Water Supply Reserve Fund
Water Activity Summary Sheet
September 15-16, 2021
Agenda Item 21(a)

Applicant & Grantee:	East Cherry Creek Valley Water and Sanitation District
Water Activity Name:	Aquifer Storage Recovery Modeling Assessment
Water Activity Purpose:	Municipal/Industrial - Study
County:	Arapahoe
Drainage Basin:	South Platte
Water Source:	Arapahoe Aquifer
Amount Requested:	$25,000 Metro Basin Account $25,000 South Platte Basin Account $75,000 Statewide Account $125,000 Total Request
Matching Funds:	**Basin Account Match** = $50,000 • 66.7% of statewide request (meets 10% min) **Applicant & 3rd Party Match** = $32,750 ($25,000 cash & $7,750 in-kind) • 43.6% of the statewide request (meets 40% min) **Total Match** (Basin request & Applicant Match) = $82,750 • 110% of the statewide request (meets 50% min)

Staff Recommendation:
Staff recommends approval of up to $25,000 from the Metro Basin Account, up to $25,000 from the South Platte Basin Account and up to $75,000 from the Statewide Account to help fund the project: Aquifer Storage Recovery Modeling Assessment

Water Activity Summary: If approved, the applicant will use WSRF funds to conduct a Aquifer Storage Recovery (ASR) modeling assessment to sustain groundwater levels in the currently mined Arapahoe Aquifer and thereby maintain long-term well yields. Under this conjunctive management strategy, in wet years, renewable surface waters from the South Platte would be diverted, conveyed through East Cherry Creek Valley's Northern Pipeline (an existing IPP in the South Platte Basin Implementation Plan), treated, and injected into the Arapahoe Aquifer. The water would be recovered during dry years, with the goal of establishing a balance between the quantities recharged and the quantities pumped, stabilizing long term groundwater conditions.

This project entails the development of a groundwater modeling tool to simulate the Arapahoe Aquifer behavior in relation to ASR injection and extraction schedules to further investigate the feasibility of how well ASR may achieve sustainable groundwater conditions underlying the applicant's service area which would aid in sustaining groundwater levels

outside of their service area. Funds from the WSRF will be used to develop the model, evaluate scenarios and document results.

The applicant plans to use the results of this modeling investigation to inform future ASR implementation and system management. A report documenting modeling results will also be made available to Colorado water providers pursuing ASR to inform the technical development of this relatively new water storage strategy within the State.

Discussion: This proposal meets the Water Plan of reducing the Municipal & Industrial gap in the basin as well as meeting South Platte Basin Implementation Plan's goals of promoting multi-purpose storage projects; maximizing implementation of IPP's; maximizing use of existing South Platte water supplies including groundwater; and managing the risks of climate change.

Issues/Additional Needs: No other issues or additional needs have been identified.

Eligibility Requirements: The application meets requirements of all eligibility components.

Evaluation Criteria: Staff has determined this activity satisfies the Evaluation Criteria.

Funding Sources/Match	Cash	In-Kind	Total	Status
East Cherry Creek Valley Water & Sanitation Dist.	$25,000	$7,750	$32,750	Secured
Sub-Total Matching Funds	$25,000	$7,750	$32,750	
WSRF Metro Basin Account	$25,000	$0	$25,000	Secured
WSRF South Platte Basin Account	$25,000	$0	$25,000	Secured
WSRF Statewide Account	$75,000	$0	$75,000	
Sub Total	$125,000	$0	$125,000	
Total Project Costs	**$150,000**	**$7,750**	**$157,750**	

CWCB Project Manager: Erik Skeie

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Water Supply Reserve Fund
Grant Application

Instructions

All WSRF grant applications shall conform to the current 2020 WSRF Criteria and Guidelines.

To receive funding from the WSRF, a proposed water activity must be recommended for approval by a Roundtable(s) **AND** the approved by the Colorado Water Conservation Board (CWCB). The process for roundtable consideration and recommendation is outlined in the 2020 WSRF Criteria and Guidelines. The CWCB meets bimonthly.

If you have questions, please contact the WSRF Grant Program Manager (for all Roundtables) or your Roundtable Liaison:

Ben Wade
ben.wade@state.co.us
303-866-3441 x3238 (office)

Sam Stein
Sam.stein@state.co.us
303-866-3441(office)

WSRF Submittal Checklist (Required)

YES■ NO□ This request was recommended for CWCB approval by the sponsoring roundtable.

YES■ NO□ I have read and understand the 2020 WSRF Criteria and Guidelines.

YES■ NO□ Grantee will be able to contract with CWCB using the Standard Contract.[1]

Application Documents included:

YES■ NO□ Exhibit A: Statement of Work[2] *(Word – see Template)*

YES■ NO□ Exhibit B: Budget & Schedule[2] *(Excel Spreadsheet – see Template)*

YES□ NO□ Letters of Matching and/or Pending 3rd Party Commitments[2]

YES■ NO□ Map[2]

YES■ NO□ Photos/Drawings/Reports

YES■ NO□ Letters of Support (letter from ECCV)

Contracting Documents[3]

YES■ NO□ Detailed/Itemized Budget[3] *(Excel Spreadsheet – see Template)*

YES□ NO■ Certificate of Insurance[4] *(General, Auto, & Workers' Comp.)*

YES□ NO■ Certificate of Good Standing[(4)]

YES□ NO■ W-9 Form[4]

YES□ NO■ Independent Contractor Form[4] *(If applicant is individual, not company/organization)*

YES□ NO■ Electronic Funds Transfer (ETF) Form[4]

[1]Click "Grant Agreements". For reference only/do not fill out or submit/required for contracting

[2] Required with application if applicable.

[3] Additional documentation providing a Detailed/Itemized Budget maybe required for contracting. Applicants are encouraged to coordinate with the CWCB Project Manager to determine specifics.

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[4] Required for contracting. While optional at the time of this application, submission can expedite contracting upon CWCB Board approval.

Schedule		
CWCB Meeting	Application Submittal Dates	Type of Request
January	October 1	Basin Account
March	December 1	Basin/Statewide Account/Water Plan Grant Match[1]
May	February 1	Basin Account
July	April 1	Basin Account
September	**June 1**	**Basin/Statewide Account**
November	August 1	Basin Account

[1] If either the basin or statewide match includes matching funds from a pending Water Plant Grant, both must be submitted by December 1st deadline for March Board meeting review.

Water Activity Summary	
Name of Applicant	East Cherry Creek Valley Water and Sanitation Water District – Water Activity Enterprise (ECCV)
Name of Water Activity	**Aquifer Storage Recovery Modeling Assessment**

Approving Roundtable(s)	Basin Account Request(s)[1]
Metro Basin Round Table	$25,000
South Platte Basin Round Table	$25,000
Basin Account Request Subtotal	$50,000
Basin Account Request Subtotal Approved by Roundtable	$0 (all pending)
Statewide Account Request[(1)]	$ 75,000
Total WSRF Funds Requested (Basin & Statewide)	$ 125,000
Total Project Costs	$ 157,750

[1] Please indicate the amount recommended for approval by the Roundtable(s)

Grantee and Applicant Information	
Name of Grantee(s)	ECCV
Mailing Address	6201 South Gun Club Road, Aurora, CO 80016
FEIN	84-0699052 (Taxpayer ID number)
Grantee's Organization Contact[1]	Chris Douglass
Position/Title	Project Manager at ECCV
Email	cdouglass@eccv.org
Phone	303-693-3800 ext. 153

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Grantee and Applicant Information	
Grant Management Contact[2]	Chris Douglass
Position/Title	Project Manager at ECCV
Email	cdouglass@eccv.org
Phone	303-693-3800 ext. 153
Name of Applicant (if different than grantee)	Same as grantee above
Mailing Address	Same as grantee above
Position/Title	Same as grantee above
Email	Same as grantee above
Phone	Same as grantee above

[1] Person with signatory authority

[2] Person responsible for creating reimbursement invoices (Invoice for Services) and corresponding with CWCB staff.

Description of Grantee
Provide a brief description of the grantee's organization (100 words or less).
The ECCV service area encompasses 14.5 square miles located east of Cherry Creek Reservoir in Arapahoe County. The District serves 65,000 residents with water provided from three independent well fields. Non-Tributary water is pumped from Denver Groundwater Basin aquifers within ECCV's In-District field, and from its Western well field. Renewable water is pumped from its alluvial well field in Beebe Draw north of Barr Lake. The Beebe Draw wells, part of ECCV's Northern Project, are augmented with South Platte water rights. Water is delivered to ECCV through its Northern and Western pipelines.

	Type of Eligible Entity (check one)
	Public (Government): municipalities, enterprises, counties, and State of Colorado agencies. Federal agencies are encouraged to work with local entities. Federal agencies are eligible, but only if they can make a compelling case for why a local partner cannot be the grant recipient.
X	**Public (Districts):** authorities, Title 32/special districts (conservancy, conservation, and irrigation districts), and water activity enterprises
	Private Incorporated: mutual ditch companies, homeowners associations, corporations
	Private Individuals, Partnerships, and Sole Proprietors: are eligible for funding from the Basin Accounts but not for funding from the Statewide Account.
	Non-governmental organizations: broadly, any organization that is not part of the government
X	**Covered Entity:** as defined in Section 37-60-126 Colorado Revised Statutes

	Type of Water Activity (check one)
X	Study
	Implementation

Category of Water Activity (check all that apply)

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	Nonconsumptive (Environmental)	
	Nonconsumptive (Recreational)	
	Agricultural	
X	Municipal/Industrial	
	Needs Assessment	
	Education & Outreach	
	Other	Explain:

Location of Water Activity	
Please provide the general county and coordinates of the proposed activity below in **decimal degrees**. The Applicant shall also provide, in Exhibit C, a site map if applicable.	
County/Counties	Arapahoe
Latitude	39.61932°N (centroid of service area)
Longitude	-104.752332°W (centroid of service area)

Water Activity Overview
Please provide a summary of the proposed water activity (200 words or less). Include a description of the activity and what the WSRF funding will be used for specifically (e.g. studies, permitting, construction). Provide a description of the water supply source to be utilized or the water body affected by the activity. Include details such as acres under irrigation, types of crops irrigated, number of residential and commercial taps, length of ditch improvements, length of pipe installed, area of habitat improvements. If this project addresses multiple purposes or spans multiple basins, please explain. The Applicant shall also provide, in Exhibit A, a detailed Statement of Work, Budget, and Schedule.
ECCV is exploring ASR to sustain groundwater levels in the currently mined Arapahoe Aquifer and thereby maintain long-term well yields. Under this conjunctive management strategy, in wet years, renewable surface waters from the South Platte would be diverted, conveyed through ECCV's Northern Pipeline (an existing IPP), treated, and injected into the Arapahoe Aquifer. The water would be recovered during dry years, with the goal of establishing a balance between the quantities recharged and the quantities pumped, stabilizing long term groundwater conditions. This project entails the development of a groundwater modeling tool to simulate the Arapahoe Aquifer behavior in relation to ASR injection and extraction schedules to further investigate the feasibility of how well ASR may achieve sustainable groundwater conditions underlying the ECCV service area which would aid in sustaining groundwater levels outside ECCV service area. Funds from the WSRF will be used to develop the model, evaluate scenarios and document results. ECCV plans to use the results of this modeling investigation to inform future ASR implementation and system management. A report documenting modeling results will also be made available to Colorado providers pursuing ASR to inform the technical development of this relatively new water storage strategy within the State.

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Measurable Results		
To catalog measurable results achieved with WSRF funds please provide any of the following values.		
	New Storage Created (acre-feet)	
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive	
ECCV plans to secure 10,000 acre-feet of existing storage in the Arapahoe Aquifer (1,371 acre-feet per year for a seven year injection cycle). This will yield 3,200 acre-feet per year of supplies during 3 dry years.	Existing Storage Preserved or Enhanced (acre-feet)	
	Length of Stream Restored or Protected (linear feet)	
ASR provides efficiency savings relative to surface water storage considering that there are no evaporative losses.	Efficiency Savings (indicate acre-feet/year OR dollars/year)	
	Area of Restored or Preserved Habitat (acres)	
	Length of Pipe/Canal Built or Improved (linear feet)	
	Other	Explain:

Water Activity Justification
Provide a description of how this water activity supports the goals of Colorado's Water Plan, the most recent Statewide Water Supply Initiative, and the respective roundtable Basin Implementation Plan and Education Action Plan [(1)]. The Applicant is required to reference specific needs, goals, themes, or Identified Projects and Processes (IPPs), including citations (e.g. document, chapters, sections, or page numbers). For applications that include a request for funds from the Statewide Account, the proposed water activity shall be evaluated based upon how well the proposal conforms to Colorado's Water Plan criteria for state support (CWP, Section 9.4, pp. 9-43 to 9-44;) (Also listed pp. 4-5 in 2020 WSRF Criteria and Guidelines).
ECCV is in the core of the southeast corridor of the Denver Groundwater Basin where multiple entities are relying on the Arapahoe Aquifer for water supplies. This water activity not only informs ECCV of future conjunctive management strategies using ASR, but also provides benefits throughout the region by studying ASR to maximize use of renewable South Platte water supplies while also stabilizing groundwater levels in the Arapahoe Aquifer underlying the ECCV service area. This will aid in stabilizing groundwater levels in the Arapahoe aquifer outside ECCV service area which would be beneficial to water providers neighboring ECCV's service area that rely on the Arapahoe aquifer. The results of this study will also be publicly available where other local providers, considering ASR, may benefit from the results and apply lessons learned. This water activity directly supports the following two goals within the Colorado Water Plan.

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Water Activity Justification
▪ Reducing the projected 2050 municipal and industrial gap from as much as 560,000 acre-feet to zero acre-feet by 2030 –This study is a critical component to understanding how ECCV can firm its water supplies and meet its future water demands. ▪ Attaining 400,000 acre-feet of water storage in order to manage and share conserved water and the yield of IPPs by 2050. This objective equates to an 80 percent success rate for these planned projects and calls for increasingly innovative storage projects including ASR. – This study coincides with this goal by 1) furthering the technical understanding of how ASR may be implemented throughout the region and 2) by supporting the optimization of ECCV's Northern Pipeline IPP included as an IPP in the 2015 South Platte BIP. In addition, two new IPPs entailing the optimization of the Northern Pipeline operations are being proposed by ECCV for the South Platte BIP update. ASR is also included as an innovative storage strategy in meeting the 400,000 goals in the Analysis & Technical Update to the Colorado Water Plan (Vol 2, Section 10 Volume 2 Section 10 p. 8). This water activity also coincides with many elements of the 2015 South Platte BIP including the following recommendation in the Executive Summary of the BIP (this is called out in the Metro BRT WSRF guidelines): "Maximize use and effectiveness of native South Platte supplies." Specifically it should help "develop new, in-basin, multipurpose water storage and conveyance mechanisms, explore further integration of South Platte water supply systems to enhance yield and reliability, and develop methods to more effectively use groundwater" (BIP S.5.3, p.S-13). In addition, this water activity meets the following bulleted BIP priorities. ▪ Promote multi-purpose storage projects including research on ASR - This ASR research activity explores how effectively ASR may be used to support 1) firm ECCV's water supplies and 2) sustain groundwater levels underlying the ECCV service area which will also aid in sustaining groundwater levels in the Arapahoe aquifer outside ECCV service area which would be beneficial to neighboring entities pursuing ASR (BIP, p. 4-74 – 4-85), (BIP Section S.5.7, 1.9.4, 4.6.2, 5.5.8). ▪ Maximize implementation of IPPs – ECCV has provided three IPPs for the 2021 BIP update. These IPPs entail the use of ECCV's renewable South Platte water supplies through the Northern Project Pipeline and supporting infrastructure. This modeling project will enhance understanding of how operations of these IPPs can be optimized to provide multiple water supply and groundwater sustainability benefits through ASR (BIP Section S.5.1, 1.9.3, 4.3.4, 4.3.5, 5.2.8, 5.5.1). ▪ Maximize use of existing South Platte water supplies including groundwater – This water activity will provide insight into how renewable South Platte supplies can be used to optimize use of the Arapahoe Aquifer at sustainable groundwater levels. This project will serve as a case study and can inform similar studies in the Basin (BIP Section 5.5.3, p. 5-25), (BIP Section S.5.3, 1.9.4, 4.6.2, 5.5.3). ▪ Manage the risks of climate change – The uncertainty and risks of climate change require proactive planning and improved water system resiliencies. Using the underlying aquifer as a storage source through ASR could prove to be an effective resiliency strategy (BIP Section S.5.8, 5.5.7).

[1] Access Basin Implementation Plans or Education Action Plans from Basin drop down menu.

Matching Requirements: Basin Account Requests	
Basin (only) Account grant requests require a 25% match (cash and/or in-kind) from the Applicant or 3rd party and shall be accompanied by a **letter of commitment** as described in the 2020 WSRF Criteria and Guidelines (submitted on the contributing entity's letterhead). Attach additional sheet if necessary.	
Contributing Entity	Amount and Form of Match (note cash or in-kind)
See following Statewide account requests.	

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Matching Requirements: Basin Account Requests	
Total Match	
If you requested a Waiver to the Basin Account matching requirements, indicate the percentage you wish waived.	

Matching Requirements: Statewide Account Requests	
Statewide Account grant requests require a 50% match as described in the 2020 WSRF Criteria and Guidelines. At least of 10% of the required Statewide Account Grant request match shall be cash from Basin Account funds whether that is from one or multiple basins; and the remaining 40% of the required match may be provided from any source, including other grants, cash from the Basin Account, or any combination of cash, in-kind services, or in-kind materials.and shall be accompanied by a **letter of commitment.** Attach additional sheet if necessary.	
Contributing Entity	Amount and Form of Match (note cash or in-kind):
ECCV cash	$25,000 (cash)
ECCV in-kind	$7,750 (in kind)
Metro BRT	$25,000
South Platte BRT	$25,000
Statewide	$75,000
Total Match	$157,750
If you requested a Waiver to the Statewide Account matching, indicate % you wish waived. (Max 50% reduction of requirement).	

Related Studies
Please provide a list of any related studies, including if the water activity is complimentary to or assists in the implementation of other CWCB programs.

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Related Studies

- U.S. Geological Survey Groundwater Availability of the Denver Basin Aqufer System, Colorado – Development of conceptual and numerical model for the Denver Groundwater Basin.
- South Metro Water Supply Authority Aquifer Storage and Recovery Feasability Study
- ECCV Well A-7R ASR Pilot Study , 2015-2020 This effort was supported by a variety of tech memos, EPA memos, water quality data, etc.

This water activity is complementary to CWCB's water supply planning efforts by helping to meet two of the Colorado Water Plan goals discussed above.

Previous CWCB Grants

List all previous or current CWCB grants (including WSRF) awarded to both the Applicant and Grantee. Include: 1) Applicant name; 2) Water activity name; 3) Approving RT(s); 4) CWCB board meeting date; 5) Contract number or purchase order

ECCV Water Efficiency Plan, PO #10000000068, Final Plan dated May 16, 2011

Tax Payer Bill of Rights

The Tax Payer Bill of Rights (TABOR) may limit the amount of grant money an entity can receive. Please describe any relevant TABOR issues that may affect the applicant.

The grant will be issued to the East Cherry Creek Valley Water & Sanitation District – Water Activity Enterprise. The Water Activity Enterprise is a subsidiary to the East Cherry Creek Valley Water & Sanitation District and does not have any relevant TABOR issues that may affect the application.

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Colorado Water Conservation Board	
Water Supply Reserve Fund	
Exhibit A - Statement of Work	
Date:	April 1, 2021
Water Activity Name:	Aquifer Storage Recovery Modeling Assessment
Grant Recipient:	East Cherry Creek Valley Water and Sanitation District – Water Activity Enterprise (ECCV)
Funding Source:	South Platte BRT, Metro BRT, Statewide WSRF and ECCV Match

Water Activity Overview: (Please provide brief description of the proposed water activity (no more than 200 words). Include a description of the overall water activity and specifically what the WSRF funding will be used for. (PLEASE DEFINE ALL ACRONYMS).

ECCV is in the process of exploring aquifer storage recovery (ASR) as a means of maintaining groundwater levels in the currently mined Arapahoe Aquifer and sustaining long-term well yields. Under this conjunctive management strategy, in wet years, renewable surface waters from the South Platte would be diverted, treated, conveyed through ECCV's Northern Pipeline (an existing IPP), and injected into the Arapahoe Aquifer. The water would be recovered during dry years, with the goal of establishing a balance between the quantities recharged and the quantities pumped, stabilizing long term groundwater conditions.

This project entails the development of a groundwater modeling tool to simulate the Arapahoe Aquifer behavior in relation to ASR injection and extraction schedules to further investigate the feasibility of how well ASR may achieve sustainable groundwater conditions underlying the ECCV service area. Funds from the WSRF will be used to develop the model, evaluate scenarios and document results.

ECCV plans to use the results of this modeling investigation to inform future ASR implementation and system management. A report documenting modeling results will also be made available to Colorado providers pursuing ASR with the intention of informing the technical development of this relatively new water storage strategy within the State.

Objectives: (List the objectives of the project. (PLEASE DEFINE ACRONYMS).

ECCV plans to work with Hydrokinetics, Inc (HKI) and INTERA in developing and conducting the modeling assessment. The objectives of the project are provided below.

1) Assess feasibility of implementing ASR to curtail water level declines and sustain aquifer performance into the future while firming ECCV's water supplies.
2) Develop a groundwater model that can be validated and used to inform ECCV's future ASR development and operational decisions.
3) Document results in a manner that serves as a technical resource for those interested in ASR throughout the State.

Tasks

Provide a detailed description of each task using the following format: (PLEASE DEFINE ACRONYMS)

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Tasks
Task 1 – Conceptual Model Assessment
Description of Task:
The purpose of this task is to develop a Conceptual Model Assessment to support the numerical modeling in Task 2. To efficiently address the modeling, the United States Geological Survey (USGS) Denver Basin Aquifer System Model (DBASM) will provide the basic structure for the simulations. However, this is a large-scale model, and it is important that the simulations within the ECCV domain be conducted with reasonably representative site-specific modeling parameters. ECCV maintains a large library of geologic and geophysical data, information on the hydraulic parameters of the Arapahoe Aquifer, time correlated water level histories within its well field, and pumping histories at the ECCV wells. The Conceptual Model Assessment will compare existing field data with associated data in the DBASM model to assure reasonable correlation between DBASM implemented parameters and measured empirical data. Inconsistencies will be evaluated for potential effects on model predictions and addressed appropriately.
Method/Procedure:
Task 1 will include evaluation of geological and geophysical data from 32 Arapahoe Wells within ECCV's service area and 5-8 Arapahoe Wells outside of ECCV's service area but within the model domain. We will assess aquifer tops and bottoms, saturated sand thicknesses, well designs, and geologic composition of the aquifer within the Domain. We will examine aquifer tests conducted on an appropriate number of wells to inform the model on transmissivity, hydraulic conductivity, and storativity of the aquifer. An examination of core data testing will also be undertaken to determine the appropriate specific yield of the aquifer. Finally, we will prepare and interpret hydrographs of key wells currently being operated, with such potentiometric data being made available as needed for verification of the DBASM model for use in this application. Once these data have been collected and refined, the data will be compared with the DBASM model data set. The project team will then make a determination of the suitability of the existing DBASM model for use in this assessment, and recommend appropriate alterations needed to increase the predictive accuracy of the model for achieving the objectives of this investigation. It should be noted that the objective of the model at this level is not to be able to precisely reproduce or predict future aquifer heads, but rather to be adequate for forecasting aquifer response to assess the basic feasibility of maintaining a sustainable aquifer through ASR operations.
Grantee Deliverable: (Describe the deliverable the grantee expects from this task)
Upon completion of the Conceptual Model Assessment, a task summary memo will be prepared highlighting the data analysis and providing a comparison of the empirical and DBASM data sets. Any significant discrepancies will be noted, and procedures for addressing any such data disagreement proposed.
CWCB Deliverable: (Describe the deliverable the grantee will provide CWCB documenting the completion of this task)
ECCV will submit a six-month progress report to CWCB documenting the progress and completion of this task. This will include a description of any major issues and correctives actions taken to address the issues.

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Tasks
Provide a detailed description of each task using the following format: (PLEASE DEFINE ACRONYMS)
Task 2 – Refine Model
Description of Task:
The overall purpose of this task is to refine a portion of the DBASM and produce a local model capable of simulating the existing ECCV wellfields and potential ASR wells in the service area. Refinement of the DBASM grid may be performed both horizontally and vertically, and lateral boundaries will be created to simulate the interactions with the regional system. Horizontal Refinement: The DBASM has a horizontal grid spacing of one mile square. This resolution is not sufficient for simulating existing wells and the potential effects of ASR within the ECCV service area. The resolution of the model will be increased by a minimum of 16 times, i.e. the maximum grid size will be one-quarter mile. Increased refinement will be considered as necessary during model construction. Vertical Refinement: The DBASM represents the Arapahoe Aquifer as three hydrogeologic units: the Upper Arapahoe Aquifer, the Arapahoe confining unit, and the Lower Arapahoe aquifer. Because nearly all of the ECCV wells fully penetrate the Arapahoe Aquifer, vertical refinement beyond these three layers is not expected to be necessary. Lateral Boundaries: Lateral boundaries will be established at sufficient distance from the ECCV wellfields such that they can be considered “distance boundaries”, i.e. the effects of activities at the ECCV wellfields do not have a large effect at the boundaries.
Method/Procedure:
Construction of a refined local groundwater model from a regional groundwater model is a common activity in groundwater modeling. INTERA has an established method for performing this task, using a set of programming tools in the Python programming language developed by the USGS for creating and manipulating MODFLOW models. These tools consist of a set of Python libraries collectively called “FloPy”. INTERA has an existing codebase that will be modified to allow for application to the DBASM. The basic steps performed by the programming scripts are: 1. Establish the row/column extents for the local model inside the regional model grid, as well as the desired local grid resolution 2. Import the regional model discretization file, create many-to-one mapping of local model cells to regional model 3. Transfer regional parameterization to local model grid, based on cell mapping. For constantly-varying parameters (e.g. hydraulic conductivity), the regional model parameter values will be linearly interpolated across the refined local model grid. This interpolation does not make the local model more accurate (i.e., no new data is created) but will make the local model perform better by smoothing discontinuities in the parameter fields, which may increase solution time). For spatially discrete parameters (e.g., pumping), the stresses will be divided among the local model grid cells. An exception to this is the ECCV wellfield pumping, which will not be transferred from the regional model, but rather created from information gathered in Task 1. 4. Read the historical heads from the DBASM regional model and use to establish the heads in the lateral boundaries of the local model. The lateral boundaries will impose any historic regional trends in water levels on the local model

Tasks
After construction, the local model calibration will be assessed against the water level datasets created as part of Task 1. The goal is for the local model to perform as well as the DBASM regional model in terms of matching water levels. The objective of creating the local model was not to improve history matching but enable more accurate depiction of future ASR activities.
Grantee Deliverable: (Describe the deliverable the grantee expects from this task)
This task will be documented as part of the final report to ECCV. This will include the electronic files that comprise the refined local model.
CWCB Deliverable: (Describe the deliverable the grantee will provide CWCB documenting the completion of this task)
ECCV will submit a six-month progress report to CWCB documenting the progress and completion of this task. This will include a description of any major issues and correctives actions taken to address the issues.

Tasks
Provide a detailed description of each task using the following format: (PLEASE DEFINE ACRONYMS)
Task 3 – Predictive Scenarios
Description of Task:
In this task, the local refined groundwater model that was constructed in Task 2 will be applied to help predict whether certain hydrogeologic conditions can be met through the application of ASR in the ECCV service area. Specifically, the simulations will explore whether ASR can be a strategy to help maintain the potentiometric surface in the Arapahoe Aquifer in the face of continued groundwater production from ECCV and surrounding groundwater users. The base predictive model will run from 2010 to 2060 and will use the first 50 years of the DBASM regional simulations performed by Banta and Paschke (2012) in setting the lateral boundaries, and the predictive non-ECCV groundwater production in the model. Several predictive scenarios will be performed under different assumptions about management of the existing ECCV wellfields and potential new ASR wellfields. Each of the scenarios will be evaluated for maintenance of the potentiometric surface, based on distance from the surface to the top of the Arapahoe Aquifer (available drawdown).
Method/Procedure:

Tasks

This task will build on the local refined model constructed in Task 2. The same hydrogeologic parameterization will be used in terms of structure and properties. In addition, the following steps will be performed:

1. Heads will be read from the "non-optimized" simulation from Banta and Paschke (2012) and used to set the lateral boundary heads from 2010 to 2060 in the local refined model.
2. Non-ECCV pumping will be transferred from the same simulation to the local refined model.
3. Scenario-specific ECCV pumping and ASR operations will be implemented in each predictive simulation. We expect some iteration will occur as these scenarios are explored, but will eventually produce "pessimistic", "expected", and "optimistic" cases, to bracket the range of potential results.
4. Each scenario will be evaluated based on maintenance of the potentiometric surface of the Arapahoe aquifer above the structural top of the Arapahoe. Specifically, the area of potentiometric surface dropping below a specified distance from the structural top will be summed. A greater area violating the minimum distance indicates a less favorable scenario.

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

This task will be documented as part of the final report to ECCV. This will include the electronic files that comprise the refined local model. The electronic modeling files may be used by ECCV in the future for further analyses.

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

ECCV will submit a six-month progress report to CWCB documenting the progress and completion of this task. This will include a description of any major issues and correctives actions taken to address the issues.

Tasks

Provide a detailed description of each task using the following format: (PLEASE DEFINE ACRONYMS)

Task 4 – Documentation

Description of Task:

The purpose of this task is to document the work accomplished in Tasks 1 through 3. This will be a public report documenting the development of ECCV's local model, simulated scenarios, results, and lessons learned. This document will serve as a reference document for ECCV as well as be a resource to other interested parties in the region interested in ASR.

Method/Procedure:

The report will compile information obtained through Tasks 1 and 3, including the Task 1 technical memo. The technical report will be written to two audiences: 1) ECCV and 2) entities within the region interested in ASR. Main sections of the report will entail background, project approach and predictive capabilities of the local model, description of scenarios, model results, lessons learned and next steps.

Tasks
Grantee Deliverable: (Describe the deliverable the grantee expects from this task)
One draft will be developed by HKI and INTERA for review by ECCV followed by a final draft incorporating comments.
CWCB Deliverable: (Describe the deliverable the grantee will provide CWCB documenting the completion of this task)
ECCV will submit a six-month progress report to CWCB documenting the progress and completion of this task. This will include a description of any major issues and correctives actions taken to address the issues. The final report developed for this task will also be provided to CWCB at the conclusion of this project.

Tasks
Provide a detailed description of each task using the following format: (PLEASE DEFINE ACRONYMS)
Task 5 – Project and Grant Administration
Description of Task:
This task includes project management activities necessary for project invoicing to ECCV by the consultant team (INTERA and HKI) as well as the activities necessary for the WSRF grant administration.
Method/Procedure:
The Consultant Team will provide monthly invoices to ECCV including a cover letter itemizing the work accomplished to date. The Consultant Team will also develop the six-month progress reports and final report required to receive WSRF grant monies. This will include draft versions for ECCV review and final versions for ECCV to submit to CWCB and the Metro and South Platte BRTs.
Grantee Deliverable: (Describe the deliverable the grantee expects from this task)
▪ Draft and final six-month progress reports for ECCV's submission to CWCB ▪ Draft and final report documenting the project for ECCV's submission to CWCB ▪ Monthly invoices from the consultant team
CWCB Deliverable: (Describe the deliverable the grantee will provide CWCB documenting the completion of this task)
This task includes the development of six-month progress reports to CWCB. This will include a description of any major issues and correctives actions taken to address the issues. A final report will also be submitted to CWCB summarizing the project and how it was completed, obstacles encountered and how these were overcome, confirmation that matching commitments have been fulfilled, and the final project report developed in Task 4.

Budget and Schedule

Exhibit B - Budget and Schedule: This Statement of Work shall be accompanied by a combined Budget and Schedule that reflects the Tasks identified in the Statement of Work and shall be submitted to CWCB in excel format. A separate excel formatted Budget is required for engineering costs to include rate and unit costs.

Reporting Requirements

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

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

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

Payments

Payment will be made based on actual expenditures, must include invoices for all work completed and must be on grantee's letterhead. The request for payment must include a description of the work accomplished by task, an estimate of the percent completion for individual tasks and the entire Project in relation to the percentage of budget spent, identification of any major issues, and proposed or implemented corrective actions.

The CWCB will pay the last 10% of the entire water activity budget when the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the water activity and purchase order or contract will be closed without any further payment. Any entity that fails to complete a satisfactory Final Report and submit to CWCB within 90 days of the expiration of a purchase order or contract may be denied consideration for future funding of any type from CWCB.

Performance Requirements

Performance measures for this contract shall include the following:
(a) Performance standards and evaluation: Grantee will produce detailed deliverables for each task as specified. Grantee shall maintain receipts for all project expenses and documentation of the minimum in-kind contributions (if applicable) per the budget in Exhibit B. Per Grant Guidelines, the CWCB will pay out the last 10% of the budget when the final deliverable is completed to the satisfaction of CWCB staff. Once the final deliverable has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment.
(b) Accountability: Per the Grant Guidelines full documentation of project progress must be submitted with each invoice for reimbursement. Grantee must confirm that all grant conditions have been complied with on each invoice. In addition, per the Grant Guidelines, Progress Reports must be submitted at least once every 6 months. A Final Report must be submitted and approved before final project payment.
(c) Monitoring Requirements: Grantee is responsible for ongoing monitoring of project progress per Exhibit A. Progress shall be detailed in each invoice and in each Progress Report, as detailed above. Additional inspections or field consultations will be arranged as may be necessary.
(d) Noncompliance Resolution: Payment will be withheld if grantee is not current on all grant conditions. Flagrant disregard for grant conditions will result in a stop work order and cancellation of the Grant Agreement.

Last Update: December 17, 2019

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Colorado Water Conservation Board

Water Supply Reserve Fund

EXHIBIT B - BUDGET AND SCHEDULE - Direct & Indirect (Administrative) Costs

Date: April 1, 2021

Water Activity Name: Aquifer Storage Recovery Modeling Assessment

Grantee Name: East Cherry Creek Valley Water and Sanitation District - Water Activity Enterprise (ECCV)

Task No.[1]	Description	Start Date[2]	End Date	Matching Funds (cash & in-kind)[3]	WSRF Funds (Basin & Statewide combined)[3]	Total
1	Conceptual Model Assessment	10/1/21	10/1/21	$22,000	$9,000	$31,000
2	Refine Model	12/1/2021	12/1/21	$6,375	$54,000	$60,375
3	Predictive Scenarios	2/15/2022	2/15/22	$1,375	$24,000	$25,375
4	Documentation	5/1/2022	5/1/22	$2,000	$34,000	$36,000
5	Project and Grant Administration	10/1/21	5/1/22	$1,000	$4,000	$5,000
			Total	**$32,750**	**$125,000**	**$157,750**

(1) The single task that include costs for Grant Administration must provide a labor breakdown (see Indirect Costs tab below) where the total WSRF Grant contribution towards that task does not exceed 15% of the total WSRF Grant amount.

(2) Round values up to the nearest hundred dollars.

• Additional documentation providing a Detailed/Itemized Budget may be required for contracting. Applicants are encouraged to coordinate with the CWCB Project Manager to determine specifics.

The CWCB will pay the last 10% of the entire water activity budget when the Final Report is completed to the satisfaction of the CWCB staff project manager. Once the Final Report has been accepted, the final payment has been issued, the water activity and purchase order (PO) or contract will be closed without any futher payment. Any entity that fails to complete a satisfactory Final Report and submit to the CWCB with 90 days of the expiration of the PO or contract may be denied consideration for future funding of any type from the CWCB.

• Additonally, the applicant shall provide a progress report every 6 months, beginning from the date of contract execution

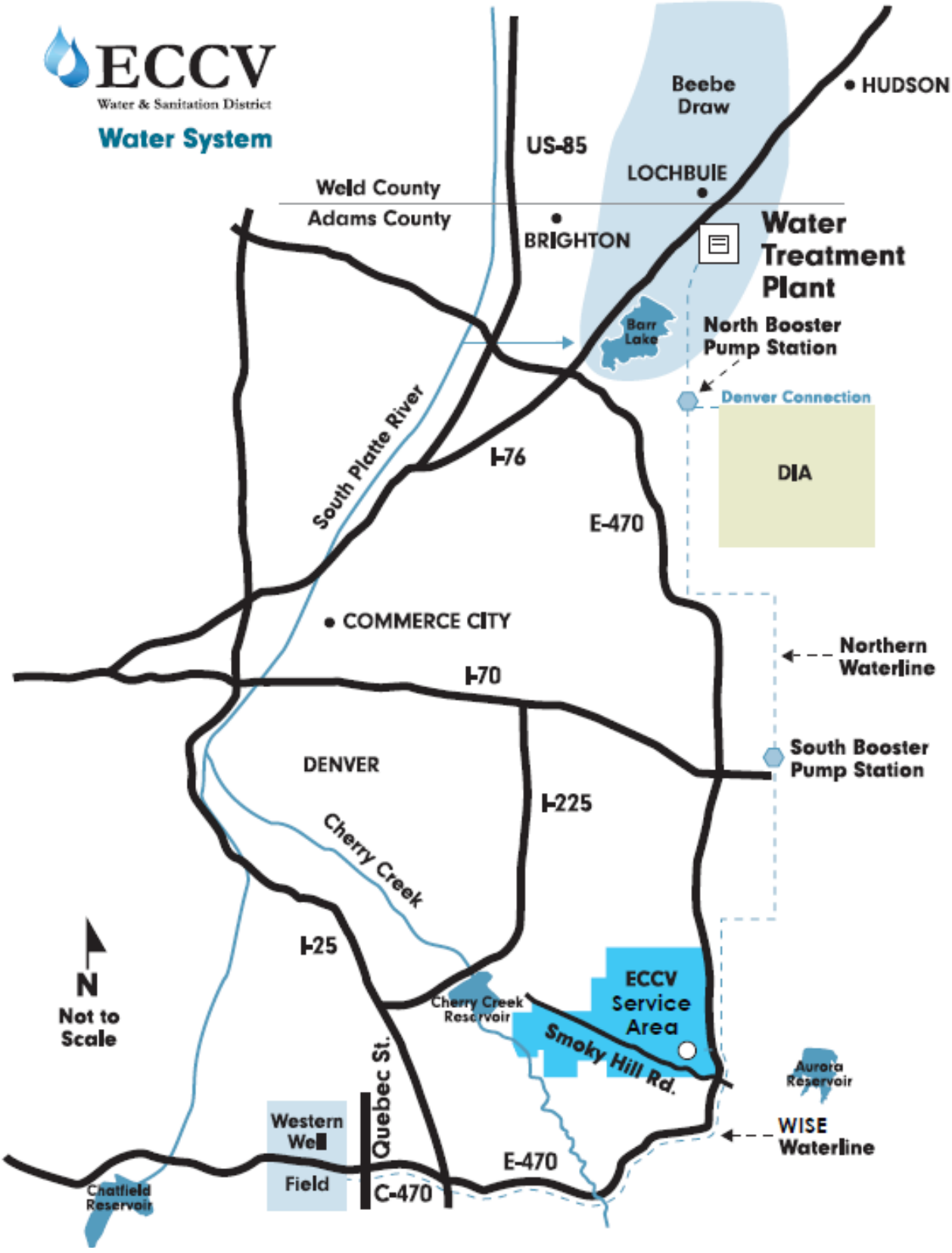

Figure 1: ECCV Water System

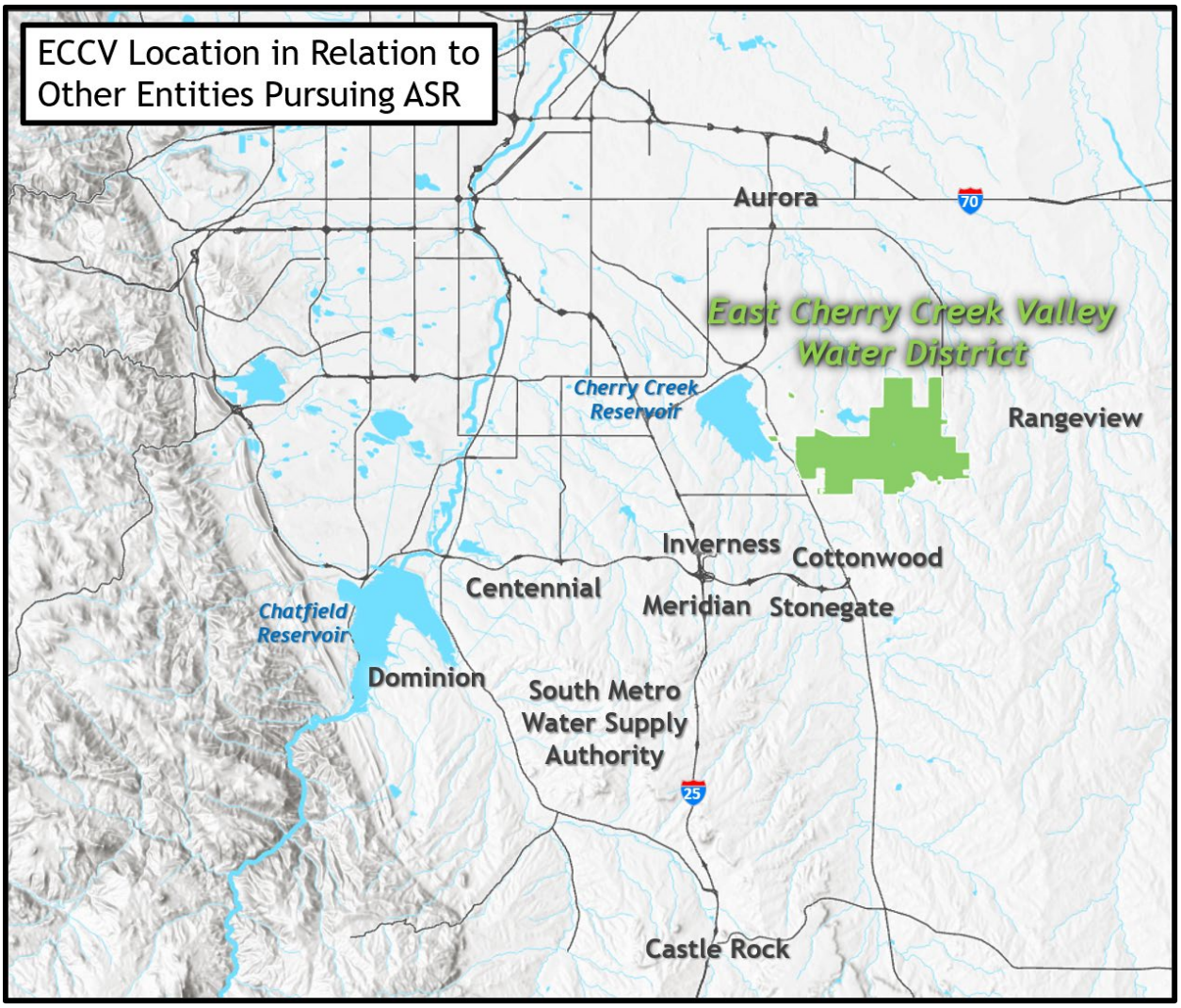

Figure 2: ECCV Location in Relation to Other Entities Pursuing ASR

Note: The City of Greeley is also pursuing ASR which is not shown in this graphic.

ECCV
Water & Sanitation District

April 1, 2021

Re: Aquifer Storage Recovery Modeling Assessment Grant Application

To Whom It May Concern:

East Cherry Creek Valley Water and Sanitation District - Water Activity Enterprise (ECCV) would like to express our support for the Aquifer Storage Recovery (ASR) Modeling Assessment application submitted to the South Platte Basin Roundtable (BRT), Metro BRT and to the Colorado Water Conservation Board (CWCB) for Statewide Water Supply Reserve Funding (WSRF).

This study will not only assist in firming ECCV's water supplies, helping to meet the 560,000 AF M&I gap referenced in the Colorado Water Plan, but also benefit the State and South Platte Basin by 1) investigating ASR to stabilize declining groundwater levels in the Arapahoe Aquifer and by 2) elevating the technical understanding of how ASR may be implemented throughout the region. These benefits directly support the M&I gap and water storage goals in the Colorado Water Plan while also meeting multiple priorities included in the South Platte Basin Implementation Plan.

ECCV is committing $25,000 of cash and $7,750 of in-kind services. As the Applicant, ECCV is aware of the obligation required for administering the contract. We plan on contracting with INTERA and Hydrokinetics in developing and conducting the modeling assessment. We look forward to working with the BRTs and the CWCB on this important project.

Sincerely,

Chris Douglass
Project Manager

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6201 S. Gun Club Road | Aurora, CO 80016
Ph: 303.693.3800 | *Fx:* 303.699.1228 | www.eccv.org

Ben Wade
ben.wade@state.co.us
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203

May 19, 2021

RE: Support for an Aquifer Storage Recovery (ASR) Modeling Assessment

Dear Mr. Wade,

On behalf of the Metro Basin Roundtable (MRT), I am pleased to write in support of the Colorado Water Conservation Board (CWCB) Water Supply Reserve Fund (WSRF) Grant application submitted by East Cherry Creek Valley Water and Sanitation District – Water Activity Enterprise (ECCV) for an ASR Modeling Assessment. The MRT officially voted in support of the ECCV grant request on May 13, 2021 and the South Platte Basin Roundtable (BRT) voted in support of the grant request on May 11, 2021. These BRT requests were for $25,000 each basin. ECCV is also applying for the Statewide WSRF grant for $75,000. The total WSRF grant request is $125,000 and ECCV is providing a $25,000 and $7,750 cash and in-kind match, respectively.

ECCV is in the process of exploring ASR to maintain groundwater levels in the currently mined Arapahoe Aquifer and sustain long-term well yields. Under this conjunctive management strategy, in wet years, renewable surface waters from the South Platte and legally reusable supplies would be diverted, treated, and injected into the Arapahoe Aquifer. The water would be recovered during dry years, with the goal of establishing a balance between the quantities recharged and the quantities pumped, stabilizing long term groundwater conditions, and preventing further declining of groundwater levels. This study entails the development of a groundwater modeling tool to simulate the Arapahoe Aquifer behavior in relation to ASR injection and extraction schedules to further investigate the feasibility of how well ASR may achieve sustainable groundwater conditions. Results of the study will inform ECCV's ASR operational decisions and be documented in a publicly available report. Other local entities pursuing ASR will have an opportunity to learn from the results of this study and apply appropriately.

This study will not only assist in firming ECCV's water supplies, help to meet the 560,000 AF Municipal & Industrial (M&I) gap referenced in the Colorado Water Plan, but will also benefit the State and South Platte Basin by 1) investigating ASR to stabilize declining groundwater levels in the Arapahoe Aquifer and by 2) elevating the technical understanding of how ASR may be implemented throughout the region. The study also corresponds with the following four elements of the 2015 South Platte Basin Implementation Plan: promote multi-purpose storage projects, maximize implementation of IPPs, maximize use of existing South Platte water supplies including groundwater, and manage the risks of climate change.

We encourage the CWCB to support this WSRF funding request, and we look forward to working with ECCV to implement this project and move towards the completion of this important endeavor.

Sincerely,

Barbara Biggs
Chair, Metro Basin Roundtable

May 20, 2021

Ben Wade
ben.wade@state.co.us
Colorado Water Conservation Board
1313 Sherman Street, Room 718
Denver, CO 80203

RE: Support for an Aquifer Storage Recovery (ASR) Modeling Assessment

Dear Mr. Wade,

On behalf of the South Platte Basin Roundtable (SPBRT), I am pleased to write in support of the Colorado Water Conservation Board (CWCB) Water Supply Reserve Fund (WSRF) Grant application submitted by East Cherry Creek Valley Water and Sanitation District – Water Activity Enterprise (ECCV) for an ASR Modeling Assessment. The SPBRT unanimously voted in support of the ECCV grant request on May 11, 2021 and the Metro Basin Roundtable (BRT) voted in support of the grant request on May 13, 2021. These BRT requests were for $25,000 each. ECCV is also applying for the Statewide WSRF grant for $75,000. The total WSRF grant request is $125,000 and ECCV is providing a $25,000 and $7,750 cash and in-kind match, respectively.

ECCV is in the process of exploring ASR to maintain groundwater levels in the currently mined Arapahoe Aquifer and sustain long-term well yields. Under this conjunctive management strategy, in wet years, renewable surface waters from the South Platte and legally reusable supplies would be diverted, treated and injected into the Arapahoe Aquifer. The water would be recovered during dry years, with the goal of establishing a balance between the quantities recharged and the quantities pumped, stabilizing long term groundwater conditions and preventing further declining of groundwater levels. This study entails the development of a groundwater modeling tool to simulate the Arapahoe Aquifer behavior in relation to ASR injection and extraction schedules to further investigate the feasibility of how well ASR may achieve sustainable groundwater conditions. Results of the study will inform ECCV's ASR operational decisions and be documented in a publicly available report. Other local entities pursuing ASR will have an opportunity to learn from the results of this study and apply appropriately.

This study will not only assist in firming ECCV's water supplies, helping to meet the 560,000 AF Municipal & Industrial (M&I) gap referenced in the Colorado Water Plan, but will also benefit the State and South Platte Basin by 1) investigating ASR to stabilize declining groundwater levels in the Arapahoe Aquifer and by 2) elevating the technical understanding of how ASR may be implemented throughout the region. The study also corresponds with the following four elements of the 2015 South Platte Basin Implementation Plan: promote multi-purpose storage projects, maximize implementation of IPPs, maximize use of existing South Platte water supplies including groundwater, and manage the risks of climate change.

We encourage the CWCB to support this WSRF funding request, and we look forward to working with ECCV to implement this project and move towards the completion of this important endeavor.

Sincerely,

Garrett Varra
Chair, South Platte Basin Roundtable