THE COLORADO BASIN ROUNDTABLE

C/O P.O. BOX 1120
GLENWOOD SPRINGS, COLORADO 81602

July 31, 2017

Colorado Water Plan Grant Program
Colorado Water Conservation Board
Supply and Demand Gap Projects: Gregory.Johnson@state.co.us
Water Storage Projects: Anna.Mauss@state.co.us
Conservation, Land Use Planning: Kevin.Reidy@state.co.us
Agricultural Projects: Brent.Newman@state.co.us
Environmental & Recreation Projects: Linda.Bassi@state.co.us

Dear CWCB staff:
The Colorado Basin Roundtable supports the West Divide Water Conservancy District/Colorado River Water Conservation District notice of application for work to further advance Kendig Reservoir investigations with attendant benefits to agriculture, safe drinking water, the environment and recreation. The Roundtable previously supported a WSRF grant to study Kendig feasibility. Kendig Reservoir was identified in the Colorado Basin Implementation Plan (BIP) as a "Top Project" for the Middle Colorado River segment in April 2015. Kendig Reservoir met 3 of 6 themes, including: protecting and restoring healthy streams, sustaining agriculture and securing safe drinking water (Colorado Basin Roundtable Basin Implementation Plan – Table 18, pp 131).

The work being proposing will primarily increase streamflow monitoring in the Divide Creek area where WDWCD holds conditional direct flow and storage water rights. The only stream measurement available in the area is the West Divide Creek Raven gage (WSDRAVCO).

Sincerely yours,

Jim Pokrandt
Chair, Colorado Basin Roundtable

Exhibit A

- Statement of Work
- Budget & Schedule
- Letter of Commitment for Matching Funds

Last Updated: July 5, 2017

Colorado Water Conservation Board
Water Plan Grant - Exhibit A

Statement Of Work	
Date:	**July 31, 2017**
Name of Applicant:	**West Divide Water Conservancy District** **Colorado River Water Conservation District**
Name of Water Project:	Understanding local streamflow to quantify West Divide Project component yield.
Funding Source:	**Colorado Water Plan Grant**

Water Project Overview: Please provide a summary of the proposed water project (200 words or less). The same summary can be used from Page 5 of the CWP Grant Application.

The work being proposing will primarily increase streamflow monitoring in the Divide Creek area where WDWCD holds conditional direct flow and storage water rights. The only stream measurement available in the area is the West Divide Creek Raven gage (WSDRAVCO). The West Divide Canal was contemplated to divert water from Garfield and Baldy Creeks into Kendig Reservoir. The Horsethief Canal was contemplated as a delivery structure from Kendig which could also divert additional water from East Mamm, Beaver, Cache and Battlement Creeks. A recent feasibility study of Kendig Reservoir found the yield to be highly variable from year to year with the only source of water being West Divide Creek. There are roughly 6,700 acres of irrigated lands growing mainly pasture grass below the contemplated Kendig Reservoir site. Because the originally contemplated Crystal River supplies have been abandoned, there is a need to quantify the additional yield that can be obtained from within the basin. In addition to yield analysis, alternative dam alignments have created the need to reinvestigate canal alignments to deliver water via gravity flow into the Kendig alternatives. Potential services areas will also be delineated.

Objectives: List the objectives of the project.

Last Updated: July 5, 2017

1.) **Increase streamflow monitoring in the Divide Creek area to understand water yield and exchange potential from conditional water rights tributary to the Colorado River.**
2.) **Create statistical relationships between tributary gages and the long term West Divide Creek Raven gage.**
3.) **Quantify the anticipated additional yield to Kendig Reservoir from these additional supplies.**
4.) **Re-evaluate canal alignments to optimize yield and delivery.**
5.) **Evaluate potential service areas that would be created by these supplies.**

Tasks

Provide a detailed description of each project task using the following format:

Task 1 – Increase streamflow monitoring in the Divide Creek area to understand water yield and exchange potential from conditional water rights tributary to the Colorado River.

Description of Task:

Installation of streamflow monitoring hardware on tributaries to the Colorado River where West Divide Water Conservancy District holds decreed water rights. In addition to hardware installation, several field visits to measure streamflow for the development of rating curves will be necessary. If possible, a long term USGS gage is desirable on East Divide Creek that could also be used for administrative purposes.

Method/Procedure:

Streamflow measurements will be taken with pressure transducers that will continuously measure the water level in the stream (stream stage). Stilling wells will be installed where the pressure transducers will be placed. After the sensors are in place, site visits to measure streamflow over a wide range of flow conditions will be made. The streamflow measurements will be used with the stage data to create the stream rating curve. The rating curve can then be used to estimate the water flow from the measured water level. It is anticipated that these sensors and measurements will be taken on the following tributaries to the Colorado River: Garfield Creek, Baldy Creek, East Divide Creek, East Mamm Creek, Beaver Creek, Cache Creek and Battlement Creek. As noted above, it is desirable to have a long term monitoring gage installed on East Divide Creek by USGS or Colorado Division of Water Resources. This gage would not only benefit this study, but would aid in administration of East Divide Creek and deliveries from Alsbury Reservoir by Division 5 staff.

Last Updated: July 5, 2017

Tasks
Grantee Deliverable: Describe the deliverable the grantee expects from this task
Datasets of stream stage, verification streamflow measurements and rating curves will be provided.
CWCB Deliverable: Describe the deliverable the grantee will provide CWCB documenting the completion of this task
A report describing the hardware installation and data obtained from this task will be delivered to the CWCB. Data collected will also be provided.

Tasks
Provide a detailed description of each task using the following format:
Task 2 – Create statistical relationships between tributary gages and the long term West Divide Creek Raven gage.
Description of Task:
After sufficient data is collected, statistical relationships between the West Divide Creek Raven gage and these tributary monitoring stations will be developed. These relationships will be firmed up with five years of data collection. These relationships will allow for flow estimation on tributary streams after the stations can no longer be maintained.
Method/Procedure:

Last Updated: July 5, 2017

Tasks
Statistical analysis, likely linear regression equations, will be developed between the West Divide Creek Raven gage and each monitored tributary. The yield analysis will use the gaged data being collected in this study, however, after sufficient data is collected the flow on these tributaries can be estimated using the statistical relationship with the long term Raven gage after this study is over. Monthly and annual regression equations will be derived from these data and the best fit will be recommended for flow estimation.
Grantee Deliverable: Describe the deliverable the grantee expects from this task
A set of regression equations to estimate flow on tributary streams using the West Divide Creek Raven gage.
CWCB Deliverable: Describe the deliverable the grantee will provide CWCB documenting the completion of this task
A report documenting the regression equations that can be used to estimate flow on tributary streams using the West Divide Creek Raven gage will be provided.

Tasks
Provide a detailed description of each project task using the following format:
Task 3 – Quantify the anticipated additional yield to Kendig Reservoir from these additional supplies.
Description of Task:
Using the gaged streamflow data collected in this study, estimates of water yield will be made for each tributary listed in the Overview section above. These points are also shown on the attached Figure 1.
Method/Procedure:

Last Updated: July 5, 2017

Tasks
The method to estimate the potential yield from the conditional water rights will be based in part on the gaged streamflow measurements being proposed in this study. In addition to the gaged data, the quantification of yield will be limited to the decreed water right amount as well as by any senior downstream water right calls. The yield will be assessed over the years of study, which will ideally include a wet, dry and average year. If these types of years are not experienced over the study period, the regression equations described in Task 2 can be used to estimate what the flows were in critically dry years, such as 2002 and 2012, using the West Divide Creek Raven gage. These yields will also be compared to the previous Kendig Reservoir feasibility study which only evaluated yield from West Divide Creek. The difference in yield and associated cost of canal construction will provide the cost per yield (i.e. dollars per acre-foot) for use in a cost-benefit analysis.
Grantee Deliverable: Describe the deliverable the grantee expects from this task
Anticipated yield during wet, dry and average years to understand the potential yield from Kendig Reservoir utilizing these conditional water rights.
CWCB Deliverable: Describe the deliverable the grantee will provide CWCB documenting the completion of this task
A report documenting the findings of the yield study by year type will be provided. The report will also compare the cost/yield from the West Divide Creek only supply to the cost/yield of these additional supplies to determine if the canal construction is cost prohibitive.

Tasks
Provide a detailed description of each project task using the following format:
Task 4 – Re-evaluate canal alignments to optimize yield and delivery.
Description of Task:
Canal alignments had been previously produced to understand how the West Divide Canal and Horsethief Canal would divert/deliver water to/from the decreed location for Kendig Reservoir (Figure 1). Subsequent studies have identified alternative alignments for the Kendig Reservoir dam which would not be able to use the original canal alignments.
Method/Procedure:

Last Updated: July 5, 2017

Tasks
Using ArcGIS or AutoCAD, new canal alignments that optimize yield and delivery to/from the Kendig alternatives will be delineated. The canal will ideally deliver water via gravity flow to Kendig Reservoir to eliminate the need for power and pumps. This task will likely be completed prior to flow meters being installed. Once the canal alignments are complete, the streamflow measurement devices will be placed at the defined point of diversion on the canal or as close to it as possible without intruding on private property.
Grantee Deliverable: Describe the deliverable the grantee expects from this task
Shapefiles of canal alignments and anticipated points of diversion.
CWCB Deliverable: Describe the deliverable the grantee will provide CWCB documenting the completion of this task
A report documenting the work completed along with shapefiles of canal alignments and anticipated points of diversion.

Tasks
Provide a detailed description of each project task using the following format:
Task 5 – Evaluate potential service areas that would be created by these supplies.
Description of Task:
Each augmentation plan operated by WDWCD has a defined service area where augmentation water can be contracted from a specific augmentation supply. This same analysis will be performed below Kendig Reservoir, West Divide canal and Horsethief canal.
Method/Procedure:

Last Updated: July 5, 2017

Tasks

In order to define the service area that can be created below Kendig Reservoir and the Horsethief canal, the sources of water delivery, topography and downstream senior water rights are taken into account. The delineation of the service area will likely involve conversations with the District 45 water commissioner in order to understand the administration on West Divide Creek as well as the tributaries below the West Divide and Horsethief Canals where augmentation water could potentially be provided.

Grantee Deliverable: Describe the deliverable the grantee expects from this task

Shapefiles and maps of the delineated service area that could be created.

CWCB Deliverable: Describe the deliverable the grantee will provide CWCB documenting the completion of this task

A report documenting how the service area was delineated along with a map and associated shapefiles of the service area.

Budget and Schedule

This Statement of Work shall be accompanied by a combined Budget and Schedule that reflects the Tasks identified in the Statement of Work and shall be submitted to CWCB in excel format.

Reporting Requirements

Progress Reports: The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of issuance of a purchase order, or the execution of a contract. The progress report shall describe the status of the tasks identified in the statement of work, including a description of any major issues that have occurred and any corrective action taken to address these issues. The CWCB may withhold reimbursement until satisfactory progress reports have been submitted.

Last Updated: July 5, 2017

Reporting Requirements

Final Report: At completion of the project, the applicant shall provide the CWCB a Final Report on the applicant's letterhead that:

- Summarizes the project and how the project was completed.
- Describes any obstacles encountered, and how these obstacles were overcome.
- Confirms that all matching commitments have been fulfilled.
- Includes photographs, summaries of meetings and engineering reports/designs.

The CWCB will withhold disbursement the last 10% of the budget until the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment.

Last Updated: July 5, 2017

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservation Board

Water Plan Grant - Exhibit A
Budget and Schedule

Date:July 31, 2017

Name of Applicant: West Divide Water Conservancy District/Colorado River Water Conservation District

Name of Water Project: Understanding local streamflow to quantify West Divide Project component yield.

Task No.	Task Description	Start Date(1)	End Date	Water Project Funding Category	Grant Funding Request	Match Funding	Total
1	**Increase streamflow monitoring in the Divide Creek area to understand water yield and exchange potential from conditional water rights tributary to the Colorado River.**	7/1/2018	7/1/2023	Water Storage, Supply and Demand Gap, Agricultural, Conservation and Land Use Planning and Environmental and Recreation	$72,650	$72,650	$145,300
2	**Create statistical relationships between tributary gages and the long term West Divide Creek Raven gage.**	7/1/2018	7/1/2023	Water Storage, Supply and Demand Gap, Agricultural, Conservation and Land Use Planning and Environmental and Recreation	$2,250	$2,250	$4,500
3	**Quantify the anticipated additional yield to Kendig Reservoir from these additional supplies.**	7/1/2018	7/1/2023	Water Storage, Supply and Demand Gap, Agricultural, Conservation and Land Use Planning and Environmental and Recreation	$3,000	$3,000	$6,000
4	**Re-evaluate canal alignments to optimize yield and delivery.**	3/1/2018	12/31/2018	Water Storage, Supply and Demand Gap, Agricultural, Conservation and Land Use Planning and Environmental and Recreation	$1,180	$1,180	$2,360
5	**Evaluate potential service areas that would be created by these supplies.**	7/1/2018	7/1/2023	Water Storage, Supply and Demand Gap, Agricultural, Conservation and Land Use Planning and Environmental and Recreation	$1,180	$1,180	$2,360
				Total	$80,260	$80,260	$160,520

(1) Start Date for funding under $100K, minimum 45 Days from Board Approval; Start Date for funding over $100K, minimum 90 Days from Board Approval.

·Round values up to the nearest hundred dollars.

·Reimbursement eligibility commences upon the grantee's receipt of a Notice to Proceed (NTP)

·NTP will not be accepted as a start date. Project activities may commence as soon as grantee enters contract and receives formal NTP if prior to the listed "Start Date".

·The applicant shall provide a progress repost every 6 months, beginning from the date of contract execution.

·CWCB will withhold disbursement of the last 10% of the total grant amount until a Final Report is completed to the satisfaction of CWCB staff (2017 CWP Grant Guidelines).

WEST DIVIDE
WATER CONSERVANCY DISTRICT

818 Taughenbaugh Blvd., Suite 101 P.O. Box 1478
Rifle, Colorado 81650-1478
Tel: (970) 625-5461
Web: www.wdwcd.org Email: water@wdwcd.org

August 1, 2017

Colorado Water Plan Grant Coordinator,

West Divide Water Conservancy District is the applicant for a Colorado Water Plan Grant project entitled "Understanding Local Streamflow to Quantify West Divide Project Component Yield." The total project cost is estimated to be $160,520, of which 50% is being requested from the Colorado Water Plan Grant Funding. This letter is being submitted as commitment that the remaining 50% of the project cost ($80,260) will be provided through matching funds from the West Divide Water Conservancy District.

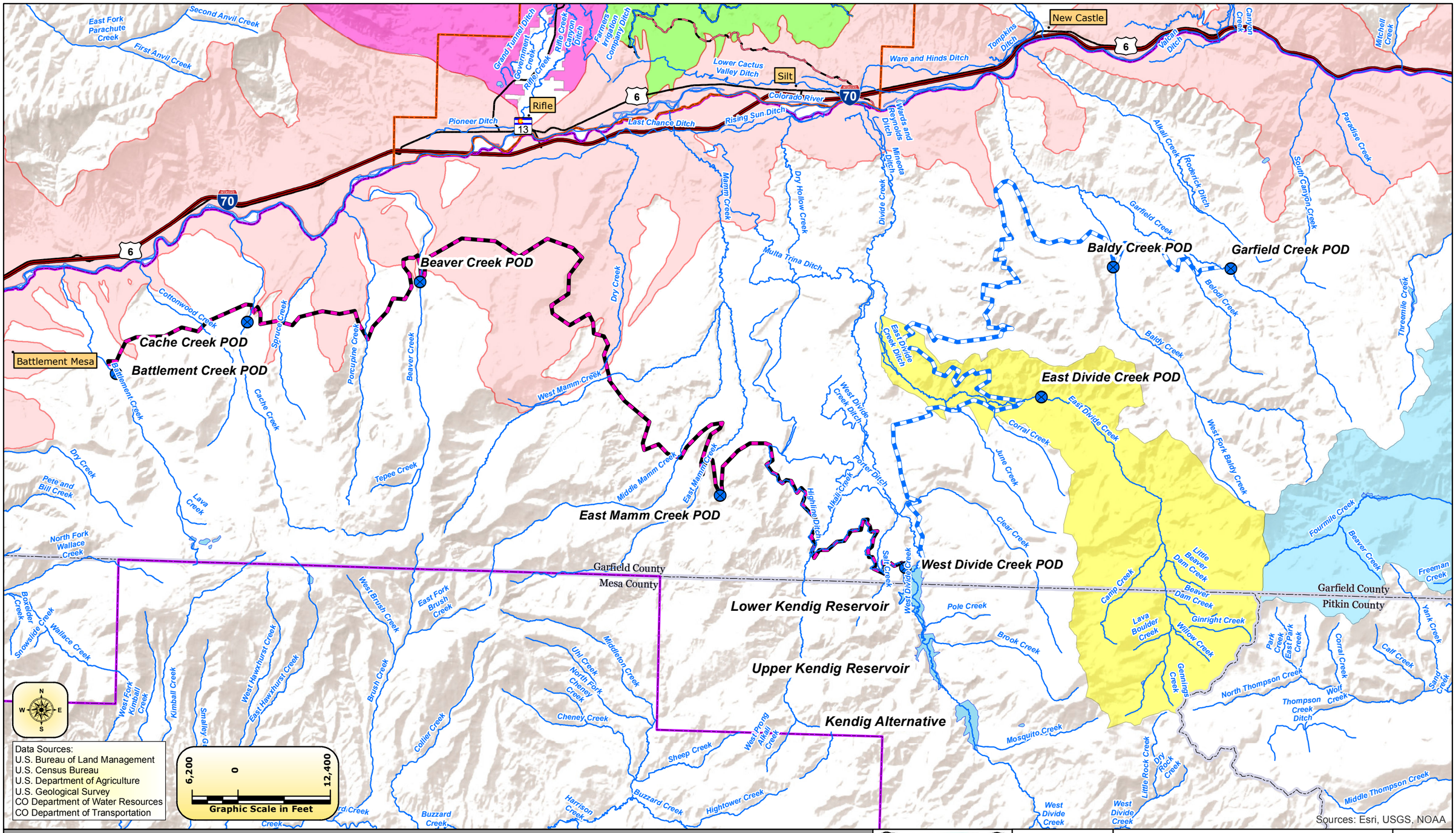
If you have any questions or require additional information, feel free to call our office at (970) 625-5461.

Sincerely,

Sam Potter, West Divide Water Conservancy District Board President

Exhibit C

- Map
- Colorado Basin Roundtable Letter of Support
- W-9
- Certificate of Insurance
- 2016 Kendig Reservoir Feasibility Report



Map Key

- West Divide Canal
- SWCD
- WDWCD
- LAKES
- Horsethief Canal
- ALSBURY SERVICE AREA
- COLORADO RIVER SERVICE AREA
- ELK CREEK SERVICE AREA
- FOUR MILE SERVICE AREA
- LOWER RIFLE CREEK SERVICE AREA
- SILT MESA SERVICE AREA
- UPPER RIFLE CREEK SERVICE AREA

COLORADO RIVER ENGINEERING INCORPORATED

PO Box 1301
Rifle, CO 81650
Tel 970-625-4933

West Divide Water Conservancy District

CO Water Plan Grant Overview Map

Figure: 1

Document Name: CWP_Grant_Map_2017.mxd

Drawn by: JTP | Approved by: CM | Date: 7/27/2017

Client: WDWCD

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FIGURES

ATTACHMENTS

1.0 INTRODUCTION AND BACKGROUND

The proposed Kendig Reservoir is located in the West Divide Creek drainage, approximately 15 miles south of Silt, Colorado (Figure 1). The reservoir was contemplated by the U.S. Bureau of Reclamation (USBR) as a component of the original West Divide Project and authorized by Congress in the Colorado River Storage Projects Act (CRSP) of 1956. Water in West Divide Creek is primarily used for irrigation of agricultural lands, industrial purposes related to natural gas development, stock watering, and domestic uses.

The West Divide Project was initially planned in the 1930s to supply supplemental irrigation water to Divide Creek and neighboring drainage basins. The primary water rights for the West Divide Project were decreed to the Colorado River Water Conservation District (CRWCD) in the 1950s and 1960s, and are currently held in trust for the West Divide Water Conservancy District (WDWCD). Over the next several decades, USBR, Hydro-Triad, LTD., Black and Veatch, Grand River Consulting, and others conducted numerous studies to analyze the feasibility of the original and alternative project configurations. In 2014, many of the original water rights associated with Crystal and Roaring Fork River drainage components of the West Divide Project were partially or entirely abandoned in association with Case No. 11CW93. Accordingly, the original West Divide Project, as contemplated, cannot be developed without new water right filings. This report focuses on Kendig Reservoir as a stand-alone project which is supplied by water originating from West Divide Creek only.

WDWCD and the CRWCD seek to complete an up-to-date analysis of the feasibility of Kendig Reservoir. The study objectives include:

1. Quantify physical and legal water availability
2. Identify existing and foreseeable water supply demands
3. Evaluate potential reservoir operations
4. Identify environmental and permitting issues
5. Develop conceptual reservoir designs and cost estimates of storage alternatives

The goal of this work is to locate and design an appropriately-sized reservoir that is capable of satisfying current and anticipated water demands, and is feasible from an engineering, environmental, and permitting perspective, while being cost-effective to construct.

1.1 KENDIG RESERVOIR WATER RIGHTS

Kendig Reservoir was initially decreed in CA 4954 to store 15,450 acre-feet (af) for irrigation, municipal, domestic, stock, and hydroelectric uses, with an appropriation date of April 22, 1957. In Case No. 79CW0315, the first enlargement of Kendig Reservoir was decreed an additional storage right of 2,610 af for irrigation, industrial, recreation, domestic, and hydroelectric uses.

1.2 KENDIG RESERVOIR SITES

The Kendig Reservoir water rights are associated with the reservoir location labeled Lower Kendig as shown on Figure 1. However, since the original decrees were issued, other alternative locations have

been considered and are described below. It should be noted that the alternative locations would be greater than 200 feet from the originally-decreed location, and as such, would require a change of location filing with the Colorado Water Court.

1.2.1 Lower Kendig Reservoir Site

This is the originally-contemplated location for Kendig Reservoir and inundates private lands within both Garfield County and Mesa County. Prior studies have evaluated various capacities of Kendig Reservoir at this site; however, this report has assumed a capacity of 16,500 af at this location (Attachment 1). The 1982 USBR Planning Report on the West Divide Project included a new canal, called the West Divide Canal, that would divert immediately below Kendig Reservoir and deliver water in the same general area as the Divide Creek Highline Ditch, although at an elevation approximately 100 ft. lower. This investigation evaluates Kendig Reservoir as a stand-alone structure and does not include evaluation of any new delivery canals.

The Lower Kendig Reservoir site is located approximately two miles downstream from the Divide Creek Highline Ditch headgate (Figure 2). The Divide Creek Highline Ditch irrigates approximately 4,300 acres, and average daily diversions equal approximately 60 cubic feet per second (cfs) in May and June according to recent Colorado Division of Water Resources (CDWR) diversion records. As such, this is a major irrigation ditch providing water to a significant area in the Divide Creek and Mamm Creek drainages. Because Kendig Reservoir was contemplated to be located below the headgate of the Divide Creek Highline Ditch, reservoir releases could not be delivered via gravity. Moreover, at full pool conditions, Lower Kendig Reservoir would potentially inundate portions of the Divide Creek Highline Ditch alignment between the dam embankment and ditch headgate. To ensure Kendig Reservoir does not affect ditch operations, construction of concrete box culverts would likely be required to carry ditch water from the headgate through the areas affected by the Kendig Reservoir high water level (Attachment 2). In addition, some of the private properties along the dam axis have existing conservation easements associated with them. Because of these, and other concerns, alternative reservoir locations have been evaluated.

1.2.2 Upper Kendig Reservoir Site

The Upper Kendig Reservoir site is located approximately two miles upstream from Lower Kendig Reservoir in Mesa County (Figure 1). The inundation area would likely affect both private and U.S. Bureau of Land Management (BLM) lands (Figure 2). The proposed embankment of this alternative is positioned approximately 250 feet downstream of the Divide Creek Highline Ditch headgate, and can deliver stored water by gravity to downstream users through the existing ditch infrastructure. This alternative site is described in more detail by Hydro-Triad, LTD in their 1986 report. Due to slope stability and landslide concerns, it is recommended that this site no longer be considered (Attachment 2).

1.2.3 Alternative Kendig Reservoir Site

This study contemplated an additional location for Kendig Reservoir, referred to as Alternative Kendig Reservoir, which is located approximately four miles upstream from the original site (Figure 1). Alternative Kendig Reservoir is located in Mesa County on U.S. Forest Service (USFS) and private lands (Figure 2), and was considered based on initial concerns of slope stability issues near the Upper Kendig

Reservoir site, and the ability to deliver water to the existing Divide Creek Highline Ditch. This site was evaluated with three potential dam alignments at a capacity of 16,500 af and one potential dam alignment at a capacity of 9,000 af (Attachment 2).

2.0 LEGAL AND PHYSICAL WATER SUPPLY

Daily streamflow data were utilized from a long-term gaging station operated by the CDWR, West Divide Creek Near Raven, Colorado (WSDRAVCO). The gage is located on West Divide Creek near the upstream extent of Upper Kendig Reservoir inundation area (Figure 1), and has operated since October of 1955. Wilson Water Group (WWG) obtained historical call data on West Divide Creek, Divide Creek, and the Colorado River to understand how senior water right calls during wet, dry, and average years may affect water available for storage. WWG also spoke with the District 45 Water Commissioner to better understand West Divide Creek and Divide Creek water rights administration. Based on this information, a Microsoft Excel-based water supply tool was developed to estimate physical and legal water availability for Kendig Reservoir. The tool runs on a daily time step for the study period of 1956 through 2015.

2.1 PHYSICAL WATER SUPPLY

Physical water available at the Kendig Reservoir site is well-represented by flow records recorded at the WSDRAVCO stream gage as described above. A study period consistent with data available at this gage, 1956 through 2015, was chosen for this analysis. For these years, the average annual discharge is 26,288 af. However, total annual discharge can vary significantly between year types. For example, only 2,450 af was measured at the stream gage in the critically-dry year of 1977, but in the wet year of 1984 the gage recorded 55,348 af. For the purposes of this study, WWG has assumed no significant variation in streamflow between the three potential Kendig Reservoir sites as shown in Figure 2.

2.2 LEGAL WATER SUPPLY

Kendig Reservoir is tributary to West Divide Creek, Divide Creek, and the Colorado River. Accordingly, development of water at this location would be restricted by downstream water right calls that are senior in priority. WWG has reviewed call records from 1987 through 2015 and spoke with the District 45 Water Commissioner to better understand the water right calling regimen for this location (West, 2015). Table 1 outlines the major calling structures below Kendig Reservoir and the amount of water senior to Kendig Reservoir in cfs. The calling rights, excluding the Grand Valley Project/Grand Valley Canal, are also shown on Figure 1.

TABLE 1		
Senior Water Rights Downstream of Kendig Reservoir		
Name	**Source**	**Water Rights**
Divide Creek Highline Ditch	West Divide Creek	155 cfs
West Divide Creek Ditch	West Divide Creek	10.89 cfs
Multa-Trina Ditch	West Divide Creek	49 cfs
Porter Ditch	West Divide Creek	61.25 cfs
Mineota Ditch	Divide Creek	14.36 cfs
Ward and Reynolds Ditch	Divide Creek	9.92 cfs
Grand Valley Project/Grand Valley Canal	Colorado River	1,950 cfs*

*This rate represents the total calling rate, per Orchard Mesa Check Case No. 91CW24. However, the total decreed water rights equal 3,397.98 cfs

2.2.1 Irrigation Season

In the daily water supply tool developed by WWG, it was conservatively assumed that senior water rights downstream of Kendig Reservoir would place a call on West Divide Creek from May 15 - October 31 of each year if flow is below 200 cfs at the WSDRAVCO gage. Only when streamflow is greater than 200 cfs at this location could water be diverted and stored in Kendig Reservoir. We believe 200 cfs is a reasonable assumption based on conversations with the water commissioner (West, 2016) and analysis of diversion records from calling structures. During this period, if streamflow drops below 200 cfs it is assumed that all water must be bypassed to satisfy senior water rights downstream. Kendig Reservoir would also be subject to a call by a group of senior irrigation water rights on the Colorado River (Grand Valley Project/Grand Valley Canal) near Grand Junction, collectively known as the Cameo Call. This call typically occurs in dry years within the mid-June through October time period, and is often less restrictive than the local calls which occur on West Divide Creek and Divide Creek.

2.2.2 Non-Irrigation Season

Most water uses in the West Divide Creek and Divide Creek drainages occur during the irrigation season; however, the Divide Creek Highline Ditch has a livestock watering and domestic water right from October 1 - March 10. This water right is decreed for 5.0 cfs and is senior to the Kendig Reservoir water rights. During this period, it was assumed that the first 5.0 cfs measured at the WSDRAVCO gage would be taken to satisfy the livestock water right and cannot be stored in Kendig Reservoir.

2.2.3 Potential Bypass Requirements

West Divide Creek does not have an instream flow water right decreed for reaches below the proposed Alternative Kendig Reservoir embankment. However, there is an instream flow water right on West Divide Creek between Beaver and Mosquito Creeks, decreed in Case No. 14CW3152 (Figure 2). At full pool, the 16,500 af Alternative Kendig Reservoir would likely inundate approximately 1,000 feet of this instream flow appropriation. Kendig Reservoir is senior in priority to the instream flow; however, it is unknown at

if the instream flow would cause any restriction on storage. The other two reservoir locations, Upper Kendig and Lower Kendig are downstream and would not be affected by this instream flow.

It is anticipated that through permitting processes Kendig Reservoir would be required to make certain bypass flows for environmental purposes. WWG has estimated bypass values for summer (Apr-Sep, 14.5 cfs), and winter (Oct-Mar, 7.3 cfs). These bypass rates were calculated as 40% of annual flows during the summer, and 20% of annual flows during the winter, and are in-line with other instream flow water rights of similar watersheds. These bypasses were based on guidelines outlined by the USFS and BLM (USFS, BLM 2013).

It is recognized that during much of the year, Kendig Reservoir would be relatively unaffected by a potential bypass requirement. This is due to senior water rights on West Divide Creek and Divide Creek. As described above, between May 15 and October 31, Kendig Reservoir can only store water when more than 200 cfs is passing through the reservoir, much greater than the estimated 14.5 cfs required bypass. Potential Kendig Reservoir storage is minimal during winter months due to limited physical water supply, and therefore the effect of senior downstream livestock water diversions and potential reservoir bypasses are also small.

2.2.4 Storable Inflow

Within the 60-year study period, Kendig Reservoir would likely have a water supply of about 19,800 af during the wettest 25% of years, and only 2,900 af during the driest 25% of years. It is estimated that on average, West Divide Creek would provide about 10,000 af of water for storage in Kendig Reservoir. Of this average annual yield, about 75% is likely to be stored during the irrigation season (primarily during snowmelt runoff) of May-October, and 25% during the non-irrigation season of November through April.

3.0 DEMANDS

Estimated water demands in Divide Creek and neighboring drainages which may be supplied by Kendig Reservoir are detailed in Figures 4 and 5. These demands, which are described in detail below, include augmentation for domestic and industrial uses, as well as providing a supplemental irrigation water supply. Note, supplemental irrigation water supplies were simulated for delivery to approximately 4,200 acres of the 6,700 total irrigable acres below the Alternative Kendig Reservoir Site.

3.1 AUGMENTATION

WDWCD currently operates an umbrella augmentation plan in the East Divide Creek watershed, and the Colorado River corridor; however, no regional augmentation plan exists to provide water in the West Divide Creek or Divide Creek drainages. As shown in Figure 1, Kendig Reservoir could potentially provide augmentation water within this area extending from Kendig Reservoir, north to the Colorado River, and west to Mamm Creek. The augmentation service area shown was developed to depict the general extent, and must be refined based on specific local calling structures within each drainage.
To provide water to the entire augmentation area, water stored in Kendig Reservoir must be carried through the existing Divide Creek Highline Ditch. Alternative Kendig and Upper Kendig locations could make releases to the Divide Creek Highline Ditch via gravity; however, the Lower Kendig Reservoir

location would require a small pump station to lift water from the dam outlet to the ditch (Figure 2). The specific augmentation service area boundaries must be assessed to ensure water released from Kendig Reservoir can physically be delivered to calling structures on small drainages downstream from the Divide Creek Highline Ditch. In some cases, especially during dry years, a live stream may not be present from the Divide Creek Highline Ditch to some downstream calling structures, and therefore may limit the extent of an augmentation service area.

3.1.1 Domestic Demands

The Divide Creek drainage is a rural area with a low population density. Much of the domestic water demands are sourced from single-family homes supplied by groundwater wells. Domestic water demands in the area were estimated by evaluating the number of permitted wells within the potential service area as shown on Figure 1, and discussion with the local water commissioner (West, 2016). Most of the existing domestic wells in the service area have a suitable physical water supply and operate pursuant to exempt well permits (West, 2016). Only a few homes have limited or poor quality well water and must haul in alternative sources of domestic water. Based on this and information available from the DWR website, WWG estimates that less than 50 wells in the area may require an augmentation supply (including existing unpermitted wells). Diversions by these wells are estimated at about one acre-foot (af) per well per year and would total about 50 af annually. At this time, it is assumed that Kendig Reservoir would supply the augmentation requirements of these wells, with releases totaling approximately 20 af (40% of total diversions).

As additional development occurs, a portion of new wells may need to be augmented in order to provide a legal water supply. It is estimated that by 2065, approximately 500 new domestic wells may be drilled in the area based on an annual growth rate of 1.9 % per year. This growth rate is consistent with the State of Colorado Demographer population estimates for Garfield County (Colorado State Demographer, 2015). For the purposes of this study, it was conservatively assumed that 90 % of these new wells may need augmentation water, with the remaining 10 % being exempt wells. Note, it was assumed Kendig Reservoir would only release water for augmentation needs associated with out-of-priority well depletions. In total, demands for domestic augmentation water may increase from 20 af currently to about 200 af per year within a 50-year planning window. We believe this estimate is reasonable for planning purposes.

3.1.2 Industrial Demands

Industrial water demands in the area are in large part driven by natural gas development. Recently, in 2007 and 2008 natural gas drilling reached a peak, before declining to current demands in response to reduced market prices. WDWCD provides a legal supply of water for these drilling and well related operations. Pursuant to water supply contracts with WDWCD, operators are allowed to pump water directly from the Colorado River and haul it to the drilling locations. Based on 2007 data, these direct haulers pumped approximately 300 af in this area. In many cases, Kendig Reservoir could provide a physical and legal water source that is closer to the drilling operations compared to pumping and hauling water from the Colorado River. Based on these data, industrial water demands in the area may range from a current level of about 25 af per year to a peak demand of about 300 af per year. WWG has assumed that these demands are 100% consumptive and would require full replacement.

Operators would benefit from Kendig Reservoir by reducing their water hauling costs. Garfield County and the Divide Creek community would benefit by having significantly reduced water hauling related truck traffic, and accordingly, reduced wear and tear on road surfaces, and less airborne dust.

3.2 SUPPLEMENTAL IRRIGATION DEMANDS

Agriculture uses the largest amount of water in the Divide Creek area. Figure 1 shows approximately 6,700 acres of alfalfa and pasture grass irrigated in the area below Alternative Kendig Reservoir. West Divide Creek and Divide Creek cannot provide a full water supply to these acres resulting in water-short crops late in the growing season. StateCU was used to evaluate current irrigation supply shortages in this area. StateCU is a software tool developed by the State of Colorado to estimate historical consumptive use. The crop irrigation requirement is calculated using modified the Blaney-Criddle method on a monthly time step. Inputs to the model are climate data, number of irrigated acres, crop type, and water available to the respective irrigation ditches. Of the 6,700 total acres shown in Figure 1, irrigation shortages were evaluated for 4,200 acres and ranged from approximately 20,250 af in the dry year of 1977 to approximately 2,015 af in the wet year of 1984. On average, shortages totaled about 10,000 af per year for the 4,200 acres assessed. This reduced irrigation service area was chosen, due to the limited water supply available to Kendig Reservoir. Accordingly, Kendig Reservoir cannot provide a full irrigation water supply to all 6,700 acres in most years. However, Kendig Reservoir could potentially serve supplemental irrigation water to 4,200 acres more reliably.

3.3 RECREATION DEMANDS

Kendig Reservoir would provide additional recreational opportunities to the community including flat water boating, fishing, camping, bird watching, warm water fishery and aquatic habitat for wildlife. These uses are non-consumptive and would occur as reservoir levels allow, similar to other regional reservoirs including Paonia Reservoir, Rifle Gap Reservoir and Grass Valley (Harvey Gap) Reservoir.

3.4 HYDROELECTRIC DEMANDS

Releases from Kendig Reservoir may be used to generate hydroelectric power if an electric turbine is incorporated in the outlet works and sufficient power transmission lines are developed. Though the economics of this concept was not specifically studied in this effort, recent evaluations by Black & Veatch indicate that hydroelectric projects are most economical as a component of a water supply project that is developed for other uses (Black and Veatch, 2011). Accordingly, Kendig Reservoir may be a good candidate. However, the hydropower aspect would require further study to determine if forecasted power revenues would pay off the added capital expenses.

4.0 RESERVOIR OPERATIONS

Kendig Reservoir would help supply water to downstream users for two primary purposes: 1) re-time annual streamflow, and 2) carryover wet-year water for dry-year use. Kendig Reservoir would help meet the late season water shortages by storing water during the spring snowmelt season, and making releases later in the year after natural streamflow has declined and crop irrigation requirements remain high. Because of the extreme streamflow variability of West Divide Creek, carryover storage is important to

ensure a firm yield for augmentation of domestic and industrial uses during times of drought. During wet years, water supplies from a full reservoir can be carried over to provide additional irrigation water in following years, as was experienced between 1993 and 1994. Note, the firm yield for supplemental irrigation water provided by Kendig Reservoir would be zero.

4.1 StateMod Analysis

To model reservoir operations, StateMod was utilized. StateMod is a software tool created by the State of Colorado to evaluate monthly surface water allocations based on existing water rights. As part of the Colorado's Decision Support Systems (CDSS), StateMod models have been developed for the entire Western Slope. WWG modified the Colorado Basin StateMod model to examine the impact of Kendig Reservoir. The Colorado Basin StateMod model inputs include historical streamflow, diversions, reservoir storage, absolute water rights, and estimates of consumptive use from StateCU. The model was operated using hydrology from 1956 through 2005. At the time of this study, input data for StateMod is only available through 2005. However, the 1956 through 2005 period includes both wet and critically dry years. Accordingly, this period is a good representation of hydrologic variability and associated ranges in potential reservoir operations.

StateMod is able to account for interactions between calls on the Colorado River, West Divide Creek, and Divide Creek. Therefore, it can be predicted how Kendig Reservoir would fill each year and evaluate a likely release schedule to meet downstream water demands. StateMod output consists of monthly reservoir inflow, storage, releases, and spills. For this evaluation, Kendig Reservoir was divided into two pools: 1) an augmentation pool that services domestic and industrial demands, and 2) a supplemental irrigation pool. Operations of both pools are described below. Total end of month storage for the modeled period is shown in Figure 3 for a 16,500 af capacity reservoir.

4.2 Augmentation Pool (Domestic and Industrial)

As described above, augmentation demands within a Divide Creek service area may reach about 500 af within a 50-year planning horizon. WWG used this assumption to simulate Kendig Reservoir operations. In order to provide an annual firm yield of 500 af, an augmentation pool of about 1,500 af must be designated within the reservoir and allowed first priority fill. Figure 5 shows how this pool may operate annually based on these assumptions. In all years, the 1,500 af augmentation pool was able to provide the required augmentation supply, even though the critically dry early 2000s.

4.3 Supplemental Irrigation Pool

The irrigation pool would be a secondary priority compared to augmentation and would fill based on available water supply. WWG assumed that of the approximately 6,700 acres currently irrigated below Alternative Kendig Reservoir, only about 4,200 acres could receive a reliable supplemental water supply. Historically, in the 50-year study period, this acreage never received a full irrigation water supply. With supplemental releases from a 16,500 af Kendig Reservoir, a nearly-full irrigation water supply could be provided in about seven out of ten years. Average irrigation releases are about 3,800 af per year; however, in back-to-back critically-dry years, no supplemental irrigation may be available. Figure 4 shows the annual operations of this pool in relation to downstream irrigation demands.

The smaller, 9,000 af Kendig Reservoir Alternative, as contemplated in the RJH Report (Attachment 2), could provide a nearly-full irrigation water supply to 4,200 acres in at least four out of ten years. Irrigation releases would average approximately 2,800 af per year. Due to the smaller reservoir size, carryover storage is reduced.

5.0 PERMITTING

Kendig Reservoir sites are located within the White River National Forest, BLM, and private lands in Garfield and Mesa counties. A fatal flaw environmental and permitting assessment was completed, which included upper and lower Kendig Reservoir sites (ERO, 2012). Although the ERO study was comprised of a much larger area and included many more alternatives, most permitting requirements remain the same, and therefore much of the language was taken from that report. Alternative Kendig Reservoir was not part of the ERO study, but would face similar permitting requirements. The following would likely be required for any of the three reservoir sites, except where noted.

As indicated above, Lower Kendig sits on all private lands, while the Alternate Site is positioned such that the inundation area would encumber both private and USFS lands. There are pros and cons for each site as described above and the permitting requirements differ between USFS and private lands.

5.1 404 Permit – United Army Corps of Engineers

A Section 404 Permit pursuant to the Clean Water Act must be obtained from the United States Army Corps of Engineers (USACE). This permit will be required for the construction of dam structures and outlets in conjunction with the placement of fill in West Divide Creek and potentially required for diversion facilities, open canals or pipelines, and road construction and improvements (ERO, 2011). Wetlands in the area would also be subject to 404 permitting if they are impacted by construction of the project or filling the reservoir. As noted in the 2012 Grand River consulting report, it is anticipated that any impacts to wetlands and riparian habitat can be mitigated, meaning that wetland construction equal to the amount of wetland impacts would be required.

5.2 Least Environmentally Damaging Practicable Alternative (LEDPA)

In order to secure a 404 permit, and pursuant to 404 regulations, the Applicant must demonstrate that the construction of Kendig Reservoir is the least environmentally damaging and practicable alternative. Even if impacts from the project are relatively minor, the project may not be permitted by the USACE if the project is not determined to be the LEDPA. The alternatives assessment in the environmental impact statement will provide a foundation for this determination.

5.3 Section 401 Certification – State of Colorado

A Section 401 certification from the Colorado Department of Public Health and Environment (CDPHE) certifying that the activities authorized by a Section 404 permit will comply with state water quality standards will be required for projects requiring a 404 individual permit (IP). At this time, there are no

known obstacles or fatal flaws to obtaining any needed Section 401 certification for any IP, provided any conditions required by the USACE and/or Forest Service can be implemented (ERO, 2011).

5.4 USDS Forest Service Special Use Permit

A Special Use Permit (SUP) and/or Right-of-Way (ROW) from the Forest Service and/or BLM for construction on and occupancy on the White River National Forest and federal lands administered by the Glenwood Springs Field Office of the BLM will be required for all Alternative Kendig Reservoir options (see Figure 1). As proposed, the 16,500 af Alternate Kendig Reservoir would inundate 112 acres of USFS lands, while the 9,000 af Alternate Kendig Reservoir would inundate 77 acres.

The Forest Service or BLM will likely be the lead agency and will prepare an Environmental Impact Study (EIS) as authorized by the National Environmental Policy Act (NEPA). This NEPA review will evaluate impacts to environmental resources and protected species, will evaluate the Project's conformance with applicable Forest Service Management Plans, and will address the conformance of the Project with Federal environmental regulations. Substantial public comment and review will be associated with the EIS process.

In order to secure a permit, the Applicants must demonstrate that a purpose and need exists for the Project. Specifically, the Applicants must demonstrate a demand for the water supply from Kendig Reservoir. Also, an extensive alternatives assessment will be required in the NEPA review. Subject to decisions by the Forest Service or BLM and site-specific studies, a SUP for the Project may have terms and conditions that affect the operations and yield of the Project. At this time, there are no known major obstacles or fatal flaws to obtaining a SUP for the Project (ERO, 2011).

5.5 Endangered Species Act (ESA) Compliance

The Forest Service, BLM and/or USACE will coordinate with the U.S. Fish and Wildlife Service (USFWS) pursuant to the ESA, and a Biological Assessment (BA) may be required if federally- listed species and/or their designated critical habitat are affected. Although large-scale GIS data downloaded from the USFWS website does not indicate the Kendig Reservoir project would impact the critical habitat of federally-listed species, a more site-specific study may be necessary to determine if the project would impact any of the native fish or bird species such as eagles that live in the region, or migratory or denning habitat of the Canada Lynx. At this time, there are no known obstacles or fatal flaws for the West Divide Project to comply with the ESA (ERO, 2011).

5.6 National Environmental Policy Act (NEPA)

The Forest Service or BLM likely would prepare an Environmental Assessment (EA) and/or EIS to comply with NEPA as part of the SUP or ROW process. Public and agency scoping, site-specific studies, data collection, evaluation of alternatives, impacts analysis, mitigation development, and public and agency review and comment would occur as part of the NEPA compliance process. There are no known major obstacles or fatal flaws for the West Divide Project going through the NEPA process (ERO, 2011).

5.7 NATIONAL HISTORIC PRESERVATION ACT (NHPA)

The Forest Service and USACE will determine if the activities for which authorization is sought will adversely affect any historic properties listed, determined to be eligible for listing, or potentially eligible for listing in the National Register of Historic Places and could comply with the NHPA. The proposed construction of Kendig Reservoir is unlikely to adversely affect any historic properties listed, and would likely comply with the NHPA (ERO, 2011).

5.8 COUNTY PERMITS

The Upper and Alternative Kendig Reservoir sites are located entirely within Mesa County. At this time, Mesa County does not have a 1041 permitting process. Lower Kendig Reservoir is located within Mesa and Garfield Counties (see Figure 2). While Garfield County does not currently implement a 1041 permitting process, it has a Unified Land Use Resolution that requires environmental review for water impoundments and reservoirs.

Site-specific studies, as well as data collection and evaluation by Mesa and Garfield Counties would be required prior to construction. At this time, there are no known major obstacles or fatal flaws obtaining the required permits from the counties for the project (ERO, 2011).

5.9 OTHER ENVIRONMENTAL PERMITS

Other minor environmental authorizations and permits for some of the West Divide Project components may be required including a construction stormwater discharge permit and/or a construction dewatering permit. These construction permits are frequently obtained from the CDPHE by the construction contractor. The permits require that Best Management Practices (BMPs) are implemented to minimize soil erosion and remove sediment from runoff and/or discharged water associated with construction. At this time, there are no known major obstacles to obtaining these authorizations and permits (ERO, 2011).

There are no known major obstacles or fatal flaws with regard to the above-listed permits or requirements with respect to water quality issues. However, it is not known where or for what duration the Forest Service may require that a certain flow level be maintained for fish habitat and other environmental purposes (ERO, 2011).

5.10 SUMMARY OF PERMITTING REQUIREMENTS

As outlined in the environmental and permitting report by ERO in 2012, multiple environmental reviews and authorizations from Federal, State, and local agencies will be required prior to, and during construction of Kendig Reservoir. At this time, there are no known major obstacles or fatal flaws that would preclude development of Kendig Reservoir that have been assessed.

6.0 GEOTECHNICAL FEASIBILITY EVALUATION

RJH Consultants, Inc. (RJH) evaluated the feasibility of constructing Kendig Reservoir at the three proposed alternative locations. Their findings are documented in a memorandum dated March 10, 2016

(Attachment 2). RJH concluded that the Upper Kendig Reservoir site was a poor location due to numerous landslides and slope stability concerns in the area. Accordingly, this alternative was removed from further consideration. Consequently, RJH focused their efforts on providing planning level construction cost estimates known as Opinion of Probable Project Cost (OPPC) for the Lower Kendig and Alternative Kendig Reservoir sites. Construction cost estimates are based on developing a 16,500 af reservoir at the Lower Kendig Reservoir, whereas two capacities were evaluated for the Alternative Reservoir site; 16,500 af and 9,000 af. Table 2 below shows the total estimated cost of construction and unit cost to develop each of these reservoir options.

TABLE 2

Opinion of Probable Project Costs

Reservoir Site	Capacity (af)	OPPC (million $)	Unit Cost ($/af)
Lower Kendig	16,500	$ 88	$ 5,327
Alternative Kendig	16,500	$ 101	$ 6,121
	9,000	$ 65	$ 7,194

As indicated in the RJH memorandum, the OPPC for Lower Kendig is approximately 13 million dollars less than the Alternative Kendig for the 16,500 af capacity. This cost difference is due to a larger embankment and increased permitting fees associated with the Alternative Site. Based on these preliminary estimates, the unit cost to develop a 16,500 af reservoir ranges from about $5,300 to $6,100 per af.

The smaller 9,000 af Alternative Kendig Reservoir has an estimated OPPC of approximately 65 million dollars at a unit cost of about $7,200 per af. While this smaller reservoir may be less expensive to build, it would be more expensive on a cost per af basis than the 16,500 af Alternative Kendig Reservoir.

The construction costs of Kendig Reservoir, as outlined by RJH, are in line with other reservoir projects being built around the state and region on a cost per af basis. According to RJH, reservoirs of a similar nature are being constructed anywhere from a low of about $6,000 per af to a high of $10,000 to $15,000 per af, depending on specific geological restraints and land acquisition costs (Friend, 2016)

Although the Lower Kendig reservoir site may be less costly to construct, the Alternative Kendig site may be preferable because of its location above the Divide Creek Highline Ditch and private property considerations including the Divide Creek Highline Ditch alignment and conservation easements. These are important factors that must be evaluated to determine a preferred reservoir location.

RJH qualitatively evaluated two additional options for dam alignments at the Alternative Kendig site, but did not provide OPPC estimates (see Attachment 2).

7.0 LAND ACQUISITION

Each of the proposed Kendig Reservoir sites are situated in-total, or in-part, on private property. To develop Kendig Reservoir, it would be necessary for the reservoir owner to acquire these private property parcels. Note, RJH did not include the potential cost of property acquisition in their OPPC estimates; however, this component may be a significant cost. WWG has calculated the area of private property impacted by construction at each of the reservoir sites and are shown in Table 3. This was done by evaluating Garfield County and Mesa County GIS parcel data.

TABLE 3

Potential Private Property Affected by Kendig Reservoir (acres)

Reservoir Site Name	Inundated Area	Entire Parcel
Lower Kendig	285	835
Alternate Kendig (16,500 AF)	92	965
Alternate Kendig (9,000 AF)	66	965

Area land values (without buildings or water rights) were estimated at between $2,500 and $4,200 per acre based on recent sales and current listing prices of undeveloped land in the West Divide Creek area. However, actual costs will depend based on property values at the time of property acquisition. Accordingly, WWG has prepared two estimates for the Lower Kendig and the Alternative Kendig Reservoir sites to show the potential range in costs. The lower cost estimate below represents the cost to purchase only the number of acres that would be inundated by the proposed reservoir at a cost of $2,500 per acre. The higher cost estimate represents the cost to acquire the entire private property parcel affected by Kendig Reservoir at a cost of $4,200. The price breakdowns for land acquisition, assuming the above variables, are as follows:

- Lower Kendig Reservoir: $700,000 - $3,500,000
- Alternative Kendig Reservoir (16,500 af): $230,000 - $4,000,000
- Alternative Kendig Reservoir (9,000 af): $165,000 - $4,000,000

Additional land acquisition related to material borrow areas, spillway construction, or other activities associated with construction of Kendig Reservoir may be required. However, based on these preliminary figures, it is estimated that land acquisition may add an additional $14 to $410 per af to develop Kendig Reservoir. As described above, both Alternate Kendig Sites would inundate USFS property, however it is assumed that these lands would not be acquired, and as such were excluded from acquisition costs in this section.

8.0 REFERENCES

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C:\Users\Max\Google Drive\WDWCD\2016\Kendig\KendigReport2016-03-15.docx

C:\GIS\WDWCD\ArcMap\2016\Kendig\KendigIrrigatedArea.mxd

Map Sources:
Irrigated Area and Water Rights- CDSS
Kendig Reservoir - WDWCD/RJH
Service Areas - WDWCD/Digitized from Topo
Rivers and Streams - ESRI ArcGIS Data
Base Map - National Geographic Topo

107°45'0"W 107°40'0"W 107°35'0"W

39°35'0"N 39°30'0"N 39°25'0"N 39°20'0"N

New Castle
Silt
Rifle
Ward and Reynolds Ditch
Mineota Ditch
Louis Reynolds Ditch
Multa-Trina Ditch
West Divide Creek Ditch
Porter Ditch
Divide Creek Highline Ditch
Lower Site
Upper Kendig Site
Alternative Site

Colorado River
Rifle Creek
Government Creek
Mamm Creek
West Mamm Creek
Middle Mamm Creek
East Mamm Creek
Dry Hollow Creek
Alkali Creek
Divide Creek
East Divide Creek
West Divide Creek
Clear Creek
Corral Creek
June Creek
Garfield Creek
Main Elk Creek
East Elk Creek
Mosquito Creek
Brook Creek
Salt Creek

Map Legend
- Modeled Ditch
- River/Stream
- Proposed Kendig Reservoir
- Colorado River Service Area
- Alsbury Service Area
- Approximate Kendig Reservoir Augmentation Service Area
- Potential Irrigated Area (≈6,760 Acres)

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N W E S

0 0.75 1.5 3 Miles

1 Inch = 1.5 Miles

Created By: MJK
Date :3/31/2016
Scale: 95,040

Kendig Reservoir Potential Service Area

Figure 1

C:\GIS\WDWCD\ArcMap\2016\Kendig\KendigSiteMap.mxd

107°36'0"W 107°35'0"W 107°34'0"W 107°33'0"W

39°22'0"N 39°21'0"N 39°20'0"N 39°19'0"N 39°18'0"N

Map Sources:
Instream Flow Data - CDSS
Kendig Reservoirs - RJH
Ditch - Digitized from Topo
Boundaries - USFS and CDSS
Base Map - National Geographic Topo

Lower Site (≈16,500 af)

Garfield County
Mesa County

Highline Ditch

Divide Creek Highline Ditch

Upper Site (Removed from Consideration)

WSDRAVCO

Alternative Site 1 (≈16,500 af)

Alternative Site 2 (≈9,000 af)

CWCB Instream Flow:
Case No, 14CW3152 - Little Beaver Creek to Mosquito Creek
4.2 cfs (3/15 - 4/15)
14.1 cfs (4/16 - 7/15)
4.2 cfs (7/16 - 7/31)
1.14 cfs (8/1 - 3/14)

Map Legend
- Stream Gage
- CWCB Instream Flow Terminus
- Ditch Headgate
- Irrigation Ditch (Approximate)
- CWCB Instream Flow Reach
- Conservation Easement
- Proposed Kendig Reservoir
- BLM Land
- USFS Land

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N W E S

0 1,000 2,000 4,000 Feet

1 Inch = 2,000 Feet

Created By: MJK
Date :3/31/2016
Scale: 24,000

Kendig Reservoir Site Map

Figure 2

Figure 3. Kendig Reservoir Monthly Storage

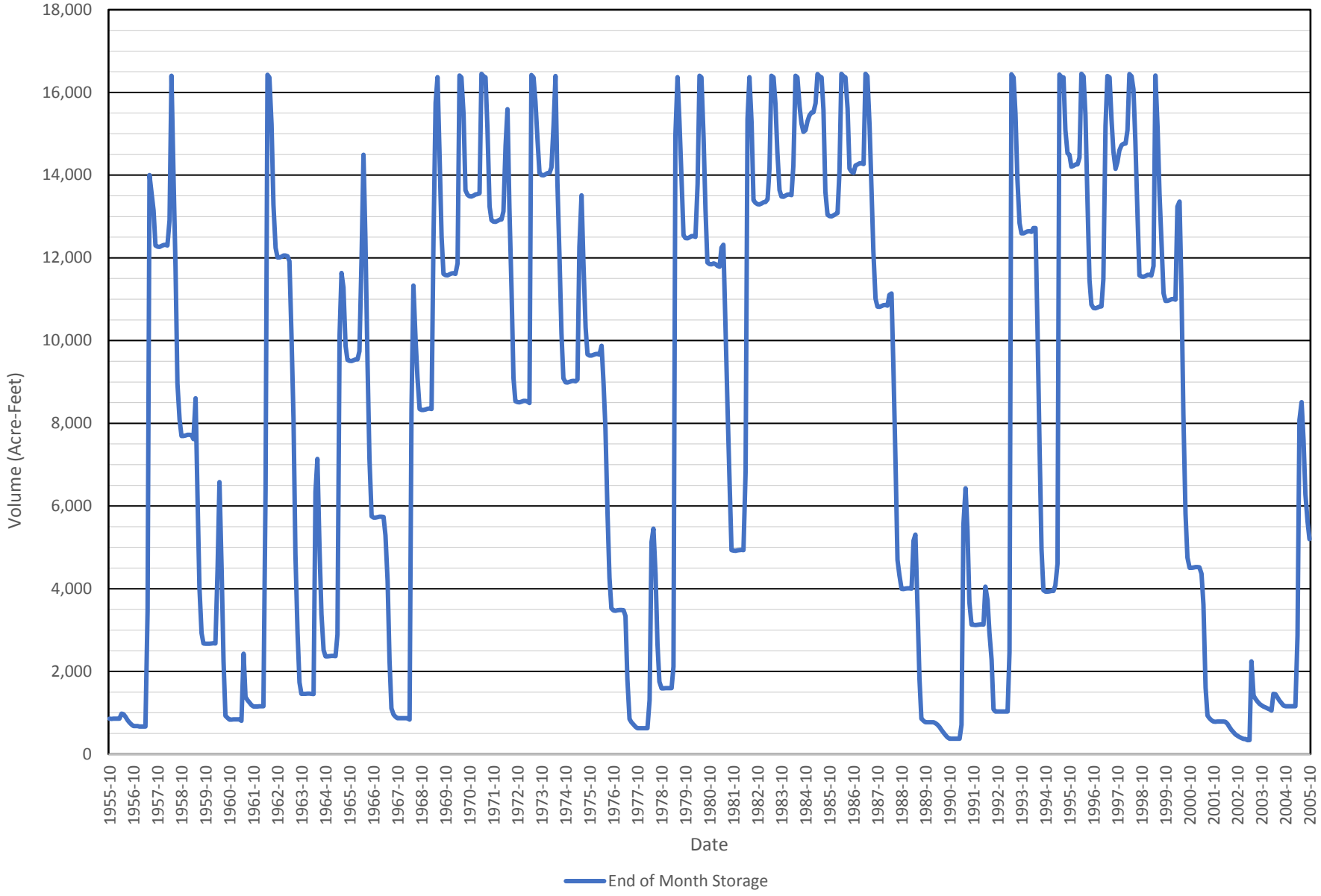


Figure 4. Kendig Reservoir Operations - Irrigation

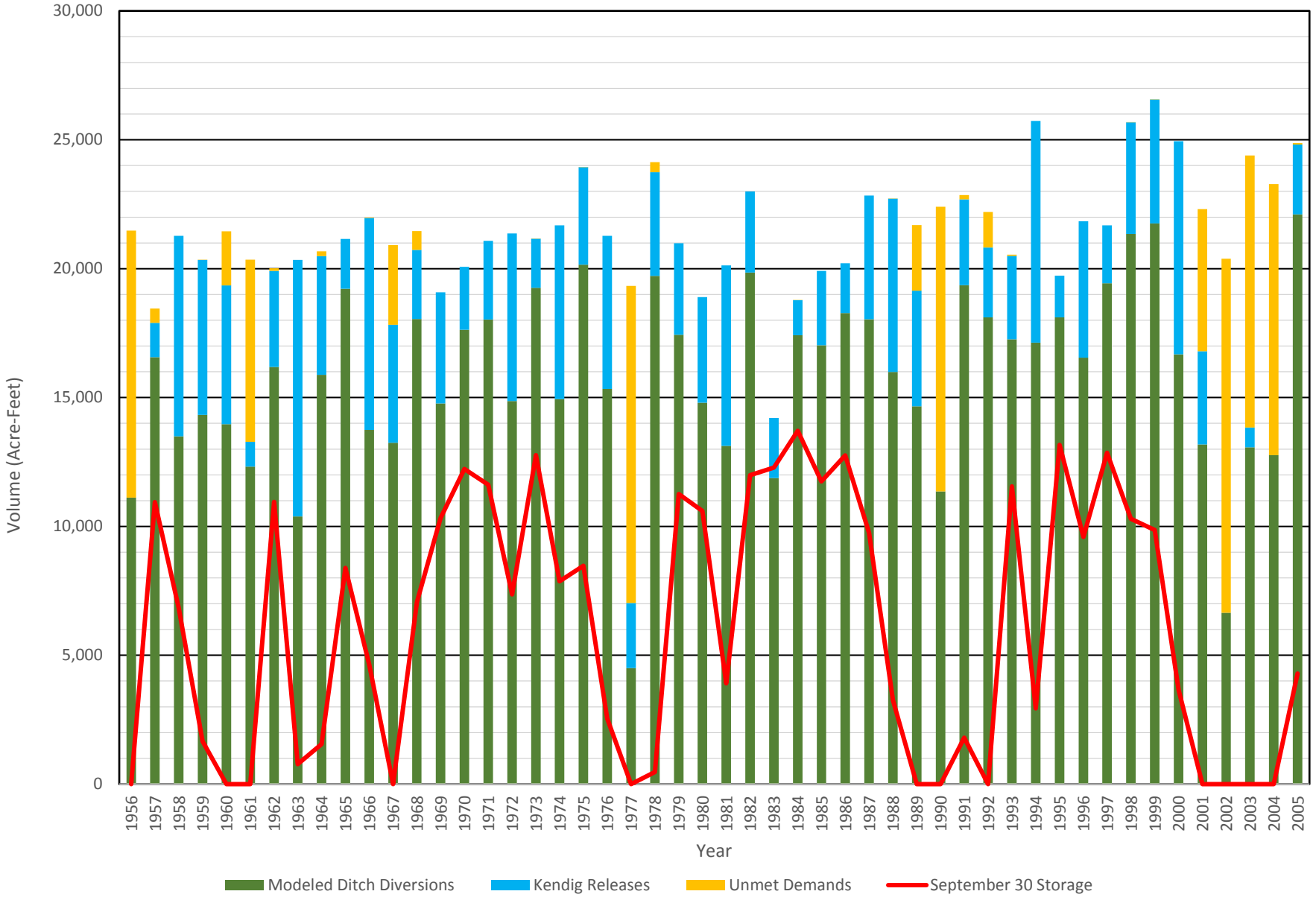
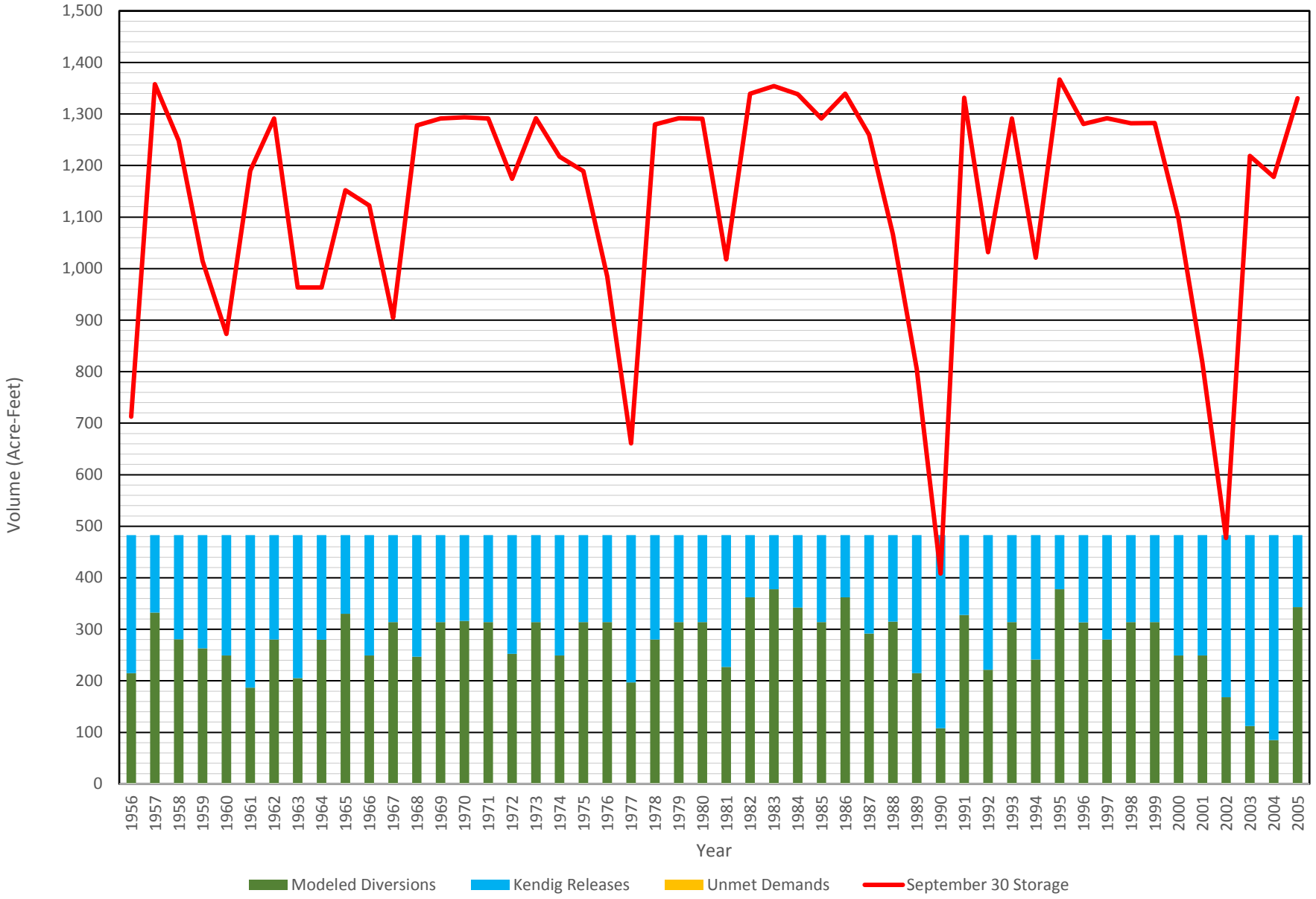


Figure 5. Kendig Reservoir Operations - Domestic and Industrial



STATE OF COLORADO
Department of Natural Resources

ORDER
Number: POGG1 PDAA 201800000572
Date: 12/07/17
Description:
Water Plan Grant storage for west divide creek streamflow
Effective Date: 01/01/18 Expiration Date: 01/01/23

BUYER
Buyer:
Email:

VENDOR
COLORADO RIVER WATER CONSERVE DIST
PO BOX 1120
GLENWOOD SPRINGS, CO 81602-1120

Contact: .
Phone: .

**** IMPORTANT ****
The order number and line number must appear on all invoices, packing slips, cartons and correspondence

BILL TO
COLORADO WATER BOARD CONSERVATION
1313 SHERMAN STREET, ROOM 718
DENVER, CO 80203

SHIP TO
COLORADO WATER BOARD CONSERVATION
1313 SHERMAN STREET, ROOM 718
DENVER, CO 80203

SHIPPING INSTRUCTIONS
Delivery/Install Date:
F.O.B:
VENDOR INSTRUCTIONS:

Line Item	Commodity/Item Code	UOM	QTY	Unit Cost	Total Cost	MSDS Req.
1	G1000		0	0.00	$80,260.00	☐

Description: Water Plan Grant storage for west divide creek streamflow

Service From: 01/01/18 Service To: 01/01/23

TERMS AND CONDITIONS
https://www.colorado.gov/osc/purchase-order-terms-conditions

DOCUMENT TOTAL = $80,260.00