November 17, 2021

Attn: Douglas County Board of County Commissioners
Douglas County, Colorado
100 Third St.
Castle Rock, CO 80104

RE: Platte Valley Water Partnership

Dear Commissioners,

Parker Water and Sanitation District (Parker Water or PWSD), in Partnership with the Lower South Platte Water Conservancy District (LSPWCD or Lower South Platte) and Castle Rock Water are pleased to submit the attached proposal to increase the renewable water supply for Douglas County's existing and expanding customer base through the Platte Valley Water Partnership. The project will make use of new and existing infrastructure to store and transport water for agricultural use in northeastern Colorado and municipal use along the Front Range. Our proposal presents a project that supports the growing communities of Douglas County while preserving and supporting agricultural uses in the South Platte River Basin.

Our vision is of a project that brings water to the Rueter-Hess Reservoir (RHR), an invaluable water resource for Parker Water & Sanitation District, Castle Rock Water, as well as the residents of Douglas County and the people of the greater Colorado Front Range.

Our proposal as detailed in the attachment presents the project and the benefits to, not only Douglas County, but to the historic agricultural uses along the South Platte River. These benefits include, but are not limited to:

- A new renewable water supply for over 300,000 residents in the Douglas County area. (Area includes the Town of Parker, Castle Rock, portions of Castle Pines and Lone Tree, areas of Unincorporated Douglas County, including county enclaves such as Bell Mountain Ranch).
- Access to over 20,000 ac-ft of renewable water (on average) annually that would otherwise leave the State of Colorado.
- A project that partners with LSPWCD and primarily relies on a 2019 junior water right along with water rights previously acquired by both PWSD and LSPWCD, as well as a 2021 junior water right filed by Castle Rock Water. **No buy and dry**.
- A program which includes additional storage on the Lower South Platte which meets a regional need and will encourage additional partnership along the front range and with the agriculture users along the South Platte in eastern Colorado.

- A vision that increases the benefits at Rueter-Hess Reservoir and the surrounding property to maintain the tranquil and serene qualities of the site while also providing a place for people to be active in the outdoors and their community year-round.

We look forward to presenting this proposal to you in more detail. If you have any questions, please reach out to us.

Sincerely,

Ron Redd, PE
District Manager of Parker Water

Cc: Joe Frank, General Manager of Lower South Platte Water Conservancy District
Mark Marlowe, Director of Castle Rock Water

Attachments: Proposal to Douglas County for the Platte Valley Water Partnership
LWS Engineering Report

Proposal to Douglas County for the Platte Valley Water Partnership

A Renewable Water Supply Project Beneficial to the Municipalities of Douglas County while Preserving and Supporting the Agricultural Uses Along the South Platte River

By: Parker Water and Sanitation District in partnership with the
Lower South Platte Water Conservancy District
as well as Castle Rock Water

TOTAL ESTIMATED COUNTY INVESTMENT: $20 MILLION - $30 MILLION

Purpose:

The intent of this proposal is to present for your consideration the Platte Valley Water Partnership, a project that will provide a new renewable water source off of the South Platte River to Douglas County Communities while preserving and supporting agricultural use in northeastern Colorado. This project not only increases the renewable water supply for our existing and future residents, it also provides infrastructure to convey this new, as well as existing, water sources to project partners. This renewable water supply is predominately available during spring runoff and major storm events and would otherwise leave Colorado.

The joint parties presenting this proposal have been working collaboratively for over 3 years to find a solution beneficial for the Douglas County Communities as well as the Lower South Platte Agricultural Users. This proposal presents the work that has been accomplished to progress this effort and the vision that we continue to stride towards.

By leveraging the American Recovery Plan Act (ARPA) monies available, we believe that this project provides an opportunity for Douglas County to invest in Douglas County sustainability. The sustainability of this project can be translated to Douglas County by renewable water, to Lower South Platte by continued agricultural activities, and to Rueter-Hess Reservoir as an additional supply that enhances and expedites recreation that focuses on educating generations to come about the reservoir and adjacent lands' rich history, unique outdoor space, and preserved native environment while securing a valuable water future.

Our project is in alignment with many components of the State's Water Plan, including benefits to Douglas County. Although this project extends beyond the boundaries of Douglas County, the County can determine its involvement on this project and focus on components that bring water into its community.

The Need:

Douglas County is a growing community. We see this project as a unique opportunity to optimize and convey existing and future water resources for all partners through the projects shared infrastructure.

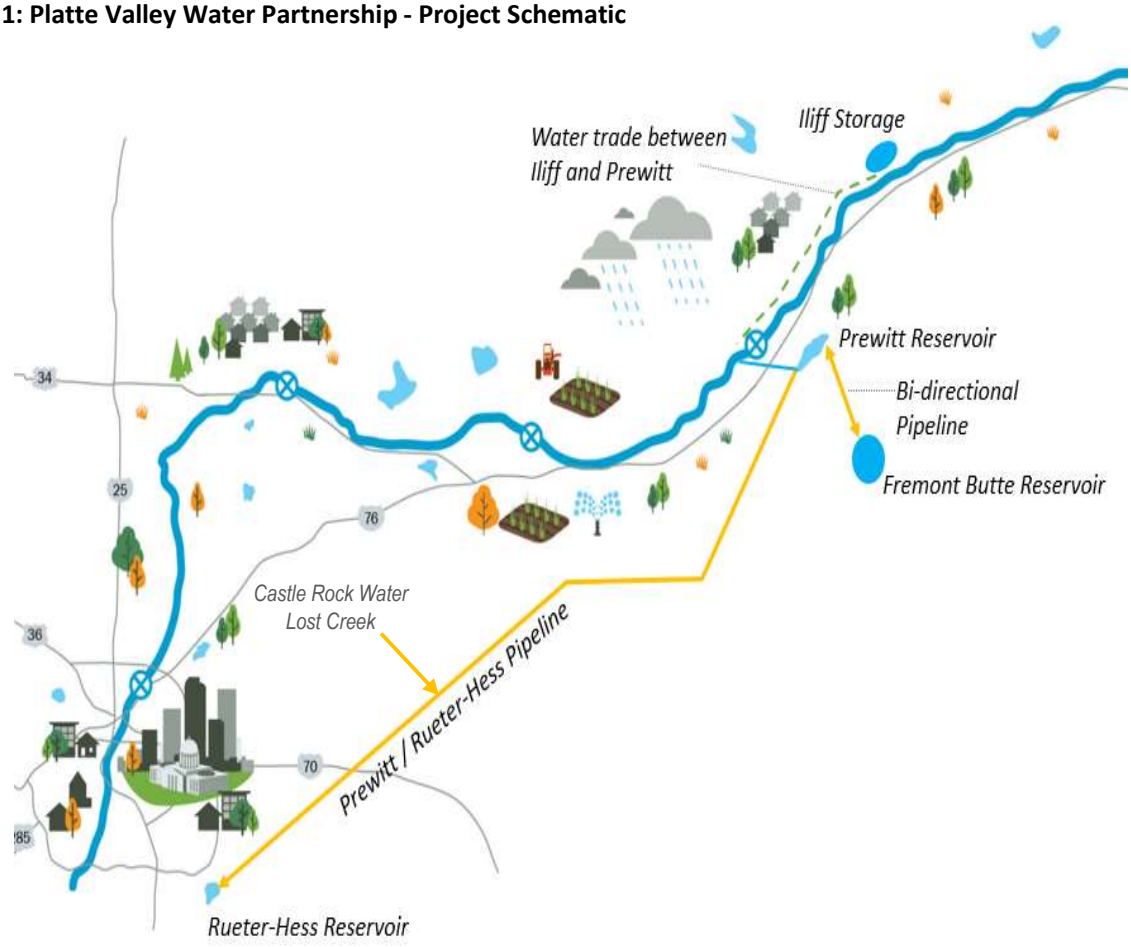
PWSD's current water resources are sufficient to meet existing demands, but with a population that's projected to double by build-out, and with the Denver Basin groundwater supplies diminishing over time, PWSD's ultimate goal is to diversify its water resources portfolio to be comprised of at least 75% renewable

water. Future partners such as Castle Rock will be able to wheel newly acquired water, as well as existing water rights through the envisioned infrastructure of the project.

With the construction of shared project infrastructure, LSPWCD will be able to capture, store, and use their water resources more effectively for irrigation purposes. These improvements will help to optimize operations necessary to meet their members' needs.

A very high-level conceptual schematic of the project is shown below:

Figure 1: Platte Valley Water Partnership - Project Schematic



The Benefits from this Project:

There are 5 key themes to the vision of this project. We believe that adhering to these themes will help create a successful project.

1. Conservation (Creating Efficiency in Demand Management)
2. Collaboration (Management & Investment in Municipalities and Agriculture)
3. Community (Avoiding Buy and Dry & Community Enhancement with RHR)
4. Cooperation (Creating a Vision that Supports Interest Groups & Regional Preservation)
5. Communication (Establishing Open, Honest and Frequent Communication)

A successful project will bring benefits not only to Douglas County, but throughout the front range and to the Lower South Platte district. These benefits include:

- A new renewable water supply for over 300,000 residents in the Douglas County area. (Area includes the Town of Parker, Castle Rock, portions of Castle Pines and Lone Tree, areas of Unincorporated Douglas County, including county enclaves such as Bell Mountain Ranch).
- Access to over 20,000 ac-ft of renewable water (on average) annually that would otherwise leave the State of Colorado.
- Sharing regional infrastructure to create economies of scale to the benefit of customers served by the partners and potential future partners including as an example bringing other water rights owned by Castle Rock Water on the South Platte back to Rueter-Hess Reservoir.
- An ability to better manage the decline of the Denver Basin aquifer by decreasing our reliance on it.
- Providing drought protection to our growing community through additional storage and a diverse water portfolio.
- Sustaining the way of life in agricultural communities. This project partners with LSPWCD and primarily relies on a 2019 junior water right along with water rights previously acquired by PWSD and LSPWCD, as well as a 2021 junior water right filed by Castle Rock Water. No buy and dry.
- A program which includes additional storage on the Lower South Platte which meets a regional need and will encourage additional partnership along the front range and with the agriculture users along the South Platte in eastern Colorado.
- A vision that increases the benefits at Rueter-Hess Reservoir and the surrounding property is to maintain the tranquil and serene qualities of the site while also providing a place for people to be active in the outdoors and their community year-round.
- Utilizing junior water rights and free river allowing tenant farmers to make use of our existing senior water rights for irrigation purposes
- Developing a project that sets a precedent to promote water management for municipalities and still support the agricultural community

Summary of Partnerships

In December of 2019, Parker Water and Lower South Platte jointly filed a water court application for water storage, exchange rights, and a change of water rights. To solidify this partnership and establish equitable terms and conditions for smooth operation, Parker Water and Lower South Platte entered into an Intergovernmental agreement in October of 2021. The IGA establishes ownership of water rights and infrastructure, financial obligations, operation of the project, and establishes the project guidelines for no buy and dry, a method often used to acquire water for municipalities that dries up farmland.

This project is being developed to provide opportunities for other entities to participate. For example, Castle Rock Water has filed for junior water rights on the South Platte with the intent to partner with PWSD and LSPWCD to build and utilize the Platte Valley Water Partnership infrastructure.

Parker Water continues to meet with Denver Water, Aurora Water, and Northern Water to discuss the opportunities available to participate in the project. Part of the outreach includes presenting the benefits to each potential partner.

- Castle Rock - Castle Rock would be able to convey new water rights recently filed on the South Platte through the entirety of this project. They could also share in the pipeline infrastructure to convey their Lost Creek Wellfield, Rothe Water Rights and Box Elder Farm water (over 2,300 acre-feet of water with more expected). Benefits for Castle Rock include:
    - Avoidance of putting treated water into RHR
    - No interruption in conveyance
    - Reduction of desalination capacity needed through blending
    - Potential elimination of the need for additional capacity in WISE and RidgeGate line
    - Reduced long term costs for infrastructure
- Aurora Water - Aurora Water has recently purchased water along the South Platte River. This project would provide conveyance for them if they can meet the no buy and dry conditions. Benefits for Aurora include sharing in infrastructure to reduce capital of building their own pipeline.
- Denver Water - Denver Water has both return flows on the South Platte as well as near Denver International Airport. This project could allow them to use excess capacity when it is available providing them water that they typically cannot capture and assisting the project with operational costs.
- Northern Water - Northern Water would likely be a partner in future phases of a regional project.

Proposed Scope of Project and Population Served

The overarching objective of this project is to provide new renewable water supplies, municipal water for PWSD and potentially Castle Rock Water and additional, supplemental irrigation water supplies for farming, as well as municipal, industrial, and commercial uses, in the LSPWCD service area. The project develops new, currently unused water supplies on the South Platte River that would otherwise be in excess of Compact commitments by Colorado, all without doing "buy and dry" of existing agricultural lands. The project will also build the infrastructure to store and convey it.

At buildout, PWSD is expected to have a population of approximately 160,000, with an estimated average daily demand of 17.9 MGD. With Castle Rocks participation this project will likely serve over 300,000 residents in Douglas County as Castle Rock's build out population could reach 155,000.

The December 2019 water rights application seeks to obtain direct flow rights, storage rights, and an appropriative right of exchange. An appropriation date of November 5, 2019 is sought for each of these rights. In addition to these new rights being sought, PWSD is also seeking to change its 2003 water rights for storage. The project is envisioned to install the infrastructure necessary to develop and convey the requested 2019 water rights to Rueter-Hess Reservoir and the LSP Irrigators, as well as use of PWSD's 2003 right. With the potential addition of Castle Rock Water as a partner, an additional October 2021 water rights application filed by Castle Rock seeks similar types of rights for additional renewable water supplies.

The components of the project include:

- Iliff Reservoir: 4,000 – 6,500 AC-FT of Storage

- Prewitt Reservoir Improvements: Improve Diversion Structure and Inlet Canal
- Delivery System to Rueter-Hess Reservoir from Prewitt Res
    - 125-miles of 36-in (~18 cubic feet per second (cfs)) pipeline
    - 4 Pump Stations at 250 cfs
    - 4 Tanks at 0.75 million gallons (MG)
- Desalinization/Phosphorus Removal Facility: 9 million gallons per day (MGD)
- Freemont Butte Reservoir: 72,000 acre feet (AC-FT) of Storage
- Delivery System between Freemont-Butte and Prewitt Reservoirs
    - 98 cfs Pump Station
    - 12.5-miles of 66-in pipeline

The project is proposed to be complete in 2 phases. Phase 1 consists of the infrastructure that pulls water off of the South Platte and delivers it to Rueter-Hess Reservoir. This is the infrastructure that will be utilized for other waters that are located near or along the pipeline and can be delivered to Rueter-Hess. Phase 2 includes the Freemont-Butte Reservoir which is envisioned as a shared reservoir to store the large excess volumes that occur on the South Platte and store them locally to then pump at lower rates into Rueter-Hess or local irrigators for optimized efficient operations.

Estimated Costs

A breakdown of estimated project costs is presented in the table below. We believe that a Douglas County investment of $20M to $30M could provide an important funding source for this long-term regional water supply project and help move design and permitting for phase 1 forward at a quicker pace.

Platte Valley Water Partnership Cost

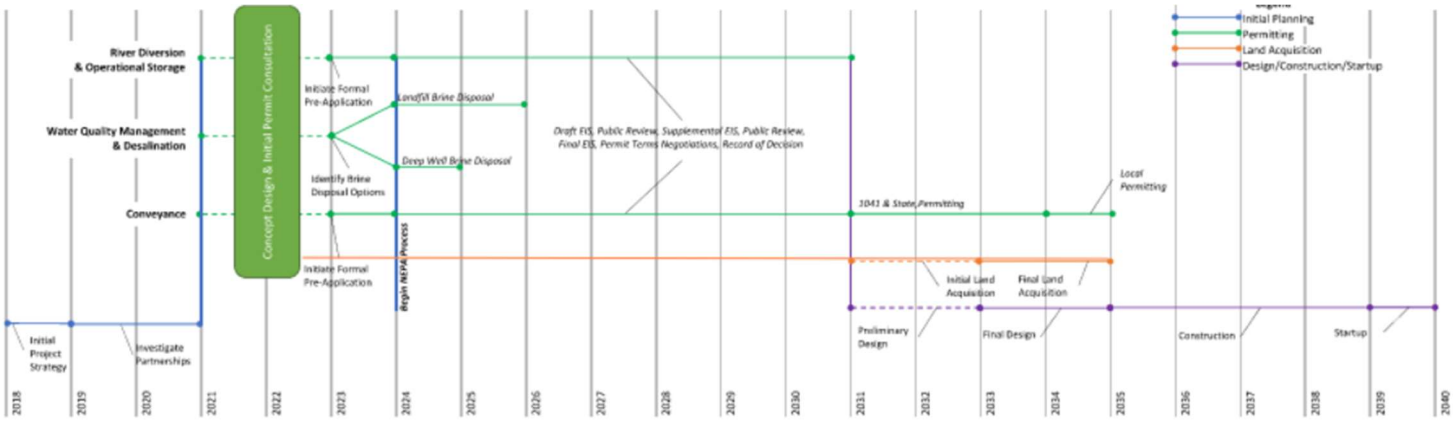
Project Component and Description	Estimated Cost
Phase 1	
Iliff Reservoir: 4,000 – 6,500 AC-FT of Storage	$70.0M
Prewitt Reservoir Improvements: Improve Diversion Structure and Inlet Canal	$3.4M
Delivery System to Rueter-Hess Reservoir from Prewitt Res: 125-miles of 36-in (~18 cfs)	$245M
4 Pump Stations at 250 cfs	$87.3M
4 Tanks at 0.75 MG	$13M
Desalinization/Phosphorus Removal Facility: 9MGD	$149.3M
Phase 1 Total	***$568.5M***
Phase 2	
Freemont Butte Reservoir: 72,000 AC-FT of Storage	$136.5M
Delivery System between Freemont-Butte and Prewitt Reservoirs: 98 cfs Pump Station	$18.0M
12.5-miles of 66-in	$71.8M
Phase 2 Total	***$226.3M***
Land: Includes land for reservoirs and pipeline easements	$21M
Permitting: 5 years of EIS study/evaluation/approval	$12.5M
Project Total	**$827.8M**

Approach to Payback of County Investment

A Douglas County investment in this project could be considered an investment for the Douglas County community. Additional renewable water provides support for the additional growth forecast for Parker, Castle Rock and other parts of Douglas County which brings in tax dollars and development fees. PWSD and Castle Rock Water could add a system development fee component to future system taps to pay back the County investment over time.

Proposed Potential Schedule

A project of this magnitude takes time to plan, permit, design, and construct. It is our intent to have the project on-line by 2040. Conceptual planning, water court, permitting, and land acquisition are activities that will occur for the next 10 years. During this time Parker Water will continue to work with other utilities to find partnering opportunities. Detailed design will be performed from about 2030 to 2035 with construction from 2035 to 2040. The below Schedule helps visualize the activities.



Next Steps

For nearly a decade this region has been talking about regional opportunities to effectively provide renewable water to the front range communities under the guiding principles of avoiding buy and dry. And while these conversations have been worthwhile, it took a proponent to start progressing a project forward. Parker Water and the Lower South Platte are that proponent. This project sets a precedent that others can join. It builds and fulfills a vision of a regional project that effectively utilizes excess water on the South Platte for growing communities while preserving the agriculture in the Basin. This project has been discussed with SPROWG (South Platte Regional Opportunities Water Group) and has been used as an example to help define a potential vision for the future.

If Douglas County is interested in investing in this project, then PWSD, LSPWCD and Castle Rock Water would work with Douglas County on an intergovernmental agreement detailing how the investment would be used and how it could be paid back over time as additional growth occurs in Douglas County.

Lytle Water Solutions, LLC

Preliminary Engineering Report

Parker Water and Sanitation District/
Lower South Platte Water Conservatory District
Case No. 19CW3253

Prepared For:
Parker Water And Sanitation District/
Lower South Platte Water Conservancy District

Project No. 1489-20

August 31, 2020

Lytle Water Solutions, LLC
640 Plaza Drive, Suite 170
Highlands Ranch, CO 80129

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1.0 INTRODUCTION

A Water Court application was filed in Case No. 19CW3253 on December 31, 2019 as a joint application of the Parker Water and Sanitation District ("PWSD") and the Lower South Platte Water Conservancy District ("LSPWCD"). The overarching objective of this application is to provide new renewable water supplies, municipal water for PWSD and additional, supplemental irrigation water supplies for farming, as well as municipal, industrial, and commercial uses, in the LSPWCD service area. There are several other uses requested in the application related to the reservoirs proposed operations. This water supply plan is proposing to develop new, currently unused water supplies on the South Platte River that would otherwise be in excess of Compact commitments by Colorado, all without doing "buy and dry" of existing agricultural lands.

The areas to be served are within the service areas of PWSD (**Figure 1**) and in the lower South Platte River basin within and without the LSPWCD boundary (**Figure 2**). PWSD currently has an average daily water demand of 7.5 million gallons per day ("MGD") to serve residential and commercial users and has a current population of approximately 60,000. At buildout, PWSD is expected t to have a population of approximately 160,000, with an estimated average daily demand of 17.9 MGD, as described in its most recent Master Plan (**Appendix A**). Within LSPWCD water use is principally for irrigation uses; however, there are additional municipal, industrial, and commercial uses. In most years, irrigation demands within the district exceed the available supplies and shortages are expected to be greater in the future. LSPWCD, through its technical consultant Deere & Ault Consultants, Inc., has estimated the water supplies that it would like to develop to meet some, or all, of the current water supply shortfalls (**Appendix B**).

PWSD is currently heavily reliant on non-renewable water supplies associated with nontributary Denver Basin bedrock aquifer water as its principal water supply. To reduce its reliance on non-renewable sources, PWSD recently constructed and put Rueter-Hess Reservoir online, which provides some renewable water supplies and is also a water management facility. However, since the primary source of renewable water for Rueter-Hess is Cherry Creek, and the storage rights are relatively junior (i.e., 1985, 1993, and 2004 priorities), Rueter-Hess Reservoir currently provides some of PWSD's demands, with the remaining demand having to continue to be provided from its non-renewable Denver Basin aquifer groundwater wells (**Appendix A**). To achieve its long-term renewable water supply plan as envisioned in the latest Master Plan, PWSD is pursuing this application as a means to reduce its dependence on non-renewable water supplies.

To achieve PWSD's overarching water supply objective to provide new renewable municipal water supplies for its customers, there are a number of proposed components to this water supply development project. The proposed project components will allow PWSD to store water in Iliff, Prewitt, and Fremont Butte Reservoirs for subsequent release to the PWSD water supply delivery pipeline for ultimate use within the PWSD service area (**Figure 1**).

Entities within the LSPWCD service area experience frequent irrigation water supply shortages. In addition, there are water supply needs within the district for municipal, industrial, and

commercial uses. To achieve its overarching water supply objective to provide additional, supplemental water supplies for all uses in the LSPWCD service area, there are a number of mechanisms that LSPWCD can use to increase water supplies. This project is projected to provide additional supplemental water through the use of Iliff, Prewitt, and Fremont Butte Reservoir storage and releases, as well as provide recharge water to help augment alluvial aquifer wells. In the upper reaches of the district, additional water supplies can be provided through an over-sizing of the PWSD water supply delivery pipeline for a distance upstream so LSPWCD can transport water to be used either to recharge the aquifer to provide delayed augmentation credit to allow more use of alluvial aquifer wells in that reach of the district and/or to deliver water directly to the river for use downstream. It is also possible that water could be administratively exchanged further upstream for LSPWCD users at times when river conditions allow.

PWSD acquired 13 farms in Logan County in the early 2000s and, therefore, has looked to this area for a number of years as a potential source for renewable water supplies (**Figure 3**). Initially, PWSD evaluated potential reservoir sites in the Sterling area in a study conducted in 2006 (States West, August 2006). Other alternatives were also evaluated by PWSD, including a 3-year research study of deficit irrigation and rotational fallowing conducted by Colorado State University (Hansen et al, June 2014). As part of a 2015 report by Providence Infrastructure Consultants ("Providence"), project alternatives to bring water from Logan County to Parker were evaluated, including a pipeline from Iliff and/or exchanges to upstream locations. A map showing potential water supply delivery options from the Providence report is shown in **Appendix C**. While the project components have changed since the Providence report in 2015, PWSD has been pursuing the general concept of development of renewable water supplies from the Lower South Platte River Basin for many years.

PWSD plans to use some of the senior water rights from its farms as a drought reserve and has not yet prepared a Water Court application to change that water to municipal use. PWSD anticipates that it will continue to lease those farms to local farmers. In addition, PWSD has been a member of the Northeast Colorado Water Cooperative ("NECWC") since September 2014 and has explored means to develop alternative transfer methods ("ATMs") with members of the NECWC to develop variable-yield renewable supplies (**Appendix D**). Prior to PWSD's participation in the NECWC, PWSD sponsored extensive research at its Hurst farm (**Figure 3**) on a deficit irrigation and rotational fallowing ATM with Colorado State University from 2007 through 2009. Based on these multiple ongoing studies that were initiated in 2006, with the evolution of the project over the years, the PWSD Board passed a resolution on December 12, 2019 authorizing the filing of the Water Court application that has become Case No. 19CW3253 (**Appendix E**).

The LSPWCD has provided input on the CSU ATM research (Hansen et al, June 2014) and has participated for a number of years with PWSD on potential ATMs that could provide renewable water supplies for Parker without permanently drying up irrigated agriculture. In addition, LSPWCD is a member of the NECWC and has actively participated in the operational feasibility and implementation of the NECWC. Analysis by the NECWC determined the feasibility and need to develop new infrastructure and new water supplies in the Lower South Platte River basin. The NECWC work concluded that new infrastructure and water development could both provide

supplemental water supplies to water users in Water Districts 1 and 64 and provide water supplies to municipalities such as PWSD, all without "buy and dry" of existing agricultural lands (NECWC, June 2020).

The NECWC determined that the LSPWCD is a more suitable form of entity under Colorado law for pursuing the current Water Court application and requested LSPWCD to move forward on behalf of its members and other water users in the Lower South Platte (Water Districts 1 and 64). The NECWC wrote a letter to the LSPWCD board of directors supporting this project on November 21, 2019 (**Appendix D**). As such, to provide mutual benefits to both PWSD and LSPWCD, as well as ancillary benefits to the NECWC,, on December 17, 2019 the LSPWCD passed a resolution authorizing the filing of the application jointly with PWSD (**Appendix F**).

While the Water Court application was filed in December 2019, it was by no means the genesis of the project components, which have been the subject of detailed planning for many years, as described above. Because of the changes to the project components over time, the appropriation date identified in this case is November 5, 2019 for the new water rights sought in this case. The reason for the appropriation date is based on a meeting at PWSD's office with representatives from PWSD, LSPWCD, and interested water users, in which the water rights and project components that are part of the application were confirmed in detail.

In addition to the project meeting on November 5, there were a number of subsequent meetings to discuss project components, both with PWSD and LSPWCD representatives (as indicated), as well as outreach meetings by LSPWCD representative to water supply entities within LSPWCD, including interested members of water user groups in the Lower South Platte River basin. These meetings were held up to the time of the Water Court filing, as shown in the summary of those meetings presented in **Table 1**.

TABLE 1

Summary of Project Meetings in 2019

DATE	MEETING WITH
11/06/2019	Lower Platte & Beaver Board
11/06/2019	Prewitt Operating Committee Board
11/08/2019	North Sterling Board
11/12/2019	LSPWCD Board
11/12/2019	Upper Platte & Beaver Board
11/15/2019	NECWC Board
11/18/2019	Bijou Irrigation District Board
11/19/2019	Morgan County Quality Water Board
11/19/2019	Fort Morgan Reservoir & Irrigation Company Board
11/20/2019	Deuel & Snyder Board
12/05/2019	Riverside Irrigation District Board
12/06/2019	Joint PWSD/LSPWCD meeting with Fremont Butte Reservoir landowners
12/12/2019	Weldon Valley Ditch Company Board
12/17/2019	Joint PWSD/LSPWCD meeting with Iliff & Platte Valley, Lower Logan Well Users, Powell & Blair, and Harmony No. 2 Boards
12/19/2019	Pioneer Augmentation Board

A copy of the Water Court application is presented in **Appendix G**. The following section provides an overview of the project components and how PWSD and LSPWCD plan to operate jointly to the mutual benefit of agricultural producers in the Lower South Platte River, as well as municipal water users in the PWSD service area, all without the "buy and dry" of existing agricultural lands.

2.0 OVERVIEW OF PROPOSED PROJECT

The application in 19CW3253 seeks to obtain direct flow rights, storage rights, and an appropriative right of exchange. Direct flow rights for storage and subsequent beneficial use are sought in the Iliff & Platte Valley Ditch, Powell & Blair Ditch, and Prewitt Inlet Canal. The storage rights sought are for the Iliff Reservoir and the Fremont Butte Reservoir, as well as forebay storage in Prewitt Reservoir. An appropriative right of exchange is sought from the river return line from Iliff Reservoir to the Prewitt Inlet Canal. An appropriation date of November 5, 2019 is sought for each of these rights. In addition to these new rights being sought, PWSD is also seeking to change its 2003 water rights decreed in 03CW428 for storage prior to putting the rights to the beneficial uses decreed in that case. The rates of diversion, amount of storage claimed, and the exchange rate sought in this case are summarized in **Table 2**.

TABLE 2

Requested Water Rights in 19CW3253

RIGHT REQUESTED	FLOW RATE (cfs)	FLOW RATE (cfs)
Direct Flow		
Iliff & Platte Valley	150.	------
Powell & Bl12/air	80.	------
Prewitt Inlet Canal	1,000.	------
Storage		
Iliff Reservoir	------	6,500.
Fremont Butte Reservoir	------	72,000.
Prewitt Reservoir Forebay	------	15,000.
Appropriative Right of Exchange		
Iliff to Prewitt	150.	------

The project, as envisioned in the application, is to install the infrastructure necessary to develop the requested 2019 water rights, as well as use of PWSD's 2003 right, decreed in Case No. 03CW428 (**Appendix H**). The uses proposed in the application include municipal, irrigation and supplemental irrigation, domestic, stock watering, recreational, piscatorial, fish and wildlife, fire protection, street washing, hydroelectric power production, and exchange, replacement, and augmentation including, without limitation, augmentation by use of recharge ponds, at any location where it is physically available within the boundaries of LSPWCD as such may change from time to time, and without the boundaries of LSPWCD pursuant to agreement, and within the service area of PWSD as such may be changed from time to time and for contract of out-of-district service by PWSD. All of these uses can be supported by the project components, as well as the uses both PWSD and LSPWCD will put the water to once delivered to its respective customers.

The components of the project include:

(a) diversion of a junior 2019 water right through the Iliff & Platte Valley and/or Powell & Blair Ditch for storage in Iliff Reservoir;

(b) storage of the 2019 water right, as well as the changed PWSD 2003 water right, in Iliff Reservoir for direct use by LSPWCD and for exchange;

(c) a river exchange from the point of discharge to the South Platte River from the Iliff Reservoir ("exchange-from point") to the Prewitt Inlet Canal ("exchange-to point") of the PWSD 2003 right and the PWSD/LSPWCD 2019 right and for exchange by LSPWCD with the 2019 right;

(d) diversion of a junior 2019 water right and water moved by exchange through the Prewitt Inlet Canal for storage in, and delivery through, the Prewitt Reservoir forebay;

(e) storage in and/or delivery through, the Prewitt Reservoir forebay;

(f) release of water from Prewitt Reservoir to the South Platte River at the Prewitt outlet works to meet demands of LSPWCD;

(g) delivery to and storage in Fremont Butte Reservoir via a pump and pipeline from the Prewitt Reservoir forebay ("Prewitt-Fremont Butte pipeline");

(h) releases through the Prewitt-Fremont Butte pipeline to the Prewitt Reservoir outlet works pump station; and

(i) delivery through the oversized PWSD water supply delivery pipeline for both PWSD and LSPWCD;

Because of the multiple components of this project, it is anticipated that the project will be developed in phases. Phase I will include the components described in (a) through (f) and the delivery of water to the RO plant for ultimate delivery of water to Parker to meet PWSD's municipal water demands, while Fremont Butte Reservoir will be constructed in Phase II along with the two-way Prewitt-Fremont Butte pipeline, as described in (g) and (h).

The project plan is to maximize the use of junior priority water through significant additional storage capacity. The anticipated physical operations will include the ability to divert and directly store water in both Iliff Reservoir and Prewitt Reservoir, with the potential for water stored in Iliff Reservoir to either be exchanged to Prewitt Reservoir or for there to be an operational trade of water stored in Prewitt Reservoir under its existing storage rights for water stored in Iliff Reservoir under the 2019 water right that will allow the delivery of Prewitt's water to Prewitt members out of Iliff Reservoir. In addition, the same volume of water would be available for use by LSPWCD and PWSD for delivery out of Prewitt Reservoir under this 2019 water right. Water attributed to the 2019 water right in both reservoirs can then be released by LSPWCD either directly to the South Platte River for LSPWCD uses or to recharge ponds to provide augmentation water. PWSD proposes to develop a delivery pipeline from the Prewitt Reservoir outlet works to Parker ("PWSD water supply delivery pipeline"), with partial treatment of the water at a reverse osmosis ("RO") plant, for ultimate delivery to Parker, with some storage of delivered water in Rueter-Hess Reservoir.

The water supply delivery pipeline to Parker is proposed to be from a pump station at the Prewitt Reservoir outlet works so water can be delivered in both Phase I and II of the project. In Phase II, there will be a second pipeline, i.e., the Prewitt-Fremont Butte pipeline, which will be constructed as a two-way pipeline both a delivery system to storage in Fremont Butte Reservoir and to deliver water back to the Prewitt Reservoir pump station for uses by both PWSD and LSPWCD and/or to be released to the Prewitt Outlet Canal for delivery of water directly to the South Platte River for LSPWCD uses.

The overall project, as described in the Water Court application, requires the development of a number of components and significant new infrastructure. Because of the extent of the infrastructure needs, the timing of future water demands, and the ability to fully finance the entire project, this project is envisioned in a phased approach, with both PWSD and LSPWCD benefitting from the development of additional water supplies in each phase.

2.1 Proposed Phase I Operations

The proposed Phase I infrastructure plan includes the construction of Iliff Reservoir, a return line to deliver water back to the South Platte River from Iliff Reservoir ("Iliff return line"), a pump station and the water supply delivery pipeline from Prewitt Reservoir to Parker and points in between, and the RO plant for delivery of water that meets the quality requirements of Rueter-Hess Reservoir. The Phase I plan will use existing storage space in Prewitt Reservoir, to the extent it is available based on a pending agreement with the reservoir owners as forebay storage and/or delivery through the reservoir for uses by PWSD and LSPWCD.

Operationally, this will allow water to be stored in Iliff Reservoir and be used to meet LSPWCD users' needs, either directly or as an augmentation source. Iliff Reservoir can also be used for water to be exchanged to the Prewitt Inlet Canal and/or in an operational trade of water stored in Prewitt Reservoir for the Iliff Irrigation District. From the Prewitt Reservoir forebay storage, water can be (a) directly released to the South Platte River for the benefit of LSPWCD users in the reach between Prewitt Reservoir and Iliff Reservoir, (b) delivered upstream by exchange for the benefit of LSPWCD users,(c) delivered upstream to recharge ponds through an oversizing of a portion of the PWSD water supply delivery pipeline, and/or (d) delivered to Parker through the PWSD water supply delivery pipeline for municipal use.

2.1.1 Iliff Reservoir

In the application, there were two alternative locations identified for the Iliff Reservoir, the western site, and the eastern site, as shown in **Figure 4**. Based on initial assessments of water availability, potential storage space accessibility, and expected uses, a storage volume of 6,500 ac-ft was identified as the target storage volume. An initial geotechnical assessment was conducted at the two reservoir sites, as described in Section 7.5.1, and the report prepared by RJH Consultants, Inc. ("RJH") is presented in **Appendix I**.

Based on this initial assessment of the two sites, the preliminary results indicate that an eastern cell at the western site is best suited for the Iliff Reservoir, as shown in **Figure 4**. Because of the location of the preferred storage area, the principal source for filling the reservoir is anticipated to be the Powell & Blair Ditch. A flow rate of 80 cfs in the ditch was requested in the 19CW3253 application, consistent with the current decreed capacity in the ditch. For this project, diversions will be junior to the use of the ditch to divert its senior water right and, therefore, this project can only use excess capacity in the ditch when it is available.

The Iliff & Platte Valley Ditch may serve as a supplemental water supply source, delivering water by pipeline into the Iliff Reservoir, as shown in **Figure 4**. A flow rate of 150 cfs, consistent with the current decreed flow rate for the ditch, is sought in 19CW3253. As with the Powell & Blair Ditch, this project will be junior to the use of the ditch to divert its senior water right and, therefore, this project can only use excess capacity in the ditch when it is available.

There are three issues that had to be considered relative to the use of the Iliff & Platte Valley Ditch and/or the Powell & Blair Ditch; namely (1) when will there be excess capacity in the ditch, and how much, relative to filling the Iliff Reservoir, (2) can the Powell & Blair Ditch transport 80 cfs from its headgate to the point where water will likely be taken out of the ditch and into storage, and (3) what is the carrying capacity of the Iliff & Platte Valley Ditch where water would be diverted from the ditch to the reservoir (**Figure 4**).

An evaluation of the excess capacity available, and the associated reservoir storage volumes, is discussed in Section 6.1 relative to assessing the potential yield from Iliff Reservoir in Phase I and Section 7.1 for Phase II Iliff Reservoir operations. The current carrying capacity of the ditch was

assessed by LWS in a flow-measuring study conducted in July-August 2020. LWS personnel measured flow in the Powell & Blair Ditch from its headgate to the location of the diversion to the proposed Iliff Reservoir to evaluate the gain/loss in the ditch through the reach. The flow in any lateral turnouts was also measured so these flows were accounted for in the gain/loss calculations.

Surveyed cross-sections were also made at each flow-measuring station so the estimated maximum flow capacity of the ditch could be estimated. The surveyed cross-sections included points of constriction on the ditches to evaluate if maintenance for the ditch will be necessary to allow the decreed flow rates to be transported down ditch. The results of the LWS flow measurement study are presented in **Appendix J**.

During the flow-measuring study on the Powell & Blair Ditch, a ditch loss of approximately 3.3 cfs per mile was identified from the ditch headgate to where water is proposed to be diverted from the ditch to the reservoir (**Table 1** in **Appendix J**). While flow measurements in the Iliff & Platte Valley Ditch were more limited (between County Roads 59 and 61), the ditch loss was similar to the losses in the Powell & Blair Ditch, i.e., 2.9 cfs per mile (**Table 2** in **Appendix J**). these ditch losses are based on a single measurement in time and at the measured flow rates. Gains/losses may vary with time and at varying flow rates. Therefore, ditch loss rates in the LWS model were maintained at conservative values as to not over-estimate availability of water.

Survey data indicate that the Powell & Blair Ditch has sufficient flow capacity to meet its decreed flow rate. **Table 3** in **Appendix J** shows that the estimated maximum flow capacity in open areas of the Powell & Blair Ditch ranges from approximately 93 to 345 cfs. However, there are points on the ditch where constrictions have the potential to limit flow. On the Powell & Blair Ditch there are multiple bridges that cross the ditch within a short span, all of which restrict flow. These constriction points are a farm road bridge, County road bridge, and a railroad bridge, as shown in **Figure 2** of the memo in **Appendix J**. However, based on the geometry of the constrictions and the estimated maximum flow rate that can be passed, these constrictions still allow the maximum decreed flow rate to be passed (80 cfs).

For the Iliff & Platte Valley Ditch, the surveyed area was limited to the area of the potential diversion from the ditch to the eastern cell of the western Iliff Reservoir site, i.e., between County Roads 59 and 61. There is only one flow constriction point in this reach, a culvert east of County Road 59. While this culvert restricts flow to an estimated 40 cfs, the flow in the open ditch portion of the Iliff & Platte Valley Ditch downstream of the culvert at County Road 61 is estimated to be 43 cfs. Therefore, while the Iliff & Platte Valley Ditch may be available to provide supplemental water to the western Iliff Reservoir site, the full decreed flow rate of 150 cfs will not be available without significant improvements to the ditch.

The applicants may, in the future, consider evaluating the benefits of increasing the capacity of each of the delivery ditches to carry their senior rights, PWSD's 2003 rights, and the 2019 rights which are the subject of this case.

While the design of the Iliff Reservoir is in the preliminary stages, it is planned that the means to release water back to the South Platte River will occur by gravity through the Iliff return line and the water will be delivered upstream of the Harmony No. 1 Ditch, as the next downstream water right from the Powell & Blair Ditch. The proposed preliminary discharge location is shown in **Figure 4**.

Iliff Reservoir and the Iliff return line are proposed to be built as part of the Phase I operations of this project, so water under the requested 2019 water right can be stored and subsequently put to beneficial use by both PWSD and LSPWCD. PWSD also proposes to store water associated with its 2003 water right adjudicated in 03CW428 (**Appendix H**). PWSD previously decreed the conditional right to divert up to 40 cubic feet per second ("cfs") from one or a combination of diversions through the Iliff & Platte Valley and Powell & Blair Ditches, with an appropriation date of December 9, 2003. The volumetric limits on this conditional water right are a maximum annual limit of 18,000 ac-ft and a 10-year running average of 9,400 ac-ft/yr. While the decree in 03CW428 was for 100 percent consumptive direct use via "suitable stream channels, reservoirs, pumps and pipelines", in this case, it is requested that the rights can be stored in Iliff, Prewitt, and Fremont Butte Reservoirs prior to their delivery to Parker for municipal use.

It is anticipated that the 2019 water right stored in Iliff Reservoir can be used by LSPWCD to provide direct supplemental irrigation water supplies to downstream users through releases via the Iliff return line, as well as to potentially release water for augmentation of depletions associated with alluvial aquifer irrigation wells. PWSD proposes to use the 2003 and 2019 rights and LSPWCD proposes to use the 2019 water stored for its benefit in an operational trade and/or exchange with the Iliff Irrigation District's storage rights in Prewitt Reservoir, as described in Section 2.1.2.

A flow schematic showing the potential uses out of Iliff Reservoir in Phase I is presented in **Figure 5**. As this figure shows, both applicants in 19CW3253 will receive benefit from storage of junior rights in the reservoir, direct releases through the Iliff return line to the South Platte River, the operational trade, and the river exchange.

2.1.2 Operational Trade/Exchange from Iliff Reservoir to Prewitt Reservoir

The application in 19CW3253 seeks an exchange from the point of delivery of water to the South Platte River from Iliff Reservoir ("exchange-from point") to the Prewitt Inlet Canal diversion point ("exchange-to point") (**Figure 6**). The exchange rate sought is 150 cfs. While an exchange is a viable means to move water from Iliff Reservoir to the Prewitt Reservoir forebay, an operational trade will likely be the primary mechanism for moving stored water upstream to the Prewitt Reservoir.

An operational trade will consist of trading water stored in Prewitt Reservoir for the Iliff Irrigation District with an equal amount of the combination of 2019 water stored in Iliff Reservoir, plus PWSD's 2003 rights, so the Iliff Irrigation District will have a more efficient means to provide water to its users. At the same time, this operational trade will provide PWSD and LSPWCD with

equivalent storage in Prewitt Reservoir. The mechanism for this trade is that, after Prewitt Reservoir has reached its winter fill level with its senior right, operational trades will be made during that year of a variable volume of water (up to 6,500 ac-ft) on an annual basis, with water in Iliff Reservoir traded for water in Prewitt Reservoir, with the traded water acquiring the character of the source water, i.e., the Iliff Irrigation District Prewitt water will be available in Iliff Reservoir, while 2003 and/or 2019 water will be stored in Prewitt Reservoir.

The operational trade will make storage space available in Prewitt Reservoir available to PWSD/LSPWCD up to an agreed amount (currently anticipated to be a maximum of 6,500 acre-feet), which will likely be variable. Once the operational trade has been accomplished, in the Phase I operations, PWSD and LSPWCD can (a) store the water in Prewitt Reservoir within the operational trade volume, (b) release water downstream for use within and without the LSPWCD service area through the Prewitt Outlet Canal by direct delivery and exchange, (c) deliver water upstream for LSPWCD direct delivery and/or recharge, and/or (d) deliver water to PWSD for use by its municipal customers. The delivery of water in (c) and (d) will be via a pump station at the Prewitt outlet works into the PWSD water supply delivery pipeline.

This operational trade will be made primarily on an annual basis, but it could be on a more frequent basis, considering the amount of water in storage in Iliff Reservoir available for an operational trade after Prewitt Reservoir has achieved its winter fill with its senior right. Given these operations, both applicants in 19CW3253 will receive benefit from the Iliff Reservoir, directly and by the operational trade.

In addition to the operational trade river exchanges can also be made. The conditions under which the river exchanges can be made include; (a) after the operational trade storage is made available so there is PWSD/LSPWCD storage in Prewitt Reservoir, (b) there is space in that forebay storage, and (c) there is exchange potential in the exchange reach. Exchanges can also be made at any time based on flow-through capacity, i.e., the ability to move water through Prewitt Reservoir to a beneficial use without actually storing water in the reservoir.

Since 2003 and 2019 water stored in Prewitt Reservoir is for storage prior to its use, storage space will be evacuated during the course of the water year to meet demands for both PWSD and LSPWCD. As water is being released and/or pumped from the available space within the operational trade volume, that volume can then be filled with the 2019 river exchange from Iliff Reservoir. The amount and timing of any exchange will depend on the amount of water available at the exchange-from and exchange-to points, as well as when there is a continuous live stream and there are no calls within the exchange reach, i.e., there is exchange potential. Therefore, within any given year, the project may exercise an operational trade as well as exchanging water from Iliff Reservoir to Prewitt Reservoir.

2.1.3 Prewitt Reservoir

The Prewitt Inlet Canal is currently decreed for a maximum flow rate of 695 cfs. In this application, a total flow rate of 1,000 cfs, inclusive of the currently-decreed rate, is sought for delivery to

Prewitt Reservoir (**Figure 7**). Pursuant to an agreement, PWSD/LSPWCD will be allowed the use of up to 305 cfs of inflow capacity if the Prewitt Inlet Canal is being used at its maximum decreed flow rate and any excess capacity in the inlet canal that is not needed to meet the senior rights associated with Prewitt Reservoir and Prewitt's existing contractual conveyance obligations.

To evaluate the current flow capacity of the Prewitt Inlet Canal, the flow-measuring study conducted in July 2020 surveyed cross-sections in the canal. No flow measurements were made as the Prewitt rights and the Johnson & Edwards Ditch right were out of priority. Based on the surveyed cross-sections and an estimation of the peak flow capacity in the canal using the Manning's equation for flow in an open channel, the inlet canal capacity currently ranges from approximately 1,061 to 1,107 cfs with one foot of freeboard (**Appendix J**). Therefore, it is judged that the inlet canal is currently capable of transporting the full 1,000 cfs being requested in this case.

The applicants are currently negotiating with the Prewitt Operating Committee on an agreement to establish the terms and conditions under which the use of Prewitt facilities, including some forebay storage, may be made available to PWSD/LSPWCD. In the Water Court application in 19CW3253, forebay storage requested was 15,000 ac-ft; however, based on model analyses that have been conducted since the time of the application, it is currently anticipated that this forebay storage will be in the range of 3,500 to 6,500 ac-ft. An analysis of the forebay storage in Prewitt Reservoir is presented in Section 6.3.

The forebay storage in Prewitt Reservoir is meant to be storage to capture in-priority water as it is available and re-time the use of the water to a time of need. Water supplies may be diverted at the Prewitt Inlet Canal and routed directly through the reservoir ("flow-through") for beneficial use by both PWSD and LSPWCD. When inflows are less than the direct instantaneous delivery needs for either PWSD, LSPWCD, or both, flow-through can be delivered directly into the PWSD water supply delivery pipeline for PWSD's needs or can be delivered upstream to LSPWCD recharge facilities.

PWSD, because it has terminal storage at the end of the water delivery line from Prewitt Reservoir, will pump water from Prewitt Reservoir on a continuous basis based on availability, up to the capacity of the PWSD water supply delivery pipeline. LSPWCD potentially can also deliver water on a continuous basis if it uses recharge ponds upstream of Prewitt Reservoir to provide stream accretion credits for well users downstream. In addition, LSPWCD may also deliver water directly to the South Platte River from Prewitt Reservoir via the Prewitt Outlet Canal and the PWSD water supply delivery pipeline to serve district users in the reach between the western Morgan County line and Iliff Reservoirs.

The means for delivery of water from Prewitt Reservoir for these anticipated uses is via the existing Prewitt outlet works. Currently, the Prewitt outlet works delivers water into the Outlet Canal for delivery to the South Platte River. With the project components envisioned, a pumping station will be installed at the outlet works that can deliver water into the PWSD water supply delivery pipeline, which also may carry LSPWCD water to upstream recharge ponds and/or for direct

delivery to the South Platte River. Therefore, water can be released by gravity into the Outlet Canal or can be pumped into the PWSD water supply delivery pipeline.

It is anticipated that 2003 and 2019 water will be stored in Iliff Reservoir when water is physically and legally available, and there is excess flow capacity in the respective ditches to be used for transporting water to storage. Storage in Prewitt Reservoir will be allocated to the applicants by the Prewitt Reservoir owners on an ongoing, dynamic basis related to need and other relevant considerations. The storage acquired on an annual basis will then be allocated between PWSD/LSPWCD pursuant to agreement between them. A flow schematic showing the potential uses out of both Iliff and Prewitt Reservoirs in Phase I is presented in **Figure 5**. As this figure shows, both applicants in 19CW3253 will receive benefit from the operational trade, river exchange, subsequent forebay storage in Prewitt Reservoir, delivery through and/or releases from Prewitt Reservoir for beneficial uses. The estimated quantification of yields associated with the Phase I operations is presented in Section 6.0.

2.2 Proposed Phase II Operations

The proposed Phase II infrastructure plan includes operating all of the components of Phase I and adding the construction of Fremont Butte Reservoir (**Figure 8**). The addition of Fremont Butte Reservoir also requires a pump station and pipeline from the Prewitt outlet works to Fremont Butte, i.e., the Prewitt-Fremont Butte pipeline. A flow schematic showing the inclusion of the Phase II components is presented in **Figure 9**.

Operationally, Phase II will allow water to be stored in Prewitt Reservoir in the operational trade storage space, as the combined flow capacity of the pump stations at Prewitt Reservoir to the PWSD water supply delivery pipeline and to Fremont Butte can move water out of Prewitt efficiently. This will allow more water to be stored in the operational trade storage space as water is evacuated to be put to beneficial use or sent to storage in Fremont Butte Reservoir. Water to be put to beneficial use from Fremont Butte will be delivered back down the same pipeline to the Prewitt outlet works and (a) directly released to the South Platte River for beneficial use for the benefit of LSPWCD users in the reach between Prewitt Reservoir and Iliff Reservoir, (b) delivered upstream to beneficial uses through an oversizing of a portion of the PWSD water supply delivery pipeline, and/or (c) delivered to Parker for municipal use.

2.2.1 Fremont Butte Reservoir

Fremont Butte dam and reservoir has been preliminarily designed, as described in Section 9.5.1 and in the RJH report (**Appendix I**). it is currently estimated the reservoir will have a capacity of approximately 72,000 ac-ft; however, that is based on currently-available topography so the capacity will be revised once more accurate topographic data are surveyed. Storage under the 2019 priority will be limited to the volume requested in the Water Court application even if more detailed topographic data indicated that there could be more storage available in Fremont Butte reservoir. The preliminary location of the dam and reservoir is shown in **Figure 8**, while the

estimated elevation-area-capacity ("EAC") for the current configuration of Fremont Butte Reservoir is presented in **Appendix K**.

The Prewitt-Fremont Butte pipeline is preliminarily estimated to have a capacity of 250 cfs and it will be operated as a two-way pipeline, allowing water to be delivered to Fremont Butte for storage but also to deliver water back to the Prewitt outlet works or the PWSD water supply delivery pipeline for ultimate delivery for beneficial uses (**Figure 10**). The source of water to be put into storage at Fremont Butte is from the South Platte River through the Prewitt Inlet Canal (or at times through ditches with storage in the Iliff Reservoir and exchange or operational trade to the Prewitt Reservoir, with storage in the Prewitt Reservoir forebay prior to being pumped to Fremont Butte Reservoir.

In addition to the uses already discussed, Fremont Butte Reservoir could be used for in-place type of beneficial uses, such as recreation and wildlife.

2.2.2 Proposed Uses

Neither PWSD nor LSPWCD needs to obtain a firm yield from this project. While the renewable and reusable water supplies obtained by PWSD from this project are to meet municipal water demands within its service area, PWSD has terminal reservoir storage in Parker, i.e., Rueter-Hess Reservoir. Therefore, with storage on both ends of the PWSD water supply delivery pipeline, water supplies can be re-timed to meet demands. Similarly, LSPWCD uses will be for providing supplemental irrigation water supplies in times of shortages, i.e., re-timing water supplies to demands, as well as recharging water to provide stream accretions to increase augmentation water supplies to well users in and around the district's service area.

In addition to this project not having to develop a firm annual yield, since it is a joint project between PWSD and LSPWCD, on a real-time basis yields can be transferred from one entity to the other based on both need and availability. In addition, there is the potential for future ATMs to be pursued on a year-to-year basis with other water users if available capacity exists to operate future ATMs.

In general, the uses for the water developed as part of this project include municipal, irrigation and supplemental irrigation, domestic, stock watering, recreational, piscatorial, fish and wildlife, fire protection, street washing, hydroelectric power production, and exchange, replacement, and augmentation including, without limitation, augmentation by use of recharge ponds, at any location where it is physically available within the boundaries of LSPWCD as such may change from time to time and without the boundaries of LSPWCD pursuant to agreement, and all uses within the service area of PWSD as such may be changed from time to time and for contract of out-of-district service by PWSD.

The appropriation date for each of the water rights sought in this case is November 5, 2019. On that date a meeting was held at the PWSD office with representatives from PWSD, LSPWCD, and

NECWC in which the project water rights and components of the water development plan were confirmed in detail to benefit all participants.

3.0 POINT-FLOW AND PROJECT YIELD MODEL

The original point-flow model used in this project was developed by Mr. Ken Fritzler, a LSPWCD Board member. That model has been extensively further developed by LWS to be able to simulate each of the project components so the parameters of the plan can be refined based on sensitivity analyses of critical parameters. The purposes for the modeling discussed below were to estimate the availability of water for the claimed water rights and to estimate the yield of the project for purposes of technical feasibility considerations.

3.1 Project Components in Model

The project components that have been added to the model by LWS so the sizing of project features can be optimized include:

- Diversions of the 2019 and PWSD 2003 rights into a proposed Iliff Reservoir from both the Powell & Blair Ditch and Iliff & Platte Valley Ditch (accounting for senior diversions)
- Storage in Iliff Reservoir
- Deliveries from Iliff Reservoir to the South Platte River for direct use via the Iliff return line
- Deliveries to Prewitt Reservoir by operational trade and/or exchange
- Exchange potential from Iliff Reservoir to the Prewitt Inlet Canal
- Diversions to the Prewitt Inlet Canal of the 2019 rights (accounting for senior Prewitt right diversions)
- Storage in the Prewitt Reservoir forebay
- Yields from Prewitt Reservoir in Phases I and II based on releases through the outlet works
- Deliveries to Fremont Butte based on the Prewitt-Fremont Butte pumping/pipeline capacity
- Yields from Fremont Butte Reservoir in Phase II through the Prewitt-Fremont Butte pipeline to the Prewitt Reservoir outlet works pump station

The model is based on hydrologic, climatic, and call data during the 20-year period of water years 1996-2015. Since the model has become very complex, and to facilitate operation of the model to test the sensitivity of project components, a dashboard has been set up in the model. A screenshot of the model dashboard is shown in **Appendix L**. The variables in the dashboard (shown in gray) can be adjusted and new results generated almost instantaneously so each of these parameters can be evaluated relative to sizing and the resultant impact on yields to PWSD and LSPWCD. This

model has been instrumental in refining project parameters and will continue to be used to evaluate any changes in the current assumptions in the model.

3.2 Model Assumptions

The assumptions used in the LWS model included:

1) During the irrigation season, a maximum of 50 percent of available in-priority flow was diverted at any of the points of diversion so that the simulations of water availability didn't affect downstream users' ability to continue to divert their legal entitlements.

2) During the non-irrigation season, a maximum of 80 percent of available in-priority flow was diverted at any of the points of diversion.

3) Irrigation season project diversions at Iliff were curtailed as flows at the Stateline decreased, beginning when flow at the Stateline was 165 cfs. A formula was used to gradually reduce diversions until all diversions were curtailed when flows at the State line were 130 cfs, as described in Section 6.1.

4) Irrigation season project diversions at Prewitt Reservoir were curtailed to maintain a target of 200 cfs for combined flows at the Stateline and below the Prewitt Inlet Canal. Non-irrigation season project diversions at Prewitt Reservoir were similarly curtailed to maintain a target of 100 cfs for combined flows at the Peterson Ditch headgate and below the Prewitt Inlet Canal. These curtailments in flow help to reduce the likelihood of inducing a Compact call and help to maintain yield in SPWRAP.

5) It was further assumed that the project's junior 2019 diversions result in Stateline flows being reduced by the diverted amount with a two-day lag from the Iliff area and a four-day lag from the Prewitt Reservoir, so Stateline flows were protected. These reduced Stateline flows were then used to estimate diversions available to the project at both Iliff and Prewitt Reservoirs.

6) Prewitt Inlet Canal diversions under the 2019 right result in reduced flows at the Powell & Blair Ditch two days later equal to the junior Prewitt diversion.

7) South Platte River flows available to the project for diversion, and at the Stateline, were reduced based on estimated yields from the Chatfield re-allocation, Denver Water and Aurora increased water reuse, potential changes in the Denver 1940 Agreement, and assumed development of 90,000 ac-ft of new storage from gravel pits in the Henderson area.

8) The yield of the changed PWSD 2003 rights is limited by the terms and conditions in the 03CW428 decree and that this, together with the fact that these rights were originally decreed as fully consumptive, prevents legal injury.

These model assumptions were applied in all of the model simulations and resultant yield analyses presented herein. However, these assumptions were used solely to conservatively evaluate the availability of unappropriated water for this project; however, these assumptions are not intended to limit the requested water rights sought in 19CW3253.

3.3 Development of Yield Model Inputs

The yield portion of the point-flow model is designed to assess what yields are estimated to be available based on an historic period of record. The period being used in the model is 1996-2015, with daily data for the entire 20-year period. The point-flow model estimates flow downstream of each river diversion; however, there have been a number of adjustments to the available flow related to the physically- and legally-available flows for diversion at both the Prewitt Inlet Canal and for storage at Iliff Reservoir via the Iliff & Platte Valley and/or Powell & Blair Ditch. These include:

- Use of excess capacity considering diversions of senior rights in the respective ditches
- Compact flow requirements
- Temperature-dependent, i.e., icing conditions, availability to use ditches in the wintertime
- Upstream conditional rights likely to be developed
- Chatfield re-allocation diversions
- Future upstream reuse
- Water rights call impacts on 2003 and 2019 rights

The maximum 2019 priority diversion rate sought in this case at the Iliff & Platte Valley Ditch is 150 cfs, 80 cfs at the Powell & Blair Ditch, and 1,000 cfs at the Prewitt Inlet Canal. The maximum 2019 diversion rates at the Iliff & Platte Valley and Powell & Blair Ditches are the same as the current decreed irrigation flow rates. For the Prewitt Inlet Canal, the current decreed flow rate is 695 cfs. However, there may be times when the senior Prewitt rights are not being used and there are high flows in the river. Therefore, the modeled rate has been increased 305 cfs beyond the currently decreed rate to allow the capture of high flows when they occur. In all cases, the PWSD/LSPWCD project will only use the amount of ditch capacity that is not being used to satisfy the senior rights. For the Prewitt-Fremont Butte pipeline, the proposed capacity is 250 cfs, although this is for movement of water between reservoirs and is not a diversion from the South Platte River.

For the storage components of the project, both total storage capability as well as an EAC for each storage facility had to be input to the model. For Iliff Reservoir, multiple locations are being considered; however, in each case, the storage capacity is estimated to be 6,500 ac-ft. The EAC for Iliff Reservoir was based on a nearly flat bottom reservoir with a maximum surface area of 850 acres, which corresponds to the largest estimated area the reservoir may be built, although the capacity of the Iliff Reservoir can be varied in the model to test yield sensitivity. This conservative EAC will be updated as the design for Iliff Reservoir is developed further. A table of the current EAC is presented in **Appendix K**, **Table K-1**.

For the Prewitt Reservoir forebay, it was simulated as a variable in the model that can range up to 6,500 ac-ft to coincide with the storage in Iliff Reservoir (as that would be the maximum operational trade that can be made). For Fremont Butte Reservoir, it is currently estimated to have a storage capacity of 72,000 ac-ft based on developing an EAC from available 10-ft topographic contours in the reservoir area **(Appendix K**, **Table K-2)**. Like Iliff Reservoir, the capacity in Fremont Butte can be varied in the model to evaluate the sensitivity of yields to the total storage capacity.

In evaluating the expected yields from the project, it was necessary to include a number of factors that allowed LWS to evaluate and differentiate the net yield from the total yield. These factors included:

- Variable demand schedules for PWSD and target deliveries for LSPWCD based on future demand projections (**Appendices A** and **B**, respectively)
- Irrigation season versus non-irrigation season demands
- Ditch losses
- Losses in reservoir storage, including evaporation and seepage
- Losses in the PWSD RO plant

Once the components described above were incorporated into the model, the LWS model was capable of performing sensitivity analyses to optimize project components. While the LWS model was used to provide simulation sensitivity analyses multiple times prior to the submittal of the Water Court application in 19CW3253, many additional refinements have been added since the time of the application. The following sections provide our current evaluation of the project components related to sizing and yields.

4.0 PROJECT NEED

PWSD is currently principally reliant on non-renewable water resources of the Denver Basin, with some renewable water supplies being provided by Rueter-Hess Reservoir. As part of the permitting process for Rueter-Hess, PWSD purchased a number of farms in Logan County, to potentially use water from the farms as mitigation for endangered species in Nebraska (**Figure 3**). However, with

SPWRAP, the need for mitigation with farm water was not necessary. PWSD has evaluated a number of water supply projects in the Lower South Platte River Basin based on the flows that are far in excess of Colorado's Compact requirements, as described in Section 1.0 (**Figure 11**). With this joint application with LSPWCD, PWSD can meet its future renewable water supply goal to sustain current water supplies in the district, as well as provide for the expected future growth, as described in Section 5.1.

Even without growth, in the Lower South Platte River valley there is an existing water supply shortfall between what is available and what could be utilized for agricultural, municipal, commercial, and industrial uses. Currently, agriculture rarely receives a full allocation of water, and those existing shortfalls are particularly large in extremely dry years with ditch companies confirming to LSPWCD that they experience demand shortages and would benefit from development of additional supplies of water. These shortfalls are expected to increase in the future. This joint application will allow LSPWCD to develop additional water supplies within the entire district area by providing the ability to delivery water to the various stream reaches within the district. An evaluation of the water demand needs for the LSPWCD are described in Section 5.2.

5.0 PROJECTED FUTURE DEMANDS

The point-flow and project yield model was used to assess what yields the project can provide to both PWSD and LSPWCD, based on future demand projections. Neither entity has to have a firm yield from the project; however, the variable hydrology both season-to-season and year-to-year, as well as the potential for climate change to affect future yields, requires efficient water management of the available supplies. Hence the need for the infrastructure and operational aspects of the project that are being requested as part of the 19CW3253 application.

The following sections describe both PWSD's and LSPWCD's projected future demands, taking into account the uncertainty related to both projecting demands and what the hydrologic variations will be in the future.

5.1 PWSD Projected Future Demand

PWSD currently has a population of approximately 60,000; however, it is projected that the population could grow to almost 160,000. The current average day demand in Parker is approximately 7.5 MGD, which equates to 8,440 ac-ft/yr. Of this current demand, since Rueter-Hess Reservoir began providing some of the water supply for Parker, Denver Basin water use has ranged from 60 to 78 percent of the water supply, with the remaining water being provided from Rueter-Hess. With the addition of WISE water from the City of Aurora in 2019, Denver Basin well use decreased to approximately 47 percent (**Appendix A**).

During the period 2016-2019, in-priority diversions to Rueter-Hess Reservoir averaged 4,067 ac-ft/yr; however, there was a large in-priority supply in 2016 (10,449 ac-ft), while the average in-priority water available and stored in 2017-2019 was 1,941 ac-ft. PWSD also has a subscription for 1,600 ac-ft of Water Infrastructure Supply Efficiency ("WISE") renewable and reusable water.

Therefore, while principally reliant on non-renewable Denver Basin aquifer water, PWSD does currently have some renewable water supplies that need to be increased to meet its goal of having a fully renewable water supply.

PWSD also operates a reuse program whereby reusable return flows from effluent discharge from its water reclamation facilities are routed to Rueter-Hess Reservoir through its Cherry Creek pump station. Therefore, both renewable and non-renewable reusable return flows are stored in Rueter-Hess Reservoir, in addition to the junior Rueter-Hess Reservoir water rights.

The renewable water supplies associated with its Rueter-Hess Reservoir water rights, as well as reusable return flows, are stored for subsequent use and, as such, are subject to evaporative losses in the reservoir. Rueter-Hess reservoir currently has a surface area of approximately 520 to 645 ac and, as such, is subject to relatively large evaporative losses. According to the weather station located directly adjacent to Rueter-Hess Reservoir and the daily surface area in the reservoir, the annual free water evaporative volume has averaged 2,322 ac-ft for the period 2016-2019. Therefore, the availability of renewable water supplies, as well as reusable return flows, being stored in Rueter-Hess Reservoir has to consider the losses that occur to these supplies, i.e., the net water supply availability which will vary from year to year.

According to the latest update to the PWSD Master Plan, water demand for the PWSD water delivery system is expected to grow from approximately 8,440 ac-ft yr currently to 20,050 ac-ft/yr at buildout (**Appendix A**). With the expected in-priority flows to Rueter-Hess Reservoir, plus WISE water, estimated to average 1,600 ac-ft/yr of renewable water, PWSD's minimum renewable water supply need at its water distribution system with a goal of 100 percent renewable water, is approximately 15,000 to 18,000 ac-ft/yr.

This demand includes losses associated with diversions from the river, losses in storage due to evaporation and seepage, and losses in the RO plant. Given the uncertainty of quantifying losses, changes in the hydrologic cycle, and the potential for climate change to permanently alter water supply availability from that projected using historic records, having a buffer of water supply above projected demands is also warranted for any prudent water supplier.

5.2 LSPWCD Projected Water Demand Shortfalls

Deere & Ault has evaluated future demands for LSPWCD related to both agricultural demands, as well as municipal and industrial ("M&I") demands (**Appendix B**), There are currently unmet agricultural demands within the LSPWCD service area. Deere & Ault evaluated the current water supply shortfalls during the period 1994 to 2012 using information and tools available through the Colorado Division of Water Resources ("CDWR") Colorado Decision Support System ("CDSS"). Based on Deere & Ault's analysis, on average the existing irrigation consumptive use demand shortages evaluated herein average approximately 36,500 ac-ft/yr and ranged from 14,200 ac-ft to approximately 75,100 ac-ft in extreme dry years. The complete historical water use analysis that estimated unmet demands is presented in the Deere & Ault preliminary engineering report attached as **Appendix B**.

To estimate future M&I demands, Deere & Ault reviewed the *Analysis and Technical Update to the Colorado Water* Plan, prepared by the Colorado Water Conservation Board ("CWCB"). The CWCB report evaluated M&I demands under five future scenarios by county in the South Platte basin. The review of the three counties in the project area (Logan, Morgan, and Sedgwick) produced increases over the 2015 baseline for M&I demand in 2070 ranging from 4,047 ac-ft/yr under the Weak Economy scenario to 19,711 ac-ft/yr under the Hot Growth scenario (**Appendix B**).

LSPWCD has a need for additional water supplies, not only to support agriculture, but also for M&I uses. It is anticipated that this project can provide substantial supplemental water supplies but may not meet all of the district's water supply shortfalls in all year.

It should be noted that the demand projections presented herein are best estimates of the demand needs, both currently and into the future. However, the contemplated demands and target deliveries developed by PWSD and LSPWCD could change in the future.

6.0 EVALUATION OF PHASE I YIELDS

With the setup of the LWS point-flow and yield model, and the understanding of the demands that are sought to be met by this project for both PWSD and LSPWCD, it has been possible to assess the operations and resultant yields of each component of the proposed project individually. "Yields", as defined herein, refers to water delivered at the end of pipe, therefore, project component losses, such as ditch losses and reservoir evaporation and seepage, have already been accounted for prior to estimating the "yield".

6.1 Iliff Reservoir

Given the multiple alternatives for the design and location of the Iliff Reservoir, the LWS model was used to evaluate water supply availability using only the Powell & Blair Ditch, or a combination of the Powell & Blair and the Iliff & Platte Valley Ditches. The LWS model was used to first assess the available water for storage in Iliff Reservoir, using the assumptions previously described.

Two separate accounts of water were modeled in the Iliff Reservoir. The first account was for the junior 2019 water requested in this case, as well as PWSD's 2003 right. The second account was the Prewitt Reservoir water transferred to Iliff Reservoir via the operational trade for the benefit of the Iliff Irrigation District. This separate accounting was necessary since the Prewitt Reservoir water traded to Iliff Reservoir can only be used by Iliff Irrigation District users in accordance with the Prewitt Reservoir decree for the senior rights. Two accounts were modeled in the Iliff Reservoir to allow for inflows and withdrawals from each account to be kept separate and to evaluate optimizing yields in each account for PWSD and LSPWCD, as well as specifically for Iliff Irrigation District users within that district.

The reservoir will be a lined structure, so no seepage was estimated in the model. Evaporation was estimated from the NOAA TR-33 Atlas at 50 inches per year, which was distributed monthly based on the Colorado Gravel Pit Rules for elevations below 6,500 ft, and then distributed daily based on the number of days per month. The daily evaporation rate was then multiplied by the daily modeled free water surface area of the reservoir from the EAC to estimate the daily volume of evaporation. The daily evaporation was then distributed to the Prewitt Reservoir operational trade account and the account for the junior 2019 water being applied for in this case (as well as the PWSD 2003 right).

The Powell & Blair Ditch was assumed to be the primary conveyance structure to Iliff Reservoir. Diversions were limited to a maximum of 80 cfs in the model and were assumed to be subordinate to senior Powell & Blair ditch diversions. However, given that there are the senior water rights associated with this ditch (80 cfs) plus the requested diversion rate requested in this case (80 cfs), there may be future evaluation of capacity expansion in the ditch.

The flow hydrograph of estimated diversions to Iliff Reservoir using the Powell & Blair Ditch are presented in **Figure 11**. Ditch loss was assumed to be 25 percent based on the river diversions. This is a very conservative estimate given the gain/loss data obtained by LWS in the flow-measuring study conducted in July-August 2020. Ditch loss information will likely be further refined in the future to better estimate available water supplies.

Diversions were further limited to zero when the three-day running average of the daily average temperature was below 20 degrees Fahrenheit. The temperature data used for this analysis was obtained from the Northern Colorado Water Conservancy District, Sterling 108 weather station. The daily average temperature was estimated as the average of the daily maximum and minimum temperatures from the same 20-year period as was modeled, i.e., from October 1, 1995 to September 30, 2015.

Diversions into Iliff Reservoir were further limited to be conservative in water supply availability by avoiding inducing a South Platte River Compact Call ("Compact call") during the Compact season from April 1 to October 15. The diversion restrictions were based on using historic Stateline flows. The following criteria were used in the model to protect Stateline flows during the Compact season.

- When Stateline flows were above 165 cfs, there were no reductions to diversions;
- When Stateline flows were between 165 and 160 cfs, diversions were reduced to 87.5 percent of the maximum available flow;
- When Stateline flows were between 160 and 150 cfs, diversions were reduced to 62.5 percent of the maximum available flow;
- When Stateline flows were between 150 and 140 cfs, diversions were reduced to 37.5 percent of the maximum available flow;

- When Stateline flows were between 140 and 130 cfs, diversions were reduced to 12.5 percent of the maximum available flow; and
- When Stateline flows were below 130 cfs, all diversions ceased.

Stateline flows were also reduced by the junior diversions that were simulated in the model as being diverted into Iliff Reservoir and the Prewitt forebay. Based on the diversions into Iliff Reservoir and the projected releases for direct delivery to the South Platte River and operational trade to Prewitt Reservoir, the estimated storage contents with time over the simulation period are presented in **Figure 12**.

It was assumed in the model that diversions into Iliff Reservoir reduce flows at the Stateline by the same amount of the diversion, albeit two days after the Iliff Reservoir diversion, to simulate a two-day travel time from the Powell & Blair Ditch to the Stateline. Similarly, diversions into the Prewitt Reservoir forebay reduce flows at the Stateline by the same amount of the diversion, albeit four days after the Prewitt Reservoir forebay diversion, to simulate a four-day travel time from the Prewitt Inlet Canal to the Stateline. Finally, diversions into the Prewitt Reservoir forebay reduce flows available to the junior rights at the Iliff & Platte Valley and Powell & Blair Ditches by a like amount two days after the Prewitt Forebay diversion to simulate a two-day travel time from the Prewitt Inlet Canal to the Iliff area.

Figure M-1 in **Appendix M** presents an analysis of river flows, available in-priority flow, and diversions to storage in Iliff Reservoir on a monthly basis. As this figure shows, even with the junior diversions to storage at Iliff Reservoir, there is significant remaining water in the South Platte River. **Figure M-2** presents a more detailed graph of the monthly diversions to Iliff Reservoir storage.

6.2 Operational Trade and Exchange

The LWS model was used to assess both the operational trade and an exchange to Prewitt Reservoir. In the model, the maximum annual operational trade can be varied from year to year. The operational trade in the model is initiated on the first day of the new water year when the volume of water in the junior account of the Iliff Reservoir is equal to, or greater than, the maximum annual trade volume acceptable to the Prewitt Operating Committee, based on Prewitt Reservoir being at its winter fill storage volumes. This model simulation method allowed the trade to be initiated when Prewitt Reservoir was at either winter or summer maximum fill volumes based on Prewitt Reservoir historic operation. If one, or both, reservoirs failed to reach the target fill volume before June 1, the trade was initiated on June 1 at a reduced volume, which is equal to the lesser of the junior water in storage in Iliff Reservoir, or 12.2 percent of the volume of senior water in Prewitt Reservoir. The 12.2 percent value is equal to the modeled trade volume of 3,500 ac-ft as a percentage of the current total storage volume of Prewitt Reservoir of 28,600 ac-ft.

Estimated annual operational trade volumes are presented in **Appendix M**, **Figure M-3**. The operational trade between Iliff Reservoir and Prewitt Reservoir can be as large as the minimum

volume of water in either storage vessel, if allowed by agreement between PWSD, LSPWCD, and the Prewitt Operating Committee.

The exchange scenario requested in the Water Court application in 19CW3253 relies upon the operational trade to make forebay storage available in Prewitt Reservoir. Before the trade occurs, the exchange to storage can be operated only after Prewitt Reservoir reaches its seasonal fill targets, which are consistent with historic operations. If the exchange is exercised before the operational trade, the exchanged water can only be used as a flow-through mechanism at Prewitt Reservoir, since water cannot be stored in Prewitt Reservoir without approved forebay storage.

The maximum exchange rate under flow-through operation was limited in the model to the minimum of the 150 cfs maximum exchange rate requested in the application, or the pipeline capacities moving the water out of Prewitt Reservoir to the various destinations previously discussed. Additionally, the maximum exchange rate was limited to the available excess capacity in the Prewitt Inlet Canal after considering senior diversions, and the minimum flow in the depleted reach of the exchange to maintain a live stream minus an additional 50 cfs, which is variable in the model. The minimum flow was simulated in the model to increase the likelihood a live stream will be maintained, and the upstream diversions will not cause new downstream calls that were not simulated based on the historic water rights call pattern.

After the operational trade was simulated in the model, the exchange could be operated to fill the available forebay space in Prewitt Reservoir based on the same maximum exchange rate as estimated before the exchange with the difference of being able to fill available Prewitt Reservoir forebay space. Annual volumes of exchanged flows are presented in **Appendix M, Figure M-4**. **Figures M-3** and **M-4** represent separate model runs, as the operational trade and exchanges were not modeled in the same scenarios.

6.3 Prewitt Reservoir Forebay

The Prewitt Reservoir forebay, and associated outlet works, is an integral part of the overall project objectives, as yields to both PWSD and LSPWCD are ultimately produced through Prewitt Reservoir in Phase I, as shown in **Figure 5**. The LWS model was initially used to assess the availability of inflows directly from the South Platte River and by an exchange. In those initial analyses prior to the filing of the Water Court application, it was estimated that as much as 15,000 ac-ft of forebay storage might be needed at times. However, as the project components have evolved, it is anticipated that the primary mechanism for moving water from Iliff Reservoir to Prewitt Reservoir will be by an operational trade. Therefore, the requested forebay storage is going to be reduced in the application in 19CW3253 to the size of the Iliff Reservoir (6,500 ac-ft), as that would be the maximum operational trade to Prewitt Reservoir.

Senior water stored legally by the Prewitt senior water rights, and a like volume of water stored under the 2019 and/or 2003 rights in Iliff Reservoir, would be traded so the senior rights would be stored in Iliff Reservoir for delivery downstream, while PWSD/LSPWCD would obtain storage in Prewitt Reservoir to provide for more junior diversions of a 2019 right at the Prewitt Inlet Canal

and/or to exchange water from Iliff Reservoir to Prewitt Reservoir. Water from any of these sources would then be stored in Prewitt Reservoir and would be assessed losses during the time of storage (including seepage and evaporative losses). Based on the management of the water availability to meet demands and target deliveries, the LWS model was used to ultimately predict the estimated yields to PWSD and LSPWCD.

Prewitt Reservoir was modeled in the LWS model based on the EAC curve presented in **Appendix K, Table K-3**. The modeled volume of storage in Prewitt Reservoir is based on the historic Prewitt Inlet Canal diversions, and the additional water available in priority to the Prewitt Inlet Canal that was not diverted. This additional flow that was not historically diverted but was in-priority water available at the Prewitt Inlet Canal is shown as exchange potential in the model and is the flow rate of water below the Prewitt Inlet Canal headgate on a daily basis. The volume of daily diversions to Prewitt Reservoir is further limited by the historic Johnson & Edwards Ditch diversions from the same time range as the model. The Johnson & Edwards Ditch shares the Prewitt Inlet Canal diversion structure and takes water from the Prewitt Inlet Canal via a turnout.

The Prewitt Inlet Canal senior diversions are then reduced by 10 percent to account for ditch losses. Once stored in the reservoir, the Prewitt Reservoir senior rights are modeled in a separate account from the junior water rights being applied for in this case. The Prewitt Reservoir senior rights are diverted to maintain Prewitt Reservoir at season fill targets, which are consistent with historic operations. During the winter, from October through February, the target fill volume for the Prewitt Reservoir senior rights is 26,500 ac-ft, and during the remaining months, the target fill volume for the Prewitt Reservoir senior rights is 28,600 ac-ft.

Evaporation and seepage were distributed to the Prewitt Reservoir senior rights storage and the junior project storage on a pro-rata basis based on the previous day's percent of total active storage in each of the two accounts. Evaporation was estimated using the same methodology and data used at the Iliff Reservoir site. Seepage was estimated as linearly increasing with stage from a minimum of zero when the reservoir is empty, to a maximum of 43.5 cfs when the Prewitt Reservoir is at the summer season target fill volume of 28,600 ac-ft. This seepage rate was estimated by subtracting the average evaporation rate from the average historic head maintenance flows diverted when Prewitt Reservoir was full. This estimated value was then confirmed as reasonable by Prewitt Reservoir Manager, Mr. Jim Yahn. The seepage losses were then distributed on a pro-rata basis based on the storage volumes in the Prewitt Reservoir senior water account and the junior account for the water rights applied for in this case.

Releases from the Prewitt Reservoir senior water rights account were based on availability, and monthly target deliveries provided by the LSPWCD. The monthly demands were met with daily releases in the model. The maximum daily release was equal to the total monthly demand divided by fifteen. This means that the monthly releases would be spread out over a minimum of 15 days in the model and spread out even more if the available supply cannot meet the full daily demand in any of the first 15 days of the month. Releases cease when there either was no additional supply available in the Prewitt Reservoir senior water account, or the monthly demand had been met.

The junior 2019 rights applied for in this case were only diverted when the Prewitt Reservoir senior account is full to avoid paper filling the senior right. The Phase I junior diversions were also considered to be subordinate to any senior diversions in the Prewitt Inlet Canal. Before the operational trade is initiated on ana annual basis, the junior rights may divert water into the Prewitt Inlet Canal at the same rate it was being removed from the reservoir. This flow-through operation does not store any water in Prewitt Reservoir.

During the Phase I operations, the maximum flow rate out of Prewitt Reservoir was estimated to be 62.25 cfs, including the oversizing of the PWSD water supply delivery pipeline for LSPWCD use for a section of the pipeline. PWSD's delivery rate from Prewitt Reservoir is estimated to be 38.5 cfs, the capacity to the split-stream RO plant to treat the water for delivery of 35 cfs to Rueter-Hess Reservoir, based on RO plant losses estimated to be 10 percent. The LSPWCD portion of pipeline capacity from Prewitt Reservoir of 23.75 cfs will be delivered to recharge sites along the PWSD water supply delivery pipeline. LSPWCD direct releases from Prewitt Reservoir to the Outlet Canal were not modeled in Phase I.

Once the operational trade was initiated and simulated in the LWS model, as described above, the Phase I junior diversions were limited to the lesser of (1) available in-priority flows after senior diversions at Prewitt Inlet Canal, (2) excess Prewitt Inlet Canal capacity, i.e., up to 1,000 cfs, (3) Prewitt Reservoir forebay space available based on the difference between the water in storage in the forebay and the total volume of the operational trade, or (4) daily PWSD water supply delivery pipeline capacity for flow-through capacity from Prewitt Reservoir forebay space.

These junior diversions, after ditch loss, into the Prewitt Reservoir forebay are distributed according to the following order until all diversions are accounted for:

1) 38.5 cfs in the PWSD water supply delivery pipeline to the RO plant for ultimate delivery to Rueter-Hess Reservoir;
2) 23.75 cfs in the PWSD water supply delivery pipeline to LSPWCD recharge sites; and
3) remaining volume stored in the Prewitt Reservoir forebay.

The LWS model automatically limits diversions so the available PWSD/LSPWCD Prewitt Reservoir forebay storage from the operational trade is not over filled. The diversions to Prewitt Reservoir estimated to be available under the foregoing conditions for the 2019 right are presented in **Figure 13**. The estimated resulting storage contents in the Prewitt Reservoir forebay for the simulation period are presented in **Figure 14**. While the storage in Prewitt Reservoir through the operational trade may vary from year to year up to 6,500 ac-ft, for these preliminary simulations, the operational trade, and associated yield, was limited to 3,500 ac-ft. While the initial model simulations presented herein were based on an operational trade of 3,500 ac-ft, this was done to estimate yields under that scenario but does not preclude the operational trade from being conducted in the full range of storage capacities up to 6,500 ac-ft. PWSD and LSPWCD reserve

the right to conduct trades of up to 6,500 ac-ft/yr when conditions allow and both parties would benefit.

The Prewitt Inlet Canal is located in District 1 and, therefore, diversions are not subject to the South Platte Compact call. However, LWS has modeled a reduction in diversions of South Platte River flows based on flows at the Stateline to reduce the likelihood of a Compact call during the Compact season. The LWS model also reduces diversions in the non-irrigation season based on flows available to the Peterson Ditch. The model reduces diversions so that the flow below the Prewitt Inlet Canal headgate, plus the flow at either the Stateline or the Peterson Ditch are equal to 200 cfs, or 100 cfs, respectively, based on the season.

For all PWSD/LSPWCD junior diversions into the Prewitt Reservoir forebay, there was assumed to be a maximum diversion of 50 percent of available flows during the irrigation season, and 80 percent of available flows during the non-irrigation season. This means that only 50 percent of the available in-priority flows were assumed to be available for diversion during the irrigation season. These terms are conservative in the modeling to account for the potential of alluvial flow under the diversion structure, and other inefficiencies in the structure.

6.4 Estimated PWSD/LSPWCD Phase I Yields

Phase I will provide yields to PWSD and LSPWCD from both Iliff Reservoir and Prewitt Reservoir. Based on the LWS model simulation results for water supply availability to store in Iliff Reservoir and to subsequently be used by LSPWCD, either directly or through water stored by operational trade for the Iliff Irrigation District, Phase I yields were estimated. Table **M1** in **Appendix M** shows the estimated yields from Iliff Reservoir. As this table shows, the yield to LSPWCD users from Iliff Reservoir is on average 2,514 ac-ft/yr. These releases are based on a monthly demand curve generated by LSPWCD, which is also presented in **Table M-2**. These releases meet 70 percent of the LSPWCD demands below Iliff Reservoir on average. Water swapped to Prewitt Reservoir in an operational trade was not included in this analysis, as the yield to PWSD and/or LSPWCD would come from the water stored in Prewitt Reservoir and subsequently put to beneficial uses.

Based on the analyses related to diverting, trading, and storing water in the Prewitt Reservoir forebay, Phase I yields were estimated under varying supply and demand scenarios for both PWSD and LSPWCD. **Table M-1** in **Appendix M** presents the estimated yields to PWSD in Phase I through use of the project components, as well as the estimated yields to LSPWCD in Phase I. These results are presented graphically in **Figure M-5** in **Appendix M**. As the tables show, there are substantial yields from Prewitt Reservoir in Phase I for both PWSD and LSPWCD. The average annual yields are estimated to be 24,387 ac-ft/yr, while they can vary from 1,484 to 46,847 ac-ft/yr. While the yields are quite variable from year to year, neither PWSD nor LSPWCD will be relying on project yields as a firm supply.

These results show significant yields; however, they also have significant year-to-year variability. There were seven years in the 20-year model simulation period with yield below 10,000 ac-ft that

occurred during the period of 2003-2008, and in 2013. These years were periods of intense drought on the South Platte River. Outside of these drought years, yields to PWSD and LSPWCD were a minimum of 15,500 ac-ft in 2002, and more than 20,000 ac-ft/yr in the remaining 13 years.

LSPWCD intends to place their portion of the yields into long-term recharge to provide augmentation supplies or physical flows to the South Platte River in times of reduced flows to supplement supplies. PWSD intends to store its portion of the water primarily in Rueter-Hess Reservoir for municipal use in the Parker area. Rueter-Hess Reservoir has 72,000 ac-ft of capacity, meaning an interruptible supply will not cause problems for PWSD, as Iliff and Prewitt Reservoirs can be utilized for carryover storage to equilibrate flows to Parker through the PWSD water supply delivery pipeline. Since the LSPWCD yields are being used to supplement irrigation water supply shortfalls, intermittent and variable yields are still valuable water sources to reduce shortfalls in the future and to also make more efficient use of the available supplies.

Table 3 presents a summary of the estimated yields from each source for both PWSD and LSPWCD from our preliminary model analyses in Phase I.

TABLE 3

Summary of Phase I Estimated Yields for PWSD and LSPWCD

ESTIMATED AVERAGE ANNUAL YIELD (ac-ft) FOR		
Source	**PWSD**	**LSPWCD**
Iliff Reservoir		
2019 Rights Direct Delivery to SPR	0	2,514
Prewitt Forebay [1)]		
Direct Delivery to SPR	0	0
Delivery to LSPWCD Upstream	0	8,842
Delivery to Parker	13,031	0
Total LSPWCD	**11,356 ac-ft/yr**	
Total PWSD	**13,031 ac-ft/yr**	
Total Project Phase I	**24,387 ac-ft/yr**	

1) Includes yields via direct delivery through the Prewitt Inlet Canal, exchanged water from Iliff Reservoir, and the operational trade.

These estimated yields are based on the conservative model assumptions in the simulations conducted to date and are not intended to limit the requested water rights sought in 19CW3253.

7.0 EVALUATION OF PHASE II YIELDS

With the addition of Fremont Butte Reservoir in Phase II of the project, the water supply availability and estimated yields change, based on running simulations in the LWS model. The reason that each component's yield analysis changes is that Fremont Butte Reservoir provides the ability to move more water through the Prewitt Reservoir forebay than in Phase I. The following sections describe the analyses conducted for each project component once Fremont Butte Reservoir and the associated Prewitt-Fremont Butte pump/pipeline system is in place (**Figure 10**).

7.1 Iliff Reservoir

The LWS model was initially used to assess the available water for storage in Iliff Reservoir, using the assumptions previously described. **Tables M-1** in **Appendix M** present an analysis of available flow to storage in Iliff Reservoir in Phase I. In Phase II, storage in Iliff Reservoir does not change significantly because the only reduction in flows available for diversion into Iliff Reservoir are the increased diversions associated with storage in Fremont Butte Reservoir. A hydrograph of the estimated diversions into Iliff Reservoir in Phase II is presented in **Figure 15**, while the estimated yields for the simulation period are presented in **Figure 16**.

Since the total project diversions are a low percentage of the total South Platte River flows, the modeled change in yield from Iliff Reservoir for LSPWCD decreases by approximately 195 ac-ft/yr on average from Phase I to Phase II, due to additional flows being diverted upstream at the Prewitt Inlet Canal. This lack of change in yield is largely attributable to the fact that yields in wet and average years are already near 100 percent of the demand, and in dry years, the 2019 water rights from both Phase I and Phase II would be largely out-of-priority, resulting in no significant increase in Iliff Reservoir yields under Phase II. **Table N-1** in **Appendix N** presents a comparison of the annual Phase I and Phase II results.

7.2 Operational Trade and Exchange

There was no change to the operation of the exchange or operational trade between Phase I and Phase II.

7.3 Prewitt Reservoir Forebay

With the completion of Fremont Butte Reservoir, there will be a significantly increased ability to move water through the Prewitt Reservoir forebay. The hydrograph of estimated diversions in Phase II at the Prewitt Inlet Canal for the simulation period is presented in **Figure 17**. It is not anticipated that there will be additional storage in Prewitt Reservoir in Phase II from that allocated in Phase I under an operational trade. However, because there will be more ability to move water through the Prewitt Reservoir operational trade forebay, the storage contents with time will vary from Phase I, as shown in **Figure 18**. When **Figure 18** is compared to **Figure 14** (comparable

estimated storage contents with time in the Prewitt Reservoir forebay), there is less water stored on average in Prewitt Reservoir, as water is either moved through storage to beneficial uses or stored in Fremont Butte Reservoir.

However, in Phase II the Prewitt-Fremont Butte pipeline system is currently estimated to have a flow capacity of 250 cfs. Combined with an estimated capacity of the PWSD water supply delivery pipeline of 38.5 cfs, plus the oversizing of the line for LSPWCD to deliver water to recharge ponds of 23.75 cfs, provides the capability to move up to 312.25 cfs (620 ac-ft/day) through Prewitt Reservoir. In addition, LSPWCD has the capability to release additional water through the Prewitt outlet works for direct delivery via the Outlet Canal to the South Platte River.

The changes in inflow to the Prewitt forebay in Phase II because of the increased flow-through capacity are presented in **Table N-3** in **Appendix N**.

7.4 Fremont Butte Reservoir

The completion of an additional estimated 72,000 ac-ft of storage, along with a 250 cfs Prewitt-Fremont Butte pump/pipeline system from Prewitt Reservoir, greatly enhances the scope of the project components. The estimated deliveries of water from Prewitt Reservoir via the Prewitt-Fremont Butte Reservoir pipeline is presented in **Figure 19**. Not only does Fremont Butte Reservoir provide significant additional storage that can be carried over to meet future demands but increases the overall yield of the project.

Fremont Butte Reservoir is located roughly 8 miles northwest of Akron, Colorado. The Fremont Butte Reservoir site can store more water per unit of surface area than more shallow reservoirs like the Prewitt Reservoir. At its estimated maximum capacity, Fremont Butte can hold approximately 72,000 ac-ft of water with approximately 1,900 acres of surface area, resulting in reduced evaporation compared to other reservoir sites with comparable storage in the area. This is due to the increased elevation relief in the local topography which allows for a maximum depth of water at the dam of approximately 100 ft.

While Fremont Butte Reservoir will have a capacity of approximately 72, 000 ac-ft, because it will be used to provide water for multiple beneficial uses for both PWSD and LSPWCD, water levels are expected to fluctuate significantly with time. **Figure 20** shows the estimated fluctuations in storage in Fremont Butte Reservoir, based on the assumptions imposed on the reservoir in the current model simulations.

Table N-2 in **Appendix N** presents the estimated flows from Prewitt Reservoir to Fremont Butte Reservoir for the period of record, 1996-2015, based on the available flows and the capacity of the Prewitt-Fremont Butte pipeline. The pipeline is currently planned with a 250-cfs capacity; however, sensitivity analyses have been conducted to assess the change in yield if the pipeline was initially designed for a capacity of 125 cfs. The comparison of water that can be moved through a 250-cfs pipeline versus a 125-cfs pipeline is shown in **Table N-4** in **Appendix N**. At this time, a 250-cfs pipeline is the preferred alternative for delivering water to Fremont Butte Reservoir.

7.5 Estimated PWSD/LSPWCD Phase II Yields

The infrastructure additions in Phase II increase the project yields and also provide for yields to be delivered from Iliff Reservoir, Prewitt Reservoir, and Fremont Butte Reservoir. The yields related to each project component for PWSD and LSPWCD are presented in **Appendix N**. **Table N-1** in **Appendix N** presents the Phase I and Phase II yields, as well as the increased yield to PWSD and LSPWCD with the addition of Phase II project components, while **Table N-2** in **Appendix N** shows the detailed estimated yields to LSPWCD and PWSD in Phase II. Free river diversions into Prewitt, deliveries to Fremont Butte, and deliveries to both PWSD and LSPWCD are presented in graphical form in **Appendix N**, **Figure N-1** for Phase II.

Based on the analyses using the LWS model related to diverting, trading, and storing water in Iliff and Prewitt Reservoirs, as well as Fremont Butte Reservoir, Phase II yields were estimated under varying supply and demand scenarios for both PWSD and LSPWCD. Table **N-2** in **Appendix N** shows the estimated yields from Iliff Reservoir. As this table shows, it is estimated that 2,440 ac-ft/yr can be yielded from Iliff Reservoir in Phase II of the project on an average annual basis. Water moved to Iliff Reservoir for the benefit of Prewitt users in an operational trade was not included in this yield. The yield to PWSD and/or LSPWCD that is traded to Prewitt Reservoir would come from the water stored in Prewitt Reservoir.

Tables N-1 and **N-2** show that the project yield increases from approximately an average annual yield of 13,031 ac-ft for PWSD in Phase I to 18,441 ac-ft in Phase II. Similarly, the project yield is estimated to increase from approximately an average annual yield associated with Prewitt Reservoir of 8,842 ac-ft for LSPWCD in Phase I to 14,046 ac-ft in Phase II. With the additional storage and delivery capabilities in Phase II with the Prewitt-Freemont Butte pipeline and Fremont Butte Reservoir, the range of yields was also estimated to increase, with an estimated maximum annual yield for PWSD of 25,086 ac-ft and a minimum yield of 950 ac-ft, while the range of yields for LSPWCD was an estimated maximum annual yield of 23,612 ac-ft and a minimum yield of 612 ac-ft.

In Phase I, there were seven years with combined PWSD and LSPWCD yields from Prewitt Reservoir that were simulated as being below 10,000 ac-ft/yr. In Phase II, the increased storage in Fremont Butte Reservoir was estimated to reduce the number of years with less than 10,000 ac-ft per year from seven to only four years, with the remaining 16 years averaging yields of 42,384 ac-ft per year. These data are presented in **Table N-2** in **Appendix N**.

This increase in reliability of the yield benefits both LSPWCD and PWSD and is a significant benefit in addition to the increased average annual yield. In Phase I the reduced storage volume made it more efficient for LSPWCD to deliver all of its pro-rata share of the project water to recharge. In Phase II, the model simulation results indicated that increased storage volume and reduced seepage allowed LSPWCD to efficiently make direct releases from Fremont Butte Reservoir via the Prewitt-Fremont Butte pipeline to its users. The increase in reliability also

benefits PWSD in both more consistent flows for treatment at the split-stream RO water treatment plant, and more consistent deliveries to Parker with storage in Rueter-Hess Reservoir.

Table 4 presents a summary of the estimated yields from each source for both PWSD and LSPWCD from our preliminary model analyses for Phase II.

TABLE 4

Summary of Phase II Estimated Yields for PWSD and LSPWCD

ESTIMATED AVERAGE ANNUAL YIELD (ac-ft) FOR		
Source	**PWSD**	**LSPWCD**
Iliff Reservoir		
2019 Rights Direct Delivery to SPR	0	2,440
Prewitt Reservoir 1)		
Direct Delivery to SPR	0	2,858
Delivery to LSPWCD Upstream	0	4,761
Delivery to Parker	10,582	0
Fremont Butte Reservoir 2)		
Direct Delivery to SPR	0	3,152
Delivery to LSPWCD Upstream	0	3,276
Delivery to Parker	7,859	0
Total LSPWCD	**16,487 ac-ft/yr**	
Total PWSD	**18,441 ac-ft/yr**	
Total Project Phase I	**34,927 ac-ft/yr**	

1) Includes yields via direct delivery through the Prewitt Inlet Canal, exchanged water from Iliff Reservoir, and the operational trade.

2) Includes yields after initial storage in Fremont Butte Reservoir and delivery back to the Prewitt outlet works through the Prewitt-Fremont Butte pipeline for beneficial use by PWSD/LSPWCD.

These estimated yields are based on the conservative model assumptions in the simulations conducted to date and are not intended to limit the requested water rights sought in 19CW3253.

7.6 Estimated Changes in Flow Due to Project Diversions

The point-flow portion of the LWS model was then used to assess flow characteristics in the South Platte River downstream of the Prewitt Inlet Canal, Iliff & Platte Valley Ditch, and the Powell & Blair Ditch. Since the point-flow model estimates flow downstream of each diversion point, with the diversions associated with the proposed project, the estimated flow through the reach between the Prewitt Inlet Canal and the Iliff Reservoir diversion points can be shown. **Figures O-1** through **O-8** in **Appendix O** are hydrographs of the estimated flow just downstream of each senior ditch diversion for the period of record 1996-2015. As shown in these figures, there is significant flow just downstream of each diversion point, which accounts for the water diverted by the ditch. These figures show that even with the junior diversions sought in this case at the Prewitt Inlet Canal, there will not be injury to the downstream senior rights.

Similarly, the point-flow model was used to estimate flow downstream of each diversion point through the reach between the Iliff Reservoir and the State line. In this evaluation, the flows in the river downstream of senior ditch diversion points includes the cumulative project-related diversions into the Prewitt Inlet Canal, Iliff & Platte Valley Ditch, and the Powell & Blair Ditch. **Figures O-9** through **O-16** in **Appendix O** are hydrographs of the estimated flow just downstream of each senior ditch diversion downstream of the Powell & Blair Ditch for the period of record 1996-2015. Similar to the analysis of flow availability to the upstream ditches that could be affected by additional junior diversions at the Prewitt Inlet Canal, these figures show that even with the cumulative junior diversions sought in this case at the Prewitt Inlet Canal, Iliff & Platte Valley Ditch, and the Powell & Blair Ditch there will not be injury to the downstream senior rights.

In addition, **Figure 22** is a bar graph of annual flows in the South Platte River at the State line that are in excess of the Compact delivery requirement, i.e., 47,282 ac-ft (120 cfs times 199 days). This figure shows that there are significant excess flows crossing the State line above and beyond the Colorado Compact entitlement, estimated to average 274,322 ac-ft/yr, with a maximum in 2015 of over 1.2 million ac-ft. As shown in **Figure 22**, while there were no excess flows during the drought of the early 2000s, there also weren't Phase I and II project diversions.

As **Figure 22** shows, this project is assisting with Colorado increasing it entitlement to South Platte River water and also shows there is significant additional water that could be developed in the future by other diversion and storage projects in Colorado on the Lower South Platte River. These data further indicate that there will not be an issue with Compact compliance during the April 1-October 15 Compact season.

The analyses provided to date demonstrate that this project and water rights can be operated without adverse impact to senior water rights both upstream and downstream of the Prewitt Inlet Canal.

8.0 INJURY ANALYSIS

There were a number of conservative assumptions incorporated into the model to demonstrate how the water rights could be operated with considerations for downstream rights and the Compact with Nebraska. The assumptions adopted in the LWS model were used solely for the purpose of conservatively estimating water supply availability, as described in Section 3.2.

The use of many conservative assumptions in the modeling for this project were made for the sole purpose to evaluate whether the yield and variability of that yield from year-to-year will be sufficient to justify the project; however, these assumptions were not intended to be used as restrictive terms and conditions in any decree. The following are the only quantitative provisions necessary or appropriate to protect the ability of senior rights to divert their legal entitlements, and are in addition to those set out in Section 11.0 of this report:

- limiting 2019 priority diversions to decreed flow rates, and 2019 priority storage to decreed amounts;
- protecting of Colorado's South Platte River Compact flow requirements;
- maintaining the limits set out in the 03CW428 decree upon PWSD's 2003 water rights; and
- requiring a live stream throughout the exchange reach as a condition for operating the 2019 appropriative right of exchange. However, the 'live stream" requirement does not include the section of stream between the diversion dam and return or waste ditch of each diversion system.

9.0 CAN AND WILL EVALUATION

There are several factors considered to demonstrate that there is a substantial probability that within a reasonable period of time the facilities necessary to effectuate the proposed appropriations can and will be completed with diligence. These factors include, (1) water supply availability, (2) ability to acquire the necessary property to operate the project, (3) existence of a permitting pathway to allow the project components to operate, (4) economic feasibility of the project, and (5) technical feasibility of the project. The applicants project can and will meet each of these criteria, as described in the following sections.

9.1 Water Availability

The water availability for this project has been adequately demonstrated through the conservative LWS model simulations presented in Sections 6 and 7. Project yields in both Phase I and Phase II provide significant yield to both LSPWCD and PWSD. Combined yields in Phase I of the project total an average annual of 24,387 ac-ft, with an estimated maximum annual yield of 46,847 ac-ft. Phase II increases yields in both volume and reliability to an average annual yield of 34,927 ac-ft, with a maximum annual yield for PWSD estimated to be 25,086 ac-ft and a maximum annual yield

for LSPWCD estimated to be 23,612 ac-ft (**Table N-2**). Not only has it been demonstrated that the project has adequate water supply availability to justify the infrastructure needed to develop the project, but there are still significant excess flows crossing the State line above and beyond the Compact delivery requirements, that can be developed in the future by other diversion and storage projects in the Lower South Platte River Basin (**Figure 22**).

9.2 Property Acquisition

If the western Iliff Reservoir site is chosen, all of the land on which the Iliff Reservoir will be built is currently on farms owned by PWSD (**Figures 3** and **4**). The PWSD farms are identified in **Figure 3** as the Kaufman, Lock, Schott, Hernandez, and Breidenbach farms (Iliff Reservoir western site). Therefore, there are no property acquisition issues with the Iliff Reservoir. However, the use of the ditches to supply water to the Iliff Reservoir will be by agreement with the appropriate ditch company, and the Iliff return pipeline will require land acquisition once the alignment of the pipeline is known. . Use of Prewitt Inlet Canal, Prewitt Reservoir, and Prewitt outlet facilities will be by agreement with the Prewitt Operating Committee. Work on that agreement is currently underway and the signed agreement will be provided once it has been executed.

For Fremont Butte Reservoir and the Prewitt-Fremont Butte pipeline (**Figure 10**), there are a number of private landowners, as shown in **Figure 21**. PWSD/LSPWCD will need to acquire those lands and/or the right to use those lands and, while it is anticipated that the lands will be acquired through land appraisals and negotiations, both PWSD and LSPWCD have powers of condemnation, as necessary. At this time, based on the initial alignment of Fremont Butte dam and reservoir, as well as the Prewitt-Fremont Butte pipeline (**Figure 10**), the only public lands crossed by any of these facilities are some Land Board parcels along the proposed alignment of the Prewitt-Fremont Butte pipeline. Applicants are in discussions with counsel for the Land Board at this time and will obtain the necessary rights-of-way before constructing any facilities on Land Board property.

9.3 Permitting Pathway

There are a number of permits that will be required for this project, including environmental permitting, which was evaluated by ERO, as well as additional State, County, City, and private landowner permits, which was evaluated by Jacobs Engineering Group. The preliminary permitting pathway analyses for the required permits are presented in the following sections.

9.3.1 ERO Environmental Permitting Analysis

ERO was retained to conduct a Federal environmental permitting assessment for the Iliff and Fremont Butte Reservoirs. In addition, because new sources of water will be stored in Rueter-Hess Reservoir through this project, and it has a current Section 404 permit, ERO also assessed the impact on the existing Rueter-Hess Section 404 permit. Condition 52 in the Rueter-Hess Reservoir 404 permit requires environmental review of any new sources to be stored in Rueter-Hess.

Therefore, ERO has preliminarily assessed each of the anticipated environmental permitting issues associated with this project.

ERO has prepared a report entitled "Federal Environmental Permitting Assessment Fremont Butte and Iliff Reservoir Sites, Logan and Washington Counties, Colorado", dated August 27, 2020. A copy of ERO's full initial assessment report is presented in **Appendix P**, and a summary of the ERO report is presented in this section.

ERO performed a review of the likely federal environmental permitting requirements for construction of the proposed Fremont Butte Reservoir and two proposed alternative Iliff Reservoir sites. ERO evaluated potential Section 404 permitting requirements for construction of the reservoirs and associated federal environmental requirements that could be triggered by the need for a Section 404 permit (e.g., National Environmental Policy Act, Endangered Species Act, and National Historic Preservation Act compliance, and Section 401 certification). ERO also reviewed the proposed reservoir sites for potential wetlands and waters of the United States ("U.S.") that could be subject to federal permitting under Section 404 of the Clean Water Act ("CWA") for activities involving the discharge of dredged or fill material into waters of the U.S.

Two of the proposed reservoir sites appear to lack waters and wetlands subject to the U.S. Army Corps of Engineers' ("Corps") jurisdiction under Section 404 of the CWA and could be constructed without a Section 404 permit from the Corps. These sites include the western Iliff Reservoir site, which is located on currently-irrigated lands owned by PWSD. Any waters or wetlands on this site are likely associated with the application of irrigation and wetlands supported solely by application of irrigation water are not regulated by the Corps.

The second reservoir site likely not subject to Federal jurisdiction is Fremont Butte Reservoir, as it is located on an ephemeral drainage, topographically connected to Twentytwo Slough. Twentytwo Slough passes through the sand hills south of Interstate 76 where the channel appears to fan out and lose any characteristics of a water of the U.S. These reaches lacking characteristics of waters of the U.S. isolate Twentytwo Slough from the South Platte River under current regulations, policy, and guidance and render Twentytwo Slough, and any associated wetlands, to be not subject to the Corps' jurisdiction under Section 404 of the CWA, i.e., they are non-jurisdictional. Ephemeral drainages are determined to be non-jurisdictional per the 2020 Rule. Therefore, under current Colorado regulations, policy, and guidance (isolated) and the 2020 Rule (ephemeral), the drainages and any associated wetlands within the proposed Fremont Butte Reservoir site would likely be non-jurisdictional and construction of the reservoir would not require a Section 404 permit from the Corps.

The third reservoir site, the eastern option for Iliff Reservoir, may have extensive wetlands issues. The proposed eastern Iliff Reservoir site appears to be a pasture that may be irrigated, or supported by shallow groundwater, or both. Based on the preliminary review, this site appears to have extensive wetlands that would likely be considered jurisdictional. In addition, the National Wetlands Inventory ("NWI") mapping shows the entire site as a freshwater emergent wetland and National Hydrography Dataset ("NHD") mapping shows three intermittent streams running

through the reservoir boundaries. These wetlands and waters may be due to a combination of irrigation and shallow ground water levels. Wetlands supported solely by application of irrigation water are not regulated by the Corps; however, natural wetlands would be jurisdictional.

This project will result in new depletions to the South Platte River and, as such, mitigation will be necessary under the Endangered Species Act. It is anticipated that this depletion mitigation will be handled through the South Platte Water Recovery Activities Program ("SPWRAP"). Both PWSD and LSPWCD are currently members in good standing with SPWRAP.

The overall project (i.e., conveyance of water from the South Platte River to Parker via the PWSD water supply pipeline and pump stations, and storage of this water in the Rueter-Hess Reservoir) will likely require approval by the Corps due to storage of water in Rueter-Hess Reservoir. It may be possible for the conveyance to minimize adverse effects to waters and wetlands and not be subject to approval by the Corps by tunneling and boring under jurisdictional waters and wetlands. However, modification of the existing Section 404 permit for Rueter-Hess Reservoir would be needed to store the South Platte River water in the reservoir pursuant to Condition 52 of the existing Section 404 permit.

9.3.2 Jacobs Permitting Analyses

In addition to assessing the environmental permitting requirements for the project, Jacobs Engineering Group ("Jacobs") has evaluated the other permitting requirements associated with the entire project related to both the timing and pathway for the permits. Jacobs prepared a report entitled **"**PWSD and LSPWCD Water Court Application Regulatory and Permitting Analysis", dated July 28, 2020. A copy of the Jacobs report is presented in **Appendix R** and a summary of that report is presented below.

There are multiple Federal, state, county, city, and private permits that likely will be required for the project components, as shown in Table 1 of the Jacobs report. Table 2 in the Jacobs report provides the anticipated pathway for each of the expected permitting requirements.

Since the project will require a full suite of state and local permits, based on the permits anticipated to be required, the following project timeframes are expected:

- Three years of initial project strategy and partnership development;
- Two years of conceptual design and initial permit consultation;
- Five years of subsequent permit consultant (if required after initial consultation);
- Two years of preliminary design and initial land acquisition;
- Two years of final design and final land acquisition;
- Four years of construction; and

- One year of startup activities.

These permitting activities can be pursued concurrently with the Federal environmental permitting processes, as described by ERO (**Appendix P**). These timelines were developed by Jacobs prior to the current phasing of the project and these timelines can be updated as we progress with refining project timing.

A reconnaissance-level survey of the ability to acquire Prewitt-Fremont Butte pipeline easements and the PWSD water supply delivery pipeline has been conducted. Given the existence of many alternative pipeline routes, this is considered sufficient at this stage of the project. No insuperable obstacles to pipeline permitting have been uncovered. Pipeline crossings over or under streams to obviate 404 processes appear to be reasonably available.

9.4 Economic Feasibility

Harvey Economics ("HE") has been retained to evaluate a number of economic feasibility issues associated with the project, both for PWSD and LSPWCD. Given the short timeframe that HE has been retained, only very preliminary evaluations have been made to date. HE's preliminary report is presented in **Appendix Q**.

9.5 Technical Feasibility

There are a number of infrastructure components to this project that have been preliminarily evaluated by specialized consultants in these areas of expertise. The following sections provide the preliminary analyses that have been conducted related to the proposed new storage structures (geotechnical) and the water delivery and treatment system to Parker.

9.5.1 Geotechnical

RJH has been retained to prepare preliminary geotechnical analyses related to both a proposed Iliff Reservoir and Fremont Butte Reservoir. RJH was requested to evaluate two separate locations for the Iliff Reservoir (**Figure 4**) and the location and storage capacity for Fremont Butte Reservoir (**Figure 8**). RJH submitted its preliminary geotechnical evaluation report entitled "Draft Feasibility Report, Long-Term Water Supply, Washington County, Colorado, Logan County, Colorado", dated August 2020. A copy of RJH's initial geotechnical investigation is presented in **Appendix I** and a summary of RJH's findings are presented below.

The RJH report has evaluated the alternative Iliff Reservoir locations (**Figure 4**), as well as the Fremont Butte Reservoir (**Figure 8**). Based on the initial geotechnical, as well as environmental assessments, the western Iliff Reservoir site appears to be the preferred location. Furthermore, RJH limited its evaluation to providing the required 6,5000 ac-ft of storage in one cell at the site. As shown in **Figure 4** and Figure 2.4 of the RJH report, there is a western and eastern storage cell at

the Iliff Reservoir western site. At the western Iliff Reservoir site, three alternative conceptual designs were also evaluated. These alternative conceptual designs included:

- Alternative 1 - Above and Below Ground Storage;
- Alternative 2 - Below Ground Storage with Gravity Outflow; and
- Alternative 3 - Below Ground Storage with Pumped Outflow.

To control seepage issues at Iliff Reservoir, the reservoir could either be lined or a barrier wall constructed to bedrock. Based on a preliminary evaluation of these two options, RJH is initially recommending the use of a soil-bentonite barrier wall that would need to be constructed to bedrock. The soil-bentonite barrier wall was estimated to be less expensive than a geosynthetic liner and would remove the uncertainty and operational concerns related to uplift pressures when the reservoir is empty and the groundwater is high. The use of a soil-bentonite barrier wall would also enable storage below the groundwater table. This is also an important consideration related to the mechanisms for diverting water into storage from the Powell & Blair Ditch, i.e., the use of gravity flow versus the need for a pump station.

The RJH report provides preliminary analyses of the site conditions, geologic and hydrologic considerations, as well as preliminary design concepts for the dams and ancillary facilities. Based on the results of RJH's preliminary geotechnical analyses, the following conclusions were drawn related to the Phase I facilities at Iliff Reservoir.

1) There were no geologic conditions identified that would prevent construction of a reservoir at the Phase I site.

2) The alluvium beneath the embankment is anticipated to have suitable strength to support the development of a dam.

3) The Iliff Reservoir could be developed by construction of a perimeter dam, excavation and maintaining the normal maximum water surface below the existing ground surface, or a combination of both above-ground and below-ground storage that would achieve the target storage volume of 6,500 ac-ft.

4) Both above-ground and below-ground storage reservoir alternatives would require a barrier wall around the perimeter of the reservoir to manage seepage losses and isolate the stored water from the groundwater.

5) Both above-ground and below-ground storage reservoir alternatives are expected to need a groundwater management system around three sides of the reservoir to maintain groundwater levels at pre-development levels.

6) Earthen materials are expected to be available on-site for construction of the embankment dam and for use in soil-cement slope protection.

7) The alternatives that provide below-ground storage would have about 15.3 and 13.5 million cubic yards of excess material, respectively, that would need to be disposed of at an off-site location. Most of these excess materials are expected to be sand and gravel that might have commercial value which, if sold, could reduce the cost of these alternatives.

8) The estimated costs for Phase I infrastructure at Iliff Reservoir range from approximately $78 million to $200 million, as shown in Table 5.1 of the RJH report.

Phase II of the project includes the construction of Fremont Butte Reservoir. Based on the results of RJH's preliminary geotechnical analyses, the following conclusions were drawn related to the Phase II facilities at Fremont Butte Reservoir.

1) No geologic conditions were identified that would prevent the construction of a dam and reservoir at Fremont Butte.

2) A modified homogenous earthen embankment is a suitable dam type based on the availability of on-site materials and foundation conditions.

3) A barrier wall is included beneath the embankment to provide seepage control. The depth of the barrier wall will need to be determined in a later phase of work and will be based on actual drilling data to determine the depth to competent bedrock.

4) Most of the earthen materials needed to construct the dam are expected to be obtained from alluvial deposits within the inundation area of the reservoir.

5) Material would need to be imported for filters and drains, and for the soil-cement upstream slope protection.

6) RJH's estimated cost to construct Phase II of the project (not including conveyance to and from the reservoir) that would achieve the target storage volume of 72,000 ac-ft is $136.5 million, which is about $1,900 per ac-ft.

The full RJH report on its preliminary geotechnical assessment of Phase I and II dam infrastructure is presented in **Appendix I**.

9.5.2 Water Delivery and Treatment System

The PWSD water supply delivery pipeline and associated RO treatment plant are not components of this Water Court case application. However, a preliminary design of both components is underway by PWSD and can be provided at a later date when the preliminary design is complete.

At this time, there are no insuperable obstacles to the construction of either the PWSD water supply delivery pipeline or the RO plant.

10.0 SUMMARY OF PROFESSIONAL OPINIONS

The following is a summary of our professional opinions at this time regarding the project proposed in Case No. 19CW3253.

1) There are significant volumes of unappropriated water available on the Lower South Platte River for new appropriations.

2) There are also significant volumes of water above and beyond the Compact requirements that are passing the State line, even after the junior diversions associated with this project.

3) The LWS modeling for this water supply project is conservative in its estimates of available unappropriated flows, based on the assumptions made in the model.

4) Using existing diversion structures, of which PWSD is part owner, water can be reliably diverted from the South Platte River at the proposed diversion rates and delivered to storage structures in the Iliff area without impacting the senior diversion rights on these ditches.

5) PWSD owns land directly adjacent to the Powell & Blair Ditch that is suitable for a 6,500 ac-ft Iliff Reservoir at the western site.

6) Water can be delivered to the South Platte River by gravity or pump from the proposed western Iliff Reservoir site upstream of the next downstream right, the Harmony Ditch No.1.

7) The proposed Iliff Reservoir sites are technically feasible and have a reasonable path to permitting.

8) Sufficient exchange potential exists for the claimed water rights from the Iliff return line to the Prewitt Inlet Canal.

9) An operational trade of 3,500-6,500 ac-ft between the proposed Iliff Reservoir and Prewitt Reservoir will provide a significant increase in efficiency for downstream Prewitt Reservoir water users, i.e., the Iliff Irrigation District.

10) Prewitt Inlet Canal has sufficient capacity to carry the proposed 1,000 cfs water right.

11) A 3,500-6,500 ac-ft operational trade between the proposed Iliff Reservoir and Prewitt Reservoir will provide sufficient forebay storage for deliveries to PWSD and LSPWCD in both Phase I and Phase II of this project.

12) The 250 cfs Prewitt-Fremont Butte pipeline can be permitted and built to transport water from Prewitt forebay storage to Fremont Butte Reservoir and

13) The Prewitt-Fremont Butte pipeline can also return water to the Prewitt outlet works pump station for delivery to beneficial uses for PWSD and LSPWCD and/or release water to the Prewitt Outlet Canal for direct delivery of water to the South Platte River.

14) There is a pathway for PWSD and LSPWCD to obtain the land needed for Fremont Butte Reservoir as well as the Prewitt-Fremont Butte pipeline.

15) There is a permitting pathway for PWSD and LSPWCD to construct Fremont Butte Reservoir as well as the Prewitt-Fremont Butte pipeline.

16) Fremont Butte Reservoir is technically feasible for construction to a 72,000 ac-ft capacity, with a reasonable path to permitting.

17) Fremont Butte Reservoir provides more efficient long-term water storage compared to other potential reservoir sites in the area due to the geology and topography of the site.

18) The 35 cfs PWSD water supply delivery pipeline can be permitted and built to transport water from the Prewitt Reservoir outlet works pump station to meet municipal water demands in Parker, including storage of some water in Rueter-Hess Reservoir and can be upsized for a distance upstream to accommodate LSPWCD deliveries to its upper reach customers

19) A split-stream RO water treatment plant can increase the quality of water delivered to PWSD to allow for storage in Rueter-Hess Reservoir.

20) Delivery points to the South Platte River and to LSPWCD recharge facilities along the increased capacity portion of the PWSD water supply delivery pipeline can be used for direct delivery to the South Platte River and for augmentation water supplies for LSPWCD water users.

21) This proposed project will not injure senior water rights.

22) This project contains safeguards to reduce the likelihood of triggering South Platte River Compact calls.

23) The LWS model results indicate that the 2019 rights may provide yields in the Iliff area of approximately 2,514 ac-ft/yr on average in Phase I and approximately 2,440 ac-ft/yr on average in Phase II.

24) The LWS model results indicate that the project may provide PWSD with yields of approximately 13,031 ac-ft/yr in Phase I, which can be increased to approximately 18,441 ac-ft/yr in Phase II with the modeled sharing structure between PWSD and LSPWCD.

25) The LWS model results indicate that the project may provide LSPWCD with yields of approximately 11,356 ac-ft/yr in Phase I, which can be increased to approximately 16,487 ac-ft/yr in Phase II in the Prewitt area with the modeled sharing structure between PWSD and LSPWCD.

26) Combined yields from this project are estimated to be approximately 24,387 ac-ft/yr in Phase I and 34,927 ac-ft/yr in Phase II, based on the LWS model simulation results.

27) This project can produce economically-viable quantities of water for both PWSD and LSPWCD.

28) PWSD and LSPWCD have the tools to finance the project.

11.0 PROPOSED TERMS AND CONDITIONS

The following terms and conditions are proposed for the operation of this project.

(1) The maximum diversion rates in this case will be 80 cfs into the Powell & Blair Ditch, 150 cfs into the Iliff & Platte Valley Ditch, and 1,000 cfs into the Prewitt Inlet Canal.

(2) The maximum diversion rate for the 2003 PWSD will be as decreed in 03CW428.

(3) PWSD's 2003 right is limited to a maximum annual diversion volume of 18,000 ac-ft and a 10-yr running average diversion of 9,400 ac-ft.

(4) PWSD will be allowed, in addition to the direct diversion of the 2003 right, to store such water in Iliff, Prewitt, and Fremont Butte Reservoirs.

(5) The terms and conditions regarding use of PWSD's 2003 water rights in 03CW428, as described in Paragraph 46.e of the proposed decree in this case, are applicable to uses in 19CW3253.

(6) Water will only be diverted from the South Platte River when the specific right is in priority.

(7) The maximum storage capacity of Iliff Reservoir will be 6,500 ac-ft and the maximum storage capacity of Fremont Butte Reservoir will be 72,000 ac-ft.

(8) The storage volume at the Iliff Reservoir and Fremont Butte Reservoir, as well as the Prewitt Reservoir forebay space, can be filled and refilled both for direct storage and subsequent release.

(9) Applicants will not store water in the Prewitt Reservoir forebay without authorization from the owners of Prewitt Reservoir.

(10) The appropriative right of exchange will be limited to 150 cfs and the exchange reach will be as shown in **Figure 6**.

(11) River exchanges shall only occur when there is a continuous live stream from the exchange-from point to the exchange-to point.

(12) Applicants may operate the appropriative right of exchange as long as all senior water rights in the exchange reach with a lawful requirement for water according to their respective priorities are satisfied.

(13) The Division Engineer shall be notified of operational trades between Prewitt Reservoir and Iliff Reservoir, as the water involved in the trade will retain the legal character as that water had in the reservoir before the trade.

(14) Applicants will install and maintain such water measurement devices, recording devices, content gauges and inlet and outlet measurement and recording devices, as the case may be, as are required by this Decree or as reasonably deemed necessary by the Division 1 Engineer, and the same shall be operated in accordance with instructions from the Division Engineer.

(15) Applicants shall maintain such records and make such measurements of water as may be reasonably required by the Division Engineer. Applicants shall submit monthly accounting to the Division Engineer and provide an annual report each year by November 15.

(16) Applicants shall submit any proposed revisions or amendments to their accounting forms to the Division Engineer for approval and shall provide written Notice to counsel for Opposers of such proposed revisions or amendments. Opposers shall have thirty (30) days from receipt of Notice to provide comments to Applicants and the Division Engineer regarding the proposed revisions or amendments to the accounting forms.

(17) LSPWCD shall not make use of the 2019 storage rights through recharge without approval of the Water Court, or approval of the Division Engineer, as appropriate.

(18) Applicants do not dispute Northern Colorado Water Conservancy District's claim to recover reusable return flows from the Colorado Big Thompson Project and will recognize those recoverable return flows when and if they are quantified and administered.

This preliminary engineering report presents the results of our findings regarding the joint application of PWSD and LSPWCD to date; however, additional studies and analyses will be conducted as this case progresses. LWS will provide additional analyses as supplemental data are made available.

Chris M.D. Fehn, P.E., P.G.
Senior Project Engineer

Bruce A. Lytle, P.E.
President

12.0 REFERENCES

Hansen, Neil, Chavez, Jose, Garcia, Luis, and Lytle, Bruce, *2014 Final Report of the Lower South Platte Irrigation Research and Demonstration Project*, prepared for Colorado Water Conservation District, Parker Water and Sanitation District, Colorado State University and CSU Extension, and Colorado Corn Growers Association, June 2014.

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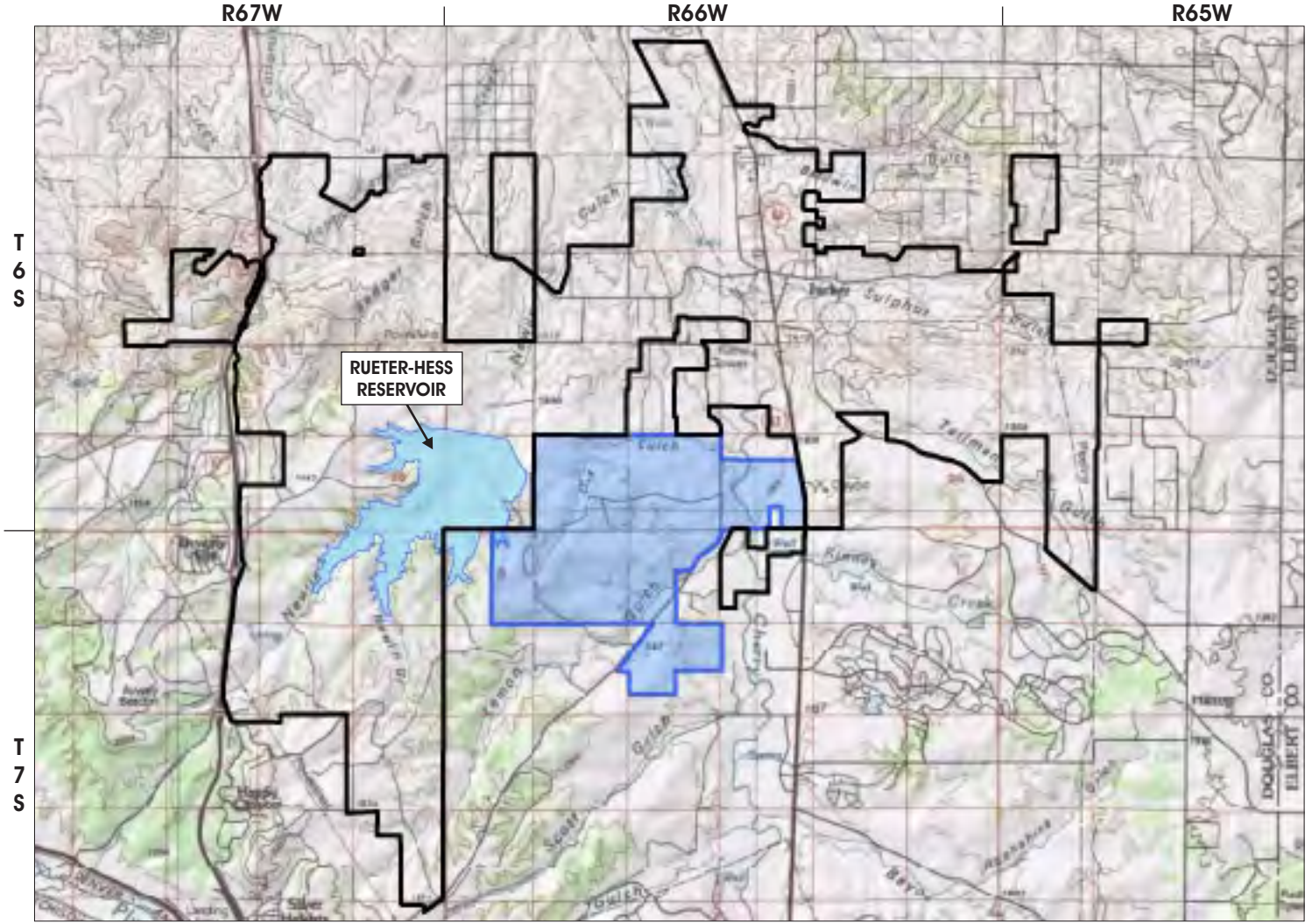
LYTLE WATER SOLUTIONS, LLC



LEGEND

- PWSD BOUNDARY
- EXTRATERRITORIAL SERVICE AREA

N

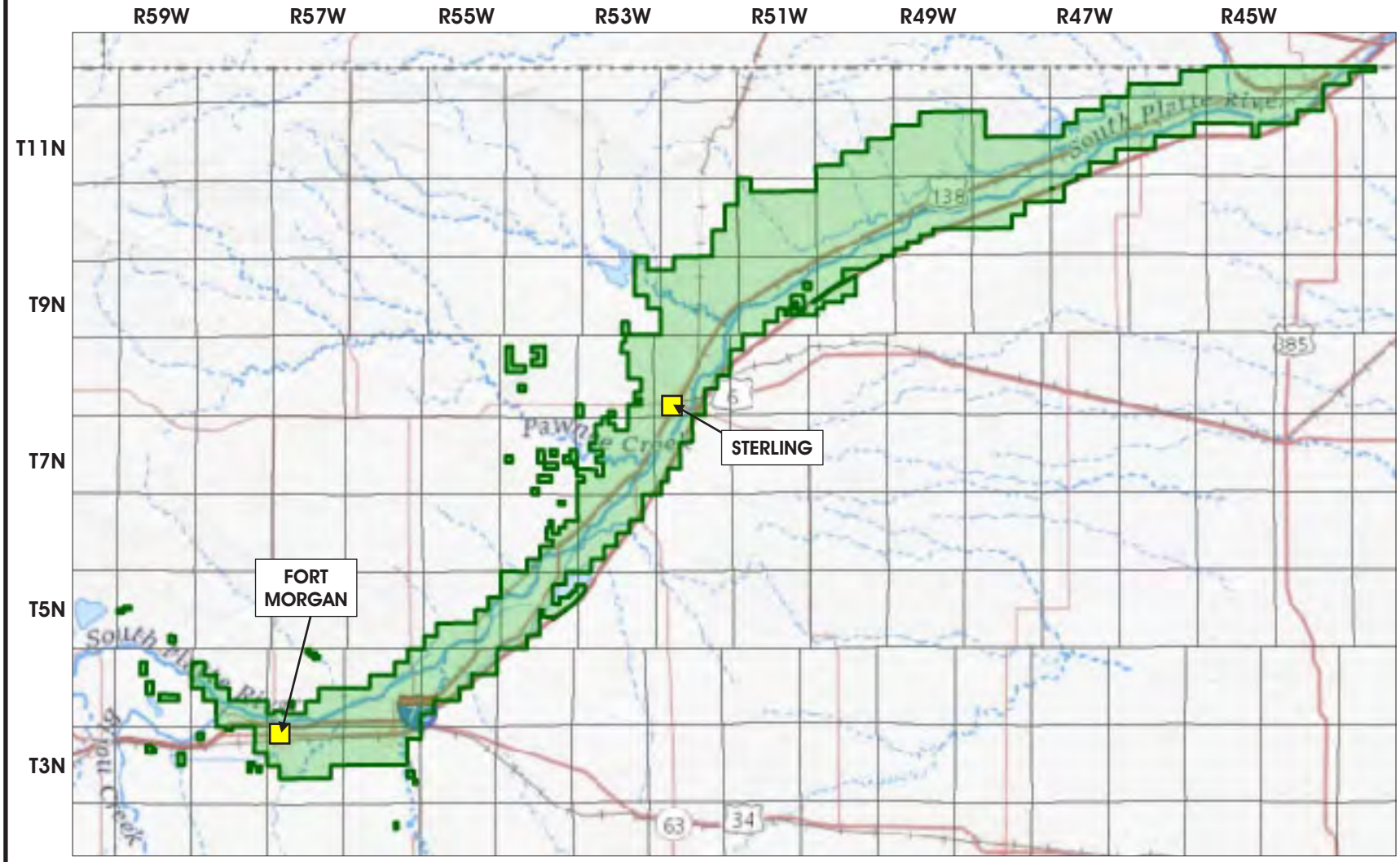
0 2.5 mi

PWSD/LSPWCD

PWSD SERVICE AREA

File Name: PWSD_ServiceArea.cdr		Date: 08/03/2020
Project No.: 1489-20	Drawn By: VAL	Fig. No.: 1

LYTLE WATER SOLUTIONS, LLC



LEGEND

LSPWCD SERVICE AREA

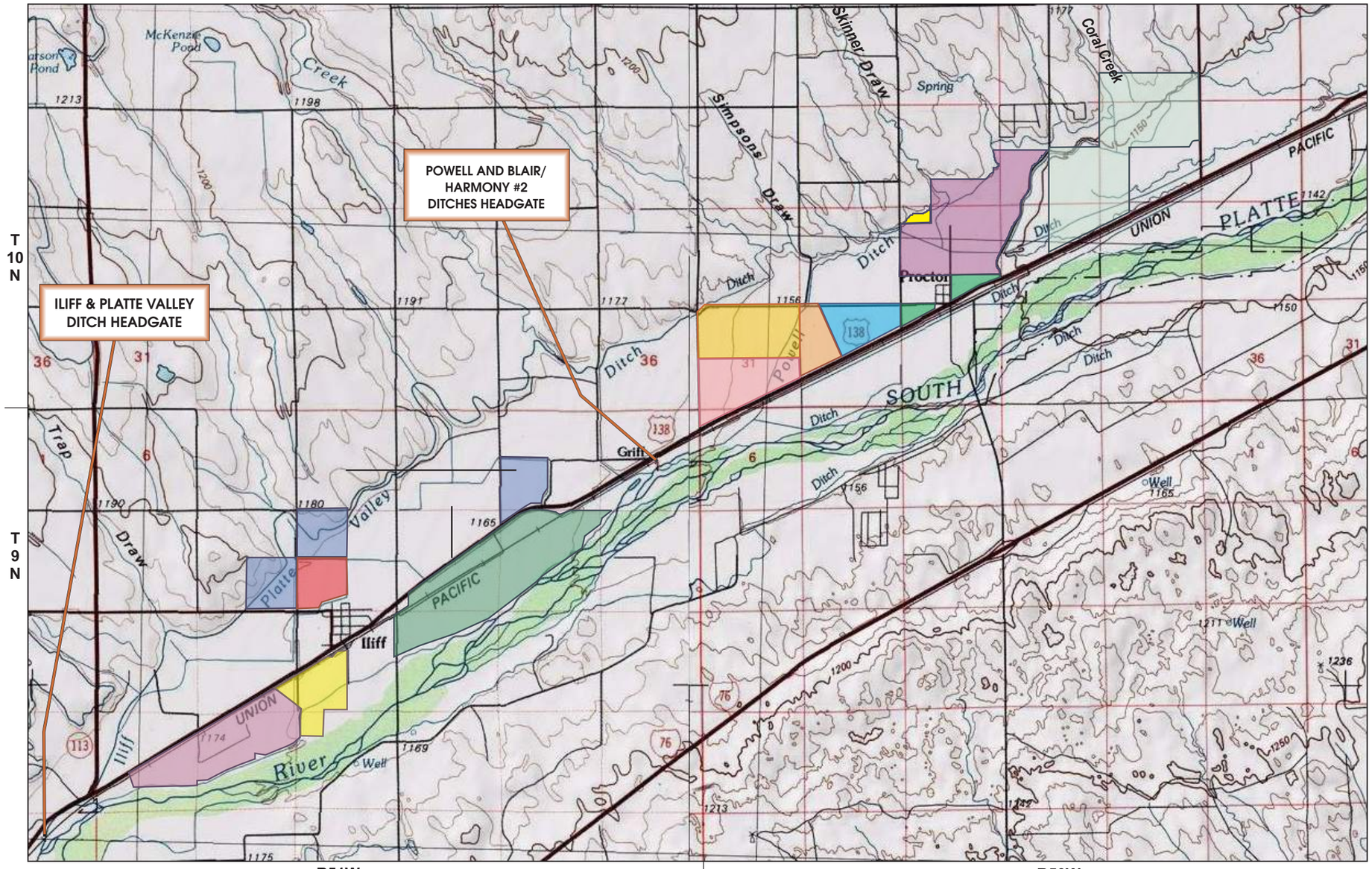
N

0 16 mi

PWSD/LSPWCD

LSPWCD SERVICE AREA

File Name: LSPWCD_ServiceArea.cdr			Date: 08/05/2020
Project No.: 1489-20		Drawn By: VAL	Fig. No.: 2



LEGEND

- BREIDENBACH
- CROWDER
- DEBUS
- HERNANDEZ
- HOOGLAND
- HURST
- KAUFMAN
- LOCK
- SCHOTT
- SPRING VALLEY
- STIEB
- STUMPF
- VANT

N

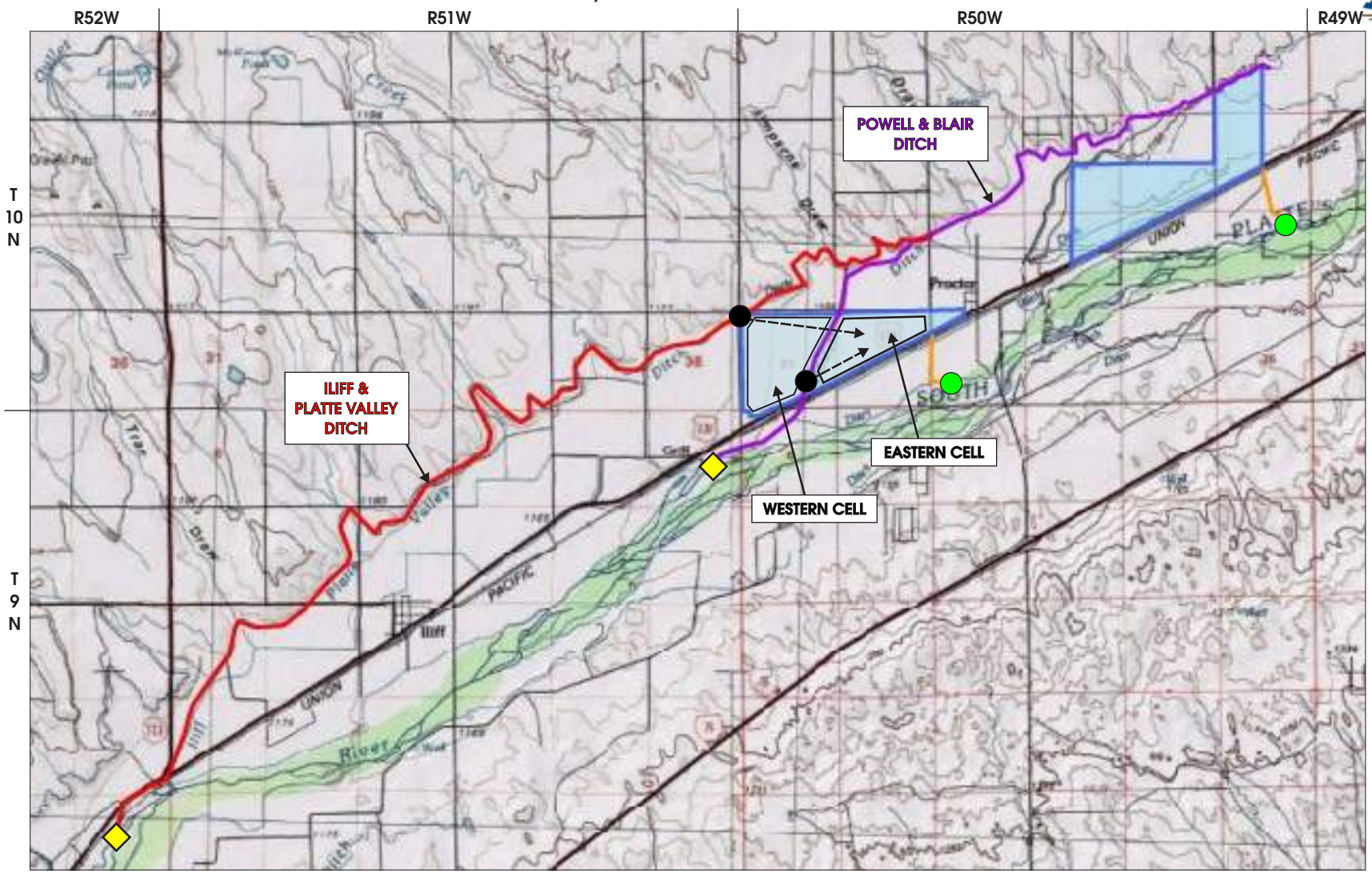
0 1.1 miles

PWSD/LSPWCD

PWSD
LOGAN COUNTY FARMS
LOCATION MAP

File Name: PWSD-LoganCoFarmsLocMap.cdr		Date: 08/24/2020
Project No.: 1489-20	Drawn By: VAL	Fig. No.: 3

LYTLE WATER SOLUTIONS, LLC



LEGEND

- DIVERSION POINTS
- EXCHANGE-FROM POINTS
- DITCH DIVERSION POINTS
- DISCHARGE TO SOUTH PLATTE RIVER
- POTENTIAL LOCATIONS FOR ILIFF RESERVOIR

Note: Exchange Reach shown in Figure 6.

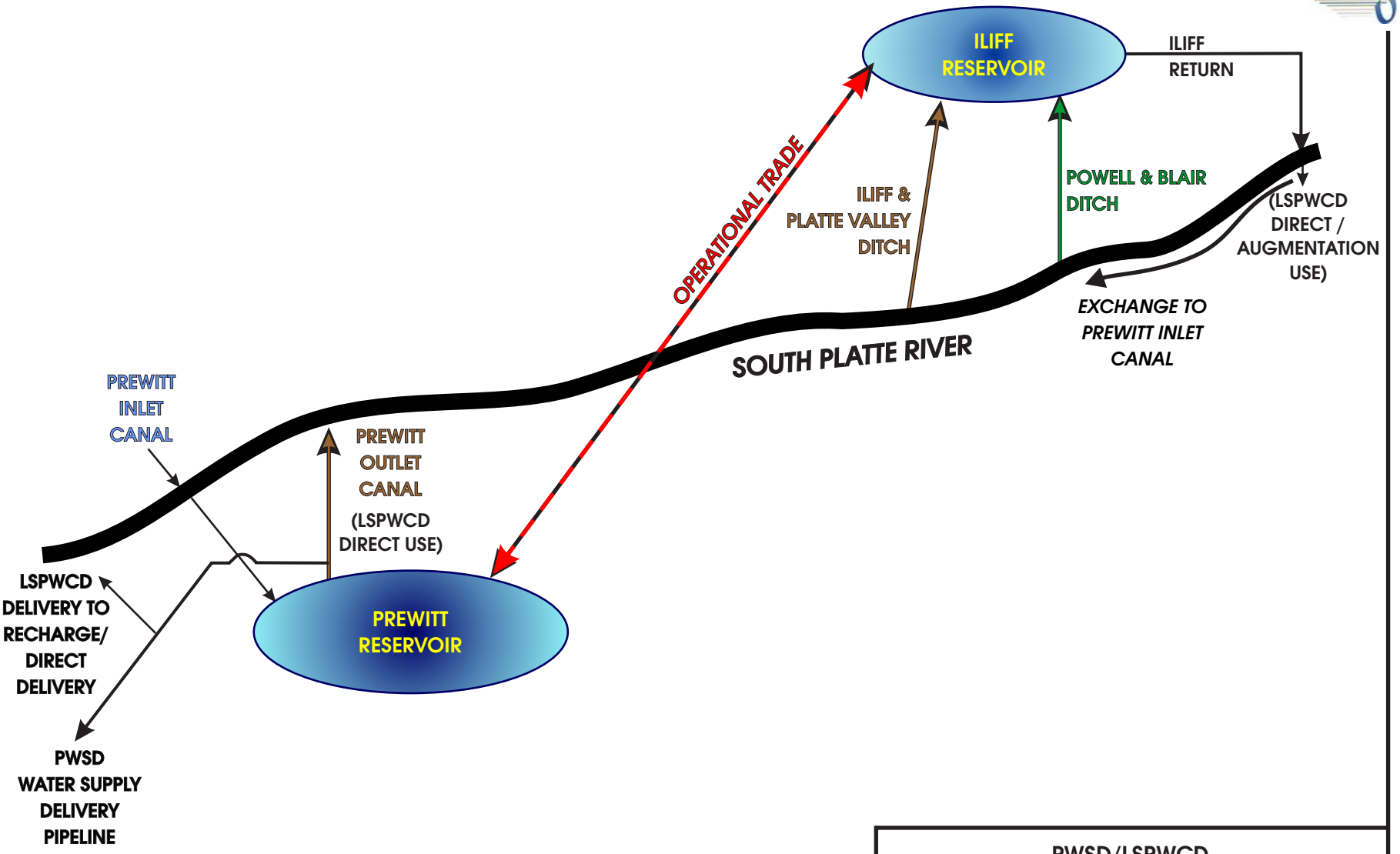
N

0 2.3 mi

PWSD/LSPWCD

POTENTIAL ILIFF RESERVOIR LOCATION MAP

File Name: IliffResLocMap.cdr			Date: 08/25/2020
Project No.: 1489-20		Drawn By: VAL	Fig. No.: 4

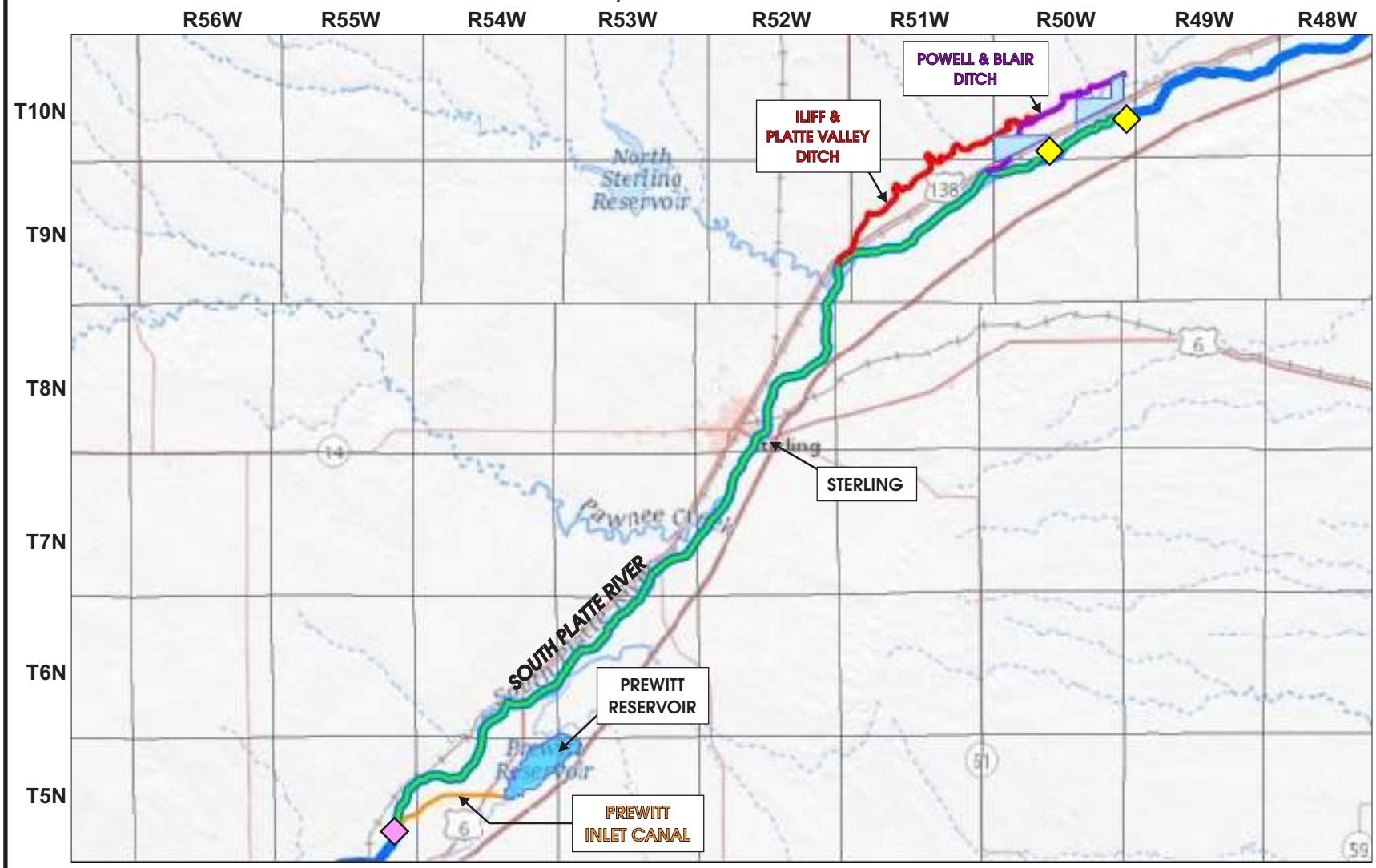


PWSD/LSPWCD

PHASE 1 PROPOSED WATER USE SCHEMATIC

File Name: Phase 1 Schematic.cdr		Date: 08/24/2020
Project No.: 1489-20	Drawn By: VAL	Fig. No.: 5

LYTLE WATER SOLUTIONS, LLC



LEGEND

- EXCHANGE-TO POINT
- EXCHANGE-FROM POINTS
- EXCHANGE REACH
- POTENTIAL LOCATIONS FOR ILIFF RESERVOIR

N

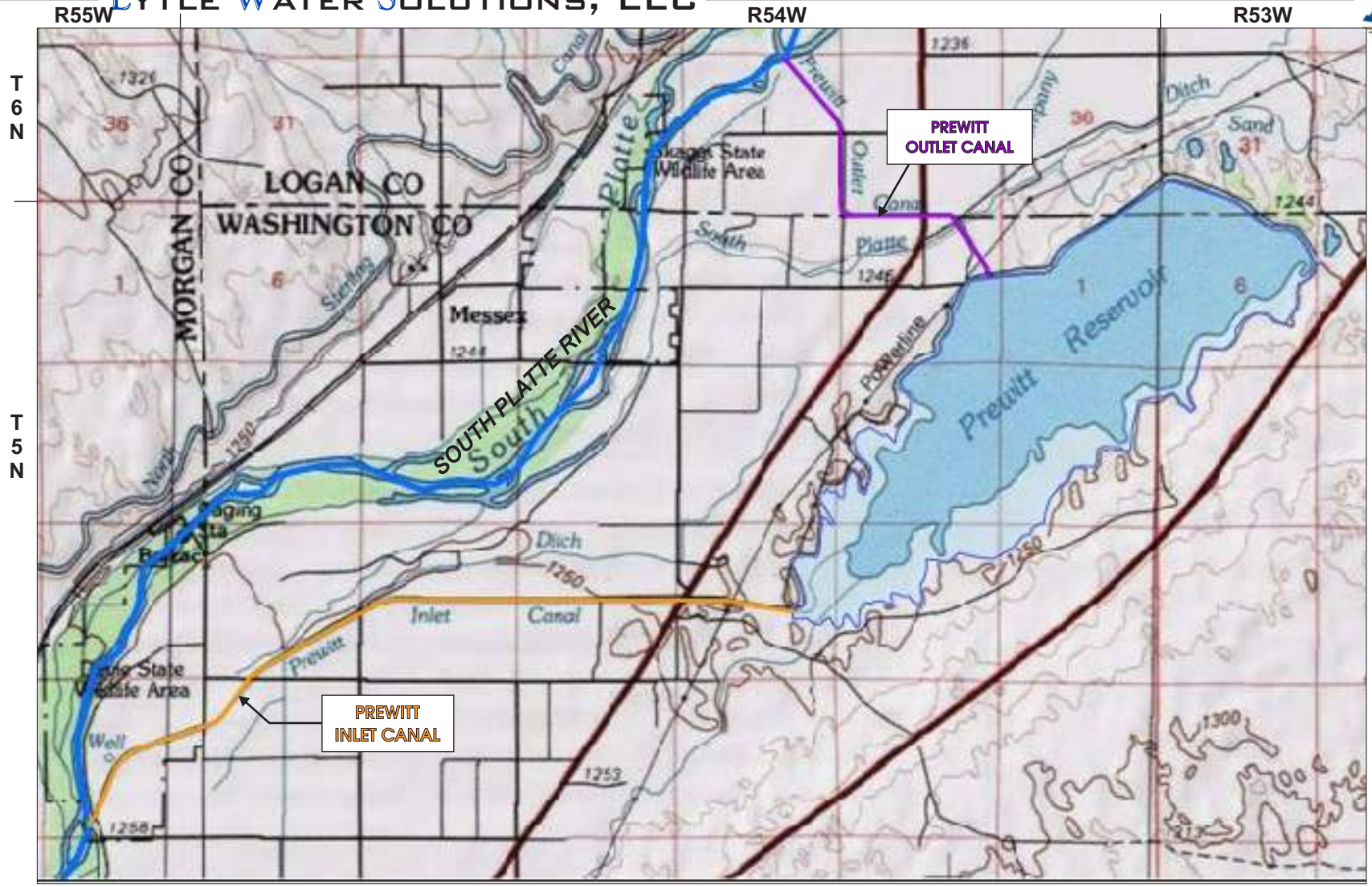
0 8.3 mi

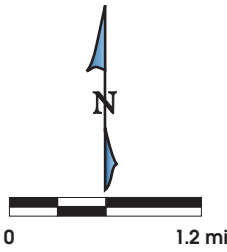
PWSD/LSPWCD

EXCHANGE REACH FROM ILIFF RESERVOIR TO PREWITT INLET CANAL

File Name: Exch.Reach_Iliff-Prewitt.cdr			Date: 08/17/2020
Project No.: 1489-20		Drawn By: VAL	Fig. No.: 6

LYTLE WATER SOLUTIONS, LLC



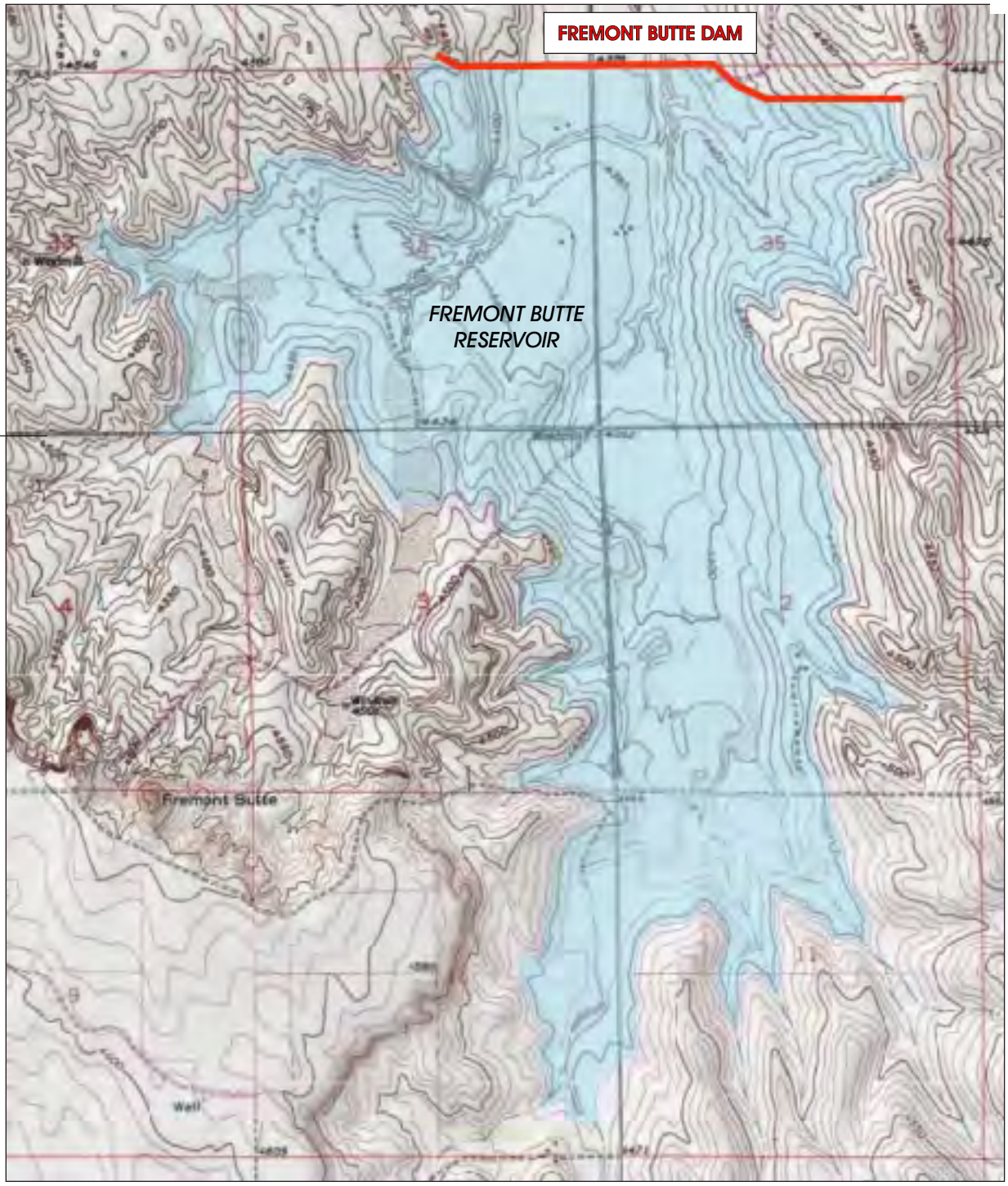


PWSD/LSPWCD

PREWITT INLET CANAL AND RESERVOIR LOCATION MAP

File Name: Prewitt-Inlet.LocMap.cdr			Date: 08/17/2020
Project No.: 1489-20		Drawn By: VAL	Fig. No.: 7

R53W



0 0.55 mi

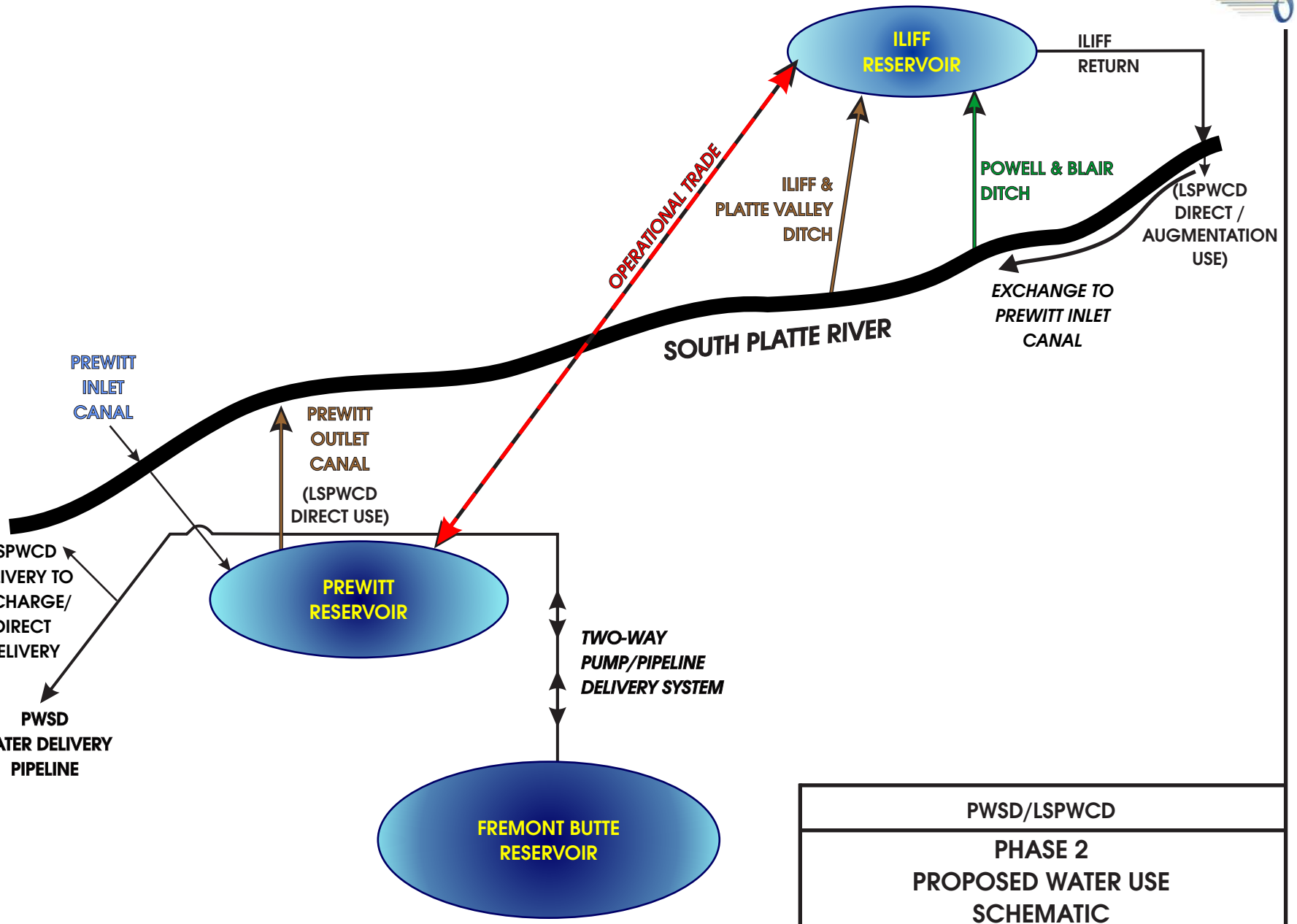
N

PWSD/LSPWCD

FREMONT BUTTE RESERVOIR

File Name: FremontButteRes.cdr		Date: 08/06/2020
Project No.: 1489-20	Drawn By: VAL	Fig. No.: 8

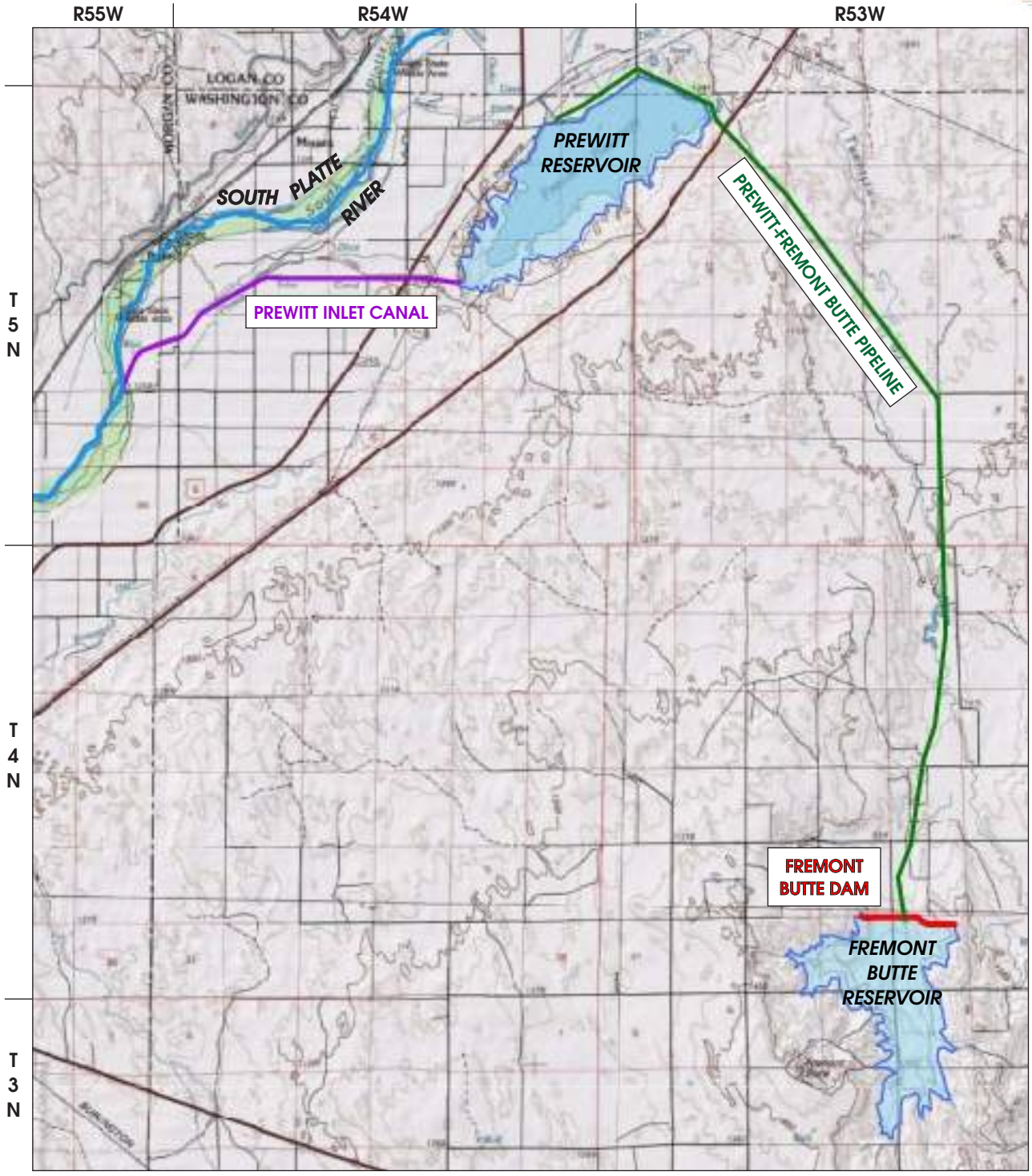
LYTLE WATER SOLUTIONS, LLC



PWSD/LSPWCD

PHASE 2 PROPOSED WATER USE SCHEMATIC

File Name: Phase 2 Schematic.cdr		Date: 08/24/2020
Project No.: 1489-20	Drawn By: VAL	Fig. No.: 9



PWSD/LSPWCD

PREWITT - FREMONT BUTTE RESERVOIRS AND PIPELINE ALIGNMENT

File Name: Prewitt-Fremont-Pipeline.cdr		Date: 08/25/2020
Project No.: 1489-20	Drawn By: VAL	Fig. No.: 10