



COLORADO

Colorado Water
Conservation Board

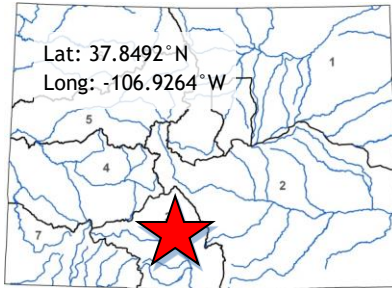
Department of Natural Resources

Water Engineering Education for the Next
Generation Research Experience for Teachers Program

Colorado School of Mines

November 2019 Board Meeting

Water Plan Grant Application



L O C A T I O N
<i>Counties:</i> Alamosa, Mineral, Rio Grande
<i>Drainage Basin:</i> Rio Grande

D E T A I L S	
<i>Total Project Cost:</i>	\$81,059
<i>Water Plan Grant Request:</i>	\$38,880
<i>Recommended Amount:</i>	\$38,880
<i>Other CWCB Funding:</i>	\$0
<i>Other Funding Amount:</i>	\$0
<i>Applicant Match:</i>	\$42,179
<i>Project Type(s):</i> Other	
<i>Project Category:</i> Engagement & Innovation	
<i>Measurable Result:</i> 60+ Coloradoans Impacted by Engagement Activity	

In 2015, the Colorado School of Mines (CSM) received a four-year grant from the National Science Foundation to run a six-week Research Experience for Teachers program called “Water and Energy Education for the Next Generation (WE²NG)”. Currently, the applicant hosts twelve to fourteen science teachers in Denver and Jefferson County per year for a six-week professional development program at the School of Mines each summer. CSM trains them in current research practices in the field of hydrology, with a specific focus on urban hydrology in the Denver area.

CSM has declared the program a success, engaging 45 teachers over four years, and the National Science Foundation to re-apply for this grant to support the program for another three years through 2022. With Engagement and Innovation funding, CMS would like to enhance the program and increase the teacher’s water literacy by including an additional field trip to other watersheds, outside of the Front Range, in Colorado beginning in the Rio Grande Basin.

The one-week fieldtrip is an opportunity to expose teachers to the agriculture industry, the farmers, and the people protecting Colorado’s water in rural Colorado. By bringing the science teachers to rural areas of Colorado, the program will be able to provide a more comprehensive view of Colorado’s water issues such as water storage in irrigation reservoirs and groundwater re-charge by touring those facilities and meeting with the agencies responsible for managing the water resources.

Throughout the program, Colorado School of Mines graduate students and research faculty associated with the WE²NG program, will visit each teacher’s classroom a minimum of three times throughout the school year to support the teacher’s implementation of the curriculum they develop in the program and any other necessary research support.

This project is consistent with the goals in the Water Plan of advancing water education by increasing teacher’s knowledge that is passed towards K-12 students in Denver and Jefferson County School Districts.

Funding Recommendation: Staff is recommending a grant of \$38,880 from the Engagement and Innovation category of funding.



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Colorado Water Conservation Board

Water Plan Grant Application

Instructions

To receive funding for a Water Plan Grant, applicant must demonstrate how the project, activity, or process (collectively referred to as “project”) funded by the CWCB will help meet the measurable objectives and critical actions in the Water Plan. Grant guidelines are available on the CWCB website.

If you have questions, please contact CWCB at (303) 866-3441 or email the following staff to assist you with applications in the following areas:

Water Storage Projects
Conservation, Land Use Planning
Engagement & Innovation Activities
Agricultural Projects
Environmental & Recreation
Projects

Anna.Mauss@state.co.us
Kevin.Reidy@state.co.us
Ben.Wade@state.co.us
Alexander.Funk@state.co.us
Chris.Sturm@state.co.us

FINAL SUBMISSION: Submit all application materials in one email to

waterplan.grants@state.co.us

in the original file formats [Application (word); Statement of Work (word); Budget/Schedule (excel)]. Please do not combine documents. In the subject line, please include the funding category and name of the project.

Water Project Summary

Name of Applicant	Dr. Terri Hogue, Colorado School of Mines	
Name of Water Project	Water Engineering Education for the Next Generation (WE ² NG), Research Experience for Teachers Program	
CWP Grant Request Amount		\$ 38,880
Other Funding Sources <u>Colorado School of Mines</u>		\$ 42,179
Other Funding Sources _____		\$
Applicant Funding Contribution		\$
Total Project Cost		\$ 81,059



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Applicant & Grantee Information	
Name of Grantee(s)	Colorado School of Mines, RET program
Mailing Address	Coolbaugh Room 206, 1500 Illinois Street, Golden CO 80401
FEIN	
Organization Contact	Dr. Terri Hogue
Position/Title	Department Head, Civil and Environmental Engineering
Email	thogue@mines.edu
Phone	(303) 384 - 2588
Grant Management Contact	Elizabeth Sanders
Position/Title	Contracts Specialist
Email	evsanders@mines.edu
Phone	(303) 384-2302
Name of Applicant (if different than grantee)	
Mailing Address	
Position/Title	
Email	
Phone	
Description of Grantee/Applicant	
Provide a brief description of the grantee's organization (100 words or less).	
<p>Colorado School of Mines (CSM) is a top research and engineering university in Colorado. The Hydrologic Science and Engineering (HSE) program at CSM is nationally recognized as a "top-5" program with broad expertise in watershed-scale water resources investigations, risk assessment, subsurface hydrogeology, hydrogeophysics and water quality, with particular expertise in field and modeling investigations. The Civil and Environmental Engineering (CEE) department (home to many of the HSE faculty, including department head, Dr. Terri Hogue) has some of the world's leading experts on water treatment and reuse technology. In addition, CSM's Liberal Arts and International Studies department (LAIS) conducts nationally recognized research in community engagement, particularly with respect to perceptions of technological risk and communication between the public, government, and industry.</p>	



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Type of Eligible Entity (check one)	
X	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.
	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: Private parties may be eligible for funding.
	Non-governmental organizations (NGO): Organization that is not part of the government and is non-profit in nature.
	Covered Entity: As defined in Section 37-60-126 Colorado Revised Statutes .

Type of Water Project (check all that apply)	
	Study
	Construction
	Identified Projects and Processes (IPP)
X	Other: Public Engagement

Category of Water Project (check the primary category that applies and include relevant tasks)		
	Water Storage - Projects that facilitate the development of additional storage, artificial aquifer recharge, and dredging existing reservoirs to restore the reservoirs' full decreed capacity and Multi-beneficial projects and those projects identified in basin implementation plans to address the water supply and demand gap.. <i>Applicable Exhibit A Task(s):</i>	
	Conservation and Land Use Planning - Activities and projects that implement long-term strategies for conservation, land use, and drought planning. <i>Applicable Exhibit A Task(s):</i>	
X	Engagement & Innovation - Activities and projects that support water education, outreach, and innovation efforts. Please fill out the Supplemental Application on the website. <i>Applicable Exhibit A Task(s):</i>	
	Agricultural - Projects that provide technical assistance and improve agricultural efficiency. <i>Applicable Exhibit A Task(s):</i>	
	Environmental & Recreation - Projects that promote watershed health, environmental health, and recreation. <i>Applicable Exhibit A Task(s):</i>	
	Other	Explain:

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Location of Water Project	
Please provide the general county and coordinates of the proposed project below in decimal degrees . The Applicant shall also provide, in Exhibit C, a site map if applicable.	
County/Countries	Mineral County, Rio Grande County, and Alamosa County
Latitude	37.8492° N
Longitude	106.9264° W

Water Project Overview
<p>Please provide a summary of the proposed water project (200 words or less). Include a description of the project and what the CWP Grant funding will be used for specifically (e.g., studies, permitting process, construction). Provide a description of the water supply source to be utilized or the water body affected by the project, where applicable. 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, and area of habitat improvements, where applicable. If this project addresses multiple purposes or spans multiple basins, please explain.</p> <p>The Applicant shall also provide, in Exhibit A, a detailed Statement of Work, Budget, Other Funding Sources/Amounts and Schedule.</p>
<p>We are seeking support to take 12 kindergarten through twelfth grade science teachers on a five- day watershed tour of the Rio Grande to expose them to a wide range of Colorado water issues. Currently we host twelve to fourteen science teachers for a six-week professional development program at the School of Mines each summer. We train them in current research practices in the field of hydrology, with a specific focus on urban hydrology in the Denver area. Our objective in applying for this grant is to expand the program to include an additional field trip to other watersheds, outside of the Front Range, in Colorado. By bringing the science teachers to rural areas of Colorado we will be able to provide a more comprehensive view of Colorado's water issues.</p> <p>CSM received a four-year grant from the National Science Foundation to run the six-week Research Experience for Teachers (RET) program from 2015-19. The program at CSM, called Water and Energy Education for the Next Generation (WE²NG) has been a success, engaging 45 teachers over four years, and we have been encouraged by the NSF to re-apply for this grant to support the program for another three years (2020-22). We would like to build on our program's success and enhance the teacher's water literacy. We are changing the name of the program slightly, to align better with Dr. Hogue's current research, the program will now be called: Water Engineering Education for the Next Generation (also WE²NG).</p> <p>We are asking the CWCB to assist in funding this valuable program by specifically supporting a five- day field trip for teachers to a rural watershed.</p>



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Measurable Results		
To catalog measurable results achieved with the CWP Grant funds, please provide any of the following values as applicable:		
	New Storage Created (acre-feet)	
	New Annual Water Supplies Developed or Conserved (acre-feet), Consumptive or Nonconsumptive	
	Existing Storage Preserved or Enhanced (acre-feet)	
	Length of Stream Restored or Protected (linear feet)	
	Efficiency Savings (indicate acre-feet/year OR dollars/year)	
	Area of Restored or Preserved Habitat (acres)	
	Quantity of Water Shared through Alternative Transfer Mechanisms	
	Number of Coloradans Impacted by Incorporating Water-Saving Actions into Land Use Planning	
60+	Number of Coloradans Impacted by Engagement Activity	
	Other	Explain:

Water Project Justification
<p>Provide a description of how this water project supports the goals of Colorado's Water Plan, the most recent Statewide Water Supply Initiative, and the applicable Roundtable Basin Implementation Plan and Education Action Plan. 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).</p> <p>The proposed water project shall be evaluated based upon how well the proposal conforms to Colorado's Water Plan Framework for State of Colorado Support for a Water Project (CWP, Section 9.4, pp. 9-43 to 9-44;)</p> <p>This project supports multiple goals of Colorado's Water Plan, the Statewide Water Supply Initiative, and the Rio Grande Basin Implementation Plan and Education Action Plan through enhancing the education and resources of our state's science teachers, this project will improve public literacy on water stewardship, watershed health, and conservation of water resources.</p> <p><u>Colorado's Water Plan</u> <u>Section 6.2 (Meeting Colorado's Water Gaps, p. 6-15-16)</u></p> <ol style="list-style-type: none">1. "The plan addresses the gaps from multiple perspectives such as water storage, reuse, recycling, integrated water management, restoration, and conservation."2. Basin Implementation Plan goals: "Continue participation, education, outreach and communication." <p>The additional one-week fieldtrip to an area such as the San Luis Valley (SLV) will expose Colorado's science teachers to issues around water storage in the Rio Grande basin (we will visit reservoirs and learn about the groundwater depletion and re-charge measures in the SLV). During the one-week fieldtrip, made possible through this grant, teachers will also learn about water management for agriculture, water compact deliveries, in-stream flows, and recreation. The fieldtrip will be a one-week immersion into rural water issues engaging teachers from the Front Range with multiple stakeholders in the SLV. Teachers will return to Denver and Jefferson County with an increased knowledge of water issues and the ability to educate their students.</p>



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Section 6.2 (Meeting Colorado's Water Gaps, p. 6-30)

1. *"Ensure that agriculture remains a viable economic driver in Colorado by supporting food security, jobs, and rural communities while protecting private property rights."*

With the population growth in Denver and the Front Range, more urban dwellers are becoming disconnected from rural Colorado. The one-week fieldtrip is an opportunity to expose teachers to the agriculture industry, the farmers, and the people protecting Colorado's water in rural Colorado. For city people to dig a fresh potato out of the ground and learn about the precise business and science of agriculture can be a paradigm-shifting moment. Teachers that learn about agriculture first-hand will share the experience with their students who in-turn will talk to their parents about it. Part of the focus of the fieldtrip will be on the vitality of agriculture and the imperative measures happening on the ground for water restoration and conservation. A professionally produced video of the fieldtrip, including visits to potato, alfalfa, and mushroom farms will be something teachers can share with their students to more fully engage them.

Section 6.3.4 (Agricultural Conservation, Efficiency and Reuse, 6-100)

1. *"Rio Grande Basin Roundtable: Operate, maintain, rehabilitate, and create necessary infrastructure to the basin's long-term water needs, including storage."*

The RET fieldtrip to the SLV will expose participants to water infrastructure such as irrigation structures and long-term storage including existing reservoirs and future proposed storage projects and groundwater re-charge efforts.

Section 6.5 (Municipal, Industrial, and Agricultural Infrastructure Projects and Methods, p. 6-127)

1. *"Use water efficiently to reduce overall future water needs"*

Increasing Colorado's science teachers' knowledge of water conservation and its role in future water management will be one avenue to reach a broader audience (students and their parents). Teachers will finish the seven-week program with a deeper understanding of Colorado's water issues, with first-hand experiences meeting farmers, learning about irrigation and conservation measures, all documented in a video produced to share with their students.

Section 6.6 (Environmental and Recreational Projects and Methods, p. 6-157-159)

1. *"Protection and restoration projects to protect watershed, habitat, water quality, species connectivity."*
2. *"Colorado's Instream Flow and Natural Lake Level Program"*

In addition to enhancing participants knowledge of urban water issues in the Front Range, our fieldtrip to the SLV will expose the teachers to stream restoration projects along the Rio Grande and its tributaries, stream management planning, water quality protection measures, land-use reclamation to improve water quality, and a variety of efforts to conserve wildlife and enhance threatened species' habitat such as the Rio Grande cutthroat trout, Rio Grande chub and Rio Grande sucker. We will highlight stakeholders on-going efforts in the SLV and Upper Rio Grande to provide instream flows to protect these species and many more. Many of these stream restoration projects are conducted by the Rio Grande Headwaters Restoration Project, an organization we will visit during the fieldtrip (please see letter of support).

Section 7.1 (Watershed Health and Management, p. 7-6-10)

1. *"All basins identify wildfire as a watershed health concern."*
2. *Informing the public, engaging stakeholders, and building coalitions are important to watershed health and protection*
3. *Actions include: "Coordinate statewide watershed-coalition and partnership plans, projects, monitoring, and adaptive management strategies."*



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Much of Dr. Hogue's research has been on forest fire impacts on water resources in Colorado, including studies on the 2013 West Fork Complex Fire and the 2018 416 Fire. Our fieldtrip will expose participants to ongoing efforts by the Hogue research group and local stakeholders to study fire impacts on the hydrology, water quality and ecology of receiving streams. Recent research by Dr. Hogue's group, highlights watershed recovery and forest resiliency. Results from research will guide forest management to minimize damage from future fires. The Upper Rio Grande is an ideal location to demonstrate the impacts of forest fire and the dynamic recovery of a healthy watershed.

Rust, A.J., Hogue, T.S., Saxe, S. & McCray, J. Post-fire water-quality response in the western United States. *International Journal of Wildland Fire* **27**, 203 (2018).

Rust, A.J., Saxe, S., McCray, J., Rhoades, C.C., & Hogue, T.S. Evaluating the factors responsible for post-fire water quality response in forests of the Western USA. *International Journal of Wildland Fire* (in press).

Section 7.3 (Water Quality, p. 7-17-30)

1. *Protection and restoration of water quality is key to support Colorado's water classified uses*
2. *In agreement with the Water Quality Control Commissions' goals: to "Protect all designated uses by attaining water quality standards through improved implementation of the CWA and the Colorado Water Quality Control Act and associated regulations." And "Restore impaired water quality to attainable standards through improved implementation of the CWA and the Colorado Water Quality Control Act and associated regulations."*

While our program does not directly improve water quality, we will be training teachers who will then show their students how to measure and collect water quality samples. The research conducted during the six-week program on the CSM campus includes training on water quality monitoring. Teachers are brought to the urban South Platte and Clear Creek in Golden to collect water samples to analyze in a lab for nutrients and total suspended solids. On site, teachers measure temperature, pH, specific conductivity, total dissolved solids, and turbidity. Additionally, teachers are taught how to collect and evaluate aquatic macroinvertebrate samples as indicators of stream water quality. The one-week fieldtrip to the SLV and Upper Rio Grande will include water quality monitoring and macroinvertebrate collection. Monitoring water quality and macroinvertebrates are an important way to protect Colorado's water quality into the future. We will be training 12 participants a year to return to their classrooms and engage their students in water quality monitoring.

Statewide Water Supply Initiative

Section 8 Recommendation (p. 8-15)

1. (15) *"The CWCB, in consultation with other state agencies, shall develop and implement a plan to educate and promote stewardship of water resources that recognizes water's critical role in supporting the quality of life and economic prosperity of all Coloradans."*

The focus of the CSM WE²NG program is water. We will enhance science teachers' knowledge of Colorado's water resources as part of the research experience. The seven-week program will promote water stewardship through education. After being immersed in a high-level program on water resources and engineering, each teacher's water literacy will be expansive. The fieldtrip will be a memorable experience that teachers will share in their classroom through curriculum they develop during the program and the video from the fieldtrip.



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The Rio Grande Basin Round Table emphasizes agriculture as a key industry, employer, and lifestyle within the basin with all of agriculture's many aspects, products and jobs. Our fieldtrip to the SLV will highlight the importance of viable agriculture and the industries dependent on reliable high quality water resources.

Rio Grande Basin Implementation Plan

Section 4.1 (Agricultural Needs p. 60-65)

1. *"Rehabilitation of river diversion structures"*
2. *"Physical and legal shortages and reliance on groundwater"*

The one-week fieldtrip to the SLV supported through this grant will include visits to diversion and irrigation structures. The Rio Grande in the SLV is an over-allocated water resource and all stakeholders continue to work judiciously to support expanding population and agriculture with the same limited volume of water. Showing teachers these on-the-ground solutions and introducing participants to stakeholders, including Rio Grande Round Table members will directly address goals of the Rio Grande Basin Implementation Plan. (See letter of support from Rio Grande Round Table)

Section 4.3.1 (Watershed Health And Ecosystem Functions, p. 74)

1. *"In addition to supplying water, the watershed provides critical ecosystem services, such as forests and rangelands, healthy soils and riparian areas, and critical habitat for wildlife and fish....As such, it is important to improve the resistance to and resiliency following disturbances to watershed functions to protect the water supply source."*

The fieldtrip will expose participants to an area impacted by the state's second largest forest fire and a forested watershed effected by beetle kill. Past and current research by the principal investigator and leader of the CSM WE²NG program has illustrated the importance of resilient watersheds. Teachers will learn about Dr. Hogue's research on watershed-scale disturbances as well as meeting forest and watershed managers of the Rio Grande National Forest.

Rio Grande Basin Implementation Education Action Plan

Section 7.2 (Topic 2: Education, Table 2, p. 160)

1. *Outreach events for agricultural water users, community members and public officials*
2. *Outreach, education, and participation to further the purpose of the Rio Grande Basin Round Table as they relate to preservation and sustainability*

The CSM WE²NG Research Experience for Teachers program is a seven week long outreach program focused on water. The one-week fieldtrip to the SLV will provide an enriching experiencing for participants. To see how food is grown first-hand is an eye-opening experience for city dwellers, far removed from agriculture. Through exposing teachers to the agricultural industry and community, and providing a video of the experience, teachers will share their knowledge with their students. Teaching the next generation the importance of water resources, we can ensure that our resources will be sustainably conserved into the future.

Related Studies

Please provide a list of any related studies, including if the water project is complementary to or assists in the implementation of other CWCB programs.

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This weeklong watershed fieldtrip for teachers is an engagement activity which is complementary to CSM's WE²NG Research Experience for Teachers program. We believe that providing hands on experience and exposing the teachers to different perspectives on water through fieldtrips they will be better prepared to teach water science to their students.

CSM's WE²NG RET program's success has been studied and written about in the following journal article:

Schneider, K., A. Martin, and T.S. Hogue (2019). Evaluation of an NSF Research Experience for Teachers (RET) program for STEM development: Water-Energy Education for the Next Generation (WE²NG) *in review in Advances in Engineering Education*

In agreement with the findings from *Science Teacher's Learning*, the National Research Council's Committee on Highly Successful Schools or Programs for K-12 STEM Education (2011) advocates for professional development that focuses on enhancing teachers content knowledge and provides multiple opportunities for teachers learning over sustained periods of time.

Unfortunately, STEM professional development "is often short, fragmented, ineffective, and not designed to address the specific need of individual teachers". From: Committee on Highly Successful Schools of Programs for K-12 STEM Education. Successful K-12 STEM Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics. (National Academic Press, 2011) doi:10.17226/13158. The CSM WE²NG program is an extended, immersive experience that increases teachers' confidence and subject knowledge.

There is evidence from participant surveys that the CSM WE²NG RET program works, and the teachers feel better prepared and more knowledgeable in their subject matter. Enhancing the program with a fieldtrip to a rural watershed will provide another opportunity for the teachers to learn over an additional week of hands-on experience and a video of the fieldtrip so teachers will be able to bring back what they learn to the classroom.

Previous CWCB Grants, Loans or Other Funding

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; 6) Percentage of other CWCB funding for your overall project.

Dr. Terri Hogue, the applicant from Colorado School of Mines, has not been awarded any previous funding from the CWCB.

Taxpayer Bill of Rights

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



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TABOR issues will not affect our application, Colorado School of Mines is a non-profit organization

Submittal Checklist

	I acknowledge the Grantee will be able to contract with CWCB using the Standard Contract .
Exhibit A	
X	Statement of Work ⁽¹⁾
X	Budget & Schedule ⁽¹⁾
	Engineer's statement of probable cost (projects over \$100,000)
	Letters of Matching and/or Pending 3 rd Party Commitments ⁽¹⁾
Exhibit C	
	Map (if applicable) ⁽¹⁾
	Photos/Drawings/Reports
	Letters of Support (Optional)
	Certificate of Insurance (General, Auto, & Workers' Comp.) ⁽²⁾
	Certificate of Good Standing with Colorado Secretary of State ⁽²⁾
	W-9 ⁽²⁾
	Independent Contractor Form ⁽²⁾ (If applicant is individual, not company/organization)
Engagement & Innovation Grant Applicants ONLY	
X	Engagement & Innovation Supplemental Application ⁽¹⁾

(1) Required with application.

(2) Required for contracting. While optional at the time of this application, submission can expedite contracting upon CWCB Board approval.

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ENGAGEMENT & INNOVATION GRANT FUND SUPPLEMENTAL APPLICATION

Introduction & Purpose

Colorado's Water Plan calls for an outreach, education, public engagement, and innovation grant fund in Chapter 9.5.

The overall goal of the Engagement & Innovation Grant Fund is to enhance Colorado's water communication, outreach, education, and public engagement efforts; advance Colorado's water supply planning process; and support a statewide water innovation ecosystem.

The grant fund aims to engage the public to promote well-informed community discourse regarding balanced water solutions statewide. The grant fund aims to support water innovation in Colorado. The grant fund prioritizes measuring and evaluating the success of programs, projects, and initiatives. The grant fund prioritizes efforts designed using research, data, and best practices. The grant fund prioritizes a commitment to collaboration and community engagement. The grant fund will support local and statewide efforts.

The grant fund is divided into two tracks: engagement and innovation. The Engagement Track supports education, outreach, communication, and public participation efforts related to water. The Innovation Track supports efforts that advance the water innovation ecosystem in Colorado.

Application Questions

*The grant fund request is referred to as "project" in this application.

Overview (answer for both tracks)
<p>In a few sentences, what is the overall goal of this project? How does it achieve the stated purpose of this grant fund (above)?</p> <p>The project will enhance the knowledge of science teachers, their students and their families on water issues in Colorado. Currently, we engage 12 science teachers per summer and teach them about urban hydrology around Golden and Denver. Support from this grant will provide an opportunity to include a fieldtrip to include more important topics in the Colorado Water Plan. The goal of the fieldtrip will be to expose science teachers from the Front Range to rural water issues to increase their water literacy. Each year we will bring the teachers to the San Luis Valley to expose them to agriculture and irrigation practices, local watershed groups improving water storage and managing river compacts, reclaimed abandoned mine sites to understand challenges with our state's heritage mining and the state's effort to clean up these point and non-point pollution sources, and local recreation industries dependent on healthy waters.</p> <p>A professionally produced video of the fieldtrip with each teacher featured in the video will provide a fun and efficient way for teachers to share their experience with their students when they return to their classrooms.</p>
<p>Who is/are the target audience(s)? How will you reach them? How will you involve the community?</p> <p>Our target audience are the science teachers of Denver and Jefferson County School Districts. With support from this grant, we will bring them on an educational fieldtrip and provide a professionally produced video of the experience for them to bring back to their students in the classroom.</p>



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Overview (answer for both tracks)
<p>Describe how the project is collaborative or engages a diverse group of stakeholders. Who are the partners in the project? Do you have other funding partners or sources?</p>
<p>The six-week NSF funded RET program exposes participants to stakeholders in the Front Range, including water providers (Denver Water, Northern Water), water reclamation (Metro Wastewater Reclamation District), and industry (Coors among others). With the support of this grant, our WE²NG RET program could be extended an additional week to include a fieldtrip to rural Colorado provide engagement with a variety of different stakeholders such as farmers, water conservation districts, the outdoor recreation industry, and regulatory agencies. We currently have letters of support from several stakeholders who will participate in the fieldtrip including the Bureau of Reclamation, the Rio Grande Round Table and the Rio Grande Headwaters Project.</p>
<p>Describe how you plan to measure and evaluate the success and impact of the project?</p>
<p>A professional external evaluator will be hired to develop and administer a comprehensive assessment of the WE²NG program. The evaluation plan will qualitatively and quantitatively measure the progress and impact in achieving the objectives of the whole program. To evaluate the impact on teacher participants, their water resource content knowledge as well as their perspectives on science, engineering, and research will be assessed. Formative weekly assessments of teachers will serve as periodic measures to chart the increase in participant knowledge and shifts in perspectives. Pre-fieldtrip and post-fieldtrip surveys will be administered to participants to provide feedback on the one-week fieldtrip.</p> <p>Additionally, graduate students and research faculty associated with the WE²NG RET program at CSM, will visit each teacher's classroom a minimum of three times throughout the school year to support the teacher's implementation of the curriculum they develop in the program and any other necessary research support.</p> <p>Finally, for the duration of the program, long-term tracking via follow-up surveys and interviews of participants will be used to determine what types of sustainable influences the WE²NG program had on teachers, students, and curricula. These results will be compiled in an Impact Report and used to advocate for future research, educator and industry collaboration projects.</p>
<p>What research, evidence, and data support your project?</p>
<p>Previous year's post-program surveys, where teachers evaluated various aspects of the WE²NG program, feedback was highly positive across-the-board. Thus, the WE²NG program is a highly effective STEM professional development model for educators of ranging abilities and K-12 grade levels, with the ability to increase STEM knowledge, perspective and enthusiasm in participants.</p> <p>These results are highlighted in: Schneider, K., A. Martin, and T.S. Hogue (2019). Evaluation of an NSF Research Experience for Teachers (RET) program for STEM development: Water-Energy Education for the Next Generation (WE²NG) <i>in review in Advances in Engineering Education</i></p>
<p>Describe potential short- and long-term challenges with this project.</p>



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Overview (answer for both tracks)

Feedback from the teachers in our past six-week program indicates that many participants felt that they could have been better informed about program logistics before they began. The program is filled with extensive research and curriculum development for the duration of the six weeks. Participants initially feel overwhelmed by the fast pace of the program. We will address this challenge by adding more time for preparation before the program starts and during the first few days of the program, with reflection and discussion time throughout the program.

The additional one-week field trip to the San Luis Valley with a large group will require some logistical coordination, however, with enough planning, this challenge is easily managed. We will be in a position to share the itinerary and provide preparatory material (links to relevant websites, reading material and other media) ahead of the fieldtrip to provide participants with background information on the San Luis Valley and the Upper Rio Grande.

Please fill out the applicable questions for either the Engagement Track or Innovation Track, unless your project contains elements in both tracks. If a question does not relate to your project, just leave it blank. Please answer each question that relates to your project. Please reference the relevant documents and use chapters and page numbers (Colorado's Water Plan, Basin Implementation Plan, PEPO Education Action Plan, etc.).

Engagement Track

Describe how the project achieves the education, outreach, and public engagement measurable objective set forth in Colorado's Water Plan to "significantly improve the level of public awareness and engagement regarding water issues statewide by 2020, as determined by water awareness surveys."

The primary goal of CSM's WE²NG program is to engage Colorado's educators in water issues and increase their awareness. The NSF funded six-week campus program will focus on urban hydrology and water issues while the additional one week fieldtrip funded through this grant will introduce the teachers to rural water issues including agriculture, reclamation, storage, compact delivery, and outdoor recreation. The nature of the CSM program is education and involves engaging teachers with a variety of water resource stakeholders.

Describe how the project achieves the other measurable objectives and critical goals and actions laid out in Colorado's Water Plan around the supply and demand gap; conservation; land use; agriculture; storage; watershed health, environment, and recreation; funding; and additional.

Colorado's Water Plan

Section 6.2 (Meeting Colorado's Water Gaps, p. 6-15-16)

1. *"The plan addresses the gaps from multiple perspectives such as water storage, reuse, recycling, integrated water management, restoration, and conservation."*

With support from the Water Plan Grant, the School of Mines will be able to bring urban science teachers to a watershed in rural Colorado where agriculture and outdoor recreation are important industries. The teachers will learn about water storage in irrigation reservoirs and groundwater re-charge by touring these facilities and meeting with the agencies responsible for managing the water resources. The San Luis Valley is an excellent example of a community that has implemented integrated water management to satisfy growing agriculture, population, and recreation industry and compact obligations. During the six-week portion of the program on the Mines campus, the teachers will visit Denver and Northern Water reuse and recycling facilities to gain a complete perspective on water conservation in Colorado.



Last Updated: November 2018

Section 6.6 (Environmental and Recreational Projects and Methods, p. 6-157-159)

1. *“Protection and restoration projects to protect watershed, habitat, water quality, species connectivity.”*

The CSM WE²NG teachers will visit stream restoration and mining reclamation projects in the Upper Rio Grande to highlight the importance of watershed protection and reclamation in the headwaters. The tour of the San Luis Valley and the Rio Grande headwaters will compliment their research education on urban hydrology and the habitat and water quality impairment in urban systems. We hope to provide a strong technical research-based understanding of all watershed issues in Colorado for the teachers so that they may be better equipped to demonstrate the same knowledge to their students.

Section 7.1 (Watershed Health and Management, p. 7-6-10)

1. *Informing the public, engaging stakeholders, and building coalitions are important to watershed health and protection*

Support from the Water Plan grant will allow Dr. Hogue and the CSM team to introduce the WE²NG teachers to members of the Rio Grande Roundtable, farmers, government agencies working on mine reclamation and watershed protection, and stakeholders engaged in forest health management, all of whom have already agreed to help and participate in the fieldtrip.

Describe how the project achieves the education, outreach, and public engagement goals set forth in the applicable Basin Implementation Plan(s).

Section 7.3 (Rio Grande Basin Long-Range Outreach Strategies, p.161)

1. *“The RGBRT recognizes the importance of a balanced and ongoing outreach plan. The Basin has built its public communications on three key ideals- outreach, education, and participation- across all demographics... To achieve this goal the RGBRT will use strategies such as...educational opportunities.”*

The proposed fieldtrip to the San Luis Valley and Upper Rio Grande is an opportunity for outreach, education and communication with science teachers from the Front Range. The fieldtrip video will allow teachers to bring the experience home to their classroom to expose their students to Colorado's important agriculture, outdoor recreation, and natural resource industries dependent on a healthy Rio Grande. This is an excellent educational opportunity for the RGBRT to reach across to citizens in another very different basin.

Describe how the project achieves the basin roundtable's PEPO Education Action Plans.

Rio Grande Basin Implementation Education Action Plan

Section 7.2 (Topic 2: Education, Table 2, p. 160)

1. *Outreach events for agricultural water users, community members and public officials*

The CSM fieldtrip to the Upper Rio Grande will be a one-week outreach event pairing Front Range educators with farmers, community members and public officials. Support from the Water Plan grant would allow CSM to bring 12 different teachers on this fieldtrip each year for three years.

Last Updated: November 2018

Innovation Track
Describe how the project enhances water innovation efforts and supports a water innovation ecosystem in Colorado.
Describe how the project engages/leverages Colorado's innovation community to help solve our state's water challenges.
Describe how the project helps advance or develop a solution to a water need identified through TAP-IN and other water innovation challenges. What is the problem/need/challenge?
Describe how this project impacts current or emerging trends; technologies; clusters, sectors, or groups in water innovation.



Last Updated: November 2018

Colorado Water Conservation Board

Water Plan Grant - Exhibit A

Statement Of Work

Date:	7/14/19
Name of Grantee:	Dr. Terri Hogue, Colorado School of Mines (CSM)
Name of Water Project:	Water Engineering Education for the Next Generation Research Experience for Teachers (WE ² NG RET)
Funding Source:	National Science Foundation and CWCB Water Plan grant

Water Project Overview:

The Colorado School of Mines (CSM) National Science Foundation (NSF) Research Experience for Teachers (RET) Site – *Water Engineering Education for the Next Generation (WE²NG)* -if funded by NSF, will continue to advance public knowledge and dialogue on water issues in the western United States through integration of teachers, and ultimately their students, with cutting-edge water research and technology. WE²NG will be an updated and improved version of the current CSM RET professional development program: *Water-Energy Education for the Next Generation (WE²NG)*, which is in its final program year. Experience in the RET program over the last four years has provided structure for a strong program that we plan to improve upon and expand. If CSM receives support from the National Science Foundation for an additional three years, the new version of the program will provide six weeks of summer training, a one-week fieldtrip and year-round support for 25-30 middle school, high school teachers over three years. Proposals for the NSF program are due in September 2019 and CSM will be notified in January 2020 if our RET program has been accepted and will be funded.

Project Objectives:

The proposed WE²NG RET program has extensive broader impacts, especially related to our goal of explicit and sustainable professional development and the creation of educational materials in western water resources for Colorado school districts. This CSM RET Site will advance public dialogue on water resources through integration of teachers, and ultimately their students, with cutting-edge water research and technology. There is a critical need for a more literate and informed citizenry on water-related issues and WE²NG will build upon past CSM RET success and ultimately advance public information and knowledge on these critical topics.

Last Updated: November 2018

Tasks
Task 1 – WE²NG RET Fieldtrip to the Rio Grande Basin
<p>Description of Task:</p> <p>The CSM WE²NG program will conduct a seven-week professional development program for science teachers. WE²NG will continue to partner with Jefferson County School District (Jeffco), Denver Public Schools (DPS) and Red Rocks Community College to recruit and engage teacher participants. Jeffco is the largest K-12 school system in the state of Colorado with over 85,000 students comprising ~ 9% of all Colorado K-12 students. There are more than 150 schools on 168 campuses, including 17 high schools and 19 middle schools. The demographics in Jeffco vary immensely from school to school, with minority populations exceeding 85% and students on free/reduced rates exceeding 90% in particular areas. Denver is within a short distance of CSM and has 108 grade 6-12 schools. 77% of DPS students are minorities, with 67% of the student body is on free and reduced lunch.</p> <p>Support from the CWCB would allow the program to expand and include a one-week fieldtrip to rural Colorado to broaden the teachers' perspectives on water issues. The first six weeks of the program will be held on CSM's campus and will focus on urban hydrology. The week seven fieldtrip is an opportunity to include more important topics in the Colorado Water Plan. The goal of the fieldtrip will be to expose science teachers from the Front Range to rural water issues to increase their water literacy. Each year we will bring the teachers to the San Luis Valley to expose them to agriculture and irrigation practices, local watershed groups improving water storage and managing river compacts, reclaimed abandoned mine sites to understand challenges with our state's heritage mining and the state's effort to clean up these point and non-point pollution sources, and local recreation industries dependent on healthy waters (see attached agenda for fieldtrip).</p>
<p>Method/Procedure:</p> <p>WE²NG will recruit a total of 36 STEM teachers from Jeffco and DPS (12 per year for three years). Recruiting efforts will target the Golden and Jefferson articulation areas within Jeffco and the Denver articulation area. These areas have been chosen based on the greatest potential impact of STEM professional development, the opportunity to involve teachers in grades 6-12 and the community college for vertical teaming benefits, and the relative proximity to CSM to enable sustainable long-term interaction between CSM students and 6-12 and community college classrooms.</p> <p>The teachers will attend a full-time (40 hours/week) paid seven-week summer program at CSM engaging in research under the direction of faculty and graduate student mentors. The program will include an initial orientation session followed by an integrated research, learning, and curriculum format. Each week will include components of individual research time, on-going workshops (e.g., communicating science, computer science technology), collaborative research meetings, connections with industry (interactive industry field trips each Friday), and integrated curriculum development workshops co-facilitated by Jeffco and DPS curriculum specialists. Another key part of the WE²NG program will be establishing long-term collaborative relationships with the participants by providing classroom support throughout the academic year. Graduate students from the CSM will provide significant, sustained support throughout the academic year. Graduate students will visit RET teacher's classrooms, help conduct hands-on experiments and facilitate field trips.</p> <p>Support from the CWCB Water Plan grant would allow CSM to expand the WE²NG program an additional week to take participants on a fieldtrip to the Rio Grande basin. A fieldtrip provides an opportunity for teachers to meet stakeholders and gain firsthand knowledge of water issues in a rural agricultural community.</p>
<p>Deliverable:</p>



Last Updated: November 2018

Tasks

A one-week fieldtrip to the Rio Grande basin in the San Luis Valley. A professionally produced video of the fieldtrip with each teacher featured in the video will provide a fun and efficient way for teachers to share their experience with their students when they return back to their classrooms.

Draft of Fieldtrip Itinerary:

Day 1

AM: leave CSM @ 7am. Arrive in Creede/South Fork area by 2pm

LUNCH: Three Barrels (Three Barrel Brewing Co, 475 Grand Ave, Del Norte) on the way

PM: Creede/Willow Creek (arrive by ~2pm)

2pm: Ken Wyley's Store (708 S Main St, Creede, CO)– overview of mining (~45 min)

3pm: Creede Mining Museum Tour (Underground Mining Museum, 503 W Willow Ck Rd, Creede, CO) (~1 hr)

4pm: Bachelor loop drive (~1.5 hrs) with stop at Last Chance Mine (if still open) and Creede Cemetery

Day 2

AM: Visit the Rio Grande Reservoir and learn about the Rio Grande Compact from Reservoir Manager

LUNCH: Picnic Lunch at Thirty Mile Campground

PM: Tour West Fork Complex Fire site: meet with USFS and RWEACT representative; observe forest and watershed recovery

Day 3:

AM: Outdoor Recreation Industry: Raft or fish on the Rio Grande

LUNCH: Creede

PM: Mining Reclamation: volunteer to help Headwaters Alliance do some restoration along the Creede floodplain, or other area, plant trees or willows

Day 4:

AM: Summitville Mine tour ~9-11am (Mark Rudolph/CDPHE)

LUNCH: Del Norte ~12:15-12:45pm

PM: 12:45pm leave downtown Del Norte

1pm: Potato Farm tour: learn about farming and modern irrigation practices

2:30pm: head to Rakhra Mushroom Farm Corporation (10719 Rd 5 S, Alamosa, CO)

3:15pm: Mushroom Farm visit

4:00pm: head to Ruybal Family Farm (arrive by 4:30pm) - irrigation systems/Ditch Rider talk/tile drainage (~1 hr)

Day 5:

AM: Rio Grande Headwater Restoration Office: Overview of water issues in Rio Grande, meet with Rio Grande Round Table members

Site visit to restoration site

PM: Leave for Golden



Tasks	
Task 2 - [Name]	
Description of Task:	
Method/Procedure:	
Deliverable:	

Repeat for Task 3, Task 4, Task 5, etc.

Last Updated: November 2018

Budget and Schedule

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

Reporting Requirements

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

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

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

The CWCB will pay out the last 10% of the 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 purchase order or grant will be closed without any further payment.

Payment

Payment will be made based on actual expenditures and must include invoices for all work completed. 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.

Costs incurred prior to the effective date of this contract are not reimbursable. The last 10% of the entire grant will be paid out when the final deliverable has been received. All products, data and information developed as a result of this contract must be provided to CWCB in hard copy and electronic format as part of the project documentation.

Performance Measures

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 Water Plan Grant Guidelines, the CWCB will pay out the last 10% of the 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 purchase order or grant will be closed without any further payment.

(b) Accountability: Per Water Plan 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 Water Plan 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.

Last Updated: November 2018

Performance Measures

- (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.

**COLORADO**Colorado Water
Conservation Board

Department of Natural Resources

Colorado Water Conservation Board**Water Plan Grant - Exhibit B
Budget and Schedule****Prepared Date: July 8, 2019****Name of Applicant: Dr. Terri Hogue, Colorado School of Mines****Name of Water Project: Research Experience for Teachers (RET) program field trip****Project Start Date: July 20, 2020****Project End Date: August 31, 2023**

Task No.	Task Description	Task Start Date	Task End Date	Grant Funding Request	Match Funding	Total
1	RET program extra week, Watershed Tour Field trip, for duration of the three year program	July 20, 2020	July 24, 2023	\$22,680		\$22,680
2	Field trip video for teachers to share in classroom, one new video each year for three years for each participant of the program	July 20, 2020	August 31, 2023	\$16,200		\$16,200
	Dr. Terri Hogue, Principal Investigator, 2.5% academic year effort with fringe, for three years	July 20, 2020	August 31, 2023		\$21,850	\$21,850
	Hourly Research Associate, 40 hours/week with fringe for three years	July 20, 2020	August 31, 2023		\$20,329	\$20,329
Total				\$38,880	\$42,179	\$81,059

Colorado Rio Grande Restoration Foundation
Rio Grande Headwaters Restoration Project
623 Fourth Street
Alamosa, CO 81101
(719) 589-2230



July 19, 2019

RE: Water Engineering Education for the Next Generation (WE²NG), Research Experience for Teachers Program
Water Plan Grant Application

Dear CWCB Water Plan Grant Review Committee:

The Rio Grande Headwaters Restoration Project (RGHRP) is excited to have the opportunity to collaborate on the proposed Colorado School of Mines (CSM) Research Experiences for Teachers (RET) Site entitled *Water Engineering Education for the Next Generation (WE²NG)*. The CSM WE²NG initiative is directly in line with the RGHRP's Outreach and Education Program, and the RGHRP's involvement in the summer teacher training will support WE²NG in achieving its objectives and goals. The proposed fieldtrip to the San Luis Valley will provide an opportunity for citizens of the Front Range to see and understand water issues in our vital agricultural basin.

The RGHRP is a small non-profit with the mission "to restore and conserve the historical functions and vitality of the Rio Grande in Colorado for improved water quality, agricultural water use, riparian health, wildlife and aquatic species habitat, recreation and community safety while meeting the Rio Grande Compact." In addition to completing diverse restoration projects to achieve this mission, the RGHRP strives to educate the public about water and restoration through our Outreach and Education Program.

The RGHRP has an excellent relationship with CSM, and in particular, with PI Terri Hogue and her post doctorate researcher, Dr. Ashley Rust through research they did on post-fire impacts on the Rio Grande from the 2013 West Fork Complex Fire. Current collaborative efforts are very strong, and the proposed renewal of the WE²NG program with this additional field trip to our basin would allow even further collaboration in the K-12 arena.

The continuation of an RET Site, WE²NG, on CSM's campus will give us an excellent opportunity to further connect to the communities around Denver via K-12 teachers and to positively impact the quality of STEM education in the water industry. Engagement of local community and preparation of the next generation engineers is essential to our company's future.

Specifically, the Rio Grande Headwaters Restoration Project is excited to participate in the one-week fieldtrip for the RET participants to the Rio Grande Basin in the San Luis Valley. The RGHRP looks forward to working with Dr. Hogue and team again on the proposed RET Site.

Sincerely

Emma Reesor
Executive Director, Rio Grande Headwaters Restoration Project

Rio Grande Basin Roundtable
623 Fourth Street
Alamosa, CO 81101
cwcd1971@hotmail.com



July 16, 2019

RE: Water Engineering Education for the Next Generation (WE²NG), Research Experience for Teachers Program Water Plan Grant Application

Dear CWCB Water Plan Grant Review Committee:

The Rio Grande Basin Roundtable (RGBRT) is excited to support the proposed Colorado School of Mines (CSM) Research Experiences for Teachers (RET) Site entitled *Water Engineering Education for the Next Generation* (WE²NG). The CSM WE²NG initiative is directly in line with the RGBRT's goal of increasing community awareness of water issues, and the RGBRT's involvement in the summer teacher training will support WE²NG in achieving its objectives and goals. The proposed fieldtrip to the San Luis Valley will provide an opportunity for citizens of the Front Range to see and understand water issues in our vital agricultural basin.

The RGBRT represents diverse water interests and user groups in the San Luis Valley, and as such, it is our responsibility to encourage water education and inform the community about water issues. As described in the RGBRT 2015 Basin Implementation Plan, outreach and education with respect to the preservation and sustainability of Colorado's water resources is integral to our role as a group of community leaders. As droughts and shortages continue to show us the value of this precious resource, it is more important than ever to share that message with the next generation of water users. The RGBRT is excited to continue collaborations with PI Terri Hogue and her post doctorate researcher, Dr. Ashley Rust

The RGBRT has an excellent relationship with CSM, and in particular, with PI Terri Hogue and her post doctorate researcher, Dr. Ashley Rust through research they did on post-fire impacts on the Rio Grande from the 2013 West Fork Complex Fire. Current collaborative efforts are very strong, and the proposed renewal of the WE²NG program with this additional field trip to our basin would allow even further collaboration in the K-12 arena.

The continuation of an RET Site, WE²NG, on CSM's campus will give us an excellent opportunity to further connect to the communities around Denver via K-12 teachers and to positively impact the quality of STEM education in the water industry. Engagement of local community and preparation of the next generation engineers is essential to our company's future.

Specifically, the Rio Grande Basin Roundtable is willing to participate in the one-week fieldtrip for the RET participants to the Rio Grande Basin in the San Luis Valley. The RGBRT looks forward to working with Dr. Hogue and team again on the proposed RET Site.

Sincerely,

A handwritten signature in black ink, appearing to read "Nathan Coombs".

Nathan Coombs
Chair, Rio Grande Basin Roundtable



United States Department of the Interior

BUREAU OF RECLAMATION
Upper Colorado Region
Albuquerque Area Office
555 Broadway NE, Suite 100
Albuquerque, NM 87102-2352

IN REPLY REFER TO:

ALB-402
2.2.4.23

JUL 26 2019

VIA ELECTRONIC MAIL ONLY

Colorado Water Conservation Board

Subject: Water Engineering Education for the Next Generation (WE²NG), Research Experience for Teachers Program Grant Application

Dear Interested Party:

Bureau of Reclamation's Albuquerque Area Office (AAO) is providing this letter in support of the proposed Colorado School of Mines (CSM) Research Experiences for Teachers (RET) program entitled *Water Engineering Education for the Next Generation (WE²NG)*. The CSM WE²NG initiative provides in-depth, topic specific education to teachers, so they can pass that knowledge to our youth. The topic of this training, water engineering and management, is directly related to the mission of Reclamation, and we are confident that this training will help to educate teachers and students about the importance of water and careful management of this resource in the arid Western United States. The proposed fieldtrip to the San Luis Valley will provide an opportunity for teachers to see and understand water management methods and challenges in this vital agricultural basin within the Rio Grande Basin that is served by our office.

Established in 1902, Reclamation is best known for the dams, powerplants, and canals it constructed in the 17 western states. These water projects led to homesteading and promoted the economic development of the West. Reclamation has constructed more than 600 dams and reservoirs. Today, we are the largest wholesaler of water in the country. We bring water to more than 31 million people, and provide one out of five Western farmers (140,000) with irrigation water for 10 million acres of farmland that produce 60 percent of the nation's vegetables and 25 percent of its fruits and nuts. Reclamation is also the second largest producer of hydroelectric power in the United States. Our 53 powerplants annually provide more than 40 billion kilowatt hours generating nearly a billion dollars in power revenues and produce enough electricity to serve 3.5 million homes.

The AAO is one of the largest in Reclamation reaching from the Alamosa area of southern Colorado through most of New Mexico and into west Texas. Staff here manage delivery of water on the Rio Grande, Rio Chama, Pecos, and Canadian rivers from the main office in Albuquerque and six field offices in Alamogordo, Chama, Elephant Butte, and Socorro, New Mexico; Alamosa, Colorado; and El Paso, Texas. This office is also responsible for overseeing the management of nine major dams with a combined reservoir storage capacity of more than 3.5

million acre-feet that supply water for more than 439,000 acres of irrigated land and several municipal drinking water projects. They also oversee hydropower production, and research and testing at the Brackish Groundwater National Desalination and Research Facility.

The AAO, particularly its Field Office in Alamosa, CO, would be happy to participate in the one-week fieldtrip for the RET participants to the Rio Grande Basin in the San Luis Valley. We look forward to working with Dr. Hogue, Dr. Rust, and the rest of the RET team.

I hope you look favorably on this proposal. Please don't hesitate to contact our office with any questions you may have about our mission or our work in the San Luis Valley. Your point of contact at our office is Dagmar Llewellyn, who can be reached at (505) 462-3594 or dllewellyn@usbr.gov. For Text Telephone Relay Service access, call the Federal Relay System Text Telephone (TTY) number at (800) 877-8339.

Sincerely,

A handwritten signature in dark ink, appearing to read 'JL Faler', with a stylized, cursive script.

Jennifer Faler, PE
Area Manager