A partnership-driven firm with exceptional professional experience and depth, DiNatale Water Consultants would accomplish this goal through implementation of the plan set forth in this proposal.

The primary contact person for this project will be:

Matt Bliss, PE
2919 Valmont Road, Suite 204
Boulder, CO 80301
303-709-7044
matt@dinatalewater.com

In addition, Kelly DiNatale and Arista Shippy will be authorized to make presentations on behalf of the firm.

The DiNatale Water Plan:

Effective planning is key when it comes to developing, protecting, and putting water resources to beneficial use and our company delivers extraordinary planning know-how and follow-through. DiNatale Water Consultants has worked on water resource management projects that range from a single water user to large water providers, and regional watersheds. With over nine years of experience as a firm, and decades of individual experience, we specialize in developing tools and plans that are designed for our end-users and that can provide Grand Junction with a viable long-term planning tool that can and will be implemented and not simply collect dust on a shelf. We offer our clients the benefit of decades of experience in water planning

on multiple scales, from local to state levels and practical planning guidance to help make the most of your valuable water assets. We provide the critical framework to guarantee your project needs are fulfilled.

Grand Junction has a long history of developing the water resources needed to serve its citizens. With the recent completion of the Water Supply Summary report (April 2018), this modeling project is a logical next step in the City's planning, outlook, and stewardship of its water resources and service to its citizens. With current technology, there are many choices for water supply modeling. Several different entities have modeled various aspects of the hydrology in and around Grand Junction using models such as RiverWare, StateMod, and Excel spreadsheet models. Each model platform has its advantages and disadvantages, and typically is chosen for the needs of the entity performing the modeling.

Grand Junction's modeling needs could be fulfilled with a number of different modeling platforms. DiNatale Water is experienced with several different software platforms, and believe ultimately, the decision on a modeling platform should be made by the City. We will provide our insights on the relative strengths and weaknesses of different platforms to be able to meet Grand Junction's needs. At DiNatale Water, our goal is help select a model that will be used—not simply developed for a single analysis and then unused for one or more reasons. To that end, we believe it is important to make the model selection collaboratively. Our experience and level of proficiency in developing models allows us to submt a cost proposal while allowing the City to make an informed decision on the modeling platform during the initial project stage.

Rather than focusing on the modeling platform, this proposal focuses on DiNatale Water's expertise in water supply planning, including years of direct staff experience for a major municipal water provider, extensive modeling experience for municipal and non-municipal clients, experience with daily operations of complex raw water supply systems, and evaluation of risk. This combination of modeling proficiency and real-world experience allows us to bring insights and conclusions to the system that may not come to light by a model-heavy team that lacks operational experience, or by an operations-driven team that may not be able to leverage the benefits possible with a computer model.

To accomplish this proposed approach, we will rely on our most valuable assets—our people.

The DiNatale Water Team:

DiNatale Water Consultants is an exceptional small firm with deep expertise in all areas of water resources planning and engineering. Located at the foot of the Rocky Mountains in Boulder, Colorado, we offer our clients an unusual combination of advanced analytical capabilities with a deep pragmatism that traces its roots to the challenges of water in the western United States. Company founder Kelly DiNatale combines his extensive background in municipal water systems with the skill sets of a carefully assembled staff of cutting-edge water professionals.

Later in this proposal, under Section B, you will find detailed information about our clients' projects and will be introduced to the DiNatale Water Consultants team members. We invite you to contact our clients included as references in Section D to hear how DiNatale Water has helped them achieve similar goals to those of Grand Junction. We are proud to say that our clients are genuinely pleased to talk about their valuable relationships with DiNatale Water Consultants.

For the Grand Junction project, our highly qualified team will be led by Mr. Matt Bliss, PE. Mr. Bliss has been involved in system modeling for several municipal water providers, integrating water rights evaluations,

historical yield analyses, infrastructure size and location options water, reuse, environmental effects and conservation into modeling scenarios. In addition, our firm's founder, Kelly DiNatale, will bring his many years of experience and expertise to the project in a technical oversight capacity. Much of the model construction and testing will be carried out by DiNatale Water's group of capable engineers: Arista Shippy, Chris Newton, and Becca Evans. We invite you to learn more about our team in the qualifications, experience, and credential section of this proposal (Part B).

Our team is looking forward to the opportunity to work with you on this project. Thank you in advance for your thoughtful consideration of our proposal.

Sincerely,

Matt Bliss, PE
DiNatale Water Consultants

SECTION B Qualifications / Experience / Credentials

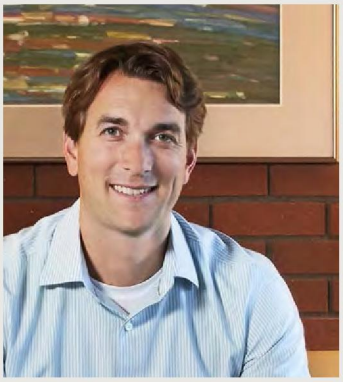
DiNatale Water was founded in 2009 by Kelly DiNatale after nearly thirty years of water resources engineering experience in the City of Westminster's water resources and treatment division and as a Principal at global consulting firm, CDM. Since its inception, DiNatale Water has grown to a seven-person highly specialized water resources firm that combines cutting-edge water analysis techniques with the deep, practical experience of our company founder. We view helping our clients as not just a technical challenge but also a creative one. Our team is well-balanced—real-world experience combined with contemporary planning, assessment, modeling, and water accounting skills. We strive to develop close working relationships with our clients to best maximize our technical expertise with the depth of knowledge and experience they bring to their projects. We are proud of the open and supportive relationships we develop with clients because that fosters timely and open communication and synergy to help them achieve their goals. In fact, most of our clients come to view us as extensions of their staff and feel comfortable with asking questions, requesting assistance, and providing input even on short notice.

We strive to develop close working relationships with our clients to best maximize our technical expertise with the depth of knowledge and experience they bring to their projects.

DiNatale Water has extensive experience with a variety of modeling platforms, such as RiverWare, MODSIM, StateMod, and Excel-based custom modeling and others. Although the fundamentals of hydrologic modeling are constant regardless of the modeling platform, we are able to leverage each platform's advantages and are aware of the disadvantages in order to provide our clients with tools that work for them and their systems.

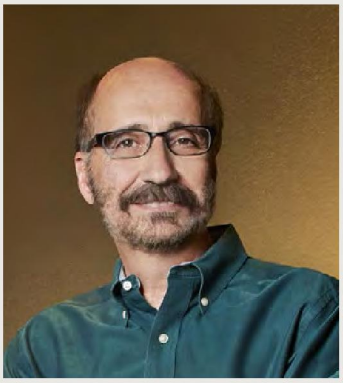
Below you will find a brief introduction to the DiNatale Water team members. Full resumes for each member are included at the end of this section. After the staff introductions, we have included several project descriptions that provide a glimpse into the combination of real-world experience, modeling expertise, and level of client service you can expect from DiNatale Water on the Grand Junction water supply modeling project.

B.1 STAFF INTRODUCTIONS



Matt Bliss, PE
Senior Water Resources Engineer

Mr. Bliss will lead our team for the Grand Junction project. Mr. Bliss began his career in water resource engineering 13 years ago with an intensive groundwater modeling effort that simulated the interaction of well pumping depletions with a large municipal provider's conjunctive use of surface water and groundwater resources. Mr. Bliss has led or been involved in system modeling projects for several municipal water providers on the Front Range of Colorado, integrating water rights evaluations, historical yield analyses, infrastructure size and location options water, reuse, environmental effects and conservation into modeling scenarios. Mr. Bliss has led or been involved in the modeling aspects of many of the projects included in the project descriptions below and also included in the Additional Data section of this proposal (Section F), including the ECCV Northern Water Supply Project, the ACWWA FLOW project, United Water and Sanitation District water supply projects, water development plans for new growth in Larimer County and Weld County, the modeling for the Halligan-Seaman and NISP Environmental Impact Statements, climate change studies related to water resources and several water rights cases in the South Platte River basin. Mr. Bliss has provided expert testimony in recent change of use cases and offers invaluable experience in assessing and understanding the value of water rights and utilizing or constructing the best-available tools to plan for the infrastructure required to put the water to beneficial use. As a former high school math teacher, Mr. Bliss is able to effectively communicate complex modeling topics and results to a wide variety of people who may not have expertise in hydrologic modeling but are in positions to make decisions based on the modeling results.



Kelly DiNatale
Founder and President

Mr. DiNatale will provide project guidance and assistance. Much of Mr. DiNatale's early experience was gained on Clear Creek and in Jefferson County where he was involved in solving multiple water rights and shared-resources conflicts among the multiple users in that watershed. He has been involved in optimization of infrastructure operations including reservoirs and irrigation ditches, and in-stream flow evaluation around the state. Mr. DiNatale has led or provided guidance and assistance on the projects listed in the DiNatale Water Consultants references section of this proposal (Section D), affording all company clients his unparalleled and long-term experience and knowledge of developing water resources management plans, infrastructure design, construction, and operations and maintenance. Mr. DiNatale excels in and loves the challenge of finding unique solutions for water operations issues to produce multiple benefits for agriculture, environmental, and recreational purposes. He was the lead consultant for the Rivanna Water and Sewer Authority Reservoir Water Quality Management Plan work, Rio Grande Basin Implementation Plan, Rio Grande Cooperative Project and the water rights inventory and operational plan for Colorado Parks and Wildlife's water rights in the Rio Grande Basin.

Arista Shippy
Water Resources Engineer

Ms. Shippy has expertise in reservoir and water supply system operations. She played an integral part in DiNatale Water's development of the system modeling for the ECCV, ACWWA and United water supply projects and the Rio Grande Basin Implementation Plan, one of the nine basin plans that are part of the Colorado State Water Plan, during which time she worked closely with the Basin's environmental and recreational subcommittee to evaluate water needs, opportunities and constraints, as well as other projects to be implemented as part of that Basin's Plan. Ms. Shippy provides water rights evaluation, development of water court applications and substitute water supply plans, and development and analysis of model results for projects including the Northern Water Supply Project. She is the lead for a current water supply project for new development in Weld County, and has orchestrated the water resources plan for the development and integration into an existing municipal system. Ms. Shippy analyzed CPW's water rights obligations and then developed the RiverWare model for the Rio Grande Cooperative Project.

Becca Evans
Water Resources Engineer

Ms. Evans joined the DiNatale Water team in 2017 and leads the daily operations for a major water utility in the South Platte River basin. Ms. Evans manages daily well pumping depletions, return flow obligations, reservoir levels and water delivery rates on a daily basis, responding to changing administrative calls as necessary. Her graduate experience modeling and streamflow forecasting in Idaho can be directly applied to similar scenarios in Colorado.

Chris Newton
Geologist

Mr. Newton has expertise in a wide variety of models, including water supply and operational modeling, geospatial analysis, groundwater evaluations, watershed assessment, and reservoir water quality management. Mr. Newton helped develop the final recommendations for the Rivanna reservoir management project. Instrumental in developing groundwater recharge sites to meet water rights obligations, Mr. Newton regularly participates in field studies, including groundwater monitoring and surface water measurement field efforts.

B.2 PROJECTS

The project descriptions below provide glimpse into the combination of real-world experience, guided by modeling expertise, and level of client service you can expect from DiNatale Water on the Grand Junction firm yield modeling project.

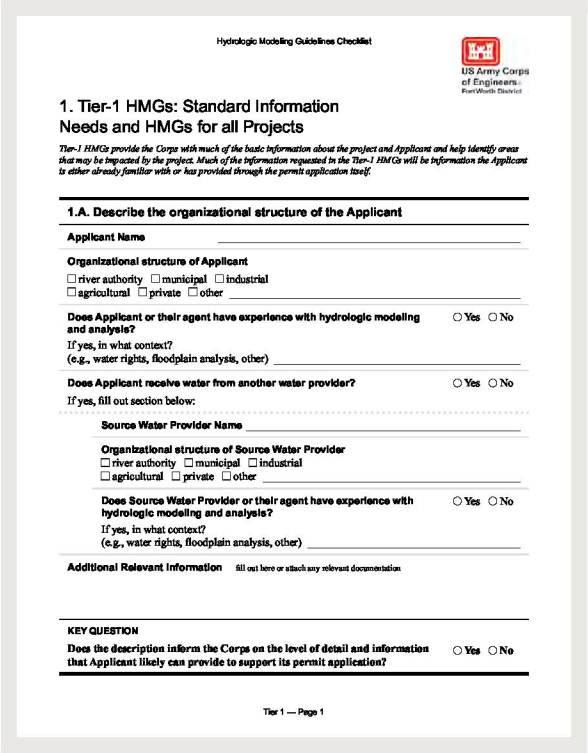
East Cherry Creek Valley Northern Water Supply Project and Arapahoe County Water and Wastewater Authority FLOW

DiNatale Water is assisting the East Cherry Creek Water and Sanitation District (ECCV) and Arapahoe County Water and Wastewater Authority (ACWWA) in the south Metro Denver area to develop a permanent renewable water supply through the development and implementation of an innovative alluvial aquifer recharge and augmentation program. These two water providers were reliant on a non-renewable groundwater source and were facing significant reductions in its existing water supply due to declining groundwater levels and reduced well yields. This fast-track project commenced delivery of a renewable water supply to East Cherry Creek Valley in 2006 and Arapahoe County in 2013. Project work includes:

- Development of a water supply project to deliver over 6,000 AFY of renewable South Platte River supply to the south Denver metro area
- Conduct modeling to assess water rights yield, exchange potential, pumping / augmentation strategies, and infrastructure siting and sizing
- Development of water resources management plan and conduct daily operations of water system
- Provide expertise and expert opinions in water court applications, substitute water supply plans, augmentation plans, groundwater modeling, and operations studies
- Provide water rights inventory, yield analysis, review of previous change cases in ditches with share ownership, attend ditch company meetings on behalf of ECCV and ACWWA
- Assess water infrastructure and provide recommendations for infrastructure needs and repairs
- Prepare water accounting to the Colorado Division of Water Resources and meet regularly with Division staff and water commissioners

Work on the ECCV Northern Water Supply Project and the ACWWA FLOW Project is ongoing. We are serving as ECCV and ACWWA's water resources operations and planning engineer.

Hydrologic Modeling Guidelines for Regulatory Permit Actions



Hydrologic Modeling Guidelines Checklist

US Army Corps of Engineers
Fort Worth District

1. Tier-1 HMGs: Standard Information Needs and HMGs for all Projects

Tier-1 HMGs provide the Corps with much of the basic information about the project and Applicant and help identify areas that may be impacted by the project. Much of the information requested in the Tier-1 HMGs will be information the Applicant is either already familiar with or has provided through the permit application itself.

1.A. Describe the organizational structure of the Applicant

Applicant Name _____

Organizational structure of Applicant
☐ river authority ☐ municipal ☐ industrial
☐ agricultural ☐ private ☐ other _____

Does Applicant or their agent have experience with hydrologic modeling and analysis? ○ Yes ○ No
If yes, in what context?
(e.g., water rights, floodplain analysis, other) _____

Does Applicant receive water from another water provider? ○ Yes ○ No
If yes, fill out section below:

Source Water Provider Name _____

Organizational structure of Source Water Provider
☐ river authority ☐ municipal ☐ industrial
☐ agricultural ☐ private ☐ other _____

Does Source Water Provider or their agent have experience with hydrologic modeling and analysis? ○ Yes ○ No
If yes, in what context?
(e.g., water rights, floodplain analysis, other) _____

Additional Relevant Information fill out here or attach any relevant documentation

KEY QUESTION
Does the description inform the Corps on the level of detail and information that Applicant likely can provide to support its permit application? ○ Yes ○ No

Tier 1 — Page 1

DiNatale Water developed at set of hydrologic modeling guidelines (HMGs) for regulatory permit actions for the US Corps of Engineers, Fort Worth District. The HMGs are designed to assist permit Applicants and Corps project managers in identifying hydrologic analysis and modeling needs and requirements associated with water supply and management permit applications. The project was motivated by frequent differences in expectations between the Corps and its requirements for hydrologic modeling, and water providers who may have already performed hydrologic modeling to obtain a water right or determine the size of a proposed project.

The HMGs are intended to add predictability and transparency to the aspects of the permitting process related to hydrologic modeling. The Corps Regulatory program evaluates hydrologic conditions to inform aquatic resource impacts analyses associated with water supply permit applications. Hydrologic analysis and modeling can also be used to develop and support the project need and define the project purpose, determine practicability of alternatives, and evaluate avoidance and minimization opportunities as well as compensatory mitigation strategies.

The Corps evaluates permits for various actions including water supply and management projects involving discharges of dredge and/or fill material into waters of the United States. The permit evaluation process must address the requirements of the National Environmental Policy Act (NEPA), Section 404 of the Clean Water Act, Public Interest Review as well as other applicable statutes. To satisfy the requirements associated with these statutes, the Corps normally develops Environmental Assessments (EA) or Environmental Impact Statements (EIS) to disclose the effects, both detrimental and beneficial, caused by its permit decisions. The level of analysis required to evaluate potential impacts is determined on a case-by-case basis and can be influenced by the size and scope of the project, the natural and human resources potentially impacted, and public and agency input provided during public scoping opportunities as well as coordination efforts.

The project deliverables included a checklist that allows Applicants and Corps regulators to quickly discern and discuss the important aspects of the hydrologic modeling specific to a proposed project. The project also resulted in a technical report that describes the details and rationale support each of the HMGs and several case studies where application of the HMGs would have helped decrease costs and delays that occurred on these projects. DiNatale Water also conducted two full-day workshops—one to Corps project managers in the Fort Worth District office and another to representatives of several key water providers, environmental non-governmental organizations and other regulatory agencies in Texas.

United Water and Sanitation District – Water Supply, Water Quality, Infrastructure and Operations Planning

DiNatale Water is assisting the United Water and Sanitation District (United) in planning and implementation of water supply projects to the meet the needs of various Colorado water providers. The District's goals are to facilitate the acquisition, diversion, storage, carriage delivery, treatment, transmission, distribution and provision of water to those who voluntarily choose to use the system. Activities include:

- Infrastructure planning and daily operational support ECCV's Northern Project and ACWWA Flow projects (described above) delivered through United infrastructure
- Development of water resources management plan for post-water right transfer farming operations
- Surface water, groundwater resource analysis and planning for industrial use
- Provide expertise and expert opinions in water court applications, substitute water supply plans, augmentation plans, groundwater modeling, and operations studies

- Assess water infrastructure and provide recommendations for infrastructure needs and repairs
- Prepare water accounting to the Colorado Division of Water Resources and meet regularly with Division staff and water commissioners
- Assist in recommendations for proposed legislative changes to current water law

Work on the United Water Supply, Water Quality, Infrastructure and Operations Planning began in 2009 and is ongoing. We are serving as United's water resources operations and planning engineer.

Halligan-Seaman and Northern Integrated Supply Project Environmental Impact Statement

The Poudre River basin is one of the most heavily-administered rivers in Colorado. At the request of the US Army Corps of Engineers, DWC developed a complex hydrologic modeling process to simulate water rights yields and realistic flows for the Corps permitting process. This entailed:

- Rapid learning of the basin water rights, exchanges and understanding the impacts of increasing urbanization
- Work with six inter-related models using MOSDIM and Excel-based platforms
- Development of the draft hydrologic model review report for NEPA EIS
- Collaboration with decision makers to modify EIS participant hydrology and water allocation models

DiNatale Water's work resulted in a more complete understanding of the hydrologic system for use in the permitting process. DiNatale Water's work resulted in a technically-defensible modeling process for use in three large water supply projects in northern Colorado.

South Platte Decision Support System – St. Vrain Basin

Teamed with Brown and Caldwell, DiNatale Water formulated a StateMod surface water model of the St. Vrain Basin, including Lefthand Creek, as part of the South Platte Decision Support System (SPDSS) model. Our data-centered approach incorporated:

- statistics from the State's hydrologic database, HydroBase,
- consumptive use analyses, and
- other evidence collected through SPDSS over the past decade.

The SPDDS StateMod model has been integrated with those of other major watersheds in the South Platte Basin to form a viable basin-wide planning tool, helping water users and administrators:

- evaluate alternative water-administration strategies,
- improve water system operations, and
- facilitate regional water resource planning in light of impending climate change.

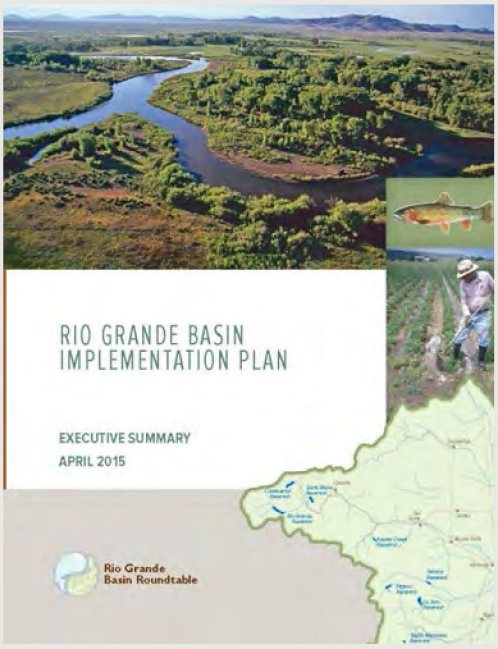
Rio Grande Cooperative Project – Joint Study between Colorado Parks and Wildlife (CWP) and San Luis Valley Irrigation District (SLVID)

The San Luis Valley Irrigation District (Irrigation District) and Colorado Parks and Wildlife (CPW), with the financial assistance of the Colorado Water Conservation Board (CWCB) developed the Rio Grande Cooperative Project. The CWCB provided grants and loans that will be used to fund the rehabilitation of Rio Grande and Beaver Park Reservoirs. DiNatale Water Consultants is serving as the project manager on the Rio Grande Cooperative Project, a collaborative effort to develop operational scenarios designed to optimize the operations of Rio Grande and Beaver Park Reservoirs to enhance yields for the Irrigation District, CPW and other water users and provide for environmental and recreational enhancements. DiNatale Water developed a model for the project which involved the following:

- Inventoried CPW's water rights, analyzed yields, timing and delivery locations of rights and obligations to in-basin users to preserve conservation pools in lakes and reservoirs
- Determined amount and timing of current surplus supplies and potential uses by CPW for increased reliability during extended draughts
- Developed a RiverWare water-rights-and-operations model of the mainstem Rio Grande in Colorado for re-operations of Rio Grande and Beaver Park reservoirs for multiple benefits and to maximize yields of in-basin and transmountain water supplies
- Assisted in formalizing the management of multiple use operations to benefit water deliveries for in-stream flow enhancement, channel maintenance, recreation, terrestrial and aquatic wildlife habitat, irrigation, augmentation, municipal and industrial, and other beneficial water uses including Compact compliance
- Identified optimal storage account volumes in Rio Grande Reservoir for CPW and other water users
- Evaluated impacts of voluntary releases to meet Colorado Water Conservation Board instream flow requirements

Rio Grande Basin Plan Model

As part of the CWCB's Colorado Water Plan, DiNatale Water Consultants was selected to coordinate efforts of the Rio Grande Basin Roundtable and prepare the Rio Grande Basin Implementation Plan. DiNatale Water expanded the RiverWare planning model of the Rio Grande that was developed for the Rio Grande Cooperative Project, by adding the Conejos River system and related water rights and operations. The broader model was used to:



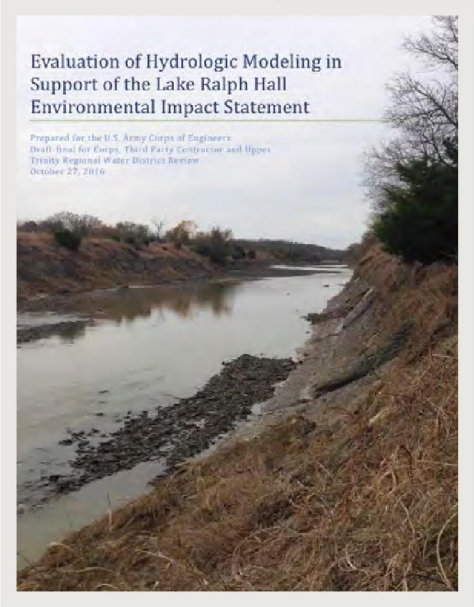
- Assess the current state of operations in the Rio Grande Basin,
- Plan for changes in hydrology due to climate change, forest fire, beetle kill, and dust on snow, and
- Evaluate potential projects that will maximize Colorado's use of flow under the Rio Grande Interstate Compact.

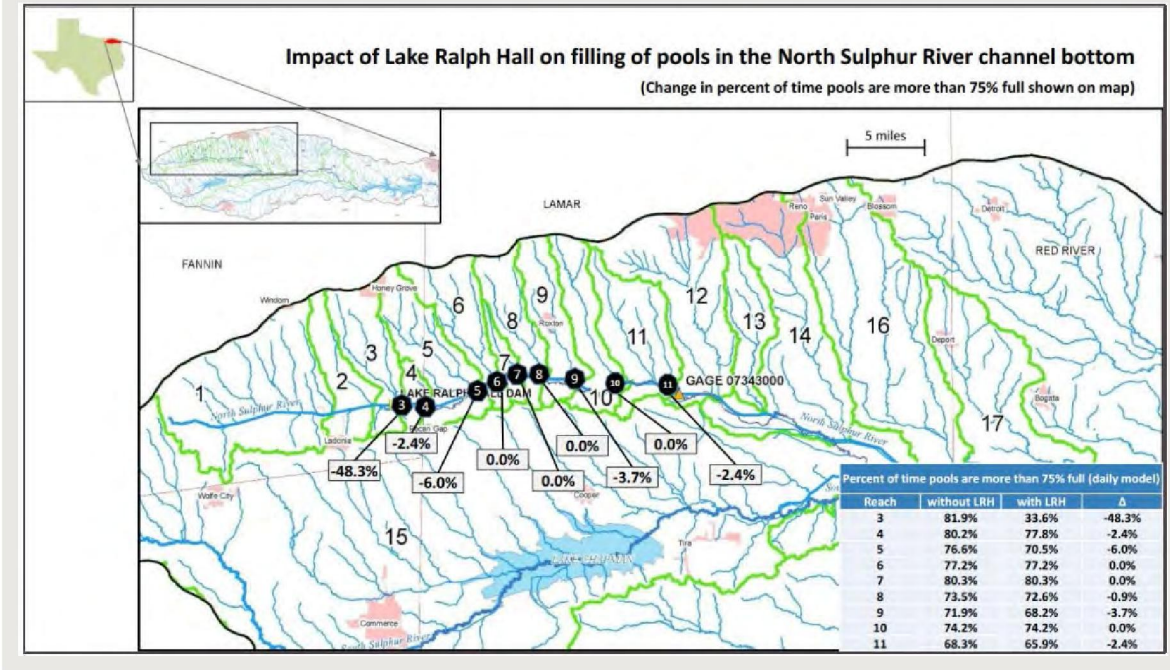
The model simulates over 500 water rights diversions under the prior appropriation system, includes:

- instream flow rights,
- reservoir storage and releases using rule-based logic,
- administrative conditions on the river, and
- consumption and return flows by agricultural users.

Lake Ralph Hall EIS Modeling

DiNatale Water was hired by the Upper Trinity Regional Water District (near Dallas, Texas) to assist in the hydrologic modeling performed to support an Environmental Impact Statement (EIS) sought for the proposed 180,000 AF Lake Ralph Hall located in northeastern Texas. DiNatale Water evaluated the suitability of existing hydrologic modeling for the Corps' effects analysis for the EIS, including the State of Texas' Water Availability Model (WAM), a Corps-developed RiverWare model designed for flood control purposes, and also developed new modeling and analysis to assess potential impacts to the aquatic habitat downstream of the proposed reservoir. Modeling work included evaluation of existing models and integrating model output and utilizing model input to efficiently provide an analysis of impacts to aquatic habitat.



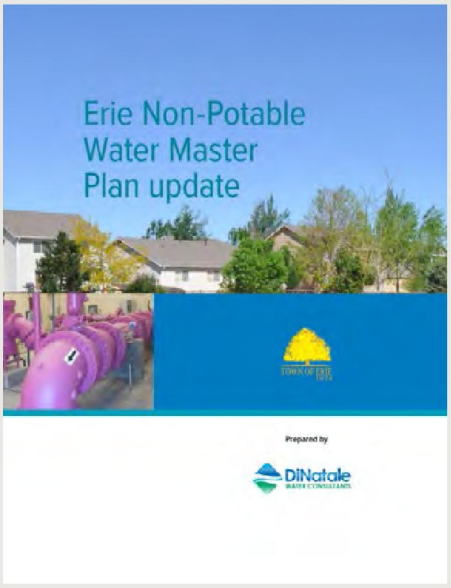


Grand River Dam Authority (GRDA) – Basin Planning and Yield Model

In support of the Grand River Comprehensive Water Plan, DiNatale Water is developing a multi-reservoir yield and management model for the Grand River Basin, a tributary of the Arkansas River, based on the existing US Army Corps of Engineers Arkansas River RiverWare Model. This effort is ongoing and includes the following:

- Characterization of key features and constraints within the existing USACE Arkansas River model
- Development of the existing Arkansas River operations model to allow for modeling of yield and supply availability of reservoirs operated by GRDA
- Update model logic and operations to incorporate refined demands, contracts, permits, estimated consumptive use and return flows, and information from other GRDA planning efforts
- Analysis and documentation of initial model output including yield, reliability, and availability

Town of Erie Non-Potable Master Plan Update



Due to significant changes in land use, annexations, development and potable and non-potable water demands, DiNatale Water Consultants prepared a Non-Potable Water Master Plan and Rate Recommendations for the Town of Erie. This project entailed:

- Projected non-potable demands for areas that could be served in the short term and mid-term horizons, such as landscape irrigation of residential areas, medians, parks, and commercial and industrial areas
- Conducted a supply analysis of Erie's current and potential raw and reclaimed water sources that could be used to meet non-potable demands
- Recommended tap fees and rates for the various non-potable user classes
- Separated design and construction of the system into several phases that can be built as development occurs
- Maximized coordinated operations of raw water and reclaimed sources through infrastructure layout to minimize operational costs and maximize operational flexibility

B.3 RESUMES

Matt Bliss, P.E., M.S.

Water Resources Engineer, DiNatale Water Consultants

Experience

Water Resource Engineer,
DiNatale Water Consultants, Inc.
2013-present

Water Resources Engineer
Hydros Consulting, Inc.
2010-2013

Water Resources Analyst
CDM, 2005 - 2010

Graduate Student Researcher
University of Colorado
2004-2005

Registrations

Professional Engineer:
Colorado, Wyoming, and Texas

Education

M.S. Civil Engineering
University of Colorado (Boulder)
2005

B.S. Mathematics
Colorado State University (Fort Collins)
2000

Mr. Bliss is a water resources engineer and project manager with 13 years of professional experience in water resources planning and engineering, groundwater and surface water simulation and modeling, reservoir operations, water rights engineering analysis, and engineering information systems. He has particular expertise in the development and use of hydrologic and groundwater modeling along with decision support systems to address a wide range of water resource management problems.

Mr. Bliss has been involved in numerous projects that address water supply involving groundwater, surface water, and their interaction. His work has involved water supply planning, augmentation plans, water rights engineering analyses, groundwater modeling and analysis, basin-wide hydrologic modeling, storage and operational alternative development and testing, water allocation modeling, environmental flow modeling and evaluation, data collection and aquifer sustainability assessment, and individual well permit compliance modeling. Mr. Bliss has utilized several different modeling platforms including the State of Colorado's Decision Support System models StateMod and StateCU MODFLOW, MODSIM, RiverWare, IDS-AWAS, and self-developed Excel spreadsheet models and post-processing tools.

Mr. Bliss utilizes the experience he gained as a high school math teacher to engage and inform model users and stakeholders who have a wide range of technical expertise. He often employs interactive graphs and charts custom designed to convey the important meaning of the results most clearly to the intended audience.

Relevant Project Experience

United Water and Sanitation District, Water Supply Planning, Modeling and Operations. DiNatale Water Consultants is assisting the United Water and Sanitation District in planning and implementation of water supply projects to the meet the needs of various Colorado water providers. Mr. Bliss is assisting the District specifically with modeling of the overall system, including groundwater modeling, surface water modeling, the interaction of

groundwater and surface water, reservoir location and sizing and daily operations. Mr. Bliss also serves as the District's engineer in water rights cases and analyzes new water rights applications by others and provides engineering for the District's water rights claims. The water rights analyses often involve evaluation of stream depletions and accretions due to groundwater pumping and recharge activities.

Water Rights Evaluation – Evaluated proposed decrees and engineering for a variety of water rights cases in the South Platte River Basin. Mr. Bliss has served as an expert engineer for the applicant and as an objector in several recent court cases and has provided engineering services as part of case settlement negotiations. Mr. Bliss has been qualified as an expert witness and testified on behalf of the East Cherry Creek Water and Sanitation District and the Arapahoe County Water and Wastewater Authority in support of their change of use of shares under the Farmers Independent Ditch in Case Nos. 12CW73 and 11CW151. Mr. Bliss also performed groundwater modeling of the Beebe Draw aquifer as part of settlement negotiations between multiple groundwater users in the Beebe Draw. The modeling helped assess the impact of different recharge locations and pumping rates on each entity's production wells and the overall water balance within the aquifer.

South Platte Decision Support System (SPDSS) – DiNatale Water developed a water allocation model using the State of Colorado's model, StateMod, for the St. Vrain River basin in Colorado. In an earlier phase of the SPDSS, Mr. Bliss compiled, analyzed, reviewed, screened and mapped aquifer properties, aquifer configuration and aquifer water level data for the South Platte alluvial aquifer and Denver Basin bedrock aquifers resulting in the most comprehensive and accessible GIS data source for water resources professionals. Results of these analyses were used to develop inputs for the SPDSS regional alluvial groundwater MODFLOW model and are often used by water rights applicants in the South Platte Basin. Mr. Bliss co-authored several technical memoranda presenting data and methods.

Halligan-Seaman and NISP EIS – Reviewed, updated and executed a complex basin-wide modeling process that involved designing and implementing an interface between six inter-related models using MODSIM and Excel-based platforms. Developed alternatives and associated modeling needs for the EIS alternatives evaluation. Models varied from basin-wide water allocation model to detailed municipal system operations model. Reviewed and modified EIS applicant's hydrology and water allocation models on behalf of the US Army Corps of Engineers resulting in technically defensible modeling process for use in three large water supply projects in northern Colorado. The Poudre River basin is one of the most heavily administered rivers in Colorado and modeling required rapid learning of the basin water rights, exchanges and understanding the impacts of increasing urbanization. Worked closely with participant modelers and decision makers; made presentations and recommendations that resulted in a more complete understanding of the hydrologic system and basin operations for use in the permitting process. Wrote several reports associated with the NEPA EIS documents.

Gunnison River Environmental Flow Evaluation – Reviewed State of Colorado surface water model (StateMod) on the Gunnison River for implementation options to simulate the Black Canyon of the Gunnison National Park reserved water right, the Endangered Species Act compliance with target flows at the Whitewater Gage. Project included review of model documentation, inputs, outputs and modification to StateMod for testing alternatives to simulate the environmental flows within the water rights framework of the model.

Town of Erie Non-potable Water Master Plan Update – Mr. Bliss updated the Town of Erie, Colorado's non-potable water master plan to address significant changes in land use, annexations, development and potable and non-potable water demands. The updated plan considered multiple pending developments within this rapidly growing town in the Denver metropolitan area. The updated plan builds on a previous plan, including updates to the list of water rights, terms of recent annexation agreements and data from actual non-potable water usage, to the extent available, and new mapping of projected non-

potable demands and also includes a non-potable irrigation planting guide. The update calls for a combination of expansion and optimization of existing raw water sources and pipeline sizing, routing, and operational recommendations for the reclaimed wastewater system. The Town is currently constructing the system in order to deliver non-potable water throughout the Town for outdoor irrigation use, thereby maximizing its water resources, reducing potable water treatment capital and operations and maintenance expenditures, and promoting conservation.

Upper Mountain Counties Aquifer Sustainability Assessment – Mr. Bliss was the project manager for an aquifer assessment of a mountainous portion of Colorado covering four counties. The project resulted in a refined estimate of aquifer use, recharge and sustainability for use by county planners. Mr. Bliss developed GIS-based geodatabase to assess demands and recharge on throughout the study area.

Rio Grande Reservoir Rehabilitation – Mr. Bliss managed a large reservoir enlargement and rehabilitation feasibility study that included geotechnical recommendations, preliminary design of spillway and outlet works and storage allocation model. Mr. Bliss developed a dynamic costing model and storage allocation model for a diverse set of public and private entities potentially interested in purchasing storage. Project required quick learning of basin water rights, interstate compact requirements and operations.

Rio Grande Basin Implementation Plan – In conjunction with a wide array of local stakeholders, DiNatale Water developed the Rio Grande Basin Implementation Plan. Mr. Bliss focused on the portion of the plan related to groundwater use in the basin, including the efforts to-date by major water users in the Basin to offset stream depletions caused by pumping and work towards aquifer sustainability. In addition, Mr. Bliss was involved in summarizing information on the Rio Grande Compact, the hydrology and geology of the Basin, and oversaw the development of the basin planning model that includes over 500 water rights, multiple reservoirs and the Rio Grande Compact.

Yampa and White River Agricultural Needs Assessment – Managed basin-wide water needs study refining agricultural shortages previously developed by the State of Colorado using the surface water model, StateMod. Performed much of the technical work as the lead modeler, and trained junior staff on the StateMod hydrologic model and data-centered process. Utilized innovative techniques to modify the state model inputs and configuration to address the water user concerns. Analyzed the potential effects of climate change on water availability, return flows and streamflows resulting in planning level alternatives to mitigate agricultural shortages.

Oklahoma Water Resources Board, Artificial Aquifer Recharge. Mr. Bliss was the project manager for a study to evaluate the potential for water supply augmentation through implementation of artificial aquifer recharge projects in Oklahoma. Site selection criteria based on physical location, local water supply and demand, geologic conditions, water quality and residence time were used to recommend the best locations for a demonstration project. Screening began with over 50 potential sites, screened through fatal flaw analyses to a secondary level of resulted in a detailed analysis three recommended sites for potential demonstration projects. The project required involvement and participation from multiple agencies and interested professionals, and was performed in cooperation with the Chickasaw Nation through the American Water Institute (AWI).

Kelly DiNatale, P.E., D.WRE, BCEE, CLM

President, DiNatale Water Consultants

Experience

President, DiNatale Water Consultants, Inc. 2009-present

Principal and Senior Water Resources Engineer, CDM, 2003-2009

Water Resources and Treatment Manager, City of Westminster, Colorado, 1999-2003

Certifications

Diplomate of Water Resources Engineering, American Academy of Water Resources Engineers

Board Certified Environmental Engineer, American Academy of Environmental Engineers

Certified Lake Manager, North American Lake Management Society

Water Rights

Kelly DiNatale, PE, is the president of DiNatale Water Consultants, a seven-person water resources consulting firm. He started DiNatale Water in 2009 after 23 years of managing the water resources and treatment division for the City of Westminster, Colorado and 6 ½ years as a principal of CDM, a global consulting firm. He has been involved with numerous federal, state, regional and local water supply planning and permitting efforts, evaluations of water supply system reliability, raw and treated water demand forecasting, reservoir accounting and operations, water rights analysis, agricultural water use and efficiency, reservoir management, water quality and treatment, optimization of infrastructure, utility financial planning and rate and tap fee analysis. He has spent much of his career providing implementable solutions to water challenges.

Expert Testimony. Mr. DiNatale has testified as an expert in Colorado Water Court, Division 1 on various water rights issues including augmentation plans, changes of water rights, exchanges, water rights and reservoir accounting and water quality issues. He has also served as a consulting expert. Mr. DiNatale has participated in numerous water court proceedings, both as an applicant and objector. He has participated in negotiations with the State Engineer, Division Engineer and objectors on water rights and reservoir accounting issues.

Water Rights and Water Supply. Mr. DiNatale was the co-developer of the original Westminster Water Supply Yield Model. This model was successfully used and defended in Water Court litigation. He also supervised the development of several complex water supply models required for implementation of the Clear Creek Agreement and municipal water supply planning.

Water Supply Acquisition and Development. Mr. DiNatale was an originator of the concept and negotiator for the Clear Creek Water Agreement, a complex water rights exchange and water quality enhancement agreement that settled a 15-year water rights and water quality dispute on Clear Creek, Colorado among the cities of Golden, Thornton and Westminster, and the Coors Brewing Company. Mr. DiNatale developed reservoir and water rights accounting for the operations of Westminster's water supply system, as well as implementation of the Clear Creek Water Agreement, involving multiple water rights sources and shared reservoirs.

Water Rights and Storage Appraisals. Mr. DiNatale has prepared numerous water rights and storage value appraisals and also testified in court on the value of water rights and storage. Mr. DiNatale tracks the cost of various water rights in the South Platte basin of Colorado since the 1970's and has been responsible for the acquisition of water rights with a current market value of over $500 Million. He has recently evaluated water rights and recommended water rights and reservoir accounting measures to conform with water court decree requirements and maximize beneficial use for ranchers in the South Platte, Rio Grande, Colorado and White River basins.

Regional and Statewide Water Supply Planning. Mr. DiNatale served on a special committee convened by the State Attorney General and the Colorado Senate and House Agriculture and Natural Resources committees to develop legislation to resolve a South Platte River water rights dispute. In addition, Mr. DiNatale served on the Colorado Governor's Metropolitan Water Roundtable and was a technical committee member on the Denver Metropolitan Water Supply Investigations. He was a representative on Metro Denver's system-wide environmental impact statement.

Water Rights and Water Storage Appraisals. Mr. DiNatale has prepared numerous water rights and water storage appraisals and also testified in court on the value of water rights and storage.

Rio Grande Basin Implementation Plan – Colorado Water Conservation Board (CWCB). DiNatale Water Consultants, in conjunction with the Rio Grande Basin Round Table, developed the Rio Grande Basin Implementation Plan for the Rio Grande Basin to address its c agricultural, municipal and industrial, recreational and environmental needs. The Implementation Plan will assist the basin to proactively meet water needs, through completion of currently planned projects, re-prioritized projects, and development of new projects, operational agreements, flow protections, or other methods as needed. The Basin Plan utilized existing information developed for the Rio Grande Decision Support System (RGDSS) Groundwater modeling, the ongoing Rio Grande Cooperative and Radar Projects and other information that is available and relevant to the process. As part of the Implementation Plan, DiNatale Water Consultants developing a RiverWare water rights model of the Rio Grande basin for use in analyzing future water supply scenarios. Over 500 water rights and numerous reservoirs were included in the daily time step model.

South Platte Decision Support System (SPDSS) Surface Water Model St. Vrain Basin- Colorado Water Conservation Board (CWCB). DiNatale Water Consultants, in conjunction with Brown and Caldwell, is developing a StateMod surface water model of the St. Vrain River as part of the SPDSS. The model uses a data-centered approach that incorporates data from the State's hydrologic database, HydroBase, consumptive use analyses, and other data collected as part of the SPDSS over the past decade. The resulting StateMod model will be integrated with models of other major watersheds in the South Platte basin to form a basin-wide planning tool.

Rio Grande Cooperative Project. The San Luis Valley Irrigation District (Irrigation District) and Colorado Parks and Wildlife (CPW), with the financial assistance of the Colorado Water Conservation Board (CWCB) is developing the Rio Grande Cooperative Project. The CWCB is providing grants and loans that will be used to fund the rehabilitation of Rio Grande and Beaver Park Reservoirs. DiNatale Water Consultants is serving as the project manager on the Rio Grande Cooperative Project, a collaborative effort between the Irrigation District and CPW to develop operational scenarios designed to optimize the operations of Rio Grande and Beaver Park Reservoirs to enhance yields for the Irrigation District, CPW and other water users and provide for environmental and recreational enhancements. DiNatale Water Consultants developed a water rights and operations model of the mainstem Rio Grande River in Colorado to analyze the impacts of alterative scenarios of coordinated operations for municipal and industrial uses, augmentation, environmental and recreation purposes, Rio Grande River Compact compliance, and overall river administration.

Rio Grande Reservoir Multi-purpose Enlargement Feasibility Study and Preliminary Design. DiNatale Water Consultants is serving as the project manager on the continuation of a series of studies for the San Luis Valley Irrigation District examining the potential for a multi-purpose enlargement of the existing 55,000 AF Rio Grande Reservoir. The existing irrigation uses could be expanded to include storage for municipal and industrial uses and Rio Grande River Compact administration and a permanent pool for fishery and recreation purposes. A water allocation model was developed that displayed how releases could be timed to provide for

environmental and other instream needs while maximizing deliveries for irrigation, M&I and compact deliveries. Geotechnical, water rights, interstate compact and environmental permitting considerations were included in the preliminary design. Implementation of plan recommendations is underway. DiNatale Water Consultants is assisting Western Land Group in the federal land exchange and environmental assessment with the U.S. Forest Service that will allow the reservoir to be rehabilitated.

Farmers Reservoir Irrigation Company Alternative Agricultural Transfer Methods Project. DiNatale Water Consultants lead a team of consultants and Colorado State University researchers on the analysis of alternative agricultural transfer methods. The project included interviews of agricultural and municipal and industrial users, water market experiments, analysis of the water court transfer challenges and development of an operations model to retime deliveries using alluvial recharge.

East Cherry Creek Valley Water and Sanitation District and Arapahoe County Water and Wastewater Authority Conjunctive Use Alluvial Aquifer Recharge Program. DiNatale Water Consultants is assisting the East Cherry Creek Water and Sanitation District and Arapahoe County Water and Wastewater Authority in the south Metro Denver area to develop a permanent renewable water supply through the development and implementation of an innovative alluvial aquifer recharge and augmentation program. These two water providers were reliant on a non-renewable groundwater source and were facing significant reductions in its existing water supply due to declining groundwater levels and reduced well yields. This fast-track project commenced delivery of a renewable water supply to East Cherry Creek Valley in 2006 and Arapahoe County in 2013. DiNatale Water is assisting the District and Authority on water supply planning and operations and water quality and reverse osmosis concentrate management issues on the project. A detailed RiverWare operations model was developed that includes complex reservoir accounting, river exchanges, well pumping depletions and recharge accretions. DiNatale Water Consultants has developed detailed reservoir and water rights accounting to meet the requirements of the water court decrees.

Halligan Water Management Project Environmental Impact Statement. DiNatale Water Consultants is serving as hydrology, water supply modeling and alternatives technical director for the Army Corps of Engineers' third party consulting team for the Halligan Water Supply Project for the City of Ft. Collins in northern Colorado. The project involves preparing an environmental impact statement for the enlargement of Halligan Seaman Reservoir. Modeling involves the extensive use of the MODSIM water allocation model platform as well as customized Excel-based models and the development of logic for reservoir operations.

United Water and Sanitation District, Water Supply, Water Quality, Infrastructure and Operations Planning. DiNatale Water Consultants is assisting the United Water and Sanitation District in planning and implementation of water supply projects to the meet the needs of various Colorado water providers. The District's goals are to facilitate the acquisition, diversion, storage, carriage delivery, treatment, transmission, distribution and provision of water to those who voluntarily choose to use the system. Activities include water acquisition and transfer, design, finance and construction of diversion structures, pumping facilities, reservoirs and wells. DiNatale Water is assisting the District on water supply planning and operations, and has developed RiverWare and excel-based modeling tools to analyze and optimize reservoir storage and alternative project configurations. DiNatale Water serves as the water rights operations and accounting expert on United's water court cases.

Rio Grande Watershed Emergency Action Coordination Team (RWEACT) – Hinsdale County. DiNatale Water Consultants lead the initial RWEACT effort to bring together local, state and federal partners to develop an effective, coordinated approach in the deployment of immediate actions to directly address fire-caused natural hazards resulting in the need for the emergent protection of human life and property and the natural

health of the Rio Grande River watershed and its environment. This included immediate implementation of monitoring efforts to determine risk and a subsequent public information campaign for safety relating to flash floods and debris flows. RWEACT also focused on increased collaboration and leverage with mission-aligned agencies for fire recovery efforts and the identification of economic impacts and potential recovery opportunities.

Use of Alternative Transfer Methods (ATM) to Increase Supplies for Conejos Basin Agriculture, Municipal and Environmental Purposes – Conejos Water Conservancy District. DiNatale Water Consultants is evaluating a potential ATM project that involves enlarging Trujillo Meadows Reservoir, located in southern Colorado. The project is intended to preserve agriculture in the Conejos Water Conservancy District and provide a reliable augmentation supply for the towns located within the Conejos Water Conservancy District that currently rely on groundwater for municipal supply. In addition, the project is also analyzing other possible multiple-objective benefits, including enhanced recreational opportunity at Trujillo Meadows Reservoir, potential environmental benefits such as enhanced riparian habitat and re-timing of streamflows on the Rio de los Pinos and on the Conejos River below Platoro Reservoir.

Town of Erie Non-potable System – DiNatale Water Consultants prepared a Non-potable Water Master Plan for the Town of Erie. The Plan included projected demands, supply analysis, reclaimed reservoir operations and an infrastructure layout that included potential coordinated operations of non-potable ditch and reclaimed deliveries. Recommendations on non-potable water rates and tap fees are currently being developed.

Water Resources Planning and Engineering

State of Colorado Statewide Water Supply Initiative. Mr. DiNatale served as Technical Director for the Colorado Statewide Water Supply Initiative (SWSI), a $2.7 million study of water supply, use and needs for the Colorado Water Conservation Board (CWCB). This was the first comprehensive analysis of water demands and supplies and alternatives for meeting the future needs of municipal and industrial, agricultural and recreational users and the environment. Projections of agricultural, municipal and industrial demands and analysis of water supply availability was conducted. Supply availability was analyzed using the StateMod water allocation model. In a follow up phase, technical round tables addressed water conservation, alternatives to permanent agricultural dry-up, environmental and recreational needs and alternatives for addressing statewide water supply gaps. SWSI was awarded the 2005 American Consulting Engineering Council of Colorado (ACEC-Colorado) Engineering Excellence Award.

Technical Director, State of Colorado Inter Basin Compact Process. Mr. DiNatale served as Technical Director for the Inter Basin Compact Round Table Process, an ongoing $1 million per year process for analyzing and resolving water supply issues across river basins for the Colorado Department of Natural Resources (DNR). This process is a follow up to the Statewide Water Supply Initiative and includes analysis of consumptive and nonconsumptive needs and water supply availability in all river basins through an extensive stakeholder and public involvement process through a basin round table process.

City of Northglenn Integrated Water Resources Plan. Mr. DiNatale managed the development of an Integrated Water Resources Plan for the City of Northglenn, a suburb in the metropolitan Denver area that is experiencing declining water supplies due to the urbanization within its agricultural exchange project. Modeling of reservoir firm yield water supply and alternatives was conducted and decision support tools used to evaluate renewable water supply alternatives.

Water Supply Planning

South Metro Water Supply Authority Regional Water Supply Master Plan. For the South Metro Water Supply Authority Regional Water Supply Authority (SMWSA), Mr. DiNatale directed the Master Planning effort. The SMWSA is composed of 13 water providers, including both municipalities and water districts that are primarily on non-renewable groundwater, but seeking renewable surface water supplies in a highly competitive water market. The plan identified future water buildout interim, mid and long term options and optimization of raw water storage. Additional investigations evaluated identified regional water supply and infrastructure opportunities and raw water storage requirements. A mid-term plan was developed and adopted. The Regional Water Master Plan was awarded the 2007 ACEC-Colorado Engineering Excellence Merit Award.

Oklahoma Comprehensive Water Plan. Mr. DiNatale served as the task leader for the analysis of surface and groundwater supply availability for the Oklahoma Comprehensive Water Plan for the Oklahoma Water Resources Board. This effort includes the analysis of the physical and legal availability of groundwater and surface water and reservoir yields under all hydrologic conditions, water allocation modeling, impacts of climate change on supplies and demands, identification of areas of vulnerability and surplus and alternatives for meeting future gaps between supplies and demands.

Water Resources Implementation Plan. Town of Castle Rock, Colorado and the Castle Pines and Castle Pines North Metro Districts. Mr. DiNatale evaluated alternatives for maximizing beneficial reuse of treated wastewater and utilizing available surface water rights. Decision support modeling and facilitated workshops guided the evaluation of diverse alternatives. He assisted in developing an implementation plan to maximize the beneficial use of these renewable supplies.

Castle Pines North Metropolitan District Integrated Water Resources Plan. For the Castle Pines North Metropolitan District in Colorado, Mr. DiNatale led the development of an Integrated Water Resources Plan (IWRP) and long-range water supply. The District is currently 100 percent dependent upon non-renewable Denver basin groundwater sources. The long-term yield of existing groundwater supplies was evaluated and decision support tools used to evaluate renewable water supply alternatives. This project included extensive public involvement.

Castle Pines North Water Conservation Plan. Mr. DiNatale served as technical advisor for the development of the Castle Pine North Metro District Long-Range Water Conservation Plan. This was the first water conservation plan to be developed under new guidelines developed by the Colorado Water Conservation Board (CWCB) and was funded in part by a grant from the CWCB.

Santa Fe Long-Range Water Supply Plan. Mr. DiNatale served as a technical advisor on the City of Santa Fe, New Mexico long-range water supply plan, assisting with the development of a water supply and reservoir model using STELLA, decision support tools, analysis of water rights and water supply alternatives and recommendations and implementation strategies for meeting Santa Fe's long-range water supply needs.

Master Planning Efforts. For a number of clients and the City of Westminster, Mr. DiNatale has been involved as project manager and technical director on the development and implementation of raw water supply, treated water, wastewater, and reclaimed water master plans.

Capital Improvement Projects. Mr. DiNatale has provided project management, technical direction or oversight for several major capital improvement projects (CIPs) including:

- Preliminary design of the rehabilitation of a 52,000 acre-foot reservoir
- Renovation of a 43,000 AF reservoir
- Permitting, planning and implementation of an alluvial storage and recovery project including wells and groundwater recharge, 10 MGD reverse osmosis water treatment plant, 32 mile 48" pipeline and two pump stations
- Permitting, design and construction of new raw water storage
- Rehabilitation and process optimization of a 44-mgd water treatment facility and high service pump station
- Pre-design of an expansion of a 9.2-mgd wastewater treatment facility
- Design-build of a 12 MGD Microfiltration Membrane Water Treatment Facility.

Water Demand Analysis. Mr. DiNatale has led water demand forecasting efforts for a variety of local and regional water providers and for the Colorado Statewide Water Supply Initiative. Mr. DiNatale partnered with the Home Builders Association of Metropolitan Denver on determining actual water use for various residential user classes, evaluating water demand reduction strategies and the development of a GIS project that linked parcel, aerial photos, land use, and utilities GIS coverages with water billing, tax assessor and building permit databases, creating a powerful tool for analyzing water demand.

Water Treatment Pilot Testing and Evaluations. Mr. DiNatale has been involved with pilot testing of various treatment processes for reclaimed water and potable water treatment including pretreatment and continuous backwash filters micro, ultra and reverse osmosis membrane filtration processes and reverse osmosis brine minimization and zero liquid discharge.

Water Rates and Tap Fees Development. Mr. DiNatale has developed water and wastewater rates and tap fees and analyzed various rate and tap fee structures for cost of service and revenue requirements. Experience includes increasing block rate and water budget rate structures and tap fees (system development charges) based on alternate methods such as irrigated area and user type to improve utility cost recovery and customer equity compared to other methods such as meter size.

Water and Reclaimed Treatment Facility Design / Construction/ Operation. Mr. DiNatale provided oversight for the design, construction, and operation of a 6-mgd reclaimed water treatment facility, which went online in 2000. He also provided oversight for a 15-mgd membrane water treatment facility, which went online in 2002.

Water Quality and Lake and Reservoir Management

Rivanna Water and Sewer Authority Reservoir Management Plan. DiNatale Water Consultants is working with Professor Alex Horne of Alex Horne Associates, an internationally experienced limnologist, on developing reservoir management strategies for five reservoirs owned by the Rivanna Water and Sewer Authority in Charlottesville, VA. Mr. DiNatale assisted Authority staff in establishing a reservoir monitoring program, conducted analysis and trending of water quality data and recommended reservoir operations strategies.

East Cherry Creek Valley Water and Sanitation District Reverse Osmosis Return Flow Discharge Permitting. DiNatale Water Consultants assisted the East Cherry Creek Valley Water and Sanitation District with Colorado Department of Public Health and Environment NPDES discharge permitting for the return flow from its planned 10 million gallon per day reverse osmosis water treatment facility. DiNatale Water is also assisting the District in ongoing water quality monitoring and protection activities.

Water Quality, Watershed Protection and Reservoir Management. DiNatale Water Consultants is serving as a Board member for the Barr-Milton Watershed Association. This Association is developing total Maximum Daily Loads, TMDLs, for Barr and Milton Reservoirs in Colorado. Mr. DiNatale previously led the establishment of the Standley Lake and Clear Creek water quality monitoring programs and was the lead negotiator for the Clear Creek Watershed Management Agreement. At the time he started at Westminster in 1980, Standley Lake was experiencing significant and regular taste and odor events. The successful implementation of the comprehensive watershed and reservoir management plan has resulted in no taste and odor events since 1988 and the delay of the need to implement hypolimnetic aeration. He also proposed and implemented the in-situ testing of Midfoil weevils for Eurasian water milfoil control. Mr. DiNatale presented expert testimony in Colorado Division 1 Water Court on the impacts of wastewater discharges on reservoir and drinking water quality that contributed to a favorable court ruling, eventually leading to a comprehensive settlement of water quality issues on Clear Creek.

Denver Water Marston Reservoir In-Lake Treatment Alternatives and Oxygenation System Design. Under Mr. DiNatale's direction, CDM working with Alex Horne Associates, conducted an evaluation of in-lake water quality management options to mitigate taste and odor issues at the Marston WTP. Denver Water then engaged CDM to design the selected approach -- a new oxygenation unit that was implemented on a fast-track schedule.

Denver Water Conduit No. 15 Wetlands Pretreatment Alternatives Evaluation. Under Mr. DiNatale's direction, CDM, working with Alex Horne Associates, prepared conceptual designs for constructed wetlands treatment to address emerging contaminants from an urbanizing watershed.

Singapore Marina Barrage Reservoir Project. Mr. DiNatale served as technical advisor on potential water quality impacts and evaluation of recreation management and carrying capacity of Singapore's Marina Barrage Reservoir as the island nation has limited water supplies and must import water from Malaysia.

Colorado Front Range Reservoirs Water Quality Studies. Mr. DiNatale has studied the water quality in Colorado Front Range drinking water reservoirs for over 30 years. He has presented the results at regional and national forums.

Kelly DiNatale, DiNatale Water Consultants

Professional Activities

American Water Works Association

American Water Resources Association

American Academy of Water Resources Engineers

American Academy of Environmental Engineers

North American Lake Management Society, Regional VIII Director 2000-2003

Colorado Lakes and Reservoir Management Society, President 1997

Colorado Water Congress

Publications and Presentations

"ECCV Water Supply Project: Alluvial Groundwater, RO and Brine Disposal " (co-author with Chris Douglass) *2011 American Water Works Association Rocky Mountain Regional Conference,* September, 2011.

"Planning, Permitting and Design of an Inland Brackish Groundwater Supply Project" (co-author with Dave Kaunisto and Doug Brown) *2010 National Water Reuse Symposium,* September, 2010.

"Colorado Water Rights: Opportunities and Constraints to Reuse" *2009 Water Reuse Workshop, Colorado Water Reuse, Rocky Mountain AWWA and WEF*, August, 2009.

"Considerations in the Selection, Design and Installation of a Mile High Reservoir Oxygenation System" (co-author with Sarah Dominick, Alex Horne and Chris Fahlin) North American Lake Management Society Annual Symposium, November, 2008..

"Evaluation of Drinking Water Reservoir Inflow Pre-treatment Options to Address Conventional Pollutants and Micro-constituents" (co-author with Travis Bray, Alex Horne and Ted Johnson) North American Lake Management Society Annual Symposium, November, 2008.

"Oklahoma Comprehensive Water Plan – Statewide Water Supply and Demand Analysis" *Oklahoma Governor's Water Conference*, October, 2008

"Lessons Learned from the 2002 Drought: Implications for Municipal Water Supply Planning" *Colorado Governor's Conference on Managing Drought and Climate Risk*, 2008.

Water Law and Allocation in the Southwest, Lakeline (Publication of the North American Lake Management Society) Winter 2009.

Needs of the Consulting Engineering Sector and Strengths and Weaknesses of Today's Graduates, Journal of Contemporary Research and Education, July 2008.

Meeting Colorado's Future Water Supply Needs: Opportunities and Challenges Associated with Agricultural Conservation Measures, co-author with Reagan Waskom and Todd Doherty, presented by the Colorado Agricultural Water Alliance, 2008.

"Integrated Water Resources Planning" *Utah Water Quality Alliance, 2008 Annual Retreat.*

"Enlarging the Rio Grande Reservoir: A Multi-Use Multi-Benefit Water Project" (co-author with Matt Bliss and Travis Smith) *American Water Resources Association Annual Symposium,* 2007.

"Developing Recreation Management Guidelines Compatible with 3-in-1 Goals: Singapore's Reservoir in the City" (co-author with Karen E. Kelley, Chang Chian Wui, Cheng Geok Ling and Ms Karen Kang. *North American Lake Management Society Annual Symposium,* 2007.

"Recapture of Return Flows: Emerging Trends in the Arid West" (co-author with Steve Witter, John Rehring, Dave Kaunisto and James McGrady.) *WateReuse Association Annual Conference*, 2007

"City of Northglenn Colorado Integrated Water Resources Planning Process" (co-author with David Allen.) *Rocky Mountain Section American Water Works Association Regional Conference*, 2007

"South Metro Water Supply Authority Regional Water Master Plan" *American Water Resources Association Colorado Chapter Annual Symposium*, 2007

"Water Quality Standards in Augmentation Plans and Exchanges: What are They and What Should They Be?" *Water Quality in Colorado Water Rights Cases Colorado Continuing Legal Education Workshop*, 2006.

"Municipal Water Supply Planning for Drought – A Colorado Perspective" (co-author with john Rehring and Courtney Peppler.) *Managing Drought Specialty Meeting Geological Society of America,* 2006

"Finding Win-Win Solutions to Colorado's Future Water Supply Challenges" (co-author with Susan Morea.) *Special Districts Association of Colorado Annual Meeting*, 2006.

"The Role of Conservation in the Statewide Water Supply Initiative" (co-author with Veva McCaig.) *Colorado Water Conservation Board sponsored Water Conservation Workshop*, 2006.

"Reserving Resources," (co-author with S. Morea and N. Rowan.) Published in *Public Works* Magazine. August 2006.

"Colorado's Statewide Water Supply Initiative" (co-author with Rick Brown, CWCB, and Sue Morea and Nicole Rowan, CDM.) *AWWA Water Sources Conference,* 2006, *AWWA Rocky Mountain Regional,* 2005 *and Colorado Water Congress,* 2005.

"Reuse Opportunities and Constraints: Colorado's Statewide Perspective" (co-author with John Rehring and Tim Cox.) *2005 WateReuse*
Annual Symposium.

"Municipal Water Supply Planning for Drought." *Colorado Water Congress Annual Convention,* 2005.

"Evaluation of Concentrate Disposal Options for Inland Alluvial Brackish Groundwater Treated by Reverse Osmosis" (co-author Kevin McCurdy.) *Natrional Salinity Summit*, 2004.

"Cooling Colorado's Water Wars," (co-author with Rod Kuharich and Rick Brown, CWCB and Sue Morea and Nicole Rowan.) Published in American City and County. December 2004.

"A Successful Approach to a Membrane Water Treatment Plant Design/Build Project", (co-author with Kent Brugler, Diane Phillips, Tom Settle, Tom Scribner, Paul Fischer, Vincent Hart and Mel Spangler.) *Rocky Mountain Section AWWA Regional Conference*, 2002.

"Getting the Most Out of Your Monitoring Data." Chairman and presenter at the *Colorado Lakes and Reservoir Management Association Workshop*. 2002.

"Integrity Testing of Membranes" (co-author with Christian Colvin, Rod Brauer, and Tom Scribner.) *American Water Works Association Membrane Treatment Specialty Conference*. 2001.

"Comparison of Water Quality in Colorado Drinking Water Reservoirs" (co-authored with Tom Settle.) *North American Lake Management Society Annual Symposium*. 2001.

"Water Quality Monitoring Results for Colorado Front Range Drinking Water Reservoirs", (co-author with Tom Settle and Jean Marie Boyer.) *Colorado Lake and Reservoir Management Association Fall Conference*, 2001.

"An Excel-based, Mechanistic Water Quality Model for Standley Lake, Colorado" (co-author with Jean Marie Boyer, Steve Chapra, and Tom Settle.) *North American Lake Management Society Annual Symposium*. 2000.

"Pilot Testing of Membranes" (co-author with Rod Brauer, Christian Colvin, and Tom Scribner.) *American Water Works Association Annual Conference*, 2000.

"Show Me the Savings: Do New Homes use Less Water?" (co-authored with Peter Mayer and Bill DeOreo.) *American Water Works Association Annual Conference,* 2000.

"GIS Development and Application in the United States, Westminster, Colorado: A Case Study" (co-authorwith Sheila Beissel, Dawn Ortega, and Katie Leone). *Korea Geospatial Institute Conference on GIS*, 2000.

"Water Resources Challenges in the United States: Water Treatment and Water Reuse." *Korea Institute for Construction Technology and Korea University*, 2000.

"When Does a Royal Flush Beat a Full House of Water Rights?" (co-author with Lee Johnson, Cynda Lower, and Tom Settle.) *North American Lake Management Society Annual Symposium*, 1999.

"To Tower or not to Tower – Selecting a Reservoir Withdrawal System" (co-author with Tom Settle, Jean Marie Boyer and James. McCarthy.) *North American Lake Management Society Annual Symposium*, 1999.

"Westminster Membrane Pilot Plant Program" (co-author with Rod Brauer, Tom Scribner, and Christian Colvin.) *Rocky Mountain American Water Works Association and Water Environment Federation Joint Technical Advisory Committee Meeting*, 1999.

"Innovative Approaches to Water and Wastewater Tap Fees – Westminster, Colorado." *Rocky Mountain American Water Works Association and Water Environment Federation Joint Technical Advisory Committee Meeting*, 1999.

"Standley Lake Nutrient Control Alternatives" (co-author with James Wulliman and Tom Settle.) *North American Lake Management Society Annual Symposium*, 1998.

"Trophic State Indices – Do Any Make Sense for Colorado?" (co-author with Alex Horne and Tom Settle.) *Colorado Lake & Reservoir Management Association Fall Conference,* 1998.

"Pilot Plant Study for the Westminster, Colorado Reclaimed Water Treatment Facility" (co-author with Mark Maxwell, Harry Britton, and Tom Settle). *Water Environment Federation Annual Conference*, 1998.

"The Incorporation of End Use Water Data in Municipal Water Planning" (co-author with William DeOreo.) *American Water Works Association Annual Conference*, 1997.

"Evaluation of Nutrient Control Alternatives for a Municipal Supply Reservoir" (co-author with Alex Horne, Peter Binney, James Wulliman and Tom Settle.) *North American Lake Management Society Annual Symposium*, 1996.

"Development of Trophic Status Indicators for a Municipal Supply Reservoir" (co-author with Alex Horne and Tom Settle.) *North American Lake Management Society Annual Symposium*, 1996.

"Upper Clear Creek Watershed Management Model and Standley Lake Nutrient Standards" (co-author with Tom Settle.) *Association of Engineering Geologists (Colorado Chapter) Meeting*. 1995.

"Upper Clear Creek Watershed Management Model" (co-author with Susan Morea and Brian Janonis). *American Water Works Association/Water Environment Federation Rocky Mountain Regional Conference*, 1994.

"Standley Lake Protection Efforts" (co-author with David Kaunisto.) *North American Lake Management Society Annual Symposium*, 1991.

"Implementation of Big Dry Creek Effluent Reuse for the City of Westminster, Colorado" (co-authored with Daniel Strietelmeier and Mark Van Nostrand.) *American Water Works Association/Water Environment Federation Rocky Mountain Regional Conference*, 1991.

"Establishing Rationale for Management Strategies to Protect a Water Supply" (co-author with George Budd and Annette Barnard.) *American Water Works Association Annual Conference*, 1984.

"Westminster's Increasing Block Rate Water Pricing Structure". *Colorado Water Congress Symposium on Impacts of Water Conservation*, 1983.

"Westminster's Comprehensive Water Conservation Program." *Southwestern Conference on Water Conservation*, 1982.

"An Assessment of Water Use and Policies in Northern Colorado Cities." Colorado Water Resources Research Institute Technical Report #28. 1981.

"Municipal Water Use in Northern Colorado: Development of Efficiency-of-Use Criterion" (co-author with Joanne Greenberg, J. Ernest Flack, and Anne U. White). Colorado Water Resources Research Institute Completion Report #105. 1980.

Arista H. Shippy, E.I., M.S.

Water Resources Engineer, DiNatale Water Consultants

Experience

Water Resource Engineer,
DiNatale Water Consultants, Inc.
2011-present

Graduate Student Researcher,
Bureau of Reclamation,
2010-2011

Mrs. Shippy has worked in the water resources engineering field since 2010. At DiNatale Water, Mrs. Shippy works on reservoir and water supply system operations, water rights engineering analysis, water resources planning and engineering, surface water modeling and project management.

Mrs. Shippy has utilized various modeling platforms including RiverWare, the State of Colorado's Decision Support System models StateMod and StateCU, IDS-AWAS, and advanced Excel spreadsheet models.

Certifications

Engineer Intern:
Colorado

Education

M.S. Civil Engineering
University of Colorado
2011

B.S. Environmental Science
University of Oregon
2006

Mrs. Shippy received her Civil Engineering Master's degree through the Hydrology, Water Resources, and Environmental Fluid Mechanics program at the University of Colorado. Mrs. Shippy worked with the Bureau of Reclamation at the Center for Advanced Decision Support for Water and Environment Systems (CADSWES) and researched changing demands within the Colorado River Basin. She is an active member on several committees in the Colorado Section of the American Water Resources Association (AWRA).

Relevant Project Experience

East Cherry Creek Valley Water and Sanitation District Conjunctive Use Alluvial Aquifer Recharge and Recovery Program. DiNatale Water Consultants is assisting the East Cherry Creek Water and Sanitation District in the south Metro Denver area to develop a permanent renewable water supply through the development and implementation of an innovative alluvial aquifer recharge and augmentation program. Mrs. Shippy is leading the water supply planning and operations modeling effort and helps to coordinate monthly accounting and current ditch, well, and reservoir operations along the South Platte and Cache la Poudre rivers. Mrs. Shippy has helped with the evaluation of water rights and potential infrastructure operations that will be needed at full buildout.

United Water and Sanitation District, Water Supply, Water Quality, Infrastructure and Operations Planning. DiNatale Water Consultants is assisting the United Water and Sanitation District in planning and implementation of water supply projects to the meet the needs of various Colorado water providers. The District's goals are to facilitate the acquisition, diversion, storage, carriage delivery, treatment, transmission, distribution and provision of water to those who use the system. Mrs. Shippy has helped with the quantification of water rights owned by water providers within the United Water District. She is also assisting the District on water supply planning and operations and has helped with the development of modeling tools to analyze and optimize alternative project configurations. Mrs. Shippy develops and submits monthly accounting for reservoir operations and substitute water supply plans. She also assists with the coordination of current ditch, well, and reservoir operations along the South Platte and Cache la Poudre rivers.

Water Rights Evaluations. Mrs. Shippy evaluated water rights and water operations for developers and ranchers in the South Platte and White river basins. After investigating historical diversion records, irrigated acreage, and water resources, Mrs. Shippy performed historical consumptive use analysis for irrigated lands and recommended actions to ensure maximum legal use of water rights and plans of augmentation to ensure compliance with all decrees. Mrs. Shippy has served as an expert engineer as an objector in several recent court cases in the South Platte River Basin. She has been qualified as an expert witness and testified on behalf of the United Water and Sanitation District in objection to a conditional water right being sought by a sand and gravel company due to a lack of demonstrated need in Case No. 13CW3168.

Rio Grande Basin Implementation Plan. In May 2013, Governor Hickenlooper issued an Executive Order directing the Colorado Water Conservation Board (CWCB) to commence work on the Colorado Water Plan by utilizing the Interbasin Compact Committee (IBCC) and the Basin Roundtables (BRT). The CWCB provided financial support to each of the Basin Roundtables to develop its own Basin Implementation Plan (the Plan) through a bottom up approach. DiNatale Water Consultants served as the Basin Planning Team lead for the Rio Grande Basin Implementation Plan and worked with the Rio Grande Basin Round Table (RGBRT), Steering Committee, and Subcommittees to develop goals and measurable outcomes, and to identify needs, opportunities and constraints in the basin. The Rio Grande Basin Plan focuses on projects and methods recommended by the RGBRT to address the consumptive and non-consumptive needs. The Plan is intended to help the basin proactively meet water needs, through completion of currently planned projects, re-prioritized projects, and development of new projects, operational agreements, flow protections, or other methods as needed. The Basin Plan also utilizes existing information developed for the Rio Grande Decision Support System (RGDSS) Groundwater modeling, the ongoing Rio Grande Cooperative and Radar Projects and other information that is available and relevant to the process. Additionally, more detailed surface water and stream-flow modeling analyses was conducted that will build on these efforts. Mrs. Shippy worked closely with the Steering Committee and subcommittees to incorporate their goals and measurable outcomes into the Plan. Mrs. Shippy aided the Environmental and Recreation Subcommittee in their development of the Basin's water environmental and recreational needs evaluation. She did substantial research and drafted information for the Plan regarding constraints and opportunities within the Basin, including dust on snow, beetle kill, soil health, and alternative cropping. Mrs. Shippy also developed a project sheet to be used for all current and proposed projects and filled in data for many of the projects that are included in the Plan as well as summarized project information such as goals and basin needs met and total funding required on an annual basis for each project and for all projects combined.

Rio Grande Cooperative Project. The San Luis Valley Irrigation District (Irrigation District) and Colorado Parks and Wildlife (CPW), with the financial assistance of the Colorado Water Conservation Board (CWCB) is developing the Rio Grande Cooperative Project. The CWCB is providing grants and loans that will be used to fund the rehabilitation of Rio Grande and Beaver Park Reservoirs. DiNatale Water Consultants is serving as the project manager on the Rio Grande Cooperative Project, a collaborative effort between the Irrigation District and CPW to develop operational scenarios designed to optimize the operations of Rio Grande and Beaver Park Reservoirs to enhance yields for the Irrigation District, CPW and other water users and provide for environmental and recreational enhancements. Mrs. Shippy developed a water rights and operations model of the mainstem Rio Grande River in Colorado to analyze the impacts of alterative scenarios of coordinated operations for municipal and industrial uses, augmentation, environmental and recreation purposes, Rio Grande River Compact compliance, and overall river administration. The model includes

augmentation accounts in Rio Grande Reservoir for the San Luis Valley Water Conservation District, the Town of Monte Vista and Colorado Parks and Wildlife. Based on model results, optimal storage account volumes in Rio Grande Reservoir for CPW and other water users were determined and proposed operational scenarios will be developed to maximize the beneficial use of stakeholders' water rights and provide for multiple benefits.

Farmers Reservoir Irrigation Company Alternative Agricultural Transfer Methods Project. DiNatale Water Consultants lead a team of consultants and Colorado State University researchers on the analysis of alternative transfer methods. The project included interviews of agricultural and municipal and industrial users, water market experiments, analysis of the water court transfer challenges and development of an operations model to retime deliveries using alluvial recharge. Specifically, Mrs. Shippy analyzed survey results from municipal and industrial water providers and collaborated in writing and editing the final project report.

Professional Activities

American Water Resources Association, Colorado Section
Colorado Water Congress, State Affairs Committee, alternate

Rebecca Evans, E.I., M.S.

Water Resources Engineer, DiNatale Water Consultants

Experience

Water Resource Engineer, DiNatale Water Consultants, Inc. 2017-present

Graduate Student Researcher
lational Resources Conservation Service
Boise State University
2014-2017

Certifications

Engineer Intern,

State of Illinois

Education

M.S. Hydrologic Sciences
Boise State University
2017

B.S. Geological Engineering
Olivet Nazarene University
2013

Mrs. Evans is a water resources engineer with experience in modeling and water resources since 2014. At DiNatale Water Consultants, Rebecca performs water supply system operations, water accounting, and surface water modeling.

Mrs. Evans has experience with logical modeling in multiple programs, including Excel, HEC-RAS, Python, MatLab, R, and SAS. She has used these programs to create models, explore data trends, and make statistical conclusions from datasets.

Mrs. Evans obtained her Hydrologic Sciences Master's Degree through Boise State University. She worked with the National Resources Conservation Service (NRCS) to create a model that forecasts key water management dates based on trends in the mountain snowpack for several snow-dominated watersheds in Idaho. The output of the model she built is one of the key forecasts generated for the NRCS in their predictions for the irrigation season.

Relevant Project Experience

United Water and Sanitation District, Water Supply Planning, Modeling and Operations. DiNatale Water Consultants assists United Water and Sanitation District in planning, modeling, and operations to provide water for metropolitan districts in the Denver area. The planning in the modeling incorporates collaboration in determining long- and short-term goals for United and its partners. Mrs. Evans performs water accounting with advanced spreadsheets and submits these spreadsheets to the respective water commissioners on a monthly basis. The planning and modeling ties into operations to perform the accounting and operations on a daily basis. Mrs. Evans also performs the daily operations, which involve tracking pumping, well augmentation, reservoir storage, and ditch operations along the South Platte River system and communicating with United and the water commissioners throughout this process.

U.S. Army Corps of Engineers – Fort Worth, Hydrologic Modeling Guidelines. DiNatale Water Consultants was teamed with Carollo Engineers to develop Hydrologic Modeling Guidelines that assist Corps project managers and applicants in the process of reviewing and applying for water supply permits, respectively. The guidelines break down the data needs of the Corps depending on the complexity of each application and provide examples of a wide range of

past applications and the data needs for the Corps. The deliverables in this project were both a final technical document and a checklist of data/analysis needed for each level of complexity of modeling. In this project, Rebecca developed the initial checklist and summarized the case studies, which detailed how prior modeling and applications could have been more streamlined in route to the granting of a water supply permit by the Corps.

U.S. Army Corps of Engineers and Fort Collins, Halligan Daily Disaggregation Modification.

Fort Collins and the U.S. Army Corps of Engineers contracted DiNatale Water to modify a daily disaggregation model for the North Fork of the Cache la Poudre River. The post-processing takes output from an existing model and accounts for additional operations controlled by Fort Collins that cause changes in flows at several points along the Cache la Poudre. These changes in output values are incorporated without modification of monthly flow volumes. The deliverable included output of daily flow values for different points along the Cache la Poudre River, a dynamic chart that displays the input and output daily values, and a summary table of changes from the post-processing procedure. Specifically, Mrs. Evans..

U.S. Department of Agriculture: National Resources Conservation Service – Snow Survey in collaboration with Boise State University Hydrologic Sciences M.S. Program

Smithsonian Marine Station, Benthic Ecology Laboratory Technician

Steel Dynamics, Inc, Environmental Engineer

Professional Activities

American Water Resources Association, Colorado Section

Chris Newton

Geologist, DiNatale Water Consultants

Experience

Geologist,
DiNatale Water Consultants, Inc.
2015-Present

Mr. Newton joined DiNatale Water Consultants in 2015 and has 3 years of experience in water resources. He has experience with ArcGIS, QGIS, Surfer, MODFLOW, HEC-RAS, IDS-AWAS, IDS-CU, StateCU, and other modeling and geospatial software.

Education

Post-baccalaureate Coursework
Northern Arizona University
2014-2015

B.A. Geology
University of Colorado
2013

Mr. Newton received his BA degree in Geology from the University of Colorado, Boulder and completed post-baccalaureate coursework in geomorphology, geochemistry and environmental science at Northern Arizona University. He volunteered with the United States Geological Survey Grand Canyon Monitoring and Research Center to help quantify potential evapotranspiration from soils around several points of interest.

Relevant Project Experience

United Water and Sanitation District, Water Supply, Water Quality, Infrastructure and Operations Planning. DiNatale Water Consultants is assisting the United Water and Sanitation District in planning and implementation of water supply projects to the meet the needs of various Colorado water providers. The District's goals are to facilitate the acquisition, diversion, storage, carriage delivery, treatment, transmission, distribution, and provision of water to those water districts that use the system. Mr. Newton is helping with water supply planning, operations modeling, maintaining water quality, and in developing recharge plans to meet supply obligations.

East Cherry Creek Valley Water and Sanitation District Conjunctive Use Alluvial Aquifer Recharge and Recovery Program. DiNatale Water Consultants is assisting the East Cherry Creek Water and Sanitation District in the south Metro Denver area to develop a permanent renewable water supply through the development and implementation of an innovative alluvial aquifer recharge and augmentation program. Mr. Newton is assisting with the water supply planning, operations modeling, and ditch, well, and reservoir operations along the South Platte and Cache la Poudre rivers.

Rivanna Water and Sewer Authority Reservoir Water Quality and Management Assessment. DiNatale Water Consultants, in conjunction with Alex Horne Associates, is working to develop a comprehensive water quality monitoring program and reservoir management strategies for five drinking water supply reservoirs owned by the Rivanna Water and Sewer Authority in Charlottesville, Virginia. Mr. Newton has conducted compilation and analysis of data collected through the monitoring program, designed and conducted watershed assessments and other special studies, conducted geospatial analyses, and conducted case studies of the reservoir management methods

and monitoring programs of several other drinking water utilities to assist in developing the final recommendations for reservoir management strategies.

Professional Affiliations

Colorado Lakes and Reservoir Management Association
Geological Society of America

SECTION C Strategy and Implementation Plan

We view the water supply modeling project for Grand Junction as far more than a technical exercise to determine the firm yield. It is our opinion that modeling tools should be end-user oriented. We aim to provide Grand Junction with a viable long-term planning tool that will be used by your operations and planning staff now and in the future—not simply a model used to develop the firm yield analysis.

After reviewing the City's available documents, decrees, and agreements, the first step of the project is a collaborative effort with Grand Junction on the model selection. With current technology, there are many choices for water supply modeling. Several different entities have modeled various aspects of the hydrology in and around Grand Junction using models such as RiverWare, StateMod, and relatively simply Excel spreadsheet models. DiNatale Water will meet with the City in person and facilitate a discussion of advantages and disadvantages to different modeling platforms. City staff and DiNatale Water will jointly make a decision on the modeling platform that will best meet Grand Junction's long-term goals.

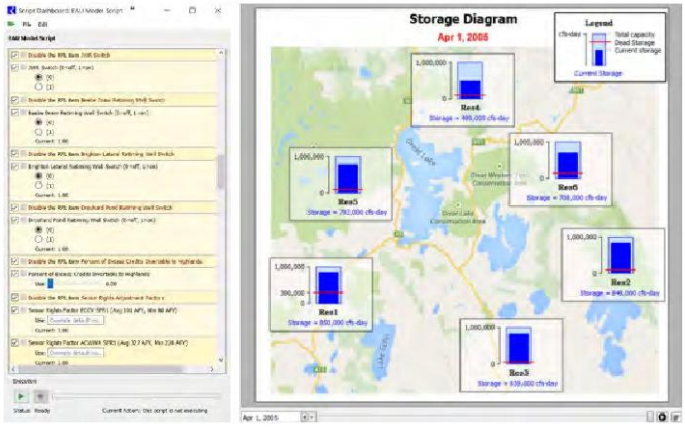
We will also review and discuss with City staff the planning and modeling assumptions that affect the determination of firm yield, as well as decisions concerning reliability and risk. Development of the City's firm yield should include an understanding of the system reliability and risks. An evaluation of system reliability includes assessment of the sources of uncertainty in the yield such as changes in future hydrology, the selection of period of record for historical hydrology, external water rights impacts, and raw water infrastructure capacity and reliability over time. Evaluation of risk includes an understanding of safety factors such as minimum storage or other water supply reserves, the impact of variable climatic conditions on demands, and the occurrence probability of the drought of record.

The City's recent Summary of Water Supply System document (April 2018) provides a basis of information that will be used to develop the model. The information and schematic included in the report, along with other decrees, agreements and discussions with Grand Junction staff provide valuable insight for the initial model construction. Once the initial model development is complete, we envision a mid-project in-person progress meeting to go over the model and discuss any additional thoughts or ideas about model configuration before final testing and the firm yield analysis is completed.

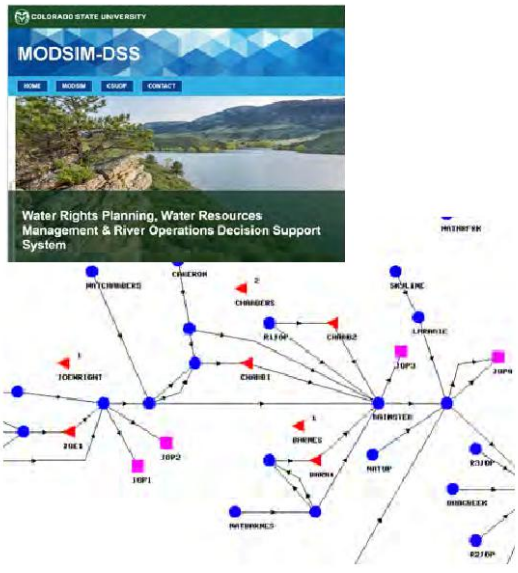
One of our strengths is our ability to recognize and incorporate operational issues into modeling where appropriate.

After this mid-project meeting, DiNatale Water's team will test the model to ensure proper function and is providing reasonable results that make sense and can actually be operated. In our experience, we have found some models easily overlook real on-the-ground operational challenges and can provide a rosier picture than can realistically be achieved. One of our strengths is our ability to recognize and incorporate these types of operational issues into modeling where appropriate.

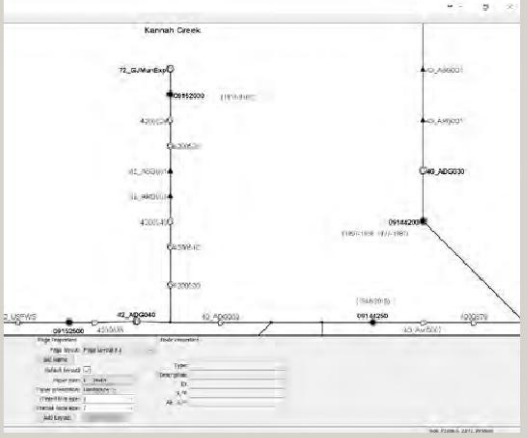
RiverWare



Excel



StateMod



Once the modeling platform is selected, DiNatale Water's modeling experts will begin constructing the model, including the following key steps:

- Selection of representative historical hydrology and model timestep
- Construct key model components (ditches, reservoirs, pipelines etc.)
- Incorporate water rights into the key model components, including non-City water rights as needed
- Forward-looking configuration options for analysis of different future scenarios
- Relevant output display options

The primary result from the initial modeling is the current system firm yield. DiNatale Water will use the model to compute the firm yield by gradually increasing the average annual demand until shortages occur in the modeled results. This firm yield of the supplies is then compared to the existing and future projected demands to assess the level of risk the City faces with the existing system.

Although the analysis scoped for this project ends with the firm yield, the model will be designed so that the items outlined in the Additional Tasks can be incorporated into the modeling, including:

- Ability to enable or disable different water rights and view the effect on the system, including determining which supplies may be unnecessary to meet projected demands
- Test various operational scenarios
- Assess adequacy of emergency backup supply

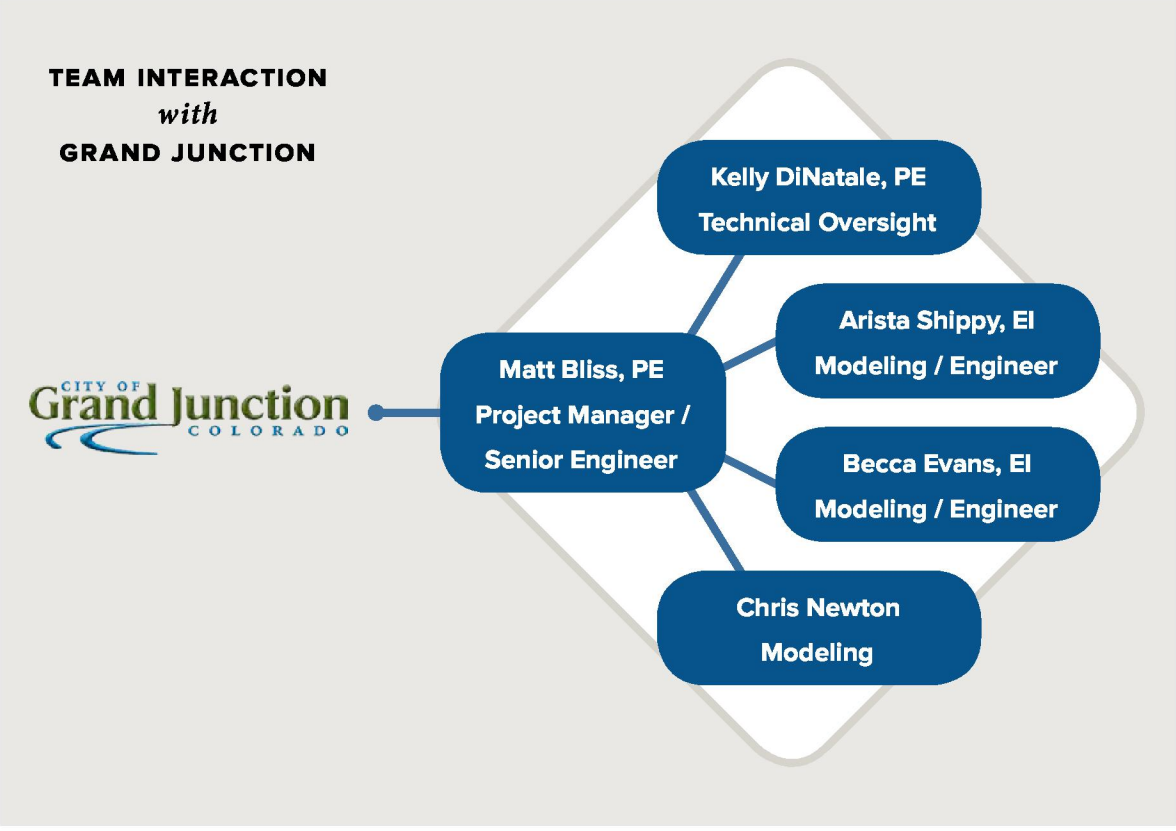
As described above, the model will be designed using feedback from Grand Junction staff who will use the model so that the model becomes a useful tool for years to come. DiNatale Water excels at developing models that are used and provide the most flexibility and relevant output information to help inform good planning and decision making.

OVERVIEW *of* PROJECT PROCESS

C.1 THE DINATALE WATER TEAM

"Our specialty is solving your problems"

For the Grand Junction project, Mr. Matt Bliss, PE will serve as the primary contact with Grand Junction and is the project manager for the DiNatale Water team. Kelly DiNatale will provide technical oversight, and engineers Arista Shippy, Becca Evans, and geologist Chris Newton will support the project. Brief staff introductions and full resumes for the full team are available in the qualifications section of this proposal (Section B). Without the right people to execute it, a good strategy simply isn't enough. We are confident that our approach executed by the DiNatale Water team will result in a successful project outcome for Grand Junction.



C.2 SCHEDULE

	DiNatale Water Tasks and Responsibilities	Grand Junction Responsibilities
Jun-18	Review documents, reports provided by Grand Junction	Provide relevant documents and reports in electronic format
	Discuss Grand Junction model use priorities and desires for tool via conference call	Provide feedback on desired model features
	Develop pros and cons list for several modeling platforms	Participate in model selection meeting
	Meeting in Grand Junction to select model	
Jul-18	Identify hydrology for firm yield run	Provide information as requested regarding specifics of water rights or operations
	Identify timestep for model	
	Incorporate all key components into model (water rights, diversions, reservoirs, pipelines)	
	Bi-weekly progress calls	
Aug-18	Mid-project, in-person meeting to discuss results	Provide information as requested regarding specifics of water rights or operations
	Model testing	
	Finalize model	
	Firm yield model run	
Sep-18	Model report write-up	Review firm yield results
		Provide comments on final report
Oct-18	Finalize report	Review presentation and internal staff coordination for presentation
	Presentation of results in Grand Junction	

SECTION D References

Northern Water Supply Project
East Cherry Creek Valley Water and Sanitation District (ECCV)
Dave Kaunisto, District Manager
6201 S. Gun Club Rd.
Aurora, Colorado 80016
(303)226-9205
dkaunisto@eccv.org

Hydrologic Modeling Guidelines for Regulatory Permit Actions
US Army Corps of Engineers Fort Worth District
Chandler Peter, Regulatory Technical Specialist
819 Taylor Street
Fort Worth, Texas 76102
(817) 886-1736
chandler.j.peter@usace.army.mil

ACWWA Flow Project
Arapahoe County Water and Wastewater Authority (ACWWA)
Steve Witter, General Manager
13031 E. Caley Avenue
Centennial, Colorado 80111
(303) 790-4830 x 340
switter@acwwa.com

United Water Supply Project
United Water and Sanitation District
Drew Damiano, Vice President of Operations
8301 E. Prentice Avenue, Suite 120
Greenwood Village, Colorado 80111
(303) 902-2564
drew@unitedwaterdistrict.com

Halligan EIS Hydrologic Modeling
City of Fort Collins Utilities
Adam Jokerst, Water Resources Engineer
222 Laporte Avenue
Fort Collins, Colorado 80524
(970) 221-6672
ajokerst@fcgov.com

Lake Ralph Hall EIS (Ladonia, TX)
Matt Barkley, Vice President, Office Executive
Michael Baker International
165 South Union Boulevard, Suite 1000
Lakewood, CO, 80228
(720) 479-3174
mbarkley@mbakerintl.com

Rio Grande Cooperative Project
Tom Spezze, Former Southwest Regional Manager for Colorado Parks and Wildlife
Current position: SW Conservation Field Manager for the National Wild Turkey Federation
3528 Highway 114
Gunnison, Colorado 81230
(970) 765-4231
tspezze@nwtf.net

St. Vrain StateMod modeling
Colorado Water Conservation Board (CWCB)
South Platte Decision Support System (SPDSS)
Dave Nettles
Division 1 Engineer
810 9th Street, Suite 200
Greeley, CO 80631
(970) 352-8712
David.Nettles@state.co.us

SECTION E Proposed Budget

hourly rate:	$195	$155	$110	—	
Task	**Technical Oversight**	**Sr. Engineer & PM**	**Engineering Staff**	**Expenses**	**Total**
Task 1 - Project Management and Coordination				**subtotal:**	**$6,790**
Six bi-weekly progress meetings (phone)	3	9	3		$2,310
Model selection meeting (in GJ)	6	6		$670	$2,770
Model results meeting (in GJ)		4		$470	$1,090
Project setup/general project admin		4			$620
Task 2 - Data Collection				**subtotal:**	**$2,135**
Obtain and review reports for pertinent information	1	4	12		$2,135
Task 3 - Model Development				**subtotal:**	**$16,533**
Develop pros and cons list for Model Selection Meeting	2	2	4		$1,140
Identify period of record and input hydrology and timestep	1	2	8		$1,385
Develop model network components (ditches/reservoirs/pipelines)	1	4	16		$2,575
Incorporate water rights and Kannah Cr. call scenarios	2	4	24		$3,650
Configuration options for Additional Tasks	2	8	16		$3,390
Model testing	2	10	16		$3,700
Firm yield run	0.5	1	4		$693
Task 4 - Model Summary Report				**subtotal:**	**$5,535**
Model report and documentation	0.5	6	16	$500	$3,288
Prepare presentation	0.5	2	4		$848
Give presentation in person (in GJ)		6		$470	$1,400
Total	**21.5**	**72**	**123**	**$2,110**	**$30,993**

DiNatale Water will charge at most half-time for travel.

SECTION 7.0: SOLICITATION RESPONSE FORM

RFP-4524-18-DH Professional Services for Water Supply Modeling for City of Grand Junction

Offeror must submit entire Form completed, dated and signed.

1) Not to exceed price to provide all labor, services, supplies, equipment, travel, etc. necessary for the Water Supply Modeling per specifications:

NOT TO EXCEED PRICE $ 30,993

WRITTEN: thirty thousand nine hundred ninety three **dollars.**

The Owner reserves the right to accept any portion of the work to be performed at its discretion

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The undersigned has thoroughly examined the entire Request for Proposals and therefore submits the proposal and schedule of fees and services attached hereto.

This offer is firm and irrevocable for sixty (60) days after the time and date set for receipt of proposals.

The undersigned Offeror agrees to provide services and products in accordance with the terms and conditions contained in this Request for Proposal and as described in the Offeror's proposal attached hereto; as accepted by the Owner.

Prices in the proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a proposal for the purpose of restricting competition.
- The individual signing this proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- City of Grand Junction payment terms shall be Net 30 days.
- Prompt payment discount of N/A percent of the net dollar will be offered to the Owner if the invoice is paid within N/A days after the receipt of the invoice.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: 2.

It is the responsibility of the Proposer to ensure all Addenda have been received and acknowledged.

DiNatale Water Consultants	Matt Bliss
Company Name – (Typed or Printed)	Authorized Agent – (Typed or Printed)
	303-709-7044
Authorized Agent Signature	Phone Number
2919 Valmont Rd, Ste 204	matt@dinatalewater.com
Address of Offeror	E-mail Address of Agent
Boulder, CO 80301	5/9/18
City, State, and Zip Code	Date

SECTION F Additional Data

WORK CONDUCTED BY DINATALE WATER STAFF WHILE AT PREVIOUS COMPANIES

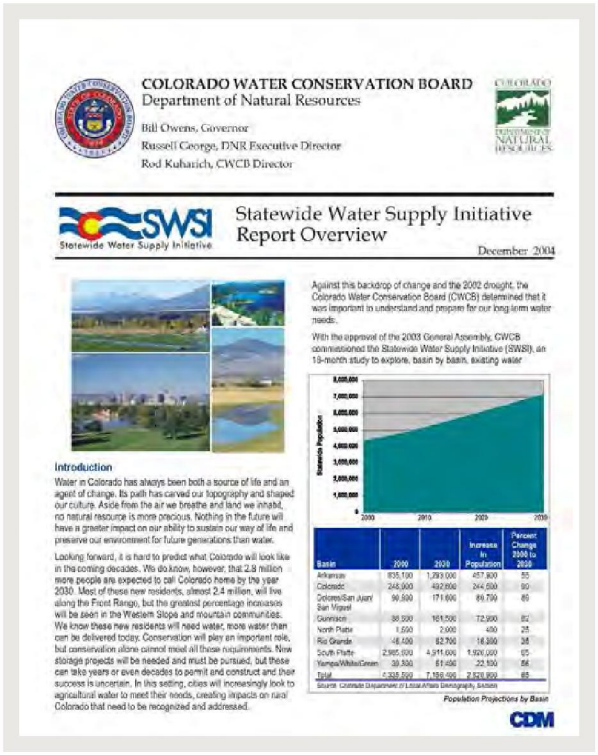
Westminster Water Rights and Water Supply. Mr. DiNatale was the co-developer of the original Westminster Water Supply Yield Model. This model was successfully used and defended in Water Court litigation. He also supervised the development of several complex water supply models required for implementation of the Clear Creek Agreement and municipal water supply planning.

Clear Creek Water Supply Acquisition and Development. Mr. DiNatale was an originator of the concept and negotiator for the Clear Creek Water Agreement, a complex water rights exchange and water quality enhancement agreement that settled a 15-year water rights and water quality dispute on Clear Creek, Colorado among the cities of Golden, Thornton, and Westminster, and the Coors Brewing Company. Mr. DiNatale developed reservoir and water rights accounting for the operations of Westminster's water supply system, as well as implementation of the Clear Creek Water Agreement, involving multiple water rights sources and shared reservoirs.

City of Northglenn Integrated Water Resources Plan. Mr. DiNatale managed the development of an Integrated Water Resources Plan for the City of Northglenn, a suburb in the metropolitan Denver area that is experiencing declining water supplies due to the urbanization within its agricultural exchange project. Modeling of reservoir firm yield water supply and alternatives was conducted and decision support tools used to evaluate renewable water supply alternatives.

Yampa and White River Agricultural Needs Assessment. Mr. Bliss managed a basin-wide water needs study refining agricultural shortages previously developed by the State of Colorado using StateMod. Mr. Bliss performed much of the technical work as the lead modeler and trained junior staff on the StateMod hydrologic model and data-centered process. Mr. Bliss utilized innovative techniques to modify the state model inputs and configuration to address the water user concerns. Using model results, Mr. Bliss analyzed the potential effects of climate change on water availability, return flows and streamflows resulting in planning level alternatives to mitigate agricultural shortages.

Statewide Water Supply Initiative and Interbasin Compact Committee. Mr. DiNatale served as Technical Director for the Colorado Statewide Water Supply Initiative (SWSI), a $2.7 million study of water supply, use and needs for the Colorado Water Conservation Board (CWCB). This was the first comprehensive statewide analysis of water demands and supplies and alternatives for meeting the future needs of municipal and industrial, agricultural and recreational users and the environment. Projections of agricultural, municipal and industrial demands and analysis of water supply availability was conducted. Supply availability was analyzed using the StateMod water allocation model. In a follow up phase, technical round tables addressed water conservation, alternatives to permanent agricultural dry-up, environmental and recreational needs and alternatives for addressing statewide water supply gaps. SWSI was awarded the 2005 American Consulting Engineering Council of Colorado Engineering Excellence Award. Mr. DiNatale also served as the initial Technical Director for the Inter Basin Compact Round Table Process, an ongoing process for analyzing and resolving water supply issues across river basins for the Colorado Department of Natural Resources.


COLORADO WATER CONSERVATION BOARD
Department of Natural Resources

Bill Owens, Governor
Russell George, DNR Executive Director
Rod Kuharich, CWCB Director

SWSI
Statewide Water Supply Initiative

Statewide Water Supply Initiative
Report Overview

December 2004

Introduction

Water in Colorado has always been both a source of life and an agent of change. Its path has carved our topography and shaped our culture. Aside from the air we breathe and land we inhabit, no natural resource is more precious. Nothing in the future will have a greater impact on our ability to sustain our way of life and preserve our environment for future generations than water.

Looking forward, it is hard to predict what Colorado will look like in the coming decades. We do know, however, that 2.8 million more people are expected to call Colorado home by the year 2030. Most of these new residents, almost 2.4 million, will live along the Front Range, but the greatest percentage increases will be seen in the Western Slope and mountain communities. We know these new residents will need water, more water than can be delivered today. Conservation will play an important role, but conservation alone cannot meet all these requirements. New storage projects will be needed and must be pursued, but these can take years or even decades to permit and construct and their success is uncertain. In this setting, cities will increasingly look to agricultural water to meet their needs, creating impacts on rural Colorado that need to be recognized and addressed.

Against this backdrop of change and the 2002 drought, the Colorado Water Conservation Board (CWCB) determined that it was important to understand and prepare for our long-term water needs.

With the approval of the 2003 General Assembly, CWCB commissioned the Statewide Water Supply Initiative (SWSI), an 18-month study to explore, basin by basin, existing water

Basin	2000	2030	Increase in Population	Percent Change 2000 to 2030
Arkansas	835,100	1,293,000	457,900	55
Colorado	245,900	492,600	244,500	99
Colorado/San Juan/ San Miguel	99,500	171,600	69,700	70
Gunnison	88,500	161,500	72,900	82
North Platte	1,550	2,000	450	29
Rio Grande	48,100	62,700	14,600	34
South Platte	2,965,000	4,911,000	1,920,000	65
Yampa/White/Green	39,300	61,400	22,100	56
Total	4,323,000	7,159,000	2,829,000	65

Source: Colorado Department of Local Affairs Demography Section

Population Projections by Basin

CDM

Gunnison River Environmental Flow Evaluation. Mr. Bliss reviewed the State of Colorado surface water model, StateMod, on the Gunnison River for implementation options to simulate the Black Canyon of the Gunnison National Park reserved water right and the Endangered Species Act compliance with target flows at the Whitewater Gage. The project included review of model documentation, inputs, outputs and modification to StateMod for testing alternatives to simulate the environmental flows within the water rights framework of the model.

Bureau of Reclamation CRS Model. Mr. Bliss participated in the Bureau of Reclamation's Colorado River Basin Water Supply and Demand Study by evaluating model inputs and outputs for a number of scenarios on behalf of several interested non-governmental organizations that followed the study and overall progress. Work included developing a tool to quantify the number of boatable days for whitewater rafting under the various model output scenarios.

Thank you for your consideration.

DiNatale
WATER CONSULTANTS

DiNatale Water Consultants
2919 Valmont Rd, Ste 204
Boulder, CO 80301
303 709 7044

dinatalewater.com

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

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:

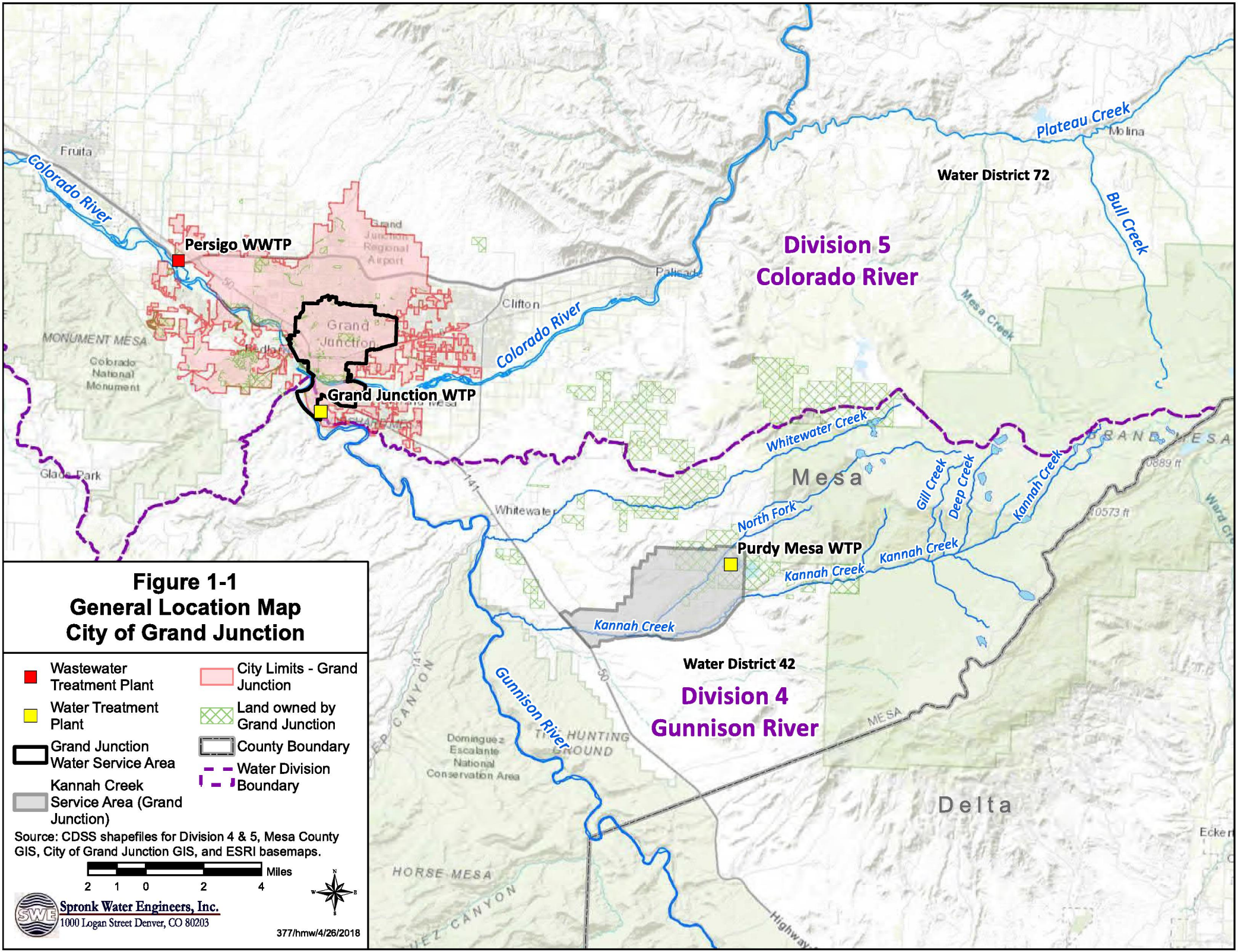
- Kannah Creek at Juniata Enlarged streamflow
- Kannah Creek Flowline diversions
- Kannah Creek Highline Ditch diversions
- Juniata Ditch Enlarged diversions

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


Persigo WWTP
Grand Junction WTP
Purdy Mesa WTP
Division 5
Colorado River
Water District 72
Division 4
Gunnison River
Water District 42
Colorado River
Gunnison River
Plateau Creek
Bull Creek
Mesa Creek
Whitewater Creek
North Fork
Gill Creek
Deep Creek
Kannah Creek
Kannah Creek
Kannah Creek
Kannah Creek
Fruita
Clifton
Grand Junction
Whitewater
Glade Park
Mesa
Delta
MONUMENT MESA
Colorado National Monument
Grand Junction Regional Airport
Dominguez Escalante National Conservation Area
HORSE MESA
HUNTING GROUND
MESA
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.
1000 Logan Street Denver, CO 80203
377/hmw/4/26/2018

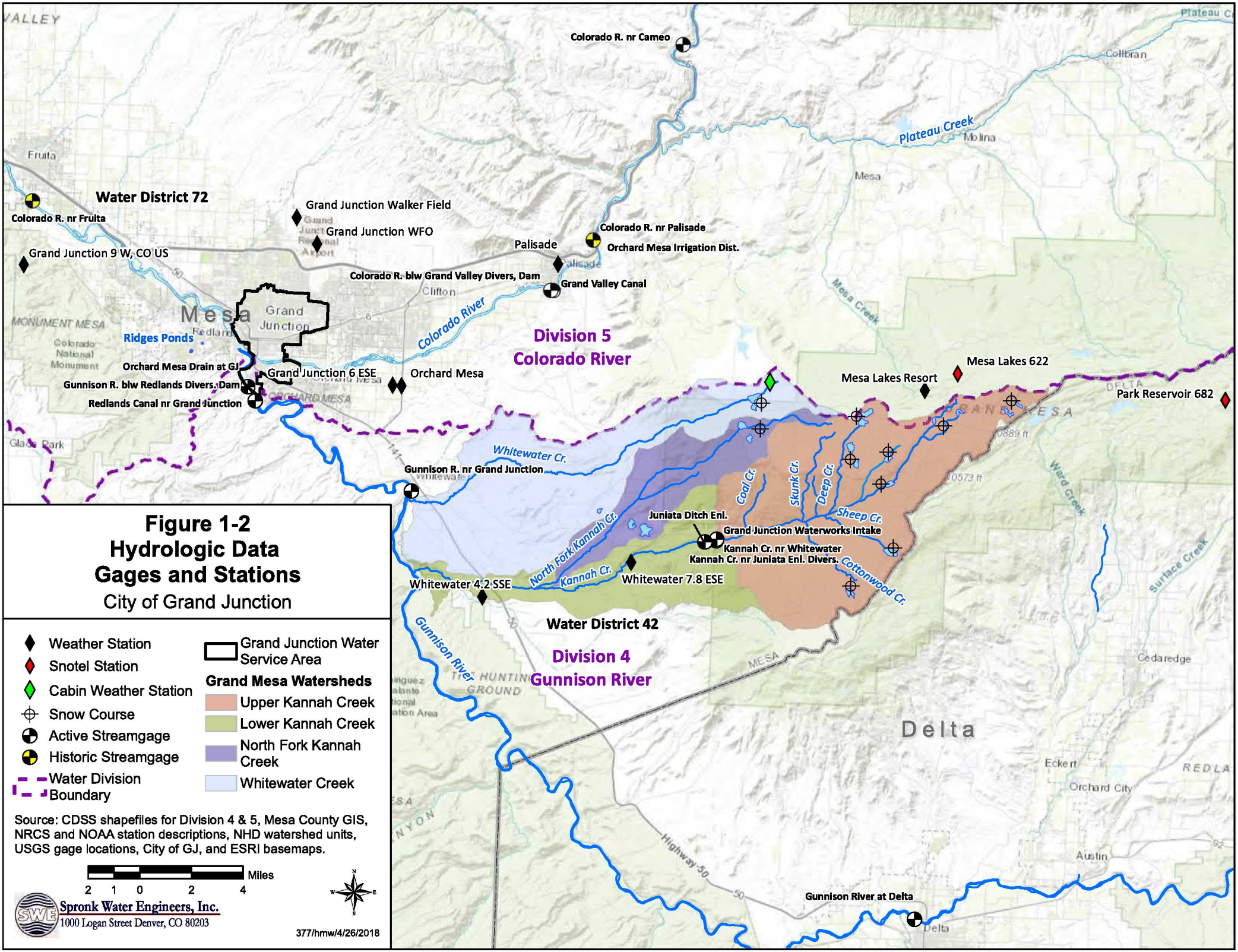


Figure 1-2
Hydrologic Data
Gages and Stations
City of Grand Junction

- 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

Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203

377/hmw/4/26/2018

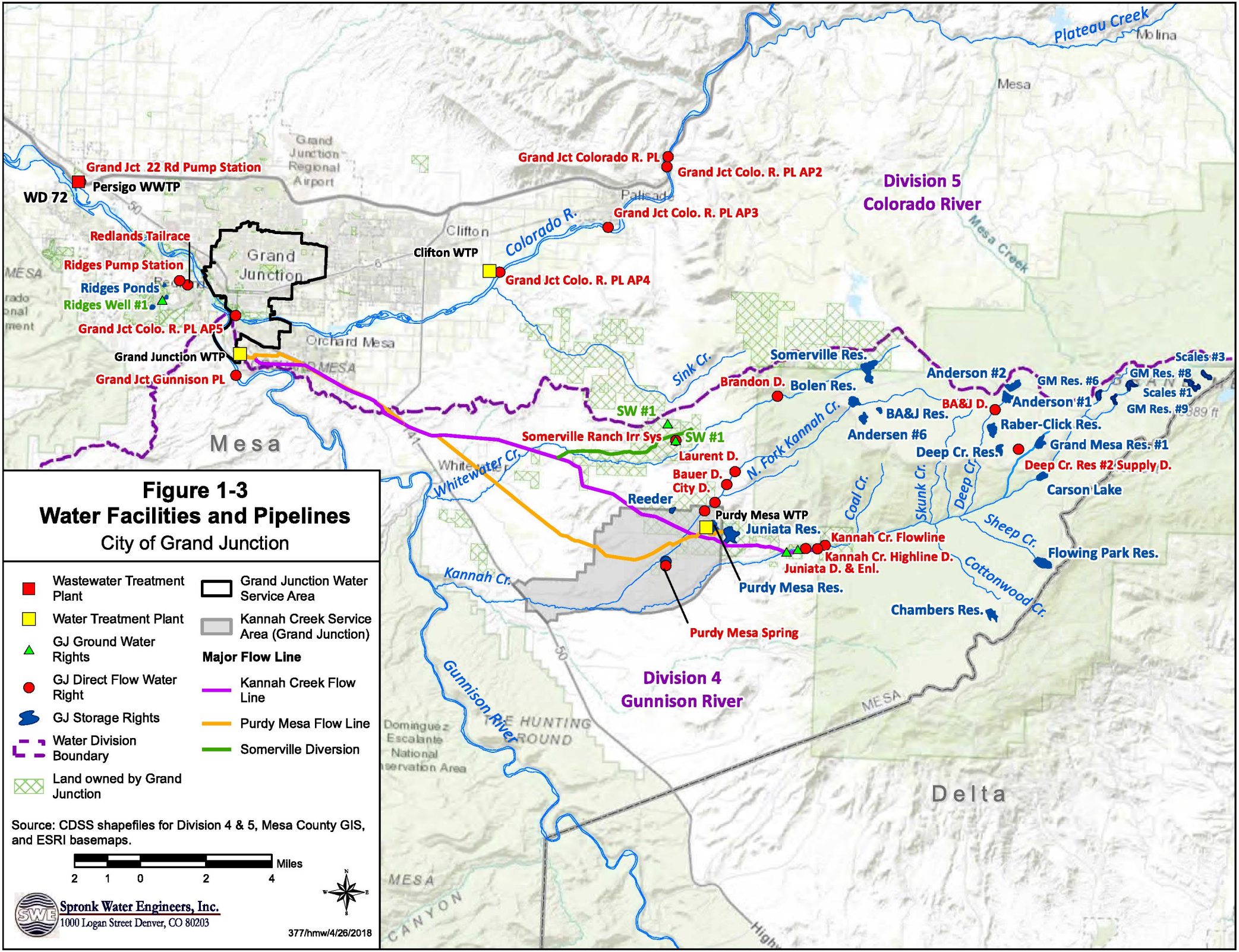


Figure 1-3
Water Facilities and Pipelines
City of Grand Junction

- 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

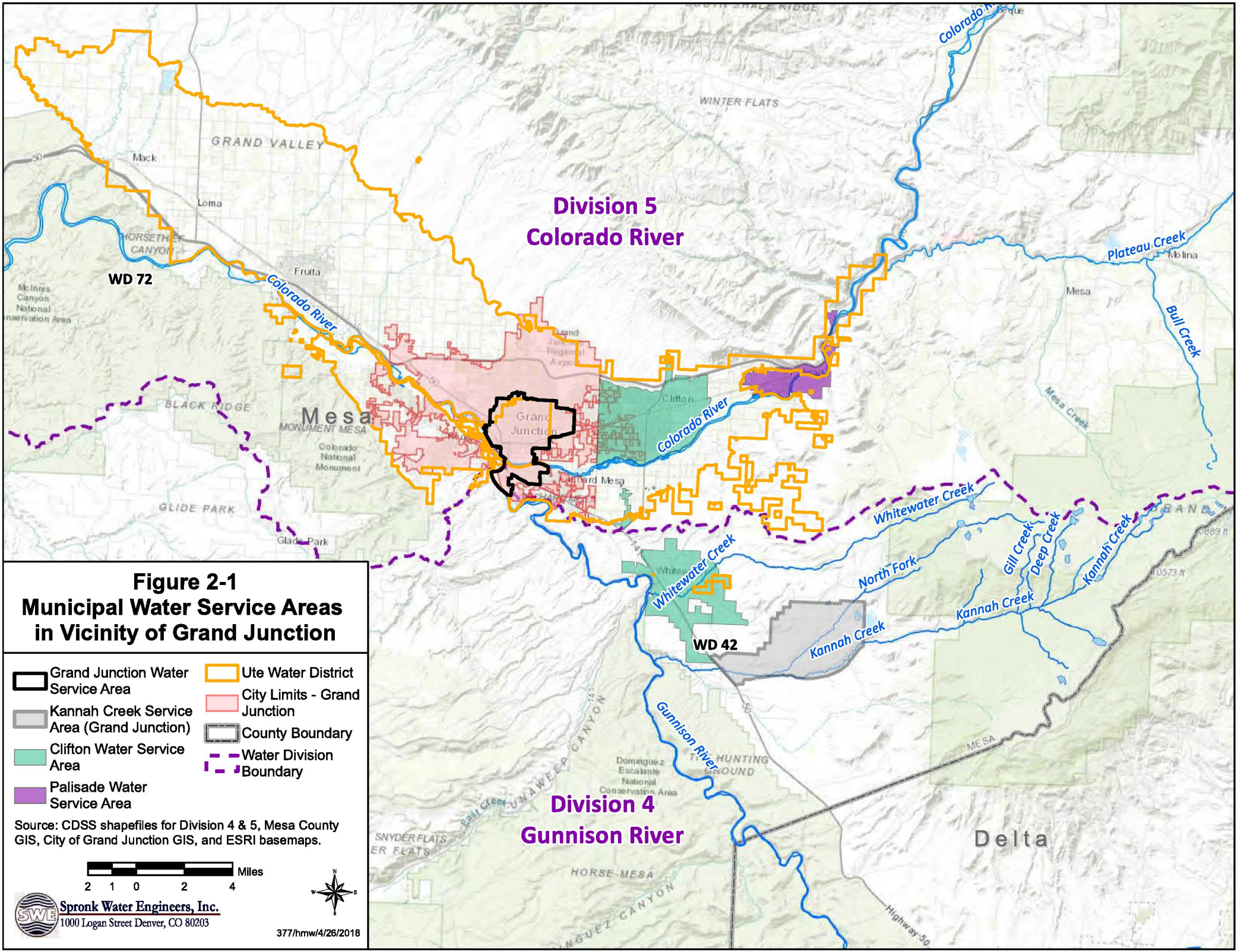
- Kannah Creek Flow Line
- Purdy Mesa Flow Line
- Somerville Diversion

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

2 1 0 2 4 Miles

Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203

377/hmw/4/26/2018


Division 5
Colorado River
Division 4
Gunnison River
WD 72
WD 42
Mesa
Grand Junction
Clifton
Fruita
Loma
Mack
Grand Valley
Winter Flats
Colorado River
Gunnison River
Plateau Creek
Bull Creek
Mesa Creek
Whitewater Creek
North Fork
Gill Creek
Deep Creek
Kannah Creek
Kannah Creek
Kannah Creek
Black Ridge
Glade Park
Glide Park
Monument Mesa
Colorado National Monument
Horsethief Canyon
McInnis Canyon National Conservation Area
Dominguez Escalante National Conservation Area
Horse Mesa
Snyder Flats
Unaweep Canyon
The Hunting Ground
Mesa
Delta
Highway 50
Molina
Grand Junction Regional Airport
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.
Miles
2 1 0 2 4
Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203
377/hmw/4/26/2018

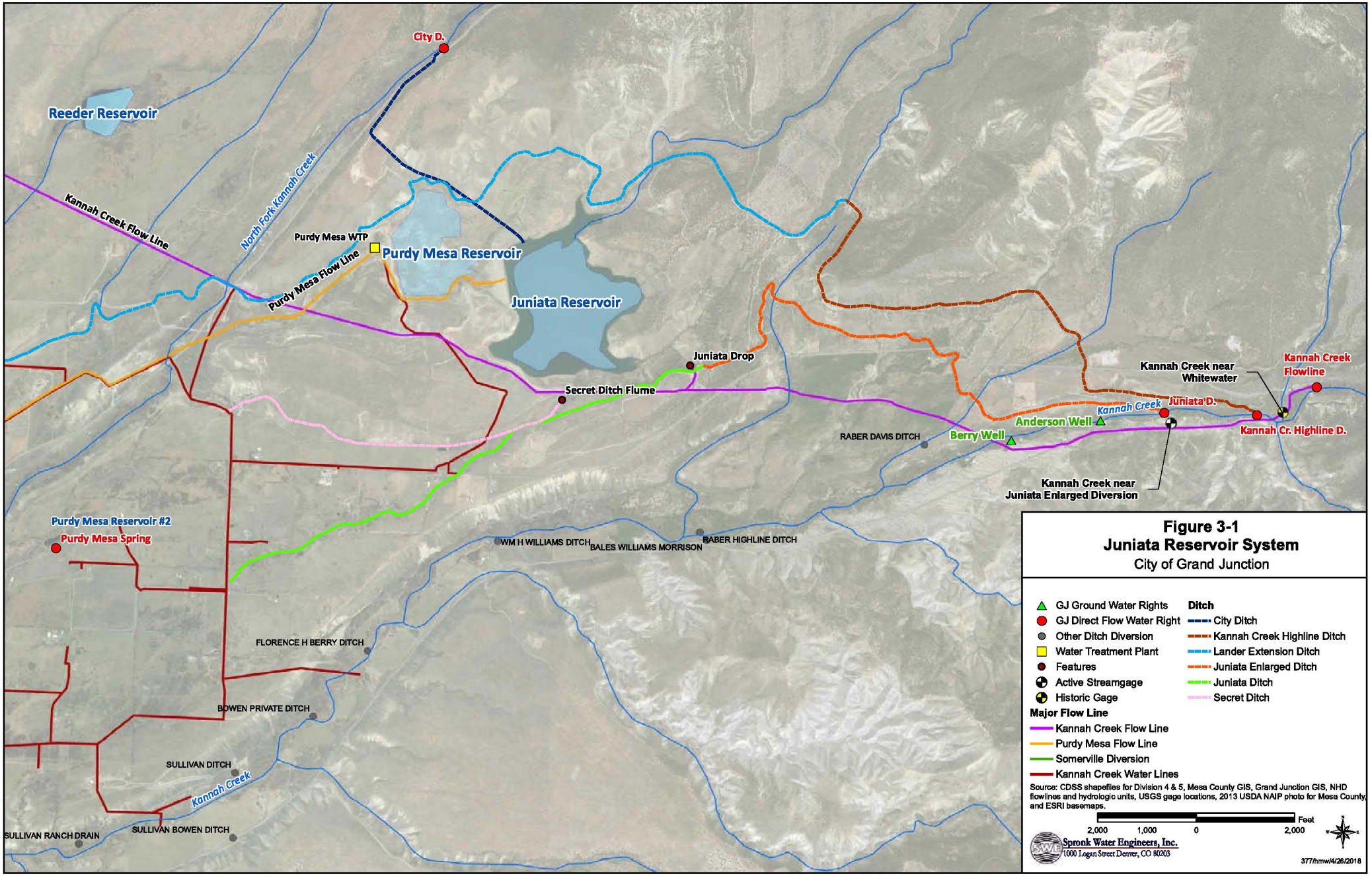


Figure 3-1
Juniata Reservoir System
City of Grand Junction

- 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

Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203

377/hmw/4/26/2018

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

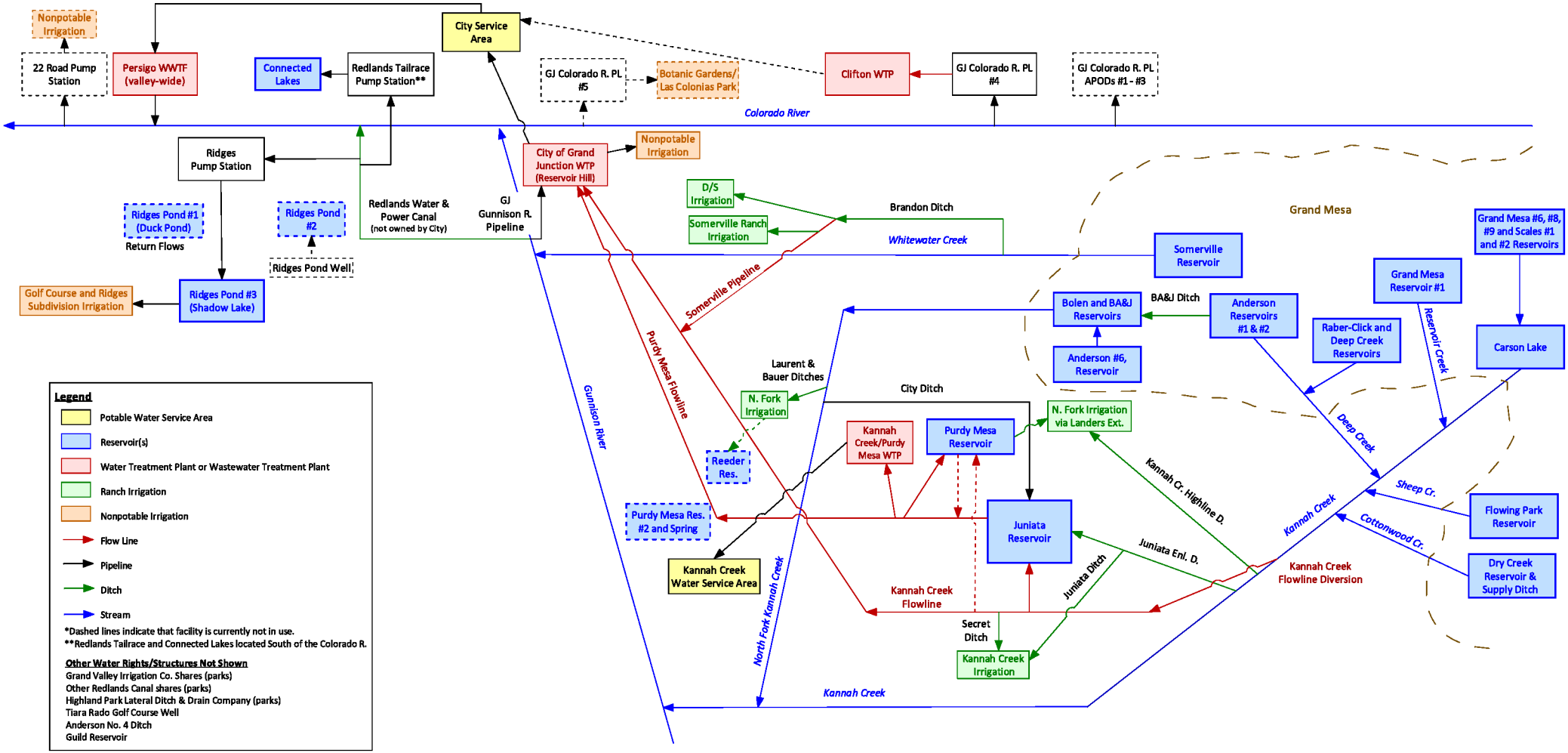
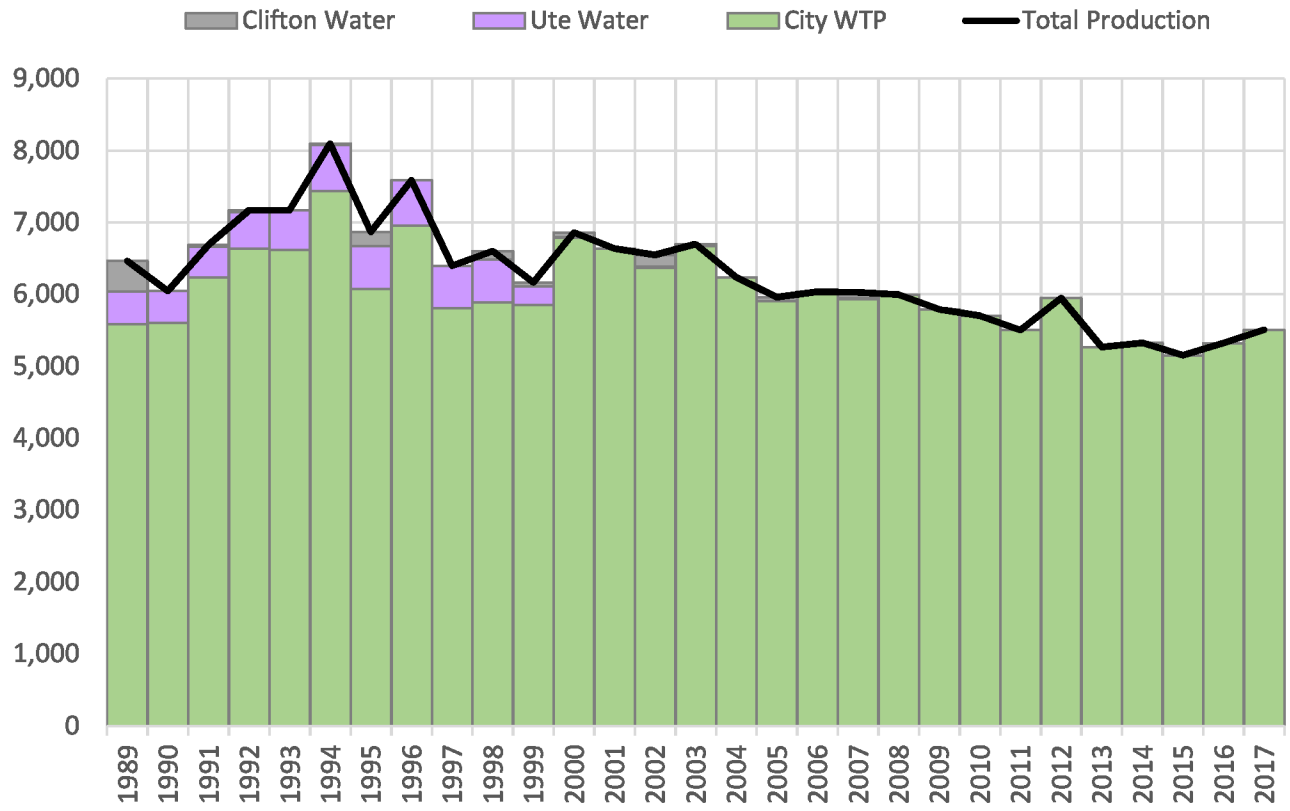


Figure 4-2

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

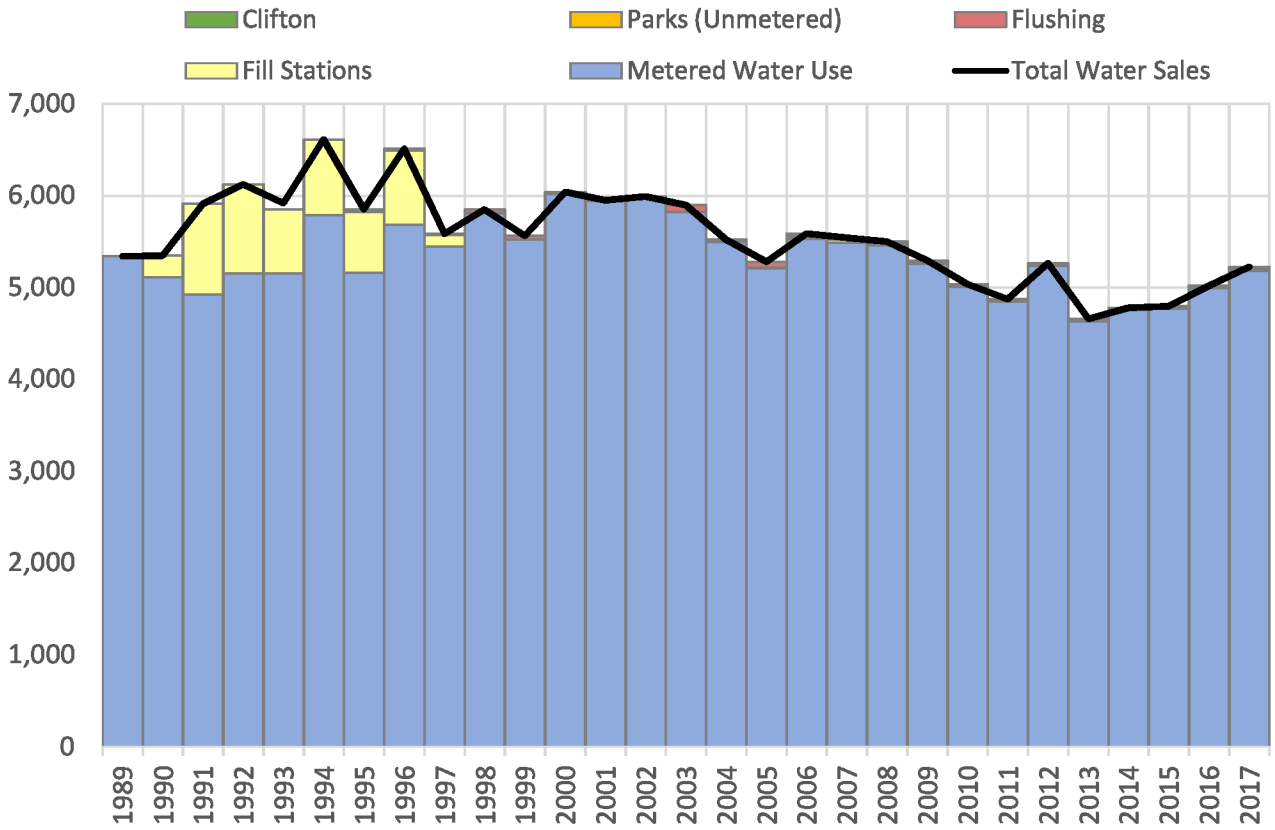


Notes:

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)

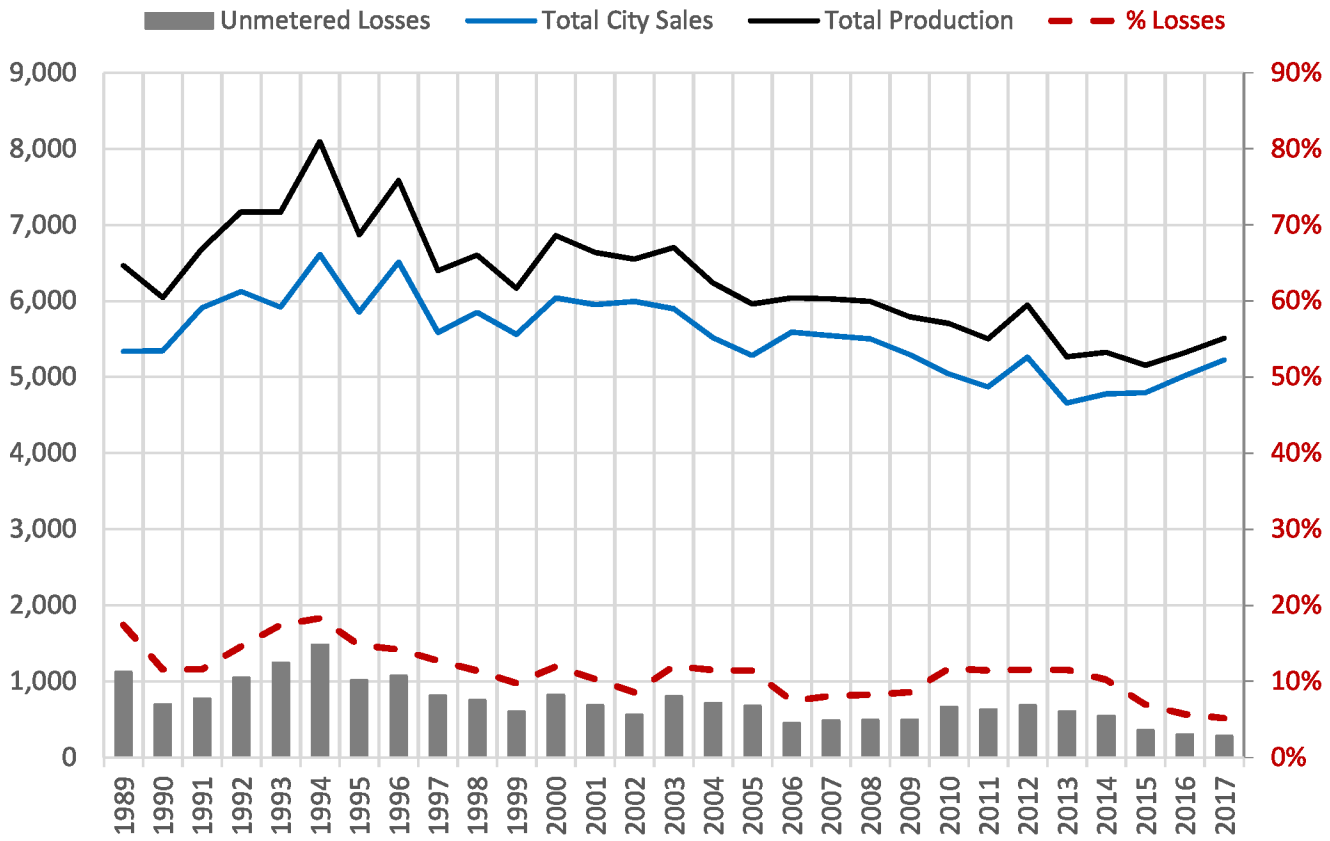


Notes:

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)

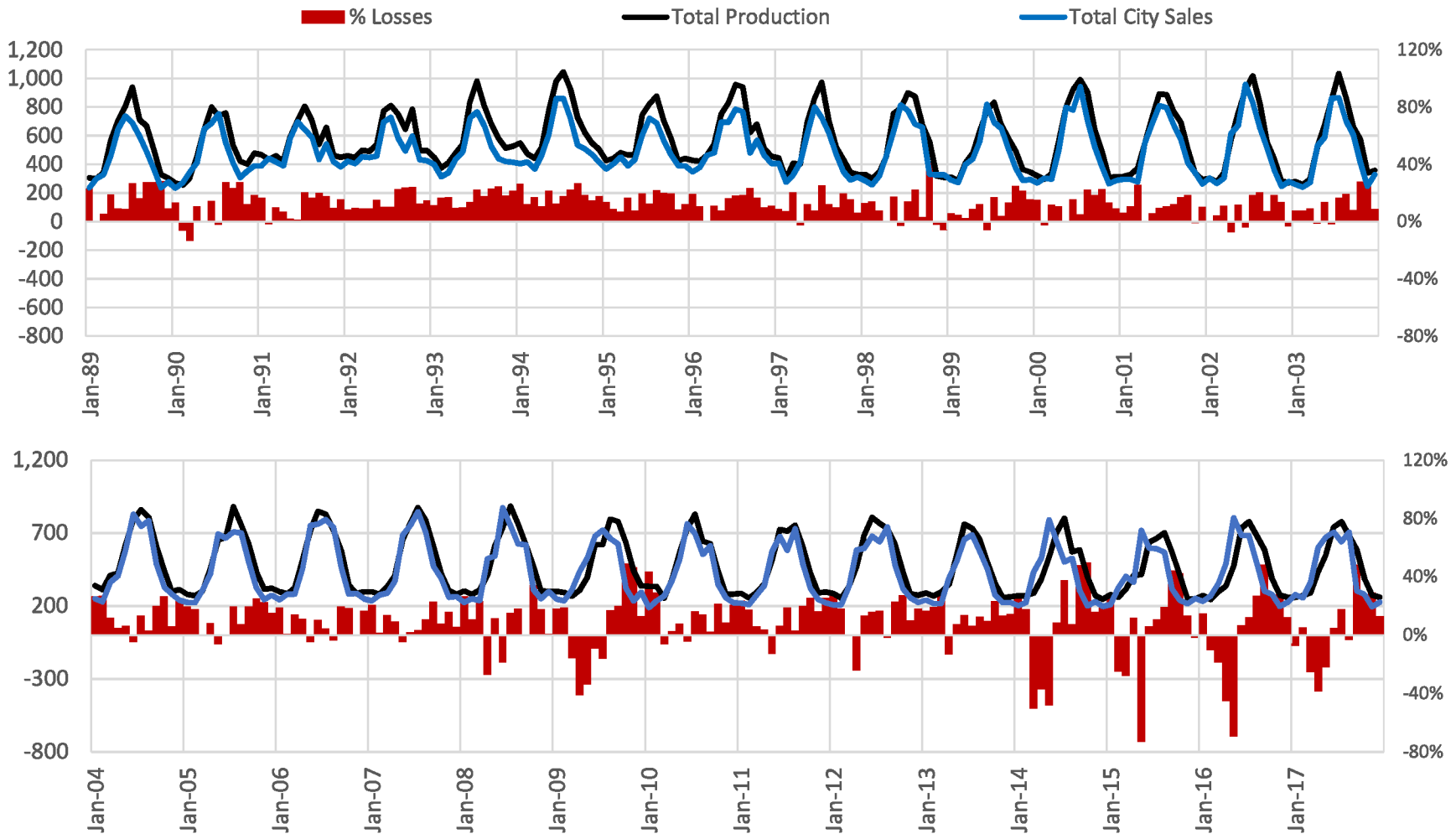


Notes:

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

Figure 4-5

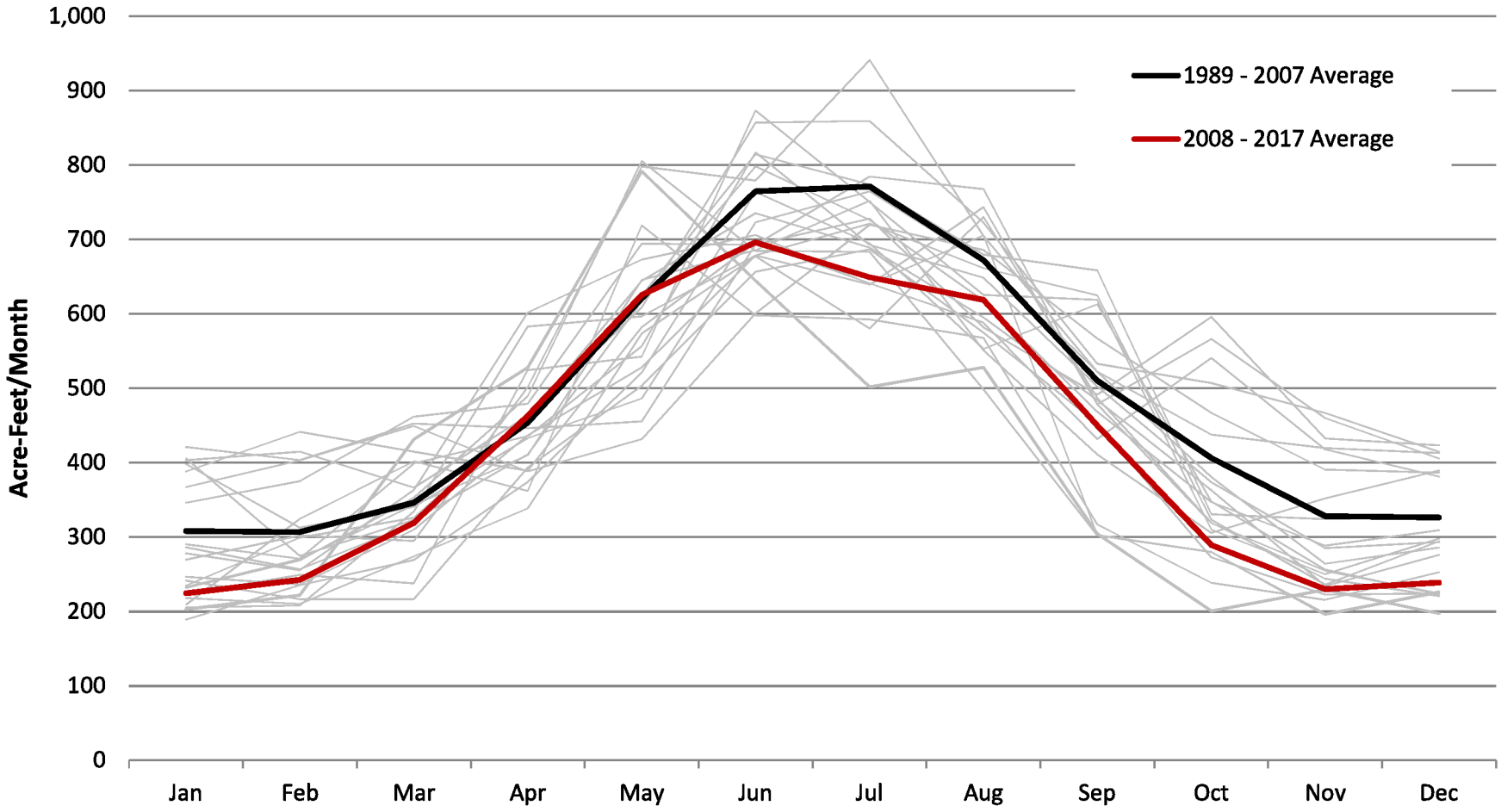
Monthly Water Production, Water Sales, and Unmetered Losses
City of Grand Junction
(acre-feet)



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



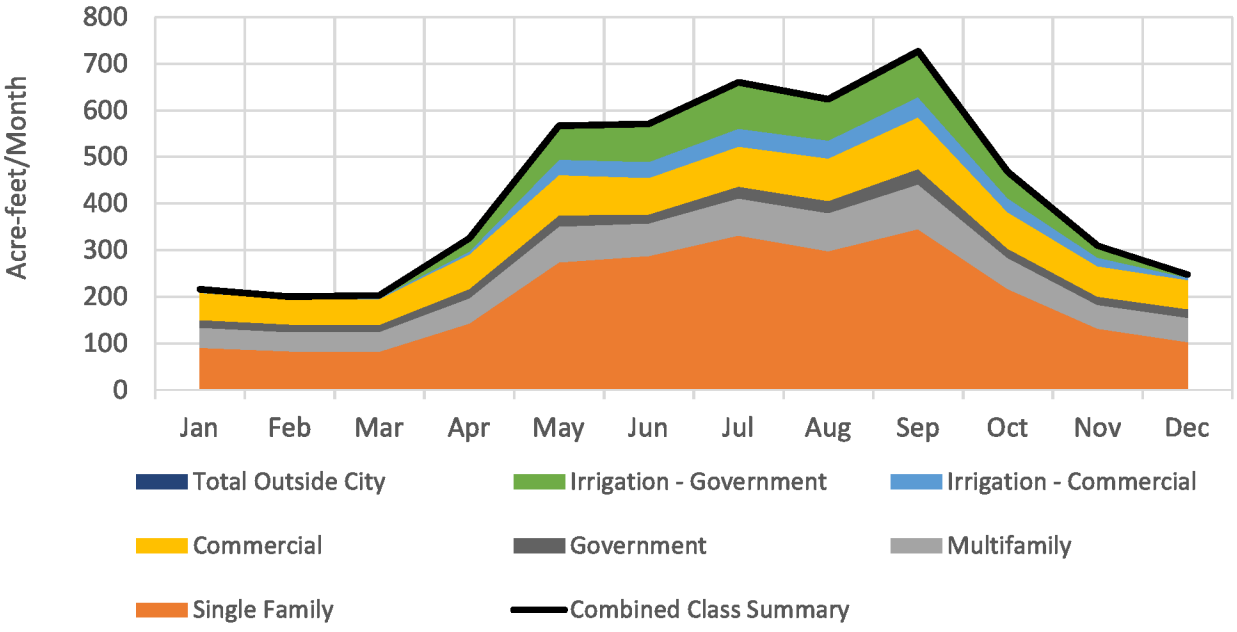
Notes:

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

2012



2013

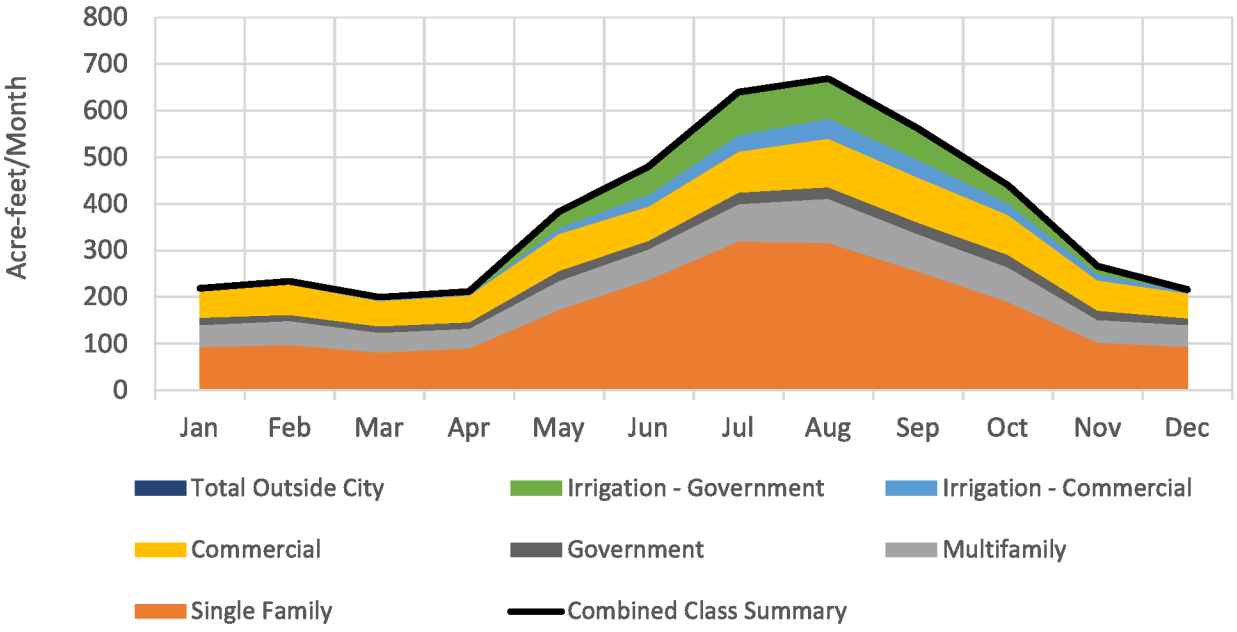
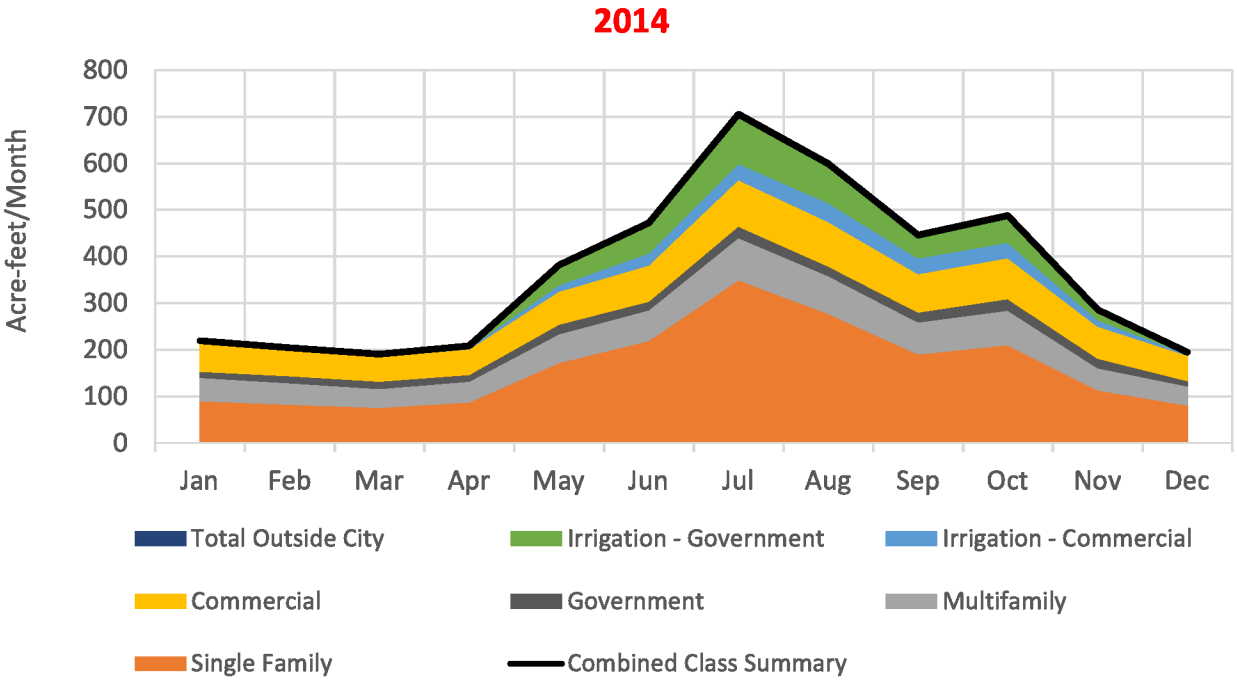
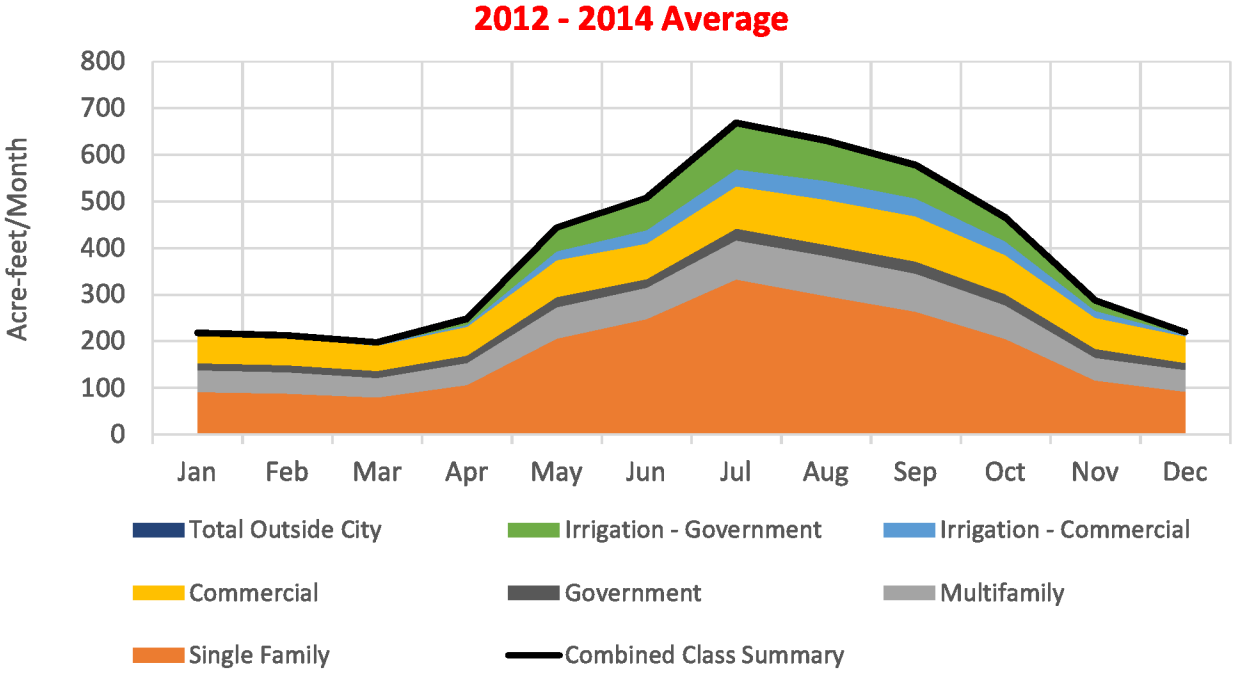


Figure 4-7

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





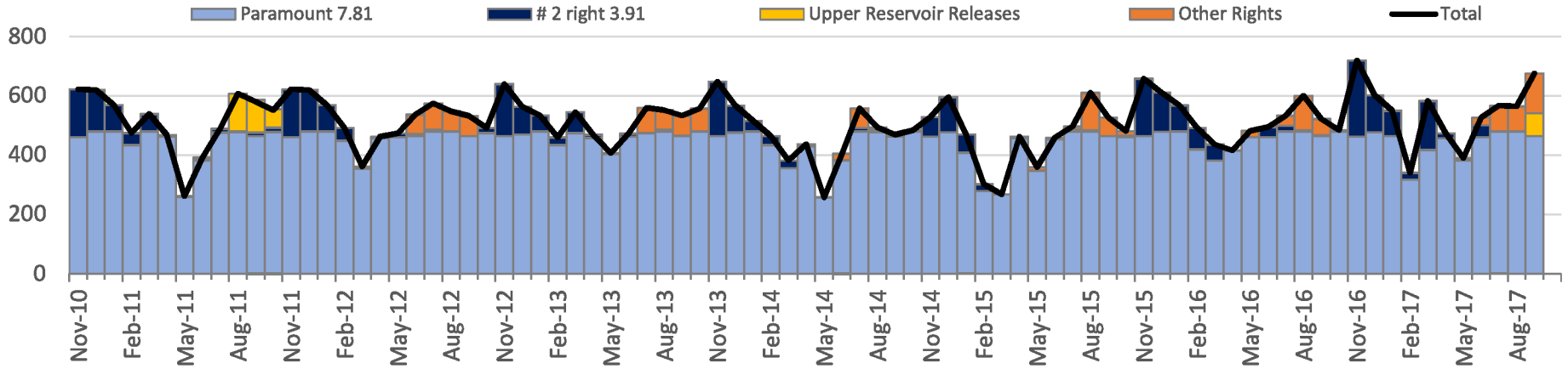
Notes:

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

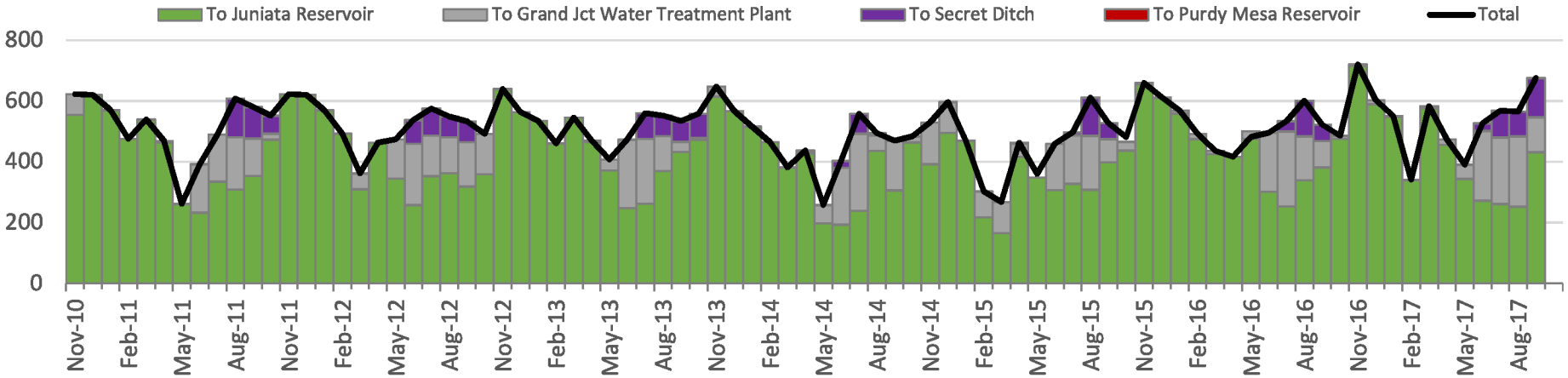
Figure 5-1

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

Kannah Creek Flowline Diversions



Kannah Creek Flowline Water Use

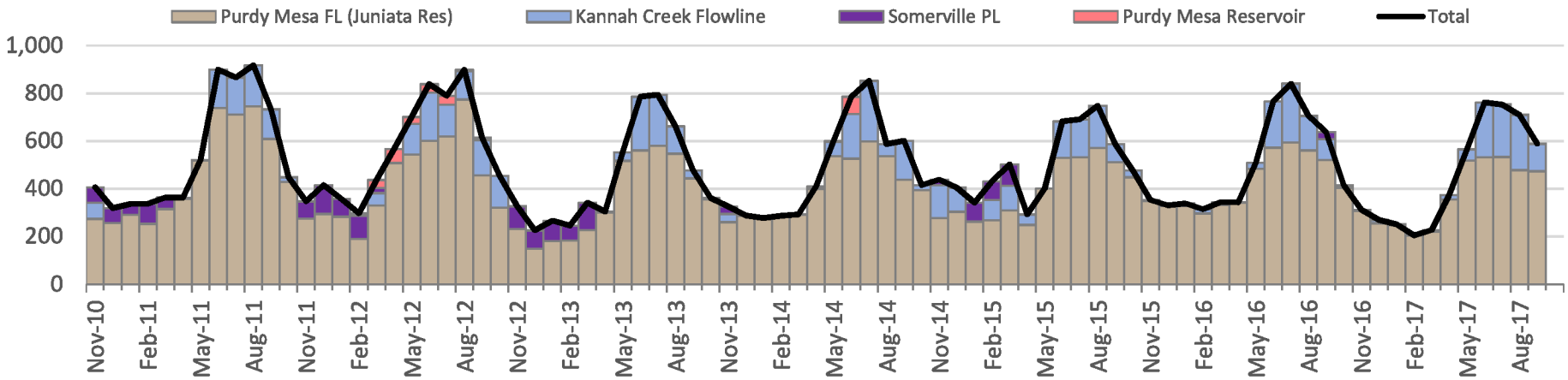


Notes: City of Grand Junction daily accounting records provided by the City of Grand Junction ("i.e., 2010-2011 Monthly Water Supply Report.xlsx").

Figure 5-2

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

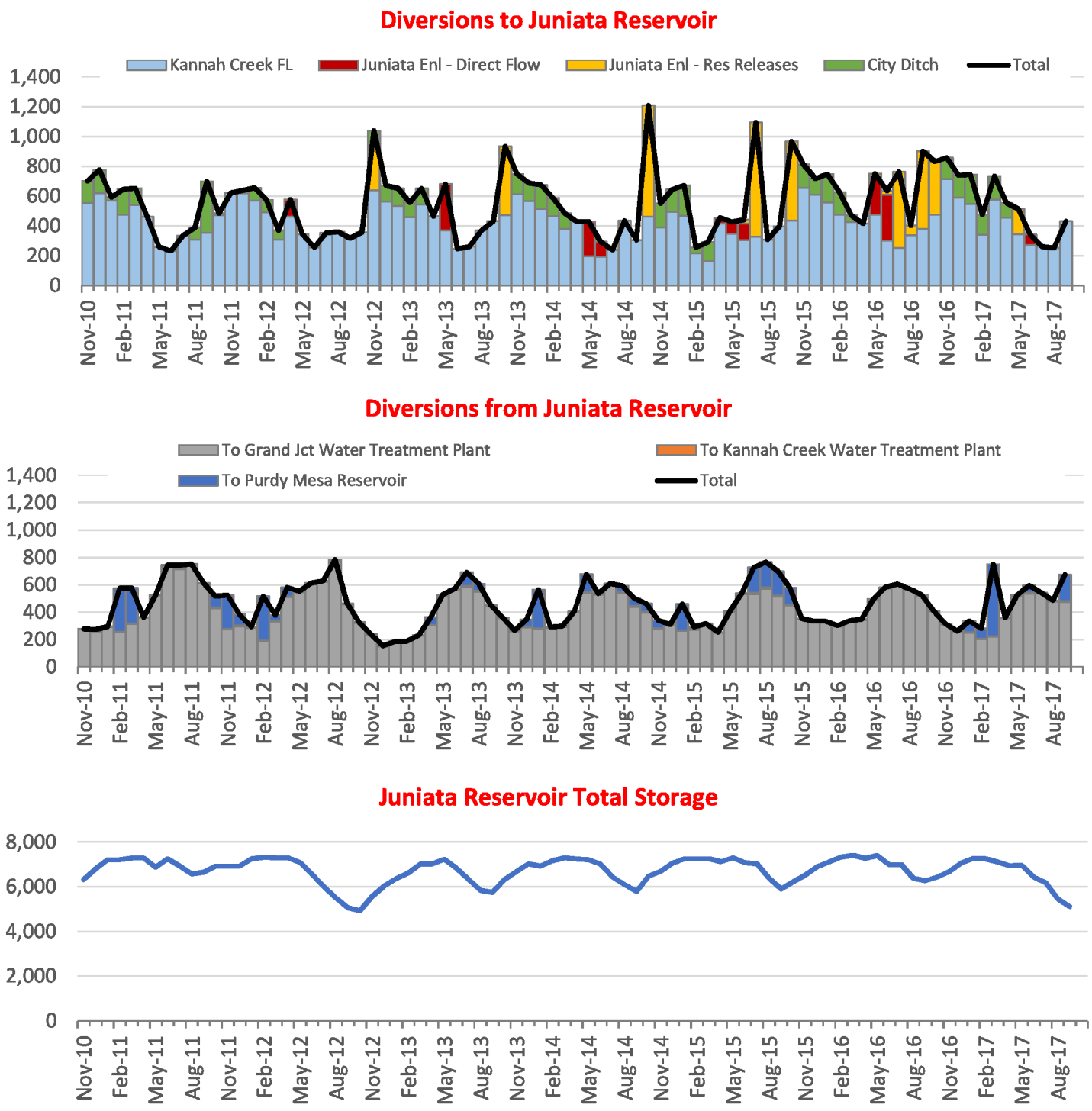
Diversions to Grand Junction Water Treatment Plant



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

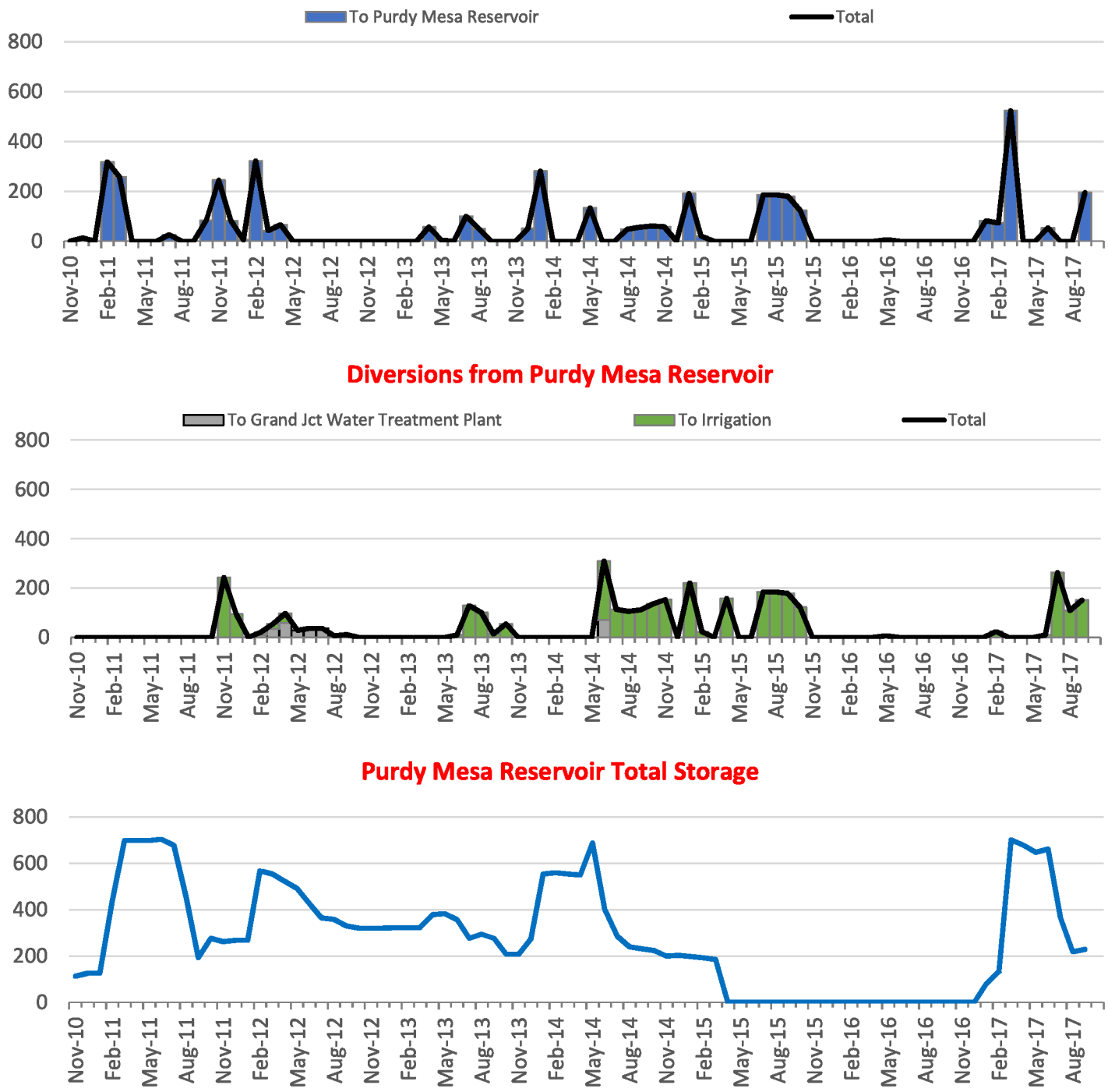
Grand Junction Water Accounting Records
Nov 2010 - Sep 2017
(acre-feet)



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

Figure 5-4

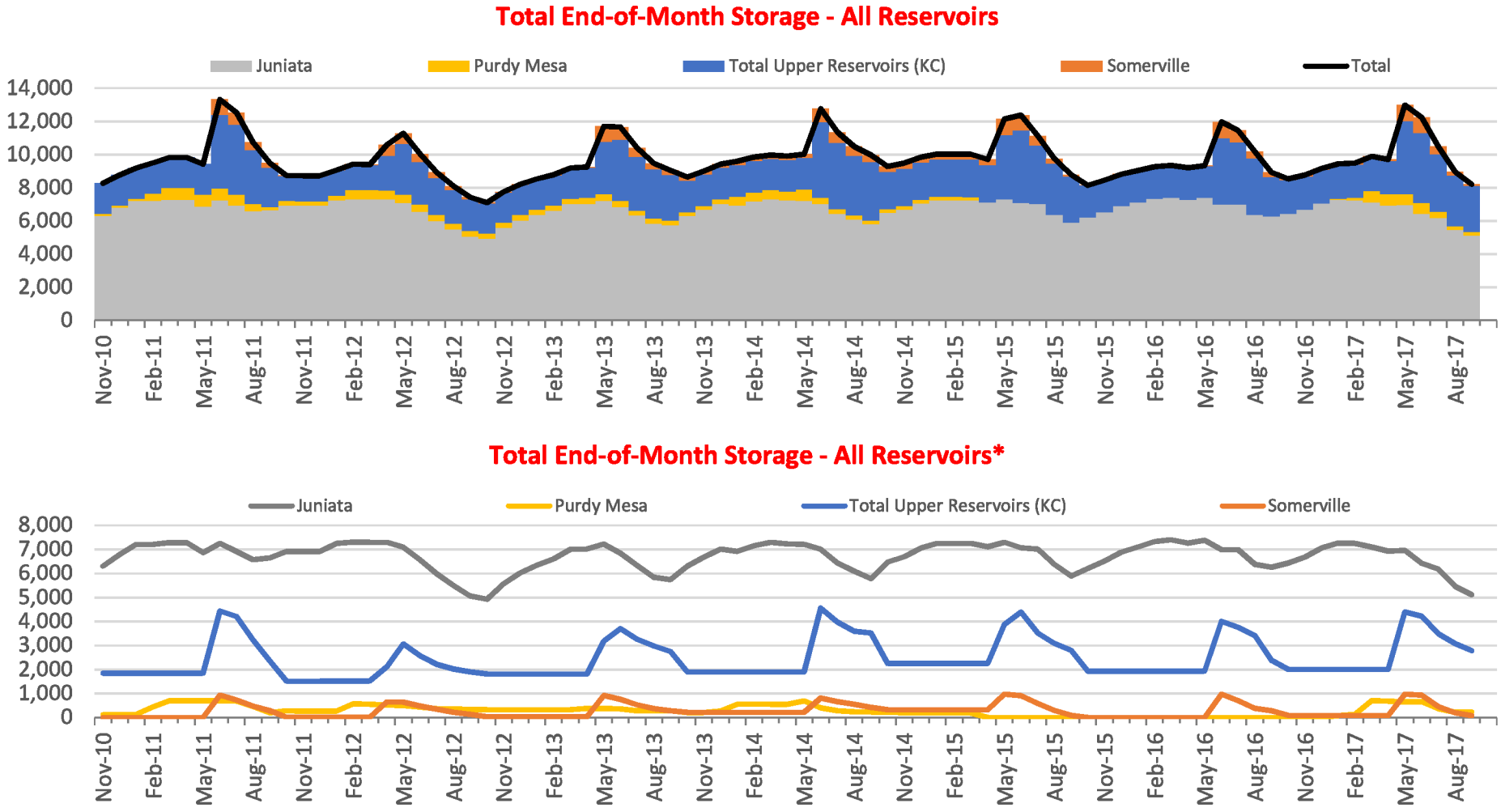
Grand Junction Water Accounting Records
Nov 2010 - Sep 2017
(acre-feet)



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)

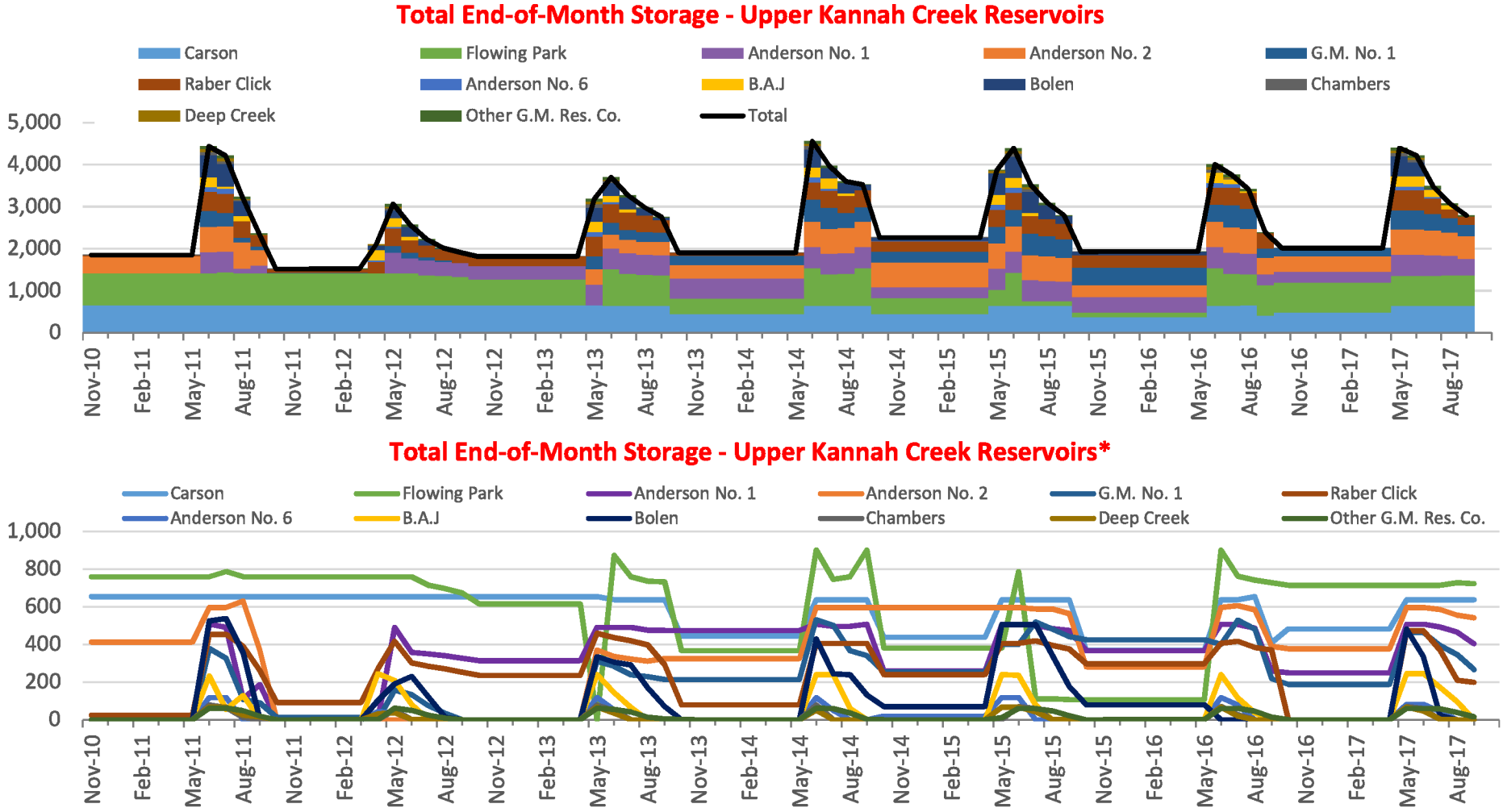


*Different scale than upper chart.

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").

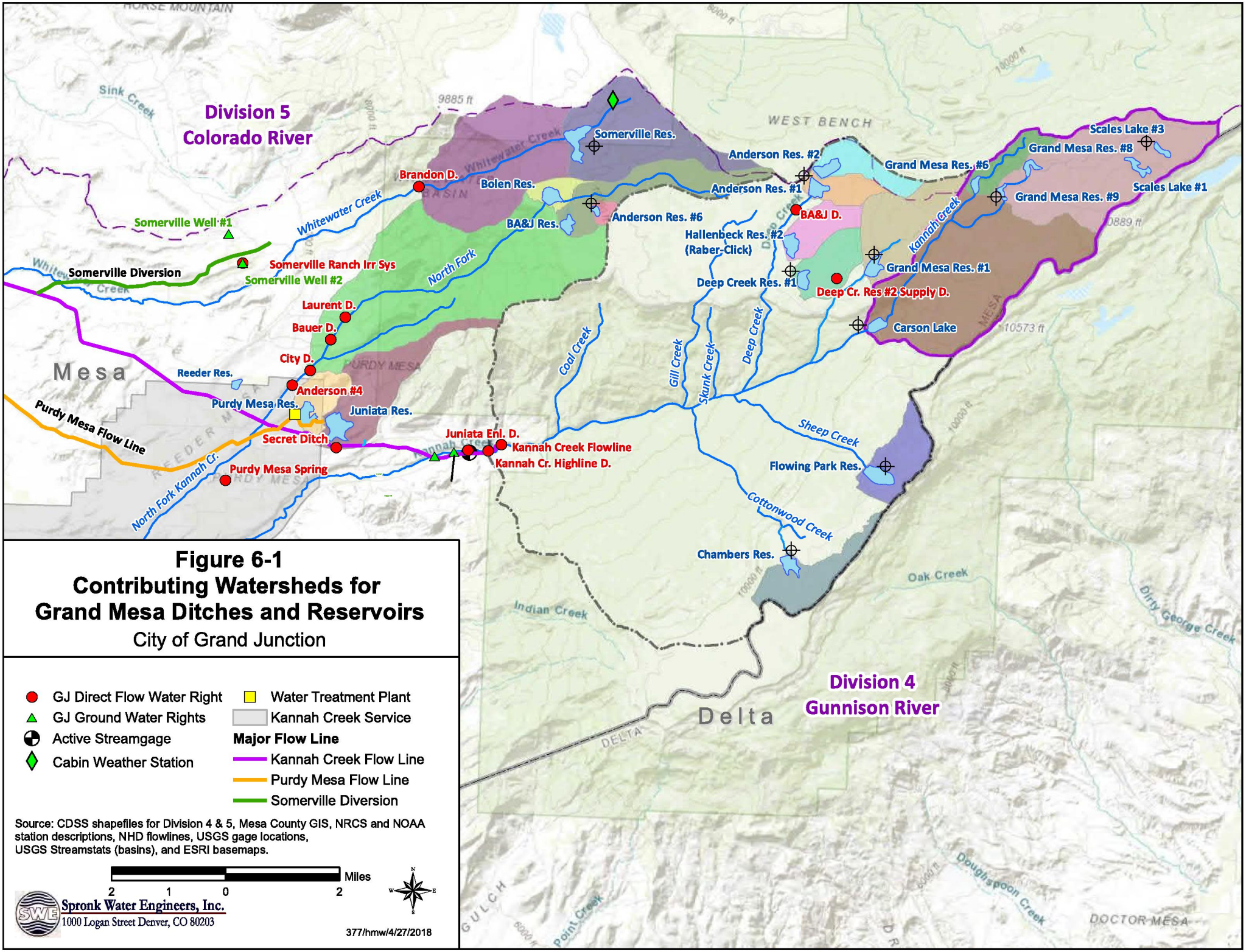


Figure 6-1
Contributing Watersheds for Grand Mesa Ditches and Reservoirs
City of Grand Junction

- 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

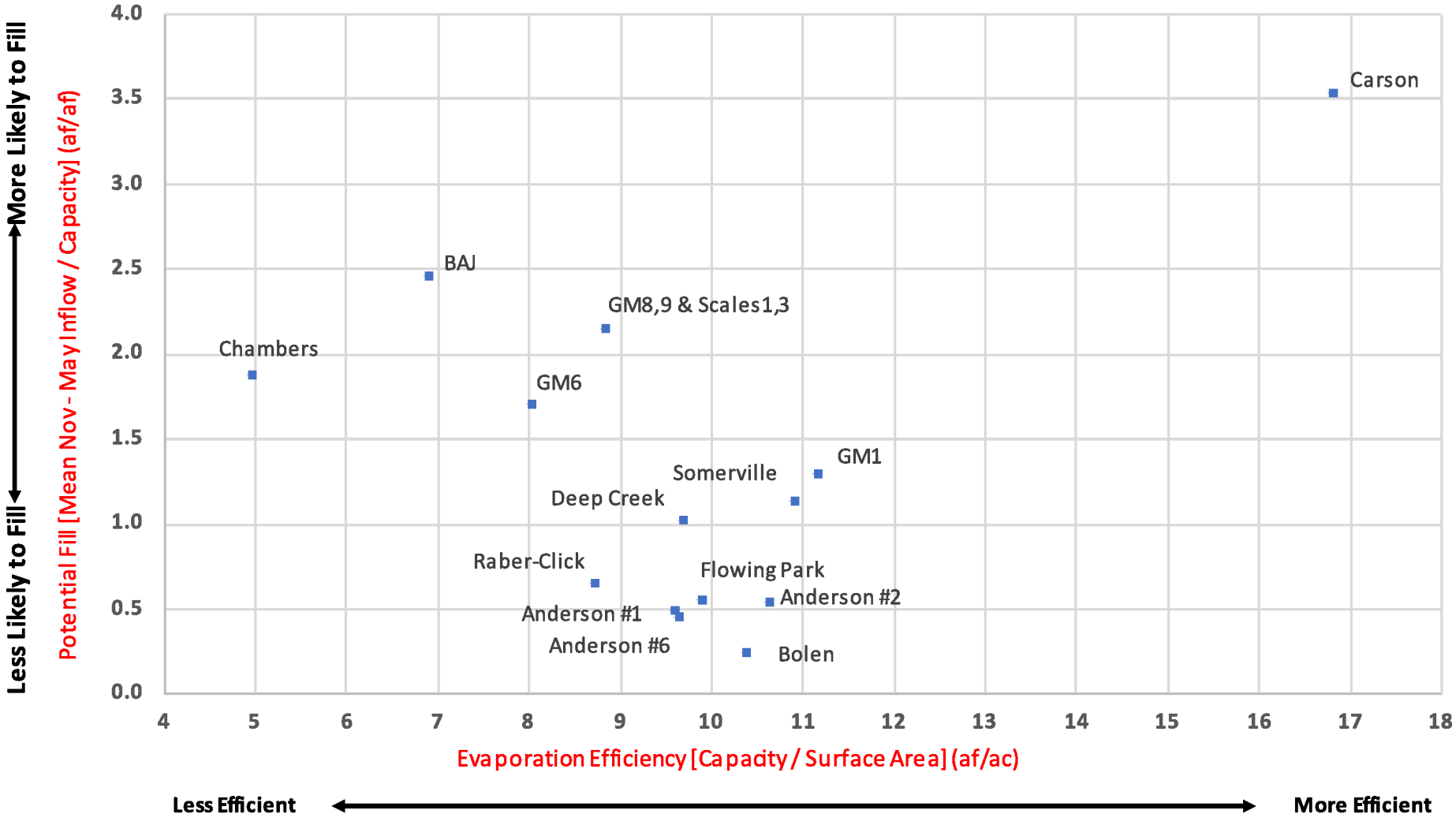
Source: CDSS shapefiles for Division 4 & 5, Mesa County GIS, NRCS and NOAA station descriptions, NHD flowlines, USGS gage locations, USGS Streamstats (basins), and ESRI basemaps.

2 1 0 2 Miles

Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203

377/hmw/4/27/2018

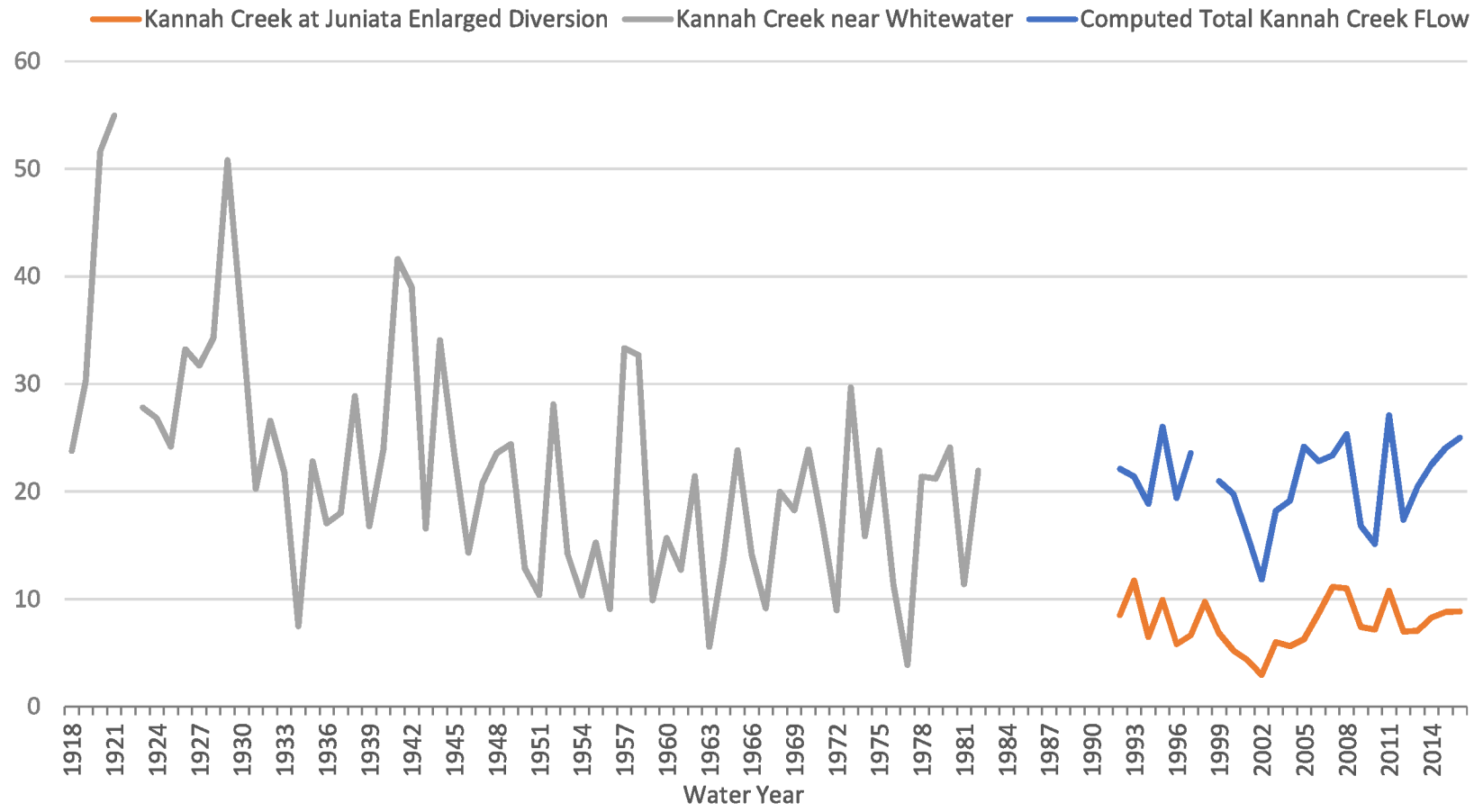
Figure 6-2
Potential Fill vs. Evaporation Efficiency
Upper Grand Mesa Reservoirs
City of Grand Junction



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)

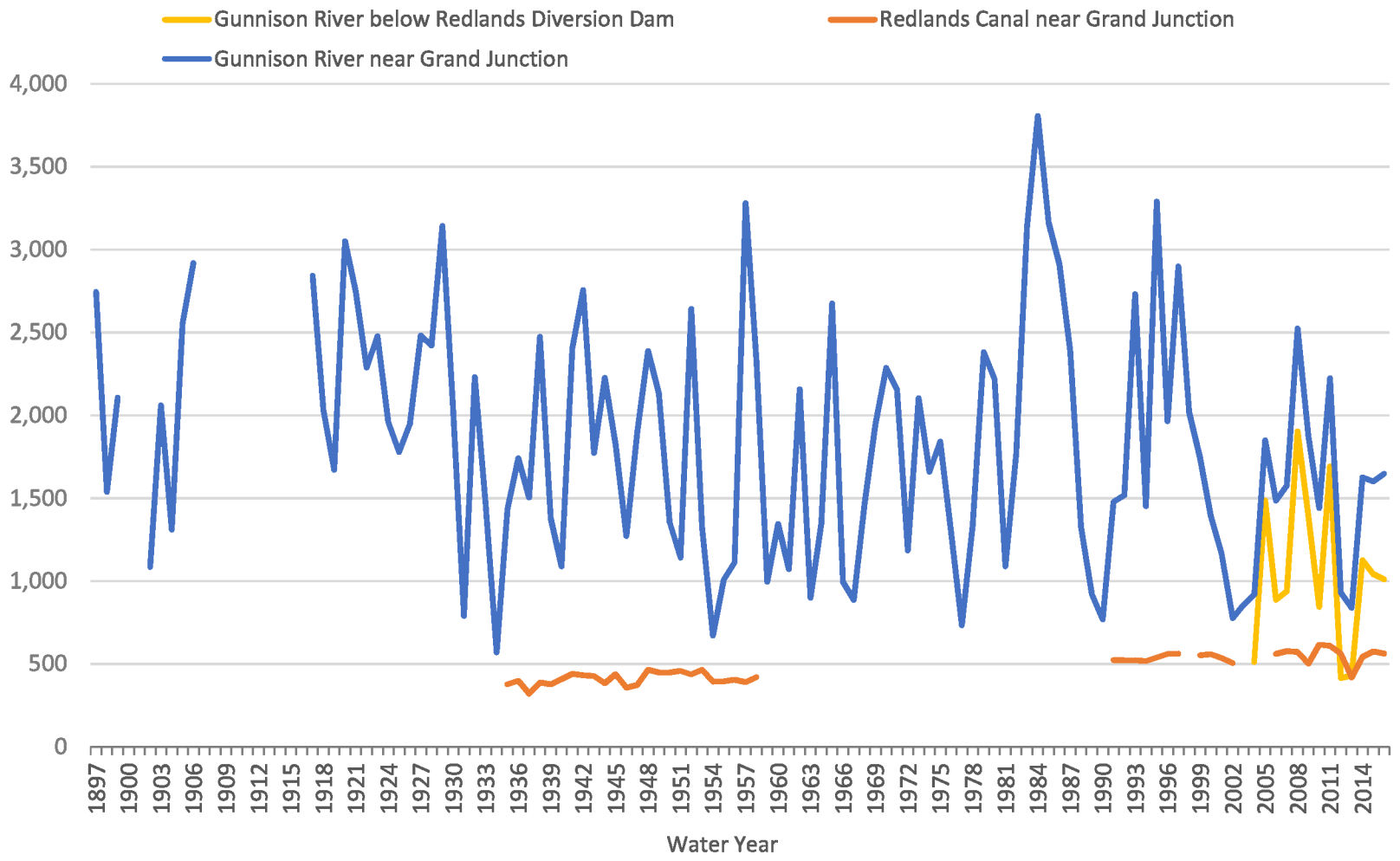


Notes:

Streamflow and diversion records from CDWR CDSS database.

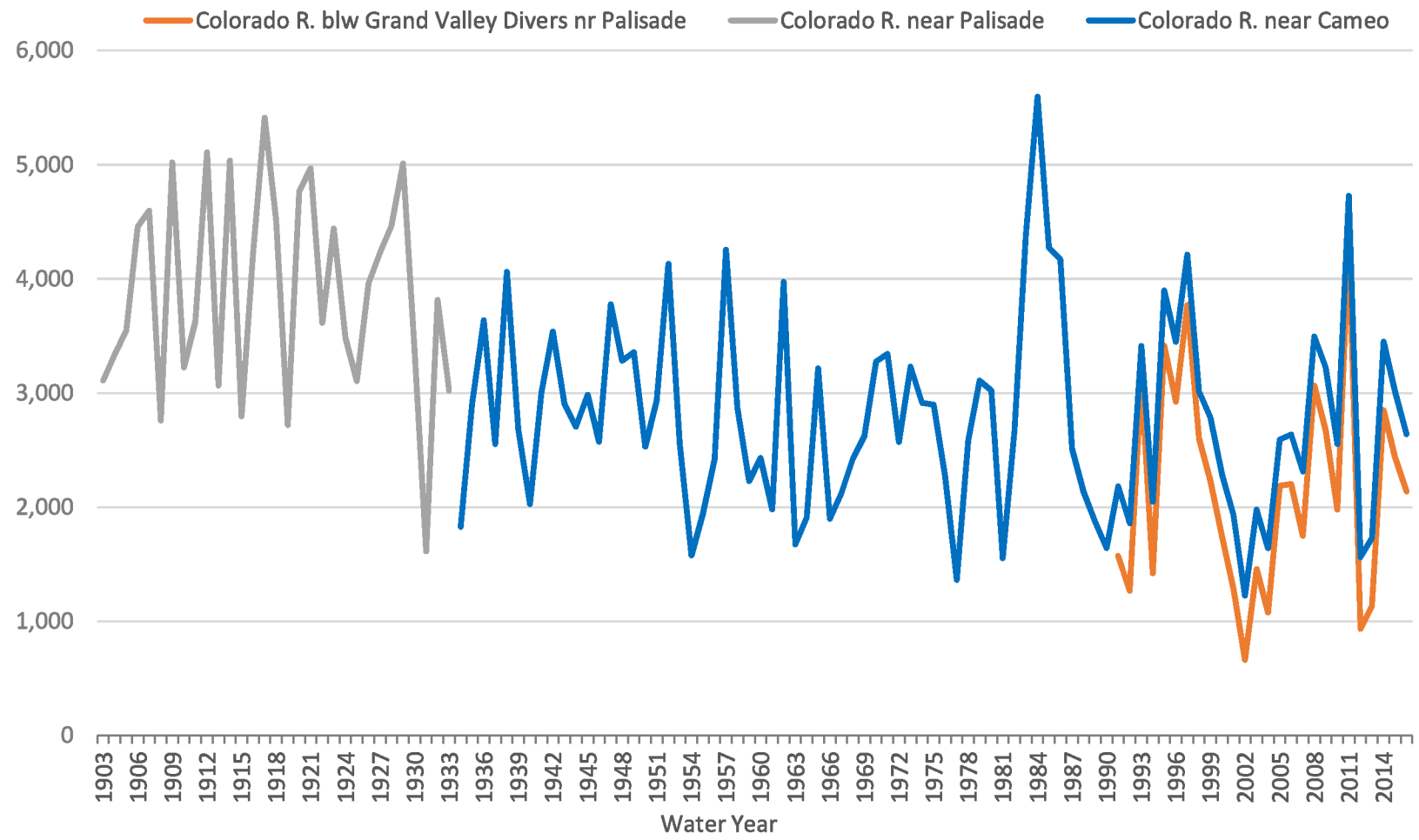
Kannah Creek flow computed from 1992 - 2015 (missing data in 1997-1998) as the sum of the diverisons (Kannah Cr. Highline, Juniata Ditch Enl., and GJ Flowline) plus the Kannah Creek near Juniata Enl. Gage.

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.

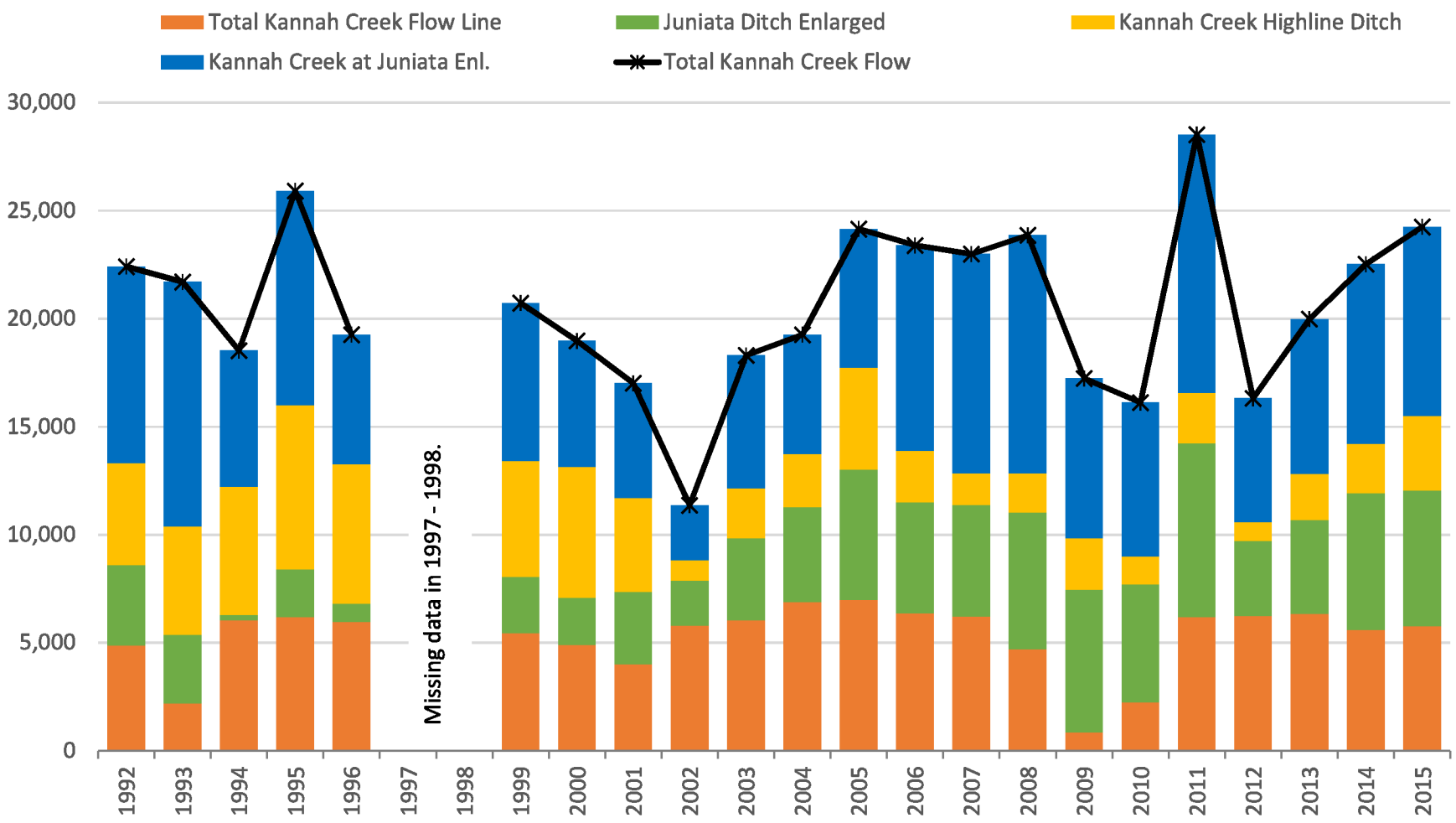
Figure 6-5
Annual Flow
Colorado River
Water Years 1903 - 2016
(1,000 acre-feet)



Notes:
Streamflow records from CDWR CDSS database.

Figure 6-6

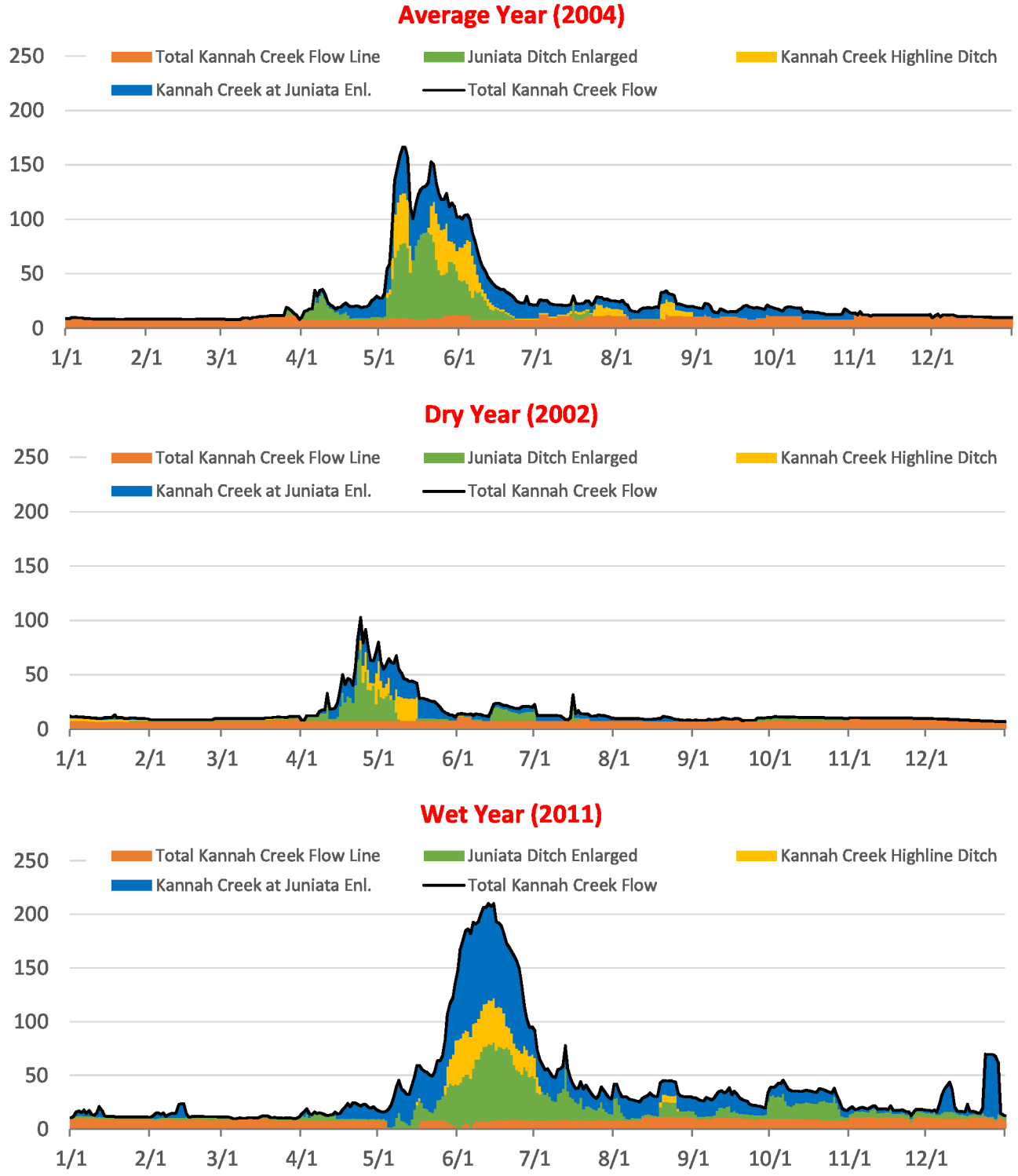
Computed Annual Total Kannah Creek Flow
1992 - 2015
(acre-feet/year)



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.

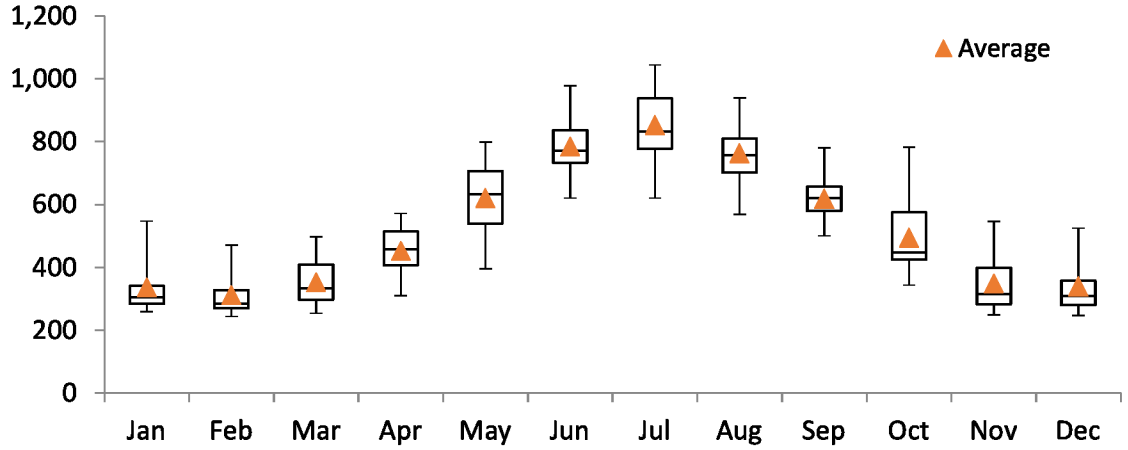
(3) (1) x (2).

(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)

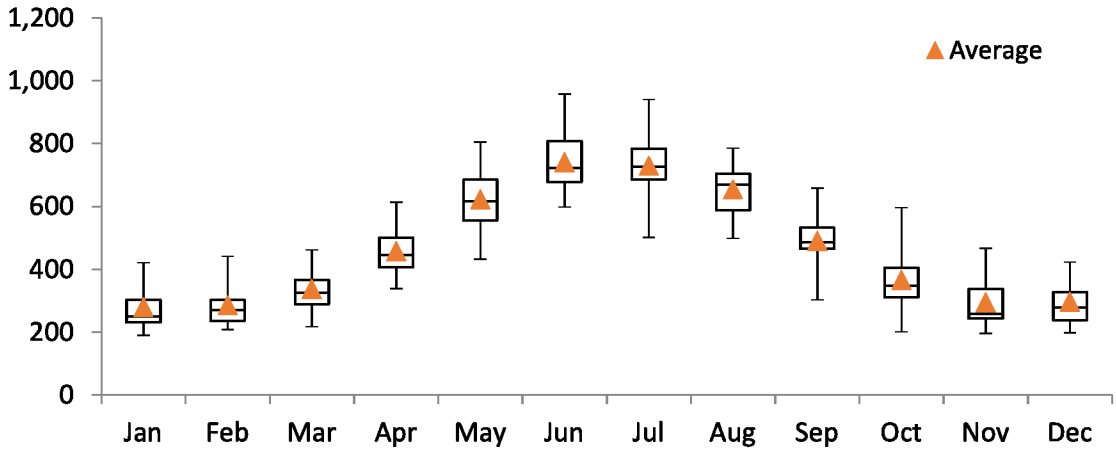
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1989	305	296	343	567	707	805	938	709	666	499	326	303	6,464
1990	268	254	302	457	641	800	735	757	535	421	399	477	6,045
1991	465	433	459	418	593	705	805	703	539	657	460	449	6,685
1992	459	445	497	489	535	771	810	748	644	783	494	495	7,170
1993	448	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

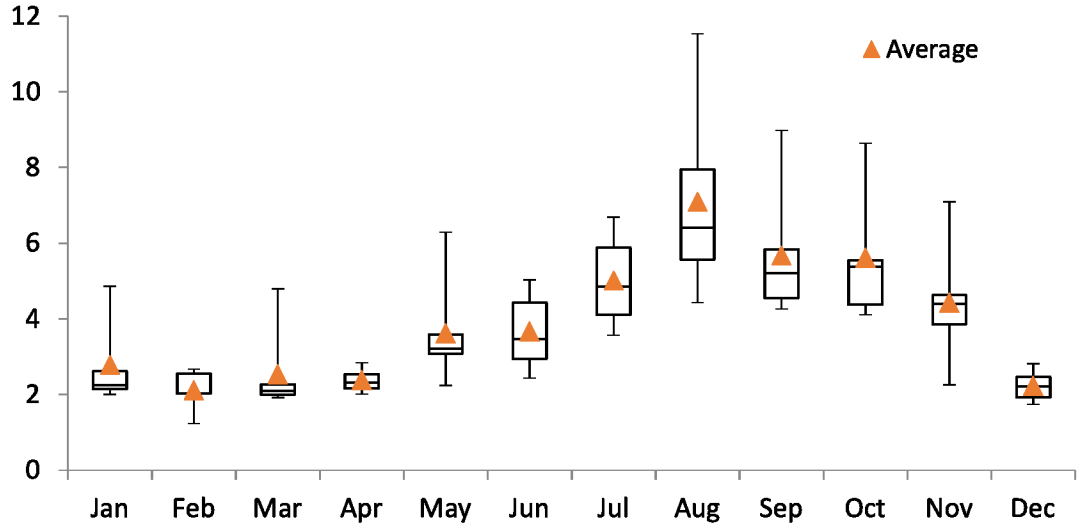


Notes:
Total sales including metered, flushing, parks, fill stations, and water to Clifton from spreadsheet provided by the City of Grand Junction ("WTR-LOSS.xlsx").

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:

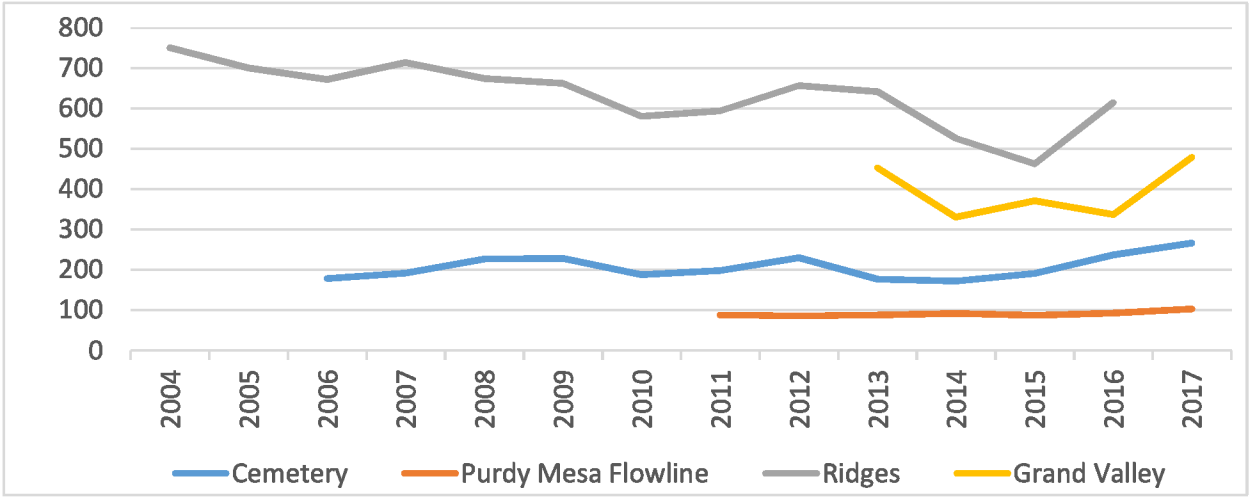
Gray cells indicate missing data. Mark is checking on these.

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

Structure	(1) Storage Capacity (af)	(2) City Owns (%)	(3) City Storage (af)	(4) Watershed Area (acres)	(5) Average Nov - May Inflow (af)	(6) Reservoir Water Surface Area (ac)	(7) Nov-May Inflow Divided by Watershed Area (af/ac)	(8) Capacity Divided by Surface Area (af/ac)	(9) 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).

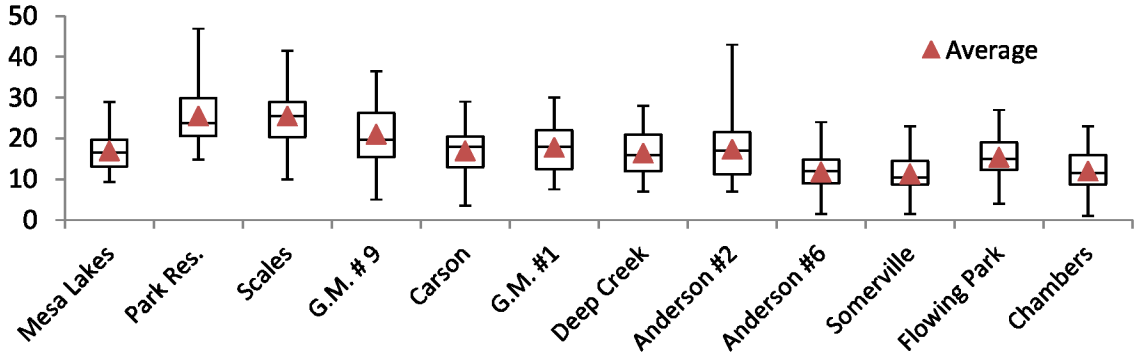
(7) (5) / (4).

(8) (1) / (6).

(9) (5) / (1).

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

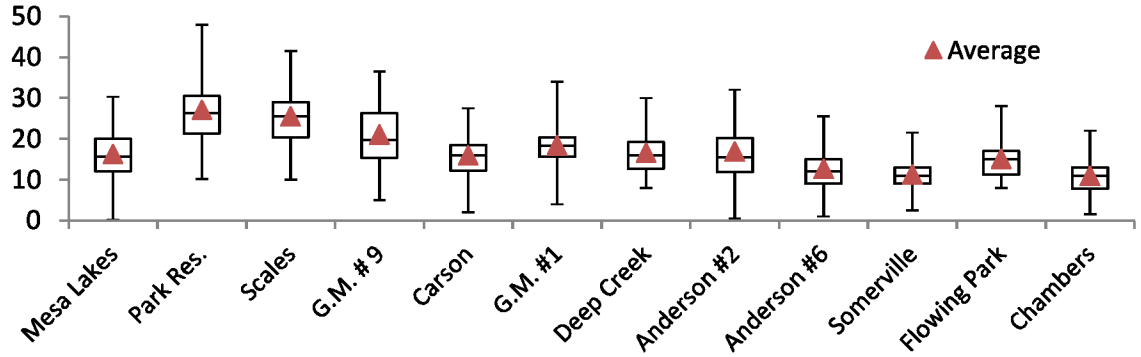
	Snotel		Snow Course Sites												
Year	Mesa Lakes	Park Res.	Scales	G.M. # 9	Carson	G.M. #1	Deep Creek	Anderson #2	Anderson #6	Somerville	Flowing Park	Chambers	Avg	Max	Min
1990	11.0	19.7	22.0	18.0	3.5	8.5	8.0	7.0	3.5	3.5	8.0	4.5	9.8	22.0	3.5
1991	17.5	26.8	21.0	19.5	13.0	16.0	7.0	18.0	13.0	10.0	14.0	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)

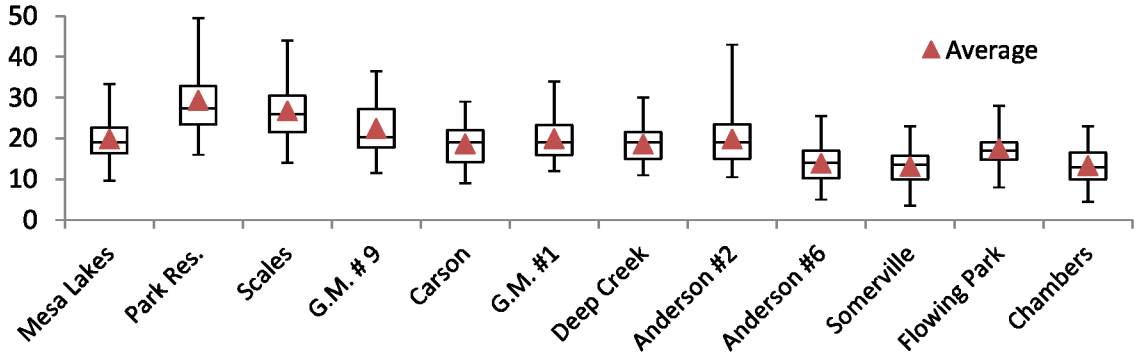
	Snotel		Snow Course Sites												
Year	Mesa Lakes	Park Res.	Scales	G.M. # 9	Carson	G.M. #1	Deep Creek	Anderson #2	Anderson #6	Somerville	Flowing Park	Chambers	Avg	Max	Min
1990	12.2	22.8	22.0	18.0	9.0	12.0	11.0	11.5	1.0	2.5	8.0	1.5	11.0	22.8	1.0
1991	19.9	28.8	21.0	19.5	16.0	16.0	16.0	19.5	20.0	12.5	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

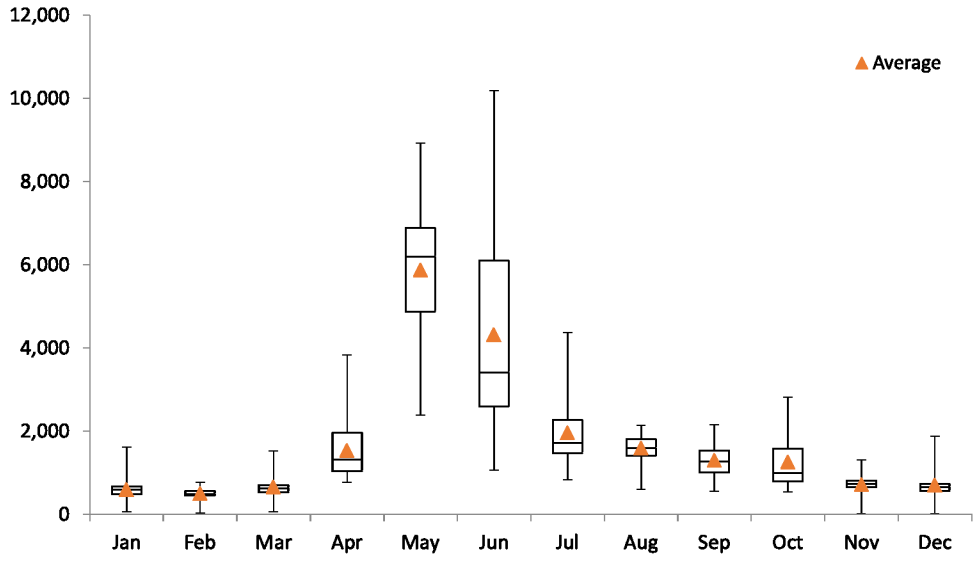


Source:
Snotel data downloaded from NRCS National Water & Climate Center (https://www.wcc.nrcs.usda.gov/index.html).
Snow course data provided by the City of Grand Junction ("SNOW2017.xlsx")
Excluded years with no measurements made in the beginning of April.

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

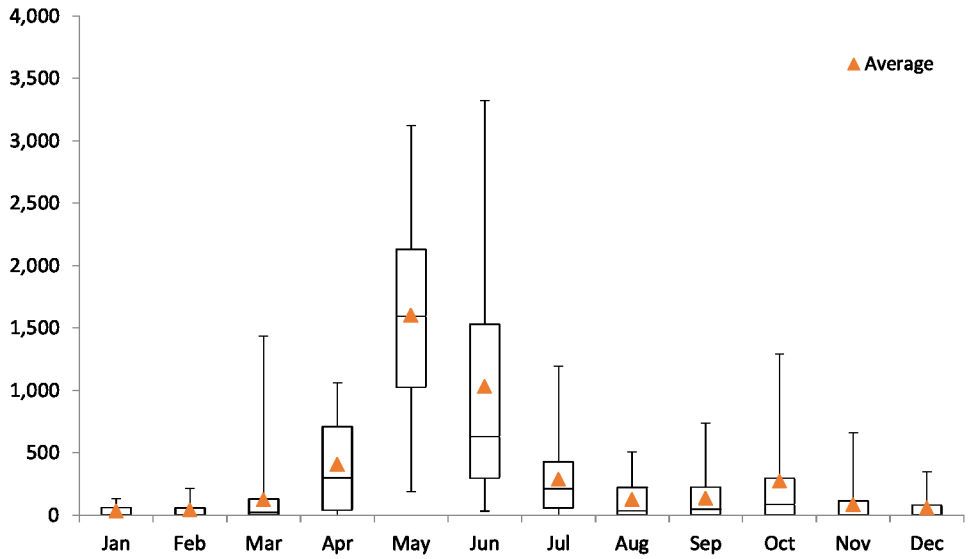


Notes: Streamflow and diversion records from CDWR CDSS database.
Kannah Creek flow computed as the sum of the diversions (Kannah Cr. Highline, Juniata Ditch Enl., and KC Flowline) plus the Kannah Creek near Juniata Enl. Gage.
Gray highlighted cells indicate that there are missing data in the month/year.

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

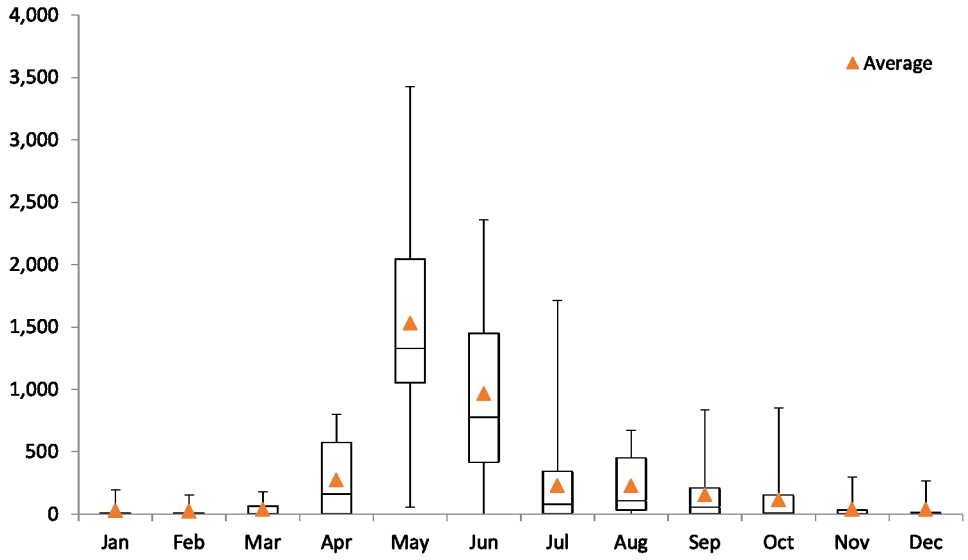


Notes: Diversion records from CDWR CDSS database.
Gray highlighted cells indicate that there are missing data in the month/year.

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

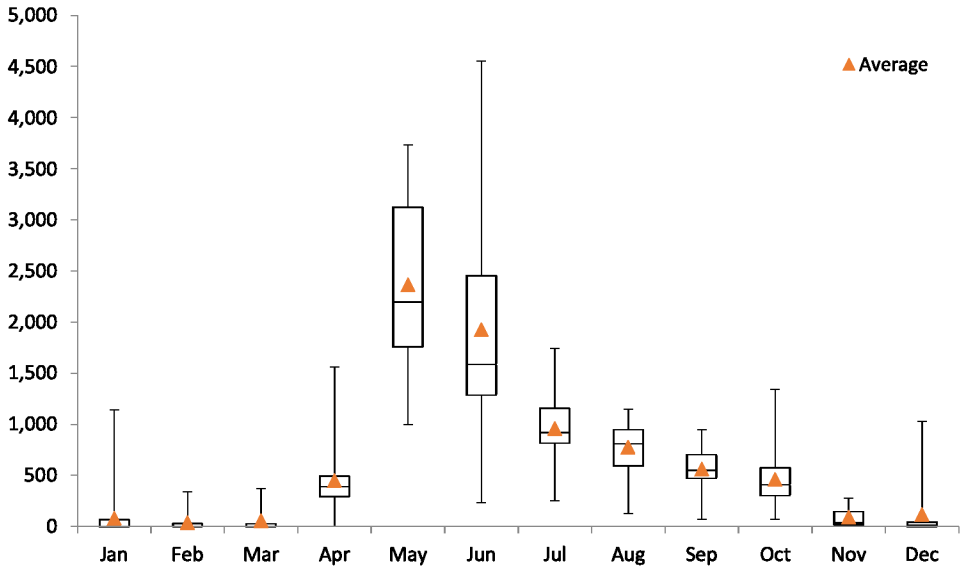
Monthly Streamflow

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

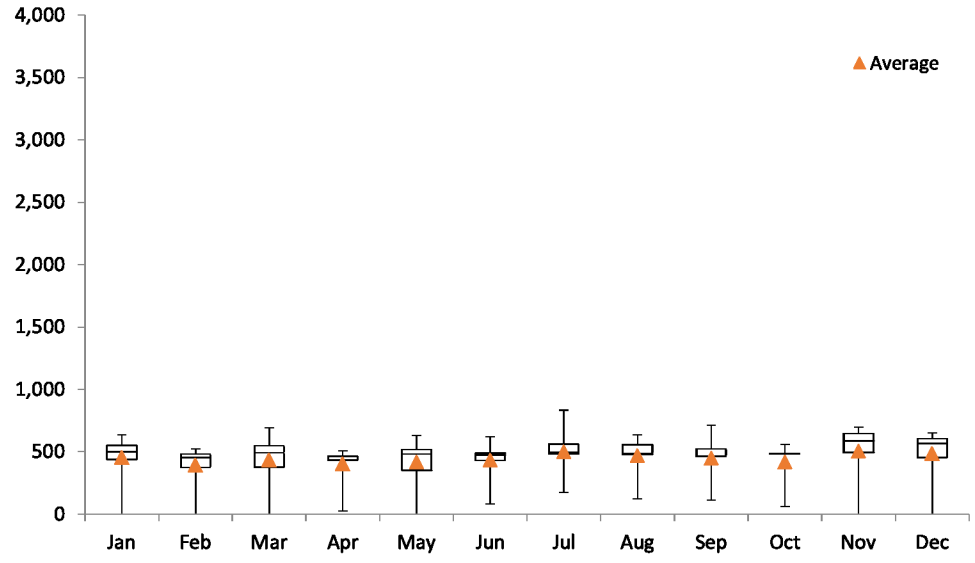


Notes: Streamflow records from CDWR CDSS database.
Gray highlighted cells indicate that there are missing data for a majority of the month.

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.

CITY OF Grand Junction COLORADO

Purchasing Division

ADDENDUM NO. 2

DATE: May 3, 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. Q. Does the scope of work include conducting the baseline Firm Yield Study?

   A. Yes.

2. Q. We understand the City will provide available data per Task 2. Please generally characterize the quality and period of record of available historical data, including historical reservoir data (storages, inflows, outflows), tributary streamflows, and diversions and water right yields. If necessary, should additional data development by the contractor be included the scope of work?

   A. The City has historical data as far back as 1918. The quality of data varies over time. We do not anticipate that the consultant will be required to develop a lot of additional data. However, we understand that the data set may need to be supplemented or some level of data quality analysis may be required. As such, we suggest budgeting an allowance that can be used for this purpose if needed.

3. Q. In the scope of services section of the RFP (Section 4.4), Task 3 specifies that "In addition, the proposed computer model should be configured to that additional operational scenarios can be evaluated as discussed in Additional Tasks." Then later under Additional Tasks, the first sentence indicates "Future phases of work may include the following additional tasks:"

   What is the City expecting for the model under the current project regarding the Additional Tasks? Should the delivered model be configured so it can evaluate all the Additional Tasks with little additional work? Or are you looking for a model that can be easily configured in the future to evaluate the Additional Tasks, pursuant to modeling under future phases of work?

   A. The City desires a model that will be configured to represent our current operations and then can be easily configured to represent changes in infrastructure/operations to evaluate the Additional Tasks in the future, pursuant to modeling under future phases of work?

4. Q. Does the City of Grand Junction have a target completion date for the Water Supply Modeling project?

   A. November 1, 2018.

5. Q. General Liability insurance requires that the policy covers explosion, collapse and underground XCU hazards. Since this is typically required for companies performing construction, underground work, etc. only, and not the professional services work contained in this RFP, can you please confirm if vendors that do not have this coverage will be precluded from performing this work?

   A. Firm shall not be required to provide insurance to cover explosion, collapse and underground hazards, for this project.

6. Q. Automobile insurance coverage includes the requirement that the policy contains a severability of interest's provision. Can you please confirm if vendors that have the severability of interest's provision in General Liability only and not in the Automobile Policies will be precluded from performing this work, or is it acceptable that the GL contains the severability of interest provision?

   A. Severability of interest shall only apply to General Liability.

7. Q. Insurance requirements clarify that the coverage will be maintained with forms and insurers acceptable to The Owner. Can you please clarify if there is a minimum AM Best rating that is required of the insurers?

   A. There is no AM Best rating required.

8. Q. Is there a ranking or point system for proposal evaluation (ranking of the parameters listed in Section 6.2?)

   A. The City has several evaluation tools at its disposal to determine the preferred proposer, based upon the evaluation criteria stated in the solicitation documents, one of which may be a point system.

9. Q. Is there a proposal page limit?

   A. No.

10. Q. In the RFP under General Contract Terms, it indicates alternative proposals are acceptable. Would you like to see more than one for this proposal?

    A. We ask that Firms submit proposals that address the requirements and desires of the solicitation documents. However, the City is always open to receiving alternative proposals, and if Firms desire to submit more than one proposal, they shall clearly indicate which proposal(s) is the alternative proposal.

11. Q. The schedule of meetings seems to imply a fairly rapid project completion time (perhaps 2 months). Is there a deadline in mind for the project?

    A. November 1, 2018.

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

Request for Proposal
RFP-4524-18-DH

Professional Services for Water Supply Modeling for City of Grand Junction

RESPONSES DUE:
May 11, 2018 prior to 3:30 PM MST
Accepting Electronic Responses Only
Responses Only Submitted Through the Rocky Mountain E-Purchasing System (RMEPS)
https://www.rockymountainbidsystem.com/default.asp
(Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor MUST contact RMEPS to resolve issue prior to the response deadline. 800-835-4603)

PURCHASING REPRESENTATIVE:
Duane Hoff, Senior Buyer
duaneh@gjcity.org
(970) 244-1545

This solicitation has been developed specifically for a Request for Proposal intended to solicit competitive responses for this solicitation, and may not be the same as previous City of Grand Junction solicitations. All offerors are urged to thoroughly review this solicitation prior to submitting. Submittal by **FAX, EMAIL or HARD COPY IS NOT ACCEPTABLE** for this solicitation.

REQUEST FOR PROPOSAL

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Section

REQUEST FOR PROPOSAL

SECTION 1.0: ADMINISTRATIVE INFORMATION & CONDITIONS FOR SUBMITTAL

1.1 Issuing Office: This Request for Proposal (RFP) is issued by the City of Grand Junction. All contact regarding this RFP is directed to:

RFP QUESTIONS:
Duane Hoff, Senior Buyer
duaneh@gjcity.org

1.2 Purpose: The purpose of this RFP is to obtain proposals from qualified professional firms to Water Supply Modeling for the City of Grand Junction's Water Services Division.

1.3 The Owner: The Owner is the City of Grand Junction and is referred to throughout this Solicitation. The term Owner means the Owner or his authorized representative.

1.4 Compliance: All participating Offerors, by their signature hereunder, shall agree to comply with all conditions, requirements, and instructions of this RFP as stated or implied herein. Should the Owner omit anything from this packet which is necessary to the clear understanding of the requirements, or should it appear that various instructions are in conflict, the Offeror(s) shall secure instructions from the Purchasing Division prior to the date and time of the submittal deadline shown in this RFP.

1.5 Submission: Please refer to section 5.0 for what is to be included. ***Each proposal shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (https://www.rockymountainbidsystem.com/default.asp).*** *This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our "**Electronic Vendor Registration Guide"** at http://www.gjcity.org/business-and-economic-development/bids/ for details. For proper comparison and evaluation, the City requests that proposals be formatted as directed in Section 5.0 "Preparation and Submittal of Proposals." Submittals received that fail to follow this format may be ruled non-responsive. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline. **800-835-4603**).

1.6 Altering Proposals: Any alterations made prior to opening date and time must be initialed by the signer of the proposal, guaranteeing authenticity. Proposals cannot be altered or amended after submission deadline.

1.7 Withdrawal of Proposal: A proposal must be firm and valid for award and may not be withdrawn or canceled by the Offeror for sixty (60) days following the submittal deadline date, and only prior to award. The Offeror so agrees upon submittal of their proposal. After award this statement is not applicable.

1.8 Acceptance of Proposal Content: The contents of the proposal of the successful Offeror shall become contractual obligations if acquisition action ensues. Failure of the successful Offeror to accept these obligations in a contract shall result in cancellation of the award and such vendor shall be removed from future solicitations.

1.9 Addenda: All questions shall be submitted in writing to the appropriate person as shown in Section 1.1. Any interpretations, corrections and changes to this RFP or extensions to the opening/receipt date shall be made by a written Addendum to the RFP by the City Purchasing Division. Sole authority to authorize addenda shall be vested in the City of Grand Junction Purchasing Representative. Addenda will be issued electronically through the Rocky Mountain E-Purchasing website at www.rockymountainbidsystem.com. Offerors shall acknowledge receipt of all addenda in their proposal.

1.10 Exceptions and Substitutions: All proposals meeting the intent of this RFP shall be considered for award. Offerors taking exception to the specifications shall do so at their own risk. The Owner reserves the right to accept or reject any or all substitutions or alternatives. When offering substitutions and/or alternatives, Offeror must state these exceptions in the section pertaining to that area. Exception/substitution, if accepted, must meet or exceed the stated intent and/or specifications. The absence of such a list shall indicate that the Offeror has not taken exceptions, and if awarded a contract, shall hold the Offeror responsible to perform in strict accordance with the specifications or scope of work contained herein.

1.11 Confidential Material: All materials submitted in response to this RFP shall ultimately become public record and shall be subject to inspection after contract award. **"Proprietary or Confidential Information"** is defined as any information that is not generally known to competitors and which provides a competitive advantage. Unrestricted disclosure of proprietary information places it in the public domain. Only submittal information clearly identified with the words "***Confidential Disclosure***" and uploaded as a separate document shall establish a confidential, proprietary relationship. Any material to be treated as confidential or proprietary in nature must include a justification for the request. The request shall be reviewed and either approved or denied by the Owner. If denied, the proposer shall have the opportunity to withdraw its entire proposal, or to remove the confidential or proprietary restrictions. Neither cost nor pricing information nor the total proposal shall be considered confidential or proprietary.

1.12 Response Material Ownership: All proposals become the property of the Owner upon receipt and shall only be returned to the proposer at the Owner's option. Selection or rejection of the proposal shall not affect this right. The Owner shall have the right to use all ideas or adaptations of the ideas contained in any proposal received in response to this RFP, subject to limitations outlined in the entitled "Confidential Material". Disqualification of a proposal does not eliminate this right.

1.13 Minimal Standards for Responsible Prospective Offerors: A prospective Offeror must affirmably demonstrate their responsibility. A prospective Offeror must meet the following requirements.

- Have adequate financial resources, or the ability to obtain such resources as required.

- Be able to comply with the required or proposed completion schedule.
- Have a satisfactory record of performance.
- Have a satisfactory record of integrity and ethics.
- Be otherwise qualified and eligible to receive an award and enter into a contract with the Owner.

1.14 Open Records: Proposals shall be received and publicly acknowledged at the location, date, and time stated herein. Offerors, their representatives and interested persons may be present. Proposals shall be received and acknowledged only so as to avoid disclosure of process. However, all proposals shall be open for public inspection after the contract is awarded. Trade secrets and confidential information contained in the proposal so identified by offer as such shall be treated as confidential by the Owner to the extent allowable in the Open Records Act.

1.15 Sales Tax: The Owner is, by statute, exempt from the State Sales Tax and Federal Excise Tax; therefore, all fees shall not include taxes.

1.16 Public Opening: Proposals shall be opened in the City Hall Auditorium, 250 North 5th Street, Grand Junction, CO, 81501, immediately following the proposal deadline. Offerors, their representatives and interested persons may be present. Only the names and locations on the proposing firms will be disclosed.

SECTION 2.0: GENERAL CONTRACT TERMS AND CONDITIONS

2.1. Acceptance of RFP Terms: A proposal submitted in response to this RFP shall constitute a binding offer. Acknowledgment of this condition shall be indicated on the Letter of Interest or Cover Letter by the autographic signature of the Offeror or an officer of the Offeror legally authorized to execute contractual obligations. A submission in response to the RFP acknowledges acceptance by the Offeror of all terms and conditions including compensation, as set forth herein. An Offeror shall identify clearly and thoroughly any variations between its proposal and the Owner's RFP requirements. Failure to do so shall be deemed a waiver of any rights to subsequently modify the terms of performance, except as outlined or specified in the RFP.

2.2. Execution, Correlation, Intent, and Interpretations: The Contract Documents shall be signed by the Owner and Contractor. By executing the contract, the Contractor represents that they have familiarized themselves with the local conditions under which the Work is to be performed, and correlated their observations with the requirements of the Contract Documents. The Contract Documents are complementary, and what is required by any one, shall be as binding as if required by all. The intention of the documents is to include all labor, materials, equipment, services and other items necessary for the proper execution and completion of the scope of work as defined in the technical specifications and drawings contained herein. All drawings, specifications and copies furnished by the Owner are, and shall remain, Owner property. They are not to be used on any other project.

2.3. Permits, Fees, & Notices: The Contractor shall secure and pay for all permits, governmental fees and licenses necessary for the proper execution and completion of the work. The Contractor shall give all notices and comply with all laws, ordinances, rules,

regulations and orders of any public authority bearing on the performance of the work. If the Contractor observes that any of the Contract Documents are at variance in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be adjusted by approximate modification. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Owner, he shall assume full responsibility and shall bear all costs attributable.

2.4. Responsibility for those Performing the Work: The Contractor shall be responsible to the Owner for the acts and omissions of all his employees and all other persons performing any of the work under a contract with the Contractor.

2.5. Payment & Completion: The Contract Sum is stated in the Contract and is the total amount payable by the Owner to the Contractor for the performance of the work under the Contract Documents. Upon receipt of written notice that the work is ready for final inspection and acceptance and upon receipt of application for payment, the Owner's Project Manager will promptly make such inspection and, when they find the work acceptable under the Contract Documents and the Contract fully performed, the Owner shall make payment in the manner provided in the Contract Documents. Partial payments will be based upon estimates, prepared by the Contractor, of the value of Work performed and materials placed in accordance with the Contract Documents. The work performed by Contractor shall be in accordance with generally accepted professional practices and the level of competency presently maintained by other practicing professional firms in the same or similar type of work in the applicable community. The work and services to be performed by Contractor hereunder shall be done in compliance with applicable laws, ordinances, rules and regulations.

2.6. Protection of Persons & Property: The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss. Contractor shall erect and maintain, as required by existing safeguards for safety and protection, and all reasonable precautions, including posting danger signs or other warnings against hazards promulgating safety regulations and notifying owners and users of adjacent utilities. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct by the Contractor in the execution of the work, or in consequence of the non-execution thereof by the Contractor, they shall restore, at their own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or it shall make good such damage or injury in an acceptable manner.

2.7. Changes in the Work: The Owner, without invalidating the contract, may order changes in the work within the general scope of the contract consisting of additions, deletions or other revisions. All such changes in the work shall be authorized by Change Order/Amendment and shall be executed under the applicable conditions of the contract documents. A Change Order/Amendment is a written order to the Contractor signed by the Owner issued after the execution of the contract, authorizing a change in the work or an adjustment in the contract sum or the contract time.

2.8. Minor Changes in the Work: The Owner shall have authority to order minor changes in the work not involving an adjustment in the contract sum or an extension of the contract time and not inconsistent with the intent of the contract documents.

2.9. Uncovering & Correction of Work: The Contractor shall promptly correct all work found by the Owner as defective or as failing to conform to the contract documents. The Contractor shall bear all costs of correcting such rejected work, including the cost of the Owner's additional services thereby made necessary. The Owner shall give such notice promptly after discover of condition. All such defective or non-conforming work under the above paragraphs shall be removed from the site where necessary and the work shall be corrected to comply with the contract documents without cost to the Owner.

2.10. Acceptance Not Waiver: The Owner's acceptance or approval of any work furnished hereunder shall not in any way relieve the proposer of their present responsibility to maintain the high quality, integrity and timeliness of his work. The Owner's approval or acceptance of, or payment for, any services shall not be construed as a future waiver of any rights under this Contract, or of any cause of action arising out of performance under this Contract.

2.11. Change Order/Amendment: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All amendments to the contract shall be made in writing by the Owner.

2.12. Assignment: The Offeror shall not sell, assign, transfer or convey any contract resulting from this RFP, in whole or in part, without the prior written approval from the Owner.

2.13. Compliance with Laws: Proposals must comply with all Federal, State, County and local laws governing or covering this type of service and the fulfillment of all ADA (Americans with Disabilities Act) requirements. Contractor hereby warrants that it is qualified to assume the responsibilities and render the services described herein and has all requisite corporate authority and professional licenses in good standing, required by law.

2.14. Debarment/Suspension: The Contractor herby certifies that the Contractor is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Governmental department or agency.

2.15. Confidentiality: All information disclosed by the Owner to the Offeror for the purpose of the work to be done or information that comes to the attention of the Offeror during the course of performing such work is to be kept strictly confidential.

2.16. Conflict of Interest: No public official and/or Owner employee shall have interest in any contract resulting from this RFP.

2.17. Contract: This Request for Proposal, submitted documents, and any negotiations, when properly accepted by the Owner, shall constitute a contract equally binding between the Owner and Offeror. The contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or

agreements, either written or oral, including the Proposal documents. The contract may be amended or modified with Change Orders, Field Orders, or Amendment.

2.18. Project Manager/Administrator: The Project Manager, on behalf of the Owner, shall render decisions in a timely manner pertaining to the work proposed or performed by the Offeror. The Project Manager shall be responsible for approval and/or acceptance of any related performance of the Scope of Services.

2.19. Contract Termination: This contract shall remain in effect until any of the following occurs: (1) contract expires; (2) completion of services; (3) acceptance of services or, (4) for convenience terminated by either party with a written *Notice of Cancellation* stating therein the reasons for such cancellation and the effective date of cancellation at least thirty days past notification.

2.20. Employment Discrimination: During the performance of any services per agreement with the Owner, the Offeror, by submitting a Proposal, agrees to the following conditions:

2.20.1. The Offeror shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, age, disability, citizenship status, marital status, veteran status, sexual orientation, national origin, or any legally protected status except when such condition is a legitimate occupational qualification reasonably necessary for the normal operations of the Offeror. The Offeror agrees to post in conspicuous places, visible to employees and applicants for employment, notices setting forth the provisions of this nondiscrimination clause.

2.20.2. The Offeror, in all solicitations or advertisements for employees placed by or on behalf of the Offeror, shall state that such Offeror is an Equal Opportunity Employer.

2.20.3. Notices, advertisements, and solicitations placed in accordance with federal law, rule, or regulation shall be deemed sufficient for the purpose of meeting the requirements of this section.

2.21. Immigration Reform and Control Act of 1986 and Immigration Compliance: The Offeror certifies that it does not and will not during the performance of the contract employ illegal alien workers or otherwise violate the provisions of the Federal Immigration Reform and Control Act of 1986 and/or the immigration compliance requirements of State of Colorado C.R.S. § 8-17.5-101, *et.seq.* (House Bill 06-1343).

2.22. Ethics: The Offeror shall not accept or offer gifts or anything of value nor enter into any business arrangement with any employee, official, or agent of the Owner.

2.23. Failure to Deliver: In the event of failure of the Offeror to deliver services in accordance with the contract terms and conditions, the Owner, after due oral or written notice, may procure the services from other sources and hold the Offeror responsible for any costs resulting in additional purchase and administrative services. This remedy shall be in addition to any other remedies that the Owner may have.

2.24. Failure to Enforce: Failure by the Owner at any time to enforce the provisions of the contract shall not be construed as a waiver of any such provisions. Such failure to

enforce shall not affect the validity of the contract or any part thereof or the right of the Owner to enforce any provision at any time in accordance with its terms.

2.25. Force Majeure: The Offeror shall not be held responsible for failure to perform the duties and responsibilities imposed by the contract due to legal strikes, fires, riots, rebellions, and acts of God beyond the control of the Offeror, unless otherwise specified in the contract.

2.26. Indemnification: Offeror shall defend, indemnify and save harmless the Owner and all its officers, employees, insurers, and self-insurance pool, from and against all liability, suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the Offeror, or of any Offeror's agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from proposal award. Offeror shall pay any judgment with cost which may be obtained against the Owner growing out of such injury or damages.

2.27. Independent Firm: The Offeror shall be legally considered an Independent Firm and neither the Firm nor its employees shall, under any circumstances, be considered servants or agents of the Owner. The Owner shall be at no time legally responsible for any negligence or other wrongdoing by the Firm, its servants, or agents. The Owner shall not withhold from the contract payments to the Firm any federal or state unemployment taxes, federal or state income taxes, Social Security Tax or any other amounts for benefits to the Firm. Further, the Owner shall not provide to the Firm any insurance coverage or other benefits, including Workers' Compensation, normally provided by the Owner for its employees.

2.28. Nonconforming Terms and Conditions: A proposal that includes terms and conditions that do not conform to the terms and conditions of this Request for Proposal is subject to rejection as non-responsive. The Owner reserves the right to permit the Offeror to withdraw nonconforming terms and conditions from its proposal prior to a determination by the Owner of non-responsiveness based on the submission of nonconforming terms and conditions.

2.29. Ownership: All plans, prints, designs, concepts, etc., shall become the property of the Owner.

2.30. Oral Statements: No oral statement of any person shall modify or otherwise affect the terms, conditions, or specifications stated in this document and/or resulting agreement. All modifications to this request and any agreement must be made in writing by the Owner.

2.31. Patents/Copyrights: The Offeror agrees to protect the Owner from any claims involving infringements of patents and/or copyrights. In no event shall the Owner be liable to the Offeror for any/all suits arising on the grounds of patent(s)/copyright(s) infringement. Patent/copyright infringement shall null and void any agreement resulting from response to this RFP.

2.32. Venue: Any agreement as a result of responding to this RFP shall be deemed to have been made in, and shall be construed and interpreted in accordance with, the laws of the City of Grand Junction, Mesa County, Colorado.

2.33. Expenses: Expenses incurred in preparation, submission and presentation of this RFP are the responsibility of the company and can not be charged to the Owner.

2.34. Sovereign Immunity: The Owner specifically reserves its right to sovereign immunity pursuant to Colorado State Law as a defense to any action arising in conjunction to this agreement.

2.35. Public Funds/Non-Appropriation of Funds: Funds for payment have been provided through the Owner's budget approved by the City Council/Board of County Commissioners for the stated fiscal year only. State of Colorado statutes prohibit the obligation and expenditure of public funds beyond the fiscal year for which a budget has been approved. Therefore, anticipated orders or other obligations that may arise past the end of the stated Owner's fiscal year shall be subject to budget approval. Any contract will be subject to and must contain a governmental non-appropriation of funds clause.

2.36. Collusion Clause: Each Offeror by submitting a proposal certifies that it is not party to any collusive action or any action that may be in violation of the Sherman Antitrust Act. Any and all proposals shall be rejected if there is evidence or reason for believing that collusion exists among the proposers. The Owner may or may not, at the discretion of the Owner Purchasing Representative, accept future proposals for the same service or commodities for participants in such collusion.

2.37. Gratuities: The Contractor certifies and agrees that no gratuities or kickbacks were paid in connection with this contract, nor were any fees, commissions, gifts or other considerations made contingent upon the award of this contract. If the Contractor breaches or violates this warranty, the Owner may, at their discretion, terminate this contract without liability to the Owner.

2.38. Performance of the Contract: The Owner reserves the right to enforce the performance of the contract in any manner prescribed by law or deemed to be in the best interest of the Owner in the event of breach or default of resulting contract award.

2.39. Benefit Claims: The Owner shall not provide to the Offeror any insurance coverage or other benefits, including Worker's Compensation, normally provided by the Owner for its employees.

2.40. Default: The Owner reserves the right to terminate the contract in the event the Contractor fails to meet delivery or completion schedules, or otherwise perform in accordance with the accepted proposal. Breach of contract or default authorizes the Owner to purchase like services elsewhere and charge the full increase in cost to the defaulting Offeror.

2.41. Multiple Offers: If said proposer chooses to submit more than one offer, THE ALTERNATE OFFER must be clearly marked "Alternate Proposal". The Owner reserves the right to make award in the best interest of the Owner.

2.42. Cooperative Purchasing: Purchases as a result of this solicitation are primarily for the Owner. Other governmental entities may be extended the opportunity to utilize the resultant contract award with the agreement of the successful provider and the participating agencies. All participating entities will be required to abide by the specifications, terms, conditions and pricings established in this Proposal. The quantities furnished in this proposal document are for only the Owner. It does not include quantities for any other jurisdiction. The Owner will be responsible only for the award for our jurisdiction. Other participating entities will place their own awards on their respective Purchase Orders through their purchasing office or use their purchasing card for purchase/payment as authorized or agreed upon between the provider and the individual entity. The Owner accepts no liability for payment of orders placed by other participating jurisdictions that choose to piggy-back on our solicitation. Orders placed by participating jurisdictions under the terms of this solicitation will indicate their specific delivery and invoicing instructions.

2.43. Definitions:

2.43.1. "Offeror" and/or "Proposer" refers to the person or persons legally authorized by the Consultant to make an offer and/or submit a response (fee) proposal in response to the Owner's RFP.

2.43.2. The term "Work" includes all labor, materials, equipment, and/or services necessary to produce the requirements of the Contract Documents.

2.43.3. "Contractor" is the person, organization, firm or consultant identified as such in the Agreement and is referred to throughout the Contract Documents. The term Contractor means the Contractor or his authorized representative. The Contractor shall carefully study and compare the General Contract Conditions of the Contract, Specification and Drawings, Scope of Work, Addenda and Modifications and shall at once report to the Owner any error, inconsistency or omission he may discover. Contractor shall not be liable to the Owner for any damage resulting from such errors, inconsistencies or omissions. The Contractor shall not commence work without clarifying Drawings, Specifications, or Interpretations.

2.43.4. "Sub-Contractor is a person or organization who has a direct contract with the Contractor to perform any of the work at the site. The term sub-contractor is referred to throughout the contract documents and means a sub-contractor or his authorized representative.

2.44. Public Disclosure Record: If the Proposer has knowledge of their employee(s) or sub-proposers having an immediate family relationship with an Owner employee or elected official, the proposer must provide the Purchasing Representative with the name(s) of these individuals. These individuals are required to file an acceptable "Public Disclosure Record", a statement of financial interest, before conducting business with the Owner.

SECTION 3.0: INSURANCE REQUIREMENTS

3.1 Insurance Requirements: The selected Firm agrees to procure and maintain, at its own cost, policy(s) of insurance sufficient to insure against all liability, claims, demands, and

other obligations assumed by the Firm pursuant to this Section. Such insurance shall be in addition to any other insurance requirements imposed by this Contract or by law. The Firm shall not be relieved of any liability, claims, demands, or other obligations assumed pursuant to this Section by reason of its failure to procure or maintain insurance in sufficient amounts, durations, or types.
Firm shall procure and maintain and, if applicable, shall cause any Subcontractor of the Firm to procure and maintain insurance coverage listed below. Such coverage shall be procured and maintained with forms and insurers acceptable to The Owner. All coverage shall be continuously maintained to cover all liability, claims, demands, and other obligations assumed by the Firm pursuant to this Section. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage. Minimum coverage limits shall be as indicated below unless specified otherwise in the Special Conditions:

(a) Worker Compensation insurance to cover obligations imposed by applicable laws for any employee engaged in the performance of work under this Contract, and Employers' Liability insurance with minimum limits of:

ONE MILLION DOLLARS ($1,000,000) each accident,
ONE MILLION DOLLARS ($1,000,000) disease - policy limit, and
ONE MILLION DOLLARS ($1,000,000) disease - each employee

(b) General Liability insurance with minimum combined single limits of:

ONE MILLION DOLLARS ($1,000,000) each occurrence and
ONE MILLION DOLLARS ($1,000,000) per job aggregate.

The policy shall be applicable to all premises, products and completed operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, products, and completed operations. The policy shall include coverage for explosion, collapse, and underground (XCU) hazards. The policy shall contain a severability of interests provision.

(c) Comprehensive Automobile Liability insurance with minimum combined single limits for bodily injury and property damage of not less than:

ONE MILLION DOLLARS ($1,000,000) each occurrence and
ONE MILLION DOLLARS ($1,000,000) aggregate

(d) Professional Liability & Errors and Omissions Insurance policy with a minimum of:

ONE MILLION DOLLARS ($1,000,000) per claim

This policy shall provide coverage to protect the contractor against liability incurred as a result of the professional services performed as a result of responding to this Solicitation.

With respect to each of Consultant's owned, hired, or non-owned vehicles assigned to be used in performance of the Work. The policy shall contain a severability of interest's provision.

3.2 Additional Insured Endorsement: The policies required by paragraphs (b), and (c) above shall be endorsed to include the Owner and the Owner's officers and employees as additional insureds. Every policy required above shall be primary insurance, and any insurance carried by the Owner, its officers, or its employees, or carried by or provided through any insurance pool of the Owner, shall be excess and not contributory insurance to that provided by Contractor. The Contractor shall be solely responsible for any deductible losses under any policy required above.

SECTION 4.0: SPECIFICATIONS/SCOPE OF SERVICES

4.1. General/Background: Since the initial development of the water supply for the City of Grand Junction in 1889, the City has overcome a number of challenges including water quality issues, severe droughts, and population growth.

Originally, water was supplied to the City by a privately-owned water company (Krusen Water Company) from the Colorado River via a pumping plant. In response to complaints of poor water quality, the City built its own pump station on the Gunnison River, which was thought to be a source of better water quality. This pump station delivered water to a small reservoir located on "Reservoir Hill" which is the site of the present water treatment plant.

The City again experienced poor water quality and began pursuing acquisition of a water right on Kannah Creek in 1907. The City was granted a Paramount water right of 7.81 cubic feet per second of direct flow from Kannah Creek in 1911. Construction of the first 20-mile flow line was completed in 1912 enabling the City to deliver up to 5 million gallons per day.

The City built its first water treatment plant in 1938 with a capacity of 5 million gallons per day and later expanded it to 7.13 million gallons per day in 1946.

As the City continued to grow, the demand for water also increased. The City responded to the increased demand by implementing several projects and acquiring additional water rights. In 1947, the City built its first reservoir in the Kannah Creek area, Carson Reservoir, with a storage capacity of 650 acre-feet to meet increasing demands and improve reliability.

In 1955, the City acquired land and water rights that include the Purdy Mesa (fka Hallenbeck #1), Juniata, and Reeder reservoirs, as well as reservoirs on the Grand Mesa and direct flow rights to fill each of these reservoirs. With this additional supply, the City built a second 20-mile flowline with a capacity of 7 million gallons per day resulting in a total flowline capacity of 12 million gallons per day to the water treatment plant.

In 1957, the City acquired additional water rights to keep pace with growth and secure backup water supply sources. These water rights included additional direct flow rights on

the Gunnison River, direct flow and storage rights for the Raber Click and Juniata Reservoirs, and additional water rights on the Colorado River.

The City constructed a new water treatment plant with a capacity of 16 million gallons per day in the 1960s. In 1972, it constructed a new pump station on the Gunnison River to serve as a backup emergency raw water supply.

Following a severe drought in 1976/77, the City partnered with the Clifton Water District to construct a new water treatment plant on the Colorado River capable of treating 12 million gallons per day. In exchange, the Clifton Water District agreed to supply up to 4.5 million gallons per day of treated water to the City, if needed. The City also enlarged the Juniata Reservoir to 6,867 acre-feet, which represents about a 1-year supply of water. The City also increased its pumping capacity on the Gunnison River for backup raw water supply.

In 1990, the City acquired the Somerville ranch and associated senior water rights in the Whitewater basin, which included a number of direct flow and reservoir storage rights that was estimated to contribute 2,000 acre-feet of water to the City's water supply in an average year.

Today, the City of Grand Junction maintains water rights in five drainage basins: the Kannah Creek drainage area, the North Fork of the Kannah Creek, the Whitewater Creek drainage area, the Gunnison River, and the Colorado River. A summary of the City's direct flow **Exhibit 3** and storage water rights is included as **Exhibit 1 & 2**.

The City has continued to invest in infrastructure projects to improve the reliability of the water supply, treatment, and distribution system. Water from Kannah Creek, the North Fork of the Kannah Creek, and the Whitewater watershed is diverted through a system of ditches, canals, reservoirs and pipelines to supply water to the City of Grand Junction Water Treatment Plant, the Kannah Creek Treatment Plant, and agricultural irrigation. A schematic of the City's water supply network is included as **Exhibit 4**.

The City continues to maintain the Gunnison River pump station as an emergency backup raw water source. The City also maintains an interconnection with the Clifton Water District to provide treated water if needed.

Current and Projected Water Demand

The City's incorporated area covers 39 square miles and has a population of about 60,000. However, the City's water service area is limited to 9 square miles serving a population of about 30,000 (9,900 active water taps). The rest of the incorporated area (about 75% of the City) is served by the Ute Water District.

By 2035, the population of the City of Grand Junction is expected to top 100,000. While population forecasts for the District's water service area estimate an annual growth rate of 2.95%, water demand for the City's water service area is currently only projected to grow at an annual rate of 0.70% because of the present service area boundaries.

In 2012, the City estimated water supply versus demand under average and drought conditions through 2050. By 2050, the projected municipal demand is about 7,000 acre-

feet and could be met by Kannah Creek/North Fork/Whitewater Creek, which can yield 16,200 acre-feet under average conditions.

In drought conditions similar to 1976/77, the projected municipal demand is about 8,000 acre-feet in 2050. Kannah Creek/North Fork/Whitewater Creek would yield about 6,000 acre-feet and would need to be supplemented with other direct flow rights available or carry over reservoir storage. About 2,485 acre-feet (1.9 mgd) average of water is available through agreement with the Clifton Water District and 13,000 acre-feet is available from the Gunnison River (depending on time of year).

4.2. Project Objectives: The City is interested in updating an evaluation of its current water rights and water supply system to determine the "firm yield" for water supply during average and drought conditions in comparison with future demand for municipal water as well as irrigation water. The City is seeking proposals from qualified engineering consultants to develop a computer model that can:

- Simulates the diversions and operation of our reservoirs that are used to supply our water treatment plants, irrigation, and raw water customers.
- Assess which water rights are needed to meet projected demands.
- Determine which water rights would not be utilized to meet future demand under normal and drought conditions.
- Determine if we need to make any operational changes to fully capture diversion rights or better manage reservoirs to enhance reliability, especially during an extended drought.
- Assess the adequacy of our emergency backup water sources.
- Provide a tool that can be used by the City's staff to help manage operations (e.g., carry over storage) from year to year.
- Provide a tool that can be used by the City's staff to evaluate planning scenarios.

4.3. Special Conditions/Provisions:

- **Price/Fees:** Pricing shall be established as "a cost not to exceed price", and shall be all inclusive, to include, but not be limited to: labor, materials, equipment, travel, drawings, engineering work, shipping/freight, licenses, permits, fees, etc.

  Provide a not to exceed price using Solicitation Response Form found in Section 7, **accompanied by a complete list of costs breakdown.**

  All fees will be considered by the Owner to be negotiable.

- **Attached Documents:**
  1. Water Rights Map
  2. Storage Rights Summary Table
  3. Direct Flow Rights Summary Table
  4. Draft Schematic of Grand Junction Water System

4.4. Scope of Services: The scope of services includes the following:

Task 1: Project Management and Coordination

Project Initiation: Develop and prepare a project schedule to meet the proposed project time frame and complete assigned tasks. The schedule shall show individual tasks described in the scope of work for the project and identify key milestone dates. The Consultant Project Manager (Consultant PM) shall maintain and update the project schedule as the work proceeds. Consultant PM will be assigned to this project for the duration of the work.

Project Team Coordination: The City PM and the Consultant PM shall maintain ongoing communication about the project on a frequent and regular basis. Consultant PM shall provide:

- Copies of pertinent written communications, including electronic (email) correspondence
- Early identification of potential problems

Progress Meetings: The City and Consultant shall meet, either in person or by telephone conference calls, at regularly scheduled Project Working Group Meetings held at approximate two-week intervals throughout the project. Meetings shall include consultant PM, City PM, and Water Services Manager. The Project Working Group Meetings shall be used to coordinate the work effort and resolve any outstanding issues or problems. The meetings shall focus on the following topics:

- Activities completed since last meeting
- Problems encountered or anticipated
- Late activities/activities slipping behind schedule
- Solutions for unresolved or newly identified problems
- Schedule of upcoming activities
- Information on items required.

The Consultant PM shall prepare a written summary report of the general discussions held including all action items assigned. This scope assumes six (6) Project Working Group Meetings via conference call.

Reporting Requirements: The Consultant PM shall provide the following on a routine basis:

- Bi-weekly status

Task 2: Data Collection

The City will assemble and provide available data regarding its water sources, water rights, water usage, operational procedures, and water demand. This will include reports, maps, records, decrees, agreements, and other information.

Task 3: Develop Water Supply Simulation Model

Develop a computer model to simulate the City's raw water supply operations over a representative historical period. The model shall be constructed with sufficient detail to represent the key elements of the City's water supplies including diversion ditches, reservoirs, water rights, and demands (irrigation and municipal treatment plants).

The proposed computer model will have the capability to estimate the firm yield of City's current water supplies. Firm yield is typically defined as the maximum average annual supply of water that can be supplied from a water source without shortages during a

repetition of the critical drought period. In addition, the proposed computer model should be configured so that additional operational scenarios can be evaluated as discussed in Additional Tasks.

Task 4: Modeling Summary Report
Prepare summary documentation of the development of the water supply simulation model and results of the firm yield simulation. Attend meeting with City staff to present results of the model and report.

Additional Tasks
Future phases of work may include the following additional tasks:

- Use the model to analyze the effect on City's firm yield by adding or subtracting water sources, water rights, and by modifying certain physical system capacities (e.g., reservoir storage and pipeline capacity).
- Analyzing system or operational improvements to enhance the reliability of the City's water supply, especially during an extended drought.
- Determine which water rights would not be utilized to meet future demand under normal and drought conditions.
- Assess the adequacy of our emergency backup water sources.
- Provide a tool that can be used by the City's staff to help manage operations (e.g., carry over storage) from year to year.
- Provide a tool that can be used by the City's staff to evaluate future planning scenarios.
- Training and technical support.

4.5. RFP Tentative Time Schedule:

• Request for Proposal available:	April 20, 2018
• Inquiry deadline, no questions after this date:	May 2, 2018
• Addendum Posted:	May 4, 2018
• Submittal deadline for proposals:	May 11, 2018
• Owner evaluation of proposals:	May 14-18, 2018
• Final selection:	May 23, 2018
• Contract execution:	May 30, 2018
• Work begins no later than:	June 6, 2018

4.6. Questions Regarding Scope of Services: All questions regarding this Request for Proposal shall be directed by email to Duane Hoff. All inquiries shall clearly identify the name of the firm and the authorized representative, the RFP number and Title, and all questions to which the responses shall be made.

Any interpretations, corrections and changes to this RFP or extensions to the opening/receipt date shall be made by a written Addendum to the RFP by the City Purchasing Division. Sole authority to authorize addenda shall be vested in the City of Grand Junction Purchasing Representative. Addenda will be issued electronically through the Rocky Mountain E-Purchasing website at www.rockymountainbidsystem.com. Offerors shall acknowledge receipt of all addenda in their proposal.

Duane Hoff Jr., Senior Buyer
duaneh@gjcity.org

SECTION 5.0: PREPARATION AND SUBMITTAL OF PROPOSALS

Submission: ***Each proposal shall be submitted in electronic format only, and only through the Rocky Mountain E-Purchasing website (https://www.rockymountainbidsystem.com/default.asp).*** *This site offers both "free" and "paying" registration options that allow for full access of the Owner's documents and for electronic submission of proposals. (Note: "free" registration may take up to 24 hours to process. Please Plan accordingly.)* Please view our "**Electronic Vendor Registration Guide"** at http://www.gjcity.org/BidOpenings.aspx for details. (Purchasing Representative does not have access or control of the vendor side of RMEPS. If website or other problems arise during response submission, vendor **MUST** contact RMEPS to resolve issue prior to the response deadline **800-835-4603**). For proper comparison and evaluation, the City requests that proposals be formatted as directed in Section 5.0 "Preparation and Submittal of Proposals." Offerors are required to indicate their interest in this Project, show their specific experience and address their capability to perform the Scope of Services in the Time Schedule as set forth herein. For proper comparison and evaluation, the Owner requires that proposals be formatted **A** to **F**:

A. **Cover Letter:** Cover letter shall be provided which explains the Firm's interest in the project. The letter shall contain the name/address/phone number/email of the person who will serve as the firm's principal contact person with Owner's Contract Administrator and shall identify individual(s) who will be authorized to make presentations on behalf of the firm. The statement shall bear the signature of the person having proper authority to make formal commitments on behalf of the firm. By submitting a response to this solicitation the Contractor agrees to all requirements herein.

B. **Qualifications/Experience/Credentials:** Proposers shall provide their qualifications for consideration as a contract provider to the City of Grand Junction/Mesa County and include prior experience in similar projects.

C. **Strategy and Implementation Plan:** Describe your (the firm's) interpretation of the Owner's objectives with regard to this RFP. Describe the proposed strategy and/or plan for achieving the objectives of this RFP. The Firm may utilize a written narrative or any other printed technique to demonstrate their ability to satisfy the Scope of Services. The narrative should describe a logical progression of tasks and efforts starting with the initial steps or tasks to be accomplished and continuing until all proposed tasks are fully described and the RFP objectives are accomplished. Include a **time schedule** for completion of your firm's implementation plan and an estimate of time commitments from Owner staff.

D. **References:** A minimum of three (3) **references** with name, address, telephone number, and email address that can attest to your experience in projects of similar scope and size.

E. **Fee Proposal:** Provide a "not to exceed price" using Solicitation Response Form found in Section 7, **accompanied by a complete list of costs breakdown.**

F. Additional Data (optional): Provide any additional information that will aid in evaluation of your qualifications with respect to this project.

SECTION 6.0: EVALUATION CRITERIA AND FACTORS

6.1 Evaluation: An evaluation team shall review all responses and select the proposal or proposals that best demonstrate the capability in all aspects to perform the scope of services and possess the integrity and reliability that will ensure good faith performance.

6.2 Intent: Only respondents who meet the qualification criteria will be considered. Therefore, it is imperative that the submitted proposal clearly indicate the firm's ability to provide the services described herein.

Submittal evaluations will be done in accordance with the criteria and procedure defined herein. The Owner reserves the right to reject any and all portions of proposals and take into consideration past performance. The following parameters will be used to evaluate the submittals (in no particular order of priority):

- Responsiveness of submittal to the RFP
- Understanding of the project and the objectives
- Experience/Required Skills
- Necessary resources
- Strategy & Implementation Plan
- References
- Fees

Owner also reserves the right to take into consideration past performance of previous awards/contracts with the Owner of any vendor, contractor, supplier, or service provider in determining final award(s).

The Owner will undertake negotiations with the top rated firm and will not negotiate with lower rated firms unless negotiations with higher rated firms have been unsuccessful and terminated.

6.3 Oral Interviews: The Owner may invite the most qualified rated proposers to participate in oral interviews.

6.4 Award: Firms shall be ranked or disqualified based on the criteria listed in Section 6.2. The Owner reserves the right to consider all of the information submitted and/or oral presentations, if required, in selecting the project Contractor.

SECTION 7.0: SOLICITATION RESPONSE FORM

RFP-4524-18-DH Professional Services for Water Supply Modeling for City of Grand Junction

Offeror must submit entire Form completed, dated and signed.

1) Not to exceed price to provide all labor, services, supplies, equipment, travel, etc. necessary for the Water Supply Modeling per specifications:

NOT TO EXCEED PRICE $_____

WRITTEN:_____dollars.

The Owner reserves the right to accept any portion of the work to be performed at its discretion

---

The undersigned has thoroughly examined the entire Request for Proposals and therefore submits the proposal and schedule of fees and services attached hereto.

This offer is firm and irrevocable for sixty (60) days after the time and date set for receipt of proposals.

The undersigned Offeror agrees to provide services and products in accordance with the terms and conditions contained in this Request for Proposal and as described in the Offeror's proposal attached hereto; as accepted by the Owner.

Prices in the proposal have not knowingly been disclosed with another provider and will not be prior to award.

- Prices in this proposal have been arrived at independently, without consultation, communication or agreement for the purpose of restricting competition.
- No attempt has been made nor will be to induce any other person or firm to submit a proposal for the purpose of restricting competition.
- The individual signing this proposal certifies they are a legal agent of the offeror, authorized to represent the offeror and is legally responsible for the offer with regard to supporting documentation and prices provided.
- Direct purchases by the City of Grand Junction are tax exempt from Colorado Sales or Use Tax. Tax exempt No. 98-903544. The undersigned certifies that no Federal, State, County or Municipal tax will be added to the above quoted prices.
- City of Grand Junction payment terms shall be Net 30 days.
- Prompt payment discount of _____ percent of the net dollar will be offered to the Owner if the invoice is paid within _____ days after the receipt of the invoice.

RECEIPT OF ADDENDA: the undersigned Contractor acknowledges receipt of Addenda to the Solicitation, Specifications, and other Contract Documents.

State number of Addenda received: _____.

It is the responsibility of the Proposer to ensure all Addenda have been received and acknowledged.

_____	_____
Company Name – (Typed or Printed)	Authorized Agent – (Typed or Printed)
_____	_____
Authorized Agent Signature	Phone Number
_____	_____
Address of Offeror	E-mail Address of Agent
_____	_____
City, State, and Zip Code	Date

Water Rights Map

Preliminary Draft - For Discussion Only

Division 5
Colorado River

Division 4
Gunnison River

WD 72

WD 42

Grand Jct 22 Rd Pump Station

Grand Jct Colorado R. PL

Grand Jct Colo. R. PL AP2

Grand Jct Colo. R. PL AP3

Grand Jct Colo. R. PL AP4

Grand Jct Colo. R. PL AP5

Grand Jct Redlands Tailrace

Grand Jct Gunnison PL

Ridges Pump Station

Ridges Pond Nos. 1-3

Ridges Well #1

Somerville Res.

Anderson Res. #2

Anderson Res. #1

Brandon D.

Bolen Res.

BA&J D.

BA&J Res.

Raber-Click Res.

Andersen Res. #6

Somerville Well #1

Somerville Ranch Irr Sys

Deep Cr. Res. #1

Grand Mesa Res. #1

Deep Cr. Res #2 Supply D.

Laurent D.

Bauer D.

City D.

Carson Lake

Anderson #4

Reeder Res.

Purdy Mesa Res.

Juniata Res.

Grand Jct Flowline

Purdy Mesa Res. #2

Kannah Cr. Highline D.

Juniata D. & Enl.

Flowing Park Res.

Purdy Mesa Spring

Berry Well

Anderson Well

Chambers Res.

Plateau Creek

Cottonwood Creek

Mesa Creek

Coon Creek

Sink Creek

Whitewater Cr.

N. Fork Kannah Cr.

Kannah Creek

Coal Cr.

Skunk Cr.

Deep Cr.

Sheep Cr.

Cottonwood Cr.

Colorado River

Gunnison River

Fruita

Grand Junction Regional Airport

Clifton

Palisade

Mesa

Grand Junction

Orchard Mesa

Colorado National Monument

Glade Park

Dominguez Escalante National Conservation Area

THE HUNTING GROUND

HORSE MESA

DOMINGUEZ CANYON

DELTA

Delta

Figure 3
Water Rights and Land Ownership
City of Grand Junction

- GJ Ground Water Rights
- GJ Direct Flow Water Right
- GJ Storage Rights
- Ditch
- Land Owned by GJ
- Grand Junction Water Service Area
- Water Division Boundary

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

2 1 0 2 4 Miles

Spronk Water Engineers, Inc.
1000 Logan Street Denver, CO 80203

377/hmw/9/25/2017

Storage Rights Summary Table

City of Grand Junction
Summary of Storage Water Rights

	ID	Water Right Name	(1) GJ (AF)	(2) Capacity (AF)	(3) Use	(4) Approp. Date	Comment
		North Kannah Creek Basin					
(5)	3630	Anderson Reservoir No. 6	57.3	118.0	IM	1928	
(6)			118.0		M	1993	
(5)	3603	Bolen Reservoir	535.7	521.0	IM	1949	First 383.3 af has 1911 approp. date
(6)			521.0		M	1993	
(5)	3602	Bolen A&J Reservoir No. 2	293.0	240.0	IM	1949	First 11.1 af has 1911 approp. date
(6)			240.0		M	1993	
	3618	Hallenbeck #1 Reservoir	863.1	659.0	I	1939	
(6)		(aka Purdy Mesa Reservoir)	659.0		M	1993	Conditional
(7)	3620	Juniata Reservoir & Enl.	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.)
(6)			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.)
	3692	Purdy Mesa Reservoir No. 2	2.5	*2.5*	IM	1955	Conditional municipal use; downslope from City's transmission lines; dam needs work
		Kannah Creek Basin					
(5)	3600	Anderson Reservoir No. 1	466.0	506.0	IM	1911	
(6)			506.0		M	1993	Includes 38 af TF Raber Click Res.
(5)	3601	Anderson Reservoir No. 2	568.4	595.0	IM	1928	
(6)			595.0		M	1993	
(8)	3619	Hallenbeck #2 Reservoir	526.1	459.0	IM	1923	459 af changed to add municipal uses
(6)		(aka Raber Click Reservoir)	459.0		M	1993	Original 1993 cond. water right was 503 af; 38 af TT Anderson #1; 5.68 af dismissed
	3606	Deep Creek Reservoir No. 2	66.5	350.0	I	1906	City owns 19%
(9)	3614	Grand Mesa Reservoir No. 1	559.0	*559.0*	I	1887	Need to file for 2017 municipal right
	3604	Carson Lake	637.0	*637.0*	M	1946	
	3607	Dry Creek Reservoir (aka Chambers Res.)	200.0	200.0	I	1903	City owns 33%; total water right for 600 af; reservoir only holds 200 af
	3608	Flowing Park Reservoir	782.2	*782.2*	IM	1911	Added irrigated lands in Div. 5 (96CW271)
		Whitewater Creek Basin					
	3625	Somerville Reservoir #1	929.8	*973.0*	I	1993	1st 70.8 af (1894 approp. - TF Cliff Lake Res.); 1st enl. 837 af (1945 approp); 2nd enl. 66 af (1993 approp.)
(6)			973.0		M	1993	Conditional
	3661	Reeder Reservoir	179.7	*179.7*	I	1889	Abandoned municipal conditional right (700 af) in 2010; filled by Bauer D. (N Fork Kannah)
	3648	Guild Reservoir	82.6	100.0	I	1909	Conditional portion abandoned (ref. 84CW93), located in Water Div. 5 (ref. 92CW62); status?
		Colorado River Basin					
	3941	Ridges Ponds No. 1	4.5	*4.5*	M	1978	
	3937	Ridges Ponds No. 2	2.3	*2.3*	M	1978	
	3938	Ridges Ponds No. 3	32.5	*32.5*	M	1978	aka Shadow Lake
		Total Capacity:		**14,212**			

Notes:

Decreed for municipal uses

(1) Water right volume owned by the City of Grand Junction.
(2) Reservoir capacity from decrees or 1991 report or capacity estimated equal to decreed volume in italic and grey text.
(3) I – Irrigation, M - Municipal
(4) Year of appropriation date or latest year with multiple water rights (see comments).
(5) Water right changed to permit storage in Purdy Mesa and Juniata Reservoirs, continued irrigation at historic place of use, and the use, re-use a use of the water for all municipal purposes within the Grand Junction's service area; 5.7% return flow obligation to Kannah Creek.
(6) The City may forego diversions without risk of abandonment under senior irrigations rights for municipal use. No return flow obligation under t
(7) Includes first and second enlargement values (3435.41 af and 5946.7 af) that were made absolute, the remaining volumes were dismissed.
(8) 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 municipa within the Grand Junction's service area; 5.7% return flow obligation to Kannah Creek.
(9) City traded shares in company to have all Grand Mesa Reservoir Company shares in single reservoir.

Direct Flow Rights Summary Table

City of Grand Junction
Summary of Direct Flow Water Rights

	ID	Water Right Name	(1) GJ CFS	(2) Use	(3) Approp Year	Comments
		North Fork Kannah Creek Water Rights				
	504	Bauer Ditch and Enl.	13.18	I	1910	Original water right (1.96 cfs) TT City Ditch
			1.00	DS	1916	Combined max 1 cfs with Laurent Ditch
	554	Laurent Ditch	33.72	I	1921	15.32 cfs with approp. date (1919)
			1.00	DS	1916	Combined max 1 cfs with Bauer Ditch
	512	City Ditch	10.97	IM	1888	TF other senior ditches fr Anderson Acq.; can be stored in Juniata Res. system and Purdy Mesa Res.
			22.80	M	1989	Absolute; 4.2 cfs of original 27 cfs abandoned
	556	Anderson No. 4 Ditch	0.29	I	1889	Still owned by city?
	732	Purdy Mesa Spring	0.20	IM	1955	Conditional municipal uses; downslope from City's pipelines
(4)		**Kannah Creek Water Rights**				
	506	BA&J Ditch and Enl.	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
(5)			29.39	IMD	1993	City has data to file for absolute
	573	Deep Cr Res #2 Sup D	20.00	I	1906	
	513	GJ Flowline - Paramount	7.81	M	1881	Year-round use with storage
		GJ Flowline - 2nd Right	3.91	M	1929	Direct use and storage in Purdy Mesa Res.
(6)	529	Kannah Cr. Highline Ditch	18.00	IM	1908	Changed to allow municipal use and storage; monthly vol.
			6.90	I	1939	
	748	Juniata Ditch	1.37	I	1884	3 APODs (Juniata Enl., Kannah Cr. Highline, & Secret Ditch)
			0.64	I	1888	
			0.06	IDS	1884	Cannot be used for storage
	528	Juniata Ditch 1st Enl.	39.00	I	1939	Irr. and to storage in Purdy Mesa
			75.00	I	1953	Irr. and to storage in Juniata Res. Enl.
(5)			129.00	M	1994	Made absolute (1999)
	5035	Anderson Well	0.04	D	2010	Aug. source is GJ Flowline
	5034	Berry Well	0.04	D	2010	Aug. source is GJ Flowline
		Whitewater Creek Water Rights				
	509	Brandon Ditch	33.40	I	1940	4.8 cfs from senior priorities TT ditch; 3.8 cfs enl. (1900 approp.); 24.8 cfs (1940 approp.)
(7)			15.00	M	1985	2nd Enl.; conditional; have data to file for 7.83 cfs absolute
	622	Somerville Ranch Irr. Sys.	3.00	IS	1882	Used on 1,000 acre ranch; 1970 adj. date
	5010	Somerville Well No. 1	0.22	DS	1964	
	5011	Somerville Well No. 2	0.44	DS	1964	
		Gunnison River Water Rights				
	520	Gunnison R. Pipeline	120.00	M	1957	Pumps on lands owned by Redlands Power Co.; obtain exchange/lease agreement
		Colorado River Water Rights				
	1368	Redlands Tailrace	50.00	IM	1977	18 cfs absolute & 32 cfs conditional
	644	Colorado R. Pipeline	80.00	MD	1947	5 points of diversion; 6.96 cfs abs.
	1367	22 Road Pump Station	1.50	IMD	1976	38.5 cfs of original 40 cfs abandoned
	5086	Ridges Well No. 1	0.08	M	1978	Absolute
(8)	1501	Ridges Pumping Station	6.53	M	1964	Absolute; TF Bridges to Gardner to Ridges Pumping Station
			10.00	M	1973	Conditional; APOD diverts from Redlands Power Canal (Gunnison R.)

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

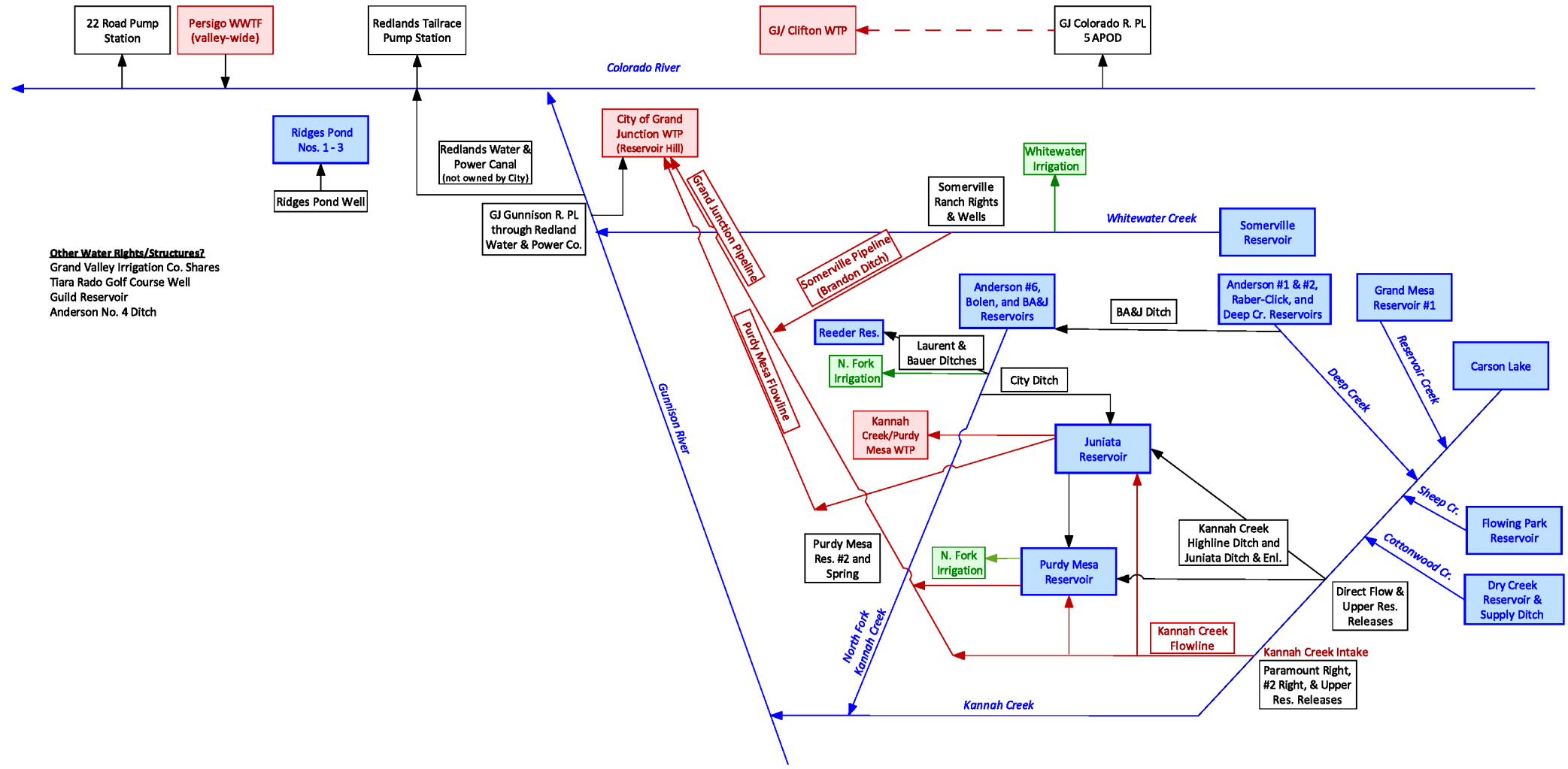
(8) Original water right was 100 cfs; 79.47 cfs abandoned and 14 cfs transferred to Orchard Mesa Irrigation District.

Draft Schematic of Grand Junction Water System

Preliminary Draft Schematic - For Discussion Only

Grand Junction Water Distribution

Not to Scale



Other Water Rights/Structures?
Grand Valley Irrigation Co. Shares
Tiara Rado Golf Course Well
Guild Reservoir
Anderson No. 4 Ditch

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 6/25/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
Arthur J. Gallagher Risk Management Services, Inc. 3005 Center Green Drive, Suite 120 Boulder CO 80301	PHONE (A/C, No, Ext): 303-444-4666	FAX (A/C, No): 303-444-8481
	E-MAIL ADDRESS:	

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Capitol Specialty Insurance Corporation	10328
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
DiNatale Water Consultants Inc
Kelly DiNatale
2919 Valmont Road, Suite 204
Boulder CO 80301

COVERAGES **CERTIFICATE NUMBER:** 807388292 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY	Y		EV20180059-01	2/23/2018	2/23/2019	EACH OCCURRENCE	$ 2,000,000
	[ ] CLAIMS-MADE [X] OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 50,000
							MED EXP (Any one person)	$ 5,000
	X Professional/Pol						PERSONAL & ADV INJURY	$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	X POLICY [ ] PRO-JECT [ ] LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	OTHER:							$
A	**AUTOMOBILE LIABILITY**			EV20180059-01	2/23/2018	2/23/2019	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	[ ] ANY AUTO						BODILY INJURY (Per person)	$
	[ ] OWNED AUTOS ONLY [ ] SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
	[ ] **UMBRELLA LIAB** [ ] OCCUR						EACH OCCURRENCE	$
	[ ] **EXCESS LIAB** [ ] CLAIMS-MADE						AGGREGATE	$
	[ ] DED [ ] RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						[ ] PER STATUTE [ ] OTH-ER	
	ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [ ] **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$
A	Professional Liability			EV20180059-01	2/23/2018	2/23/2019	Occurrence Aggregate	$2,000,000 $2,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)
City of Grand Junction, its owner, owners officers and employees are included as Additional Insured.

CERTIFICATE HOLDER

City of Grand Junction
250 N. 5th Street
Grand Junction CO 81501

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 07/03/2018

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
PAYCHEX INSURANCE AGENCY INC 150 SAWGRASS DR ROCHESTER, NY 14620 (877) 362-6785	PHONE (A/C, No, Ext): (877) 362-6785	FAX (A/C, No): (877) 677-0447
	E-MAIL ADDRESS: paychex@travelers.com	
	INSURER(S) AFFORDING COVERAGE	NAIC #
	INSURER A : THE STANDARD FIRE INSURANCE COMPANY	
INSURED DINATALE WATER CONSULTANTS INC 4833 VALHALLA DRIVE BOULDER, CO 80301	INSURER B :	
	INSURER C :	
	INSURER D :	
	INSURER E :	
	INSURER F :	

COVERAGES **CERTIFICATE NUMBER:** 381379914531481 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	☐ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☐ OCCUR ☐ ☐ GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☐ PRO-JECT ☐ LOC ☐ OTHER:						EACH OCCURRENCE	$
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
							GENERAL AGGREGATE	$
							PRODUCTS - COMP/OP AGG	$
								$
	AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY ☐ ☐						COMBINED SINGLE LIMIT (Ea accident)	$
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
	☐ UMBRELLA LIAB ☐ OCCUR ☐ EXCESS LIAB ☐ CLAIMS-MADE ☐ DED ☐ RETENTION $						EACH OCCURRENCE	$
							AGGREGATE	$
								$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		UB-3B020775-18	02/07/2018	02/07/2019	X PER STATUTE ☐ OTH-ER	
							E.L. EACH ACCIDENT	$ 500,000
							E.L. DISEASE - EA EMPLOYEE	$ 500,000
							E.L. DISEASE - POLICY LIMIT	$ 500,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

CITY OF GRAND JUNCTION
250 NORTH 5TH STREET
GRAND JUNCTION, CO 81501

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE Misty Ruckelman