PUEBLO

Planning & Community Development
Jerry M. Pacheco, Director

211 East D Street | Pueblo, Colorado 81003 | Tel 719-553-2259 | Fax 719-553-2359 | TTY 719-553-2611 | www.pueblo.us

January 26, 2010

Todd Doherty, CWCB
Intrastate Water Management and Development
1580 Logan Street, Suite 200
Denver Co 80203

Re: Bedload /Sediment Collection and Removal Technology Study – Fountain Creek

Dear Mr. Doherty:

Please find attached the W-9 Form and the invoice tracking information for the City of Pueblo's Bedload /Sediment Collection and Removal Technology Study. The grant application form has been revised to include a revised Scope of Work on pages 9-10, along with a revised and more detailed budget breakdown (Attachments 1 & 1-A). A revised timeline is also included as Attachment 2. Within the next couple of days, I will be forward the certificate of insurance verifying the City's compliance with the State governmental entity insurance requirements.

A Supplemental Project Information description is also included to address the areas of the grant application that were not fully addressed or needed additional clarification. The items addressed include the following:

1. The project's connection to the Basin Roundtable's consumptive and/or nonconsumptive needs within the Arkansas River Basin.
2. The other important efforts underway associated with this project along Fountain Creek.
3. Additional information to address grant application criteria I through T.

If you have any further questions or need any additional information, please contact me at (719) 553-2244 or by email at shobson@pueblo.us.

Sincerely,

Scott Hobson

Scott Hobson
Assistant City Manager - Community Investment

cc: Earl Wilkinson, City of Pueblo Public Works Director
Jerry Pacheco, City Manager

Form **W-9**
Substitute Form
State of Colorado 8-2007

Request for Taxpayer Identification Number and Certification

Give form to the requester. Do not send to the IRS.

Print or Type
See Specific Instructions on page 3.

Name
City of Pueblo

Business name, if different from above

Check appropriate box:
☐ Individual/ Sole Proprietor ☐ Corporation ☐ Partnership ☐ Other ▶ ..... ☐ Exempt from backup withholding

Address (number, street, and apt. or suite no.)
1 City Hall Place

Requester:
State of Colorado
Colorado Water Conservation Board

City, state, and ZIP code.
Pueblo, CO 81003

List Account number(s) here (optional)

Phone Number:
(719) 553-2625

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. For individuals, this is your social security number (SSN) **However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3.** For other entities, it is your employer identification number (EIN). If you do not have a number, see **How to get a TIN on page 3.**

Note: *If the account is in more than one name, see the chart on page 3 for guidelines on whose number to enter.*

Social Security number

Employer identification number

8	4	6	0	0	0	6	1	5

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), **and**
2. I am not subject to backup withholding because. **(a)** I am exempt from backup withholding, or **(b)** I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or **(c)** the IRS has notified me that I am no longer subject to backup withholding, **and**
3. I am a U.S. person (including a U.S. resident alien).

Certification instructions. You must cross out item **2** above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item **2** does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. (See the instructions on page 3.)

Sign Here | Signature of U.S. person ▶ Scott W. Holsen | Date ▶ January 13, 2010

Minority and Women-owned Businesses (M/WBEs) Self Certification (Please check all boxes that apply)

In an effort to track levels of participation by women and minorities doing business with the State of Colorado, the following information is requested. Please indicate the appropriate category of ownership for your company. "Owned" in this context means a business that is at least 51 percent owned by an individual(s) who also control(s) and operate(s) it. "Control" in this context means exercising the power to make policy decisions. "Operate" means actively involved in the day-to-day management. If you business is jointly owned by both men and women or is a large publicly held corporation, please check the box labeled "Not Applicable."

Gender Information:

☐ Female-Owned ☐ Male-Owned ☒ Not Applicable

Owner Ethnicity Information

☐ African American ☐ Asian/Pacific American ☐ White (non-Hispanic) ☒ Not Applicable

☐ Hispanic American ☐ Native American ☐ Other: _____

Small Business Information

Small Business (a business that is organized for profit, is independently owned and operated, and has 25 or fewer full time equivalent employees.)

☐ Yes ☒ No

Bedload/Sediment Collection and Removal Technology Study

Contract Routing Number:
CWCB Contract or Pucahse Order No.:
Grant Amount: $225,000
Date of Invoice:

Task	Description	Total Budget/Grant Funds	Current Amount Invoiced	Invoiced to Date	% of Budget Spent	% of Task Complete
1	Bedload Sediment System	$196,000				
2	Monitoring Water Quality & Sediments	$21,000				
3	Administrative	$8,000				
4						
5						
6						
7						
	TOTALS	**$225,000**				

COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
2007-2008 GRANT APPLICATION FORM

Bedload/Sediment collection and removal technology - Fountain Creek

Name of Water Activity/Project | **River Basin Location**

$75,000	X	Basin Account	X	Yes
$150,000	X	Statewide Account		No
Amount of Funds Requested	Please Check Applicable Box		Approval Letter Signed By Roundtable Chair and Description of Results of Evaluation and Approval Process	
$225,000				

*** For the Basin Account, the Application Deadline is 60 Days Prior to the Bimonthly CWCB meeting. The CWCB meetings are posted at www.cwcb.state.co.us and are generally the third week of the month.**

*** For the Statewide Account, the Application Deadline is 60 Days Prior to the March and September CWCB Board Meetings.**

* In completing the application you may attach additional sheets if the form does not provide adequate space. If additional sheets are attached please be sure to reference the section number of the application that you are addressing (i.e., A.1. etc.).

Instructions: This application form must be submitted in electronic format (Microsoft Word or Original PDF are preferred). The application can be emailed or a disc can be mailed to the address at the end of the application form. The Water Supply Reserve Account Criteria and Guidelines can be found at http://cwcb.state.co.us/IWMD/. **The criteria and guidelines should be reviewed and followed when completing this application**. You may attach additional sheets as necessary to fully answer any question, or to provide additional information that you feel would be helpful in evaluating this application. Include with your application a cover letter summarizing your request for a grant. If you have difficulty with any part of the application, contact Rick Brown of the Intrastate Water Management and Development (Colorado Water Conservation Board) for assistance, at (303) 866-3514 or email Rick at rick.brown@state.co.us. Generally, the applicant is also the prospective owner and sponsor of the proposed water activity. If this is not the case, contact the Rick Brown before completing this application.

Water Supply Reserve Account – Grant Application Form
Form Revised May 2007

Part A. - Description of the Applicant (Project Sponsor or Owner);

1. Applicant Name(s): City of Pueblo (Stormwater Utility)

Mailing address: 1 City Hall Place
Pueblo, CO 81003

Taxpayer ID#: 84-6000615 Email address: dmaroney@pueblo.us

Phone Numbers: Business: (719) 553-2283
Home:
Fax: (719) 553-2294

2. Person to contact regarding this application if different from above:

Name: Dennis Maroney

Position/Title City of Pueblo Stormwater Utility Director

3. Provide a brief description of your organization below: see "Description of Applicant" in Part 2 of Criteria and Guidance for required information.

Type: Home Rule Municipality

Official Name: City of Pueblo, CO, 1 City Hall Place, Pueblo, CO 81003

Year Formed: Four cities were consolidated to establish the City of Pueblo - incorporated in 1885

Statutes: Organized under Article XX of the Constitution of the State of Colorado

Contact Person: Jerry Pacheco, Interim City Manager and for project specific questions contact Dennis Maroney, Stormwater Utility Director.

Mission Statement: **P**ride in our community, its history, work ethic, and diverse culture; **U**nited in our goals and mission for a strong and vibrant community; **E**ntrepreneurial spirit that fosters educational excellence and enhanced opportunities; **B**eautification, cleanliness, and amenities for a Proud City; **L**eadership with the utmost integrity, character, ethical standards, and honesty; **O**utstanding service toward an enhanced quality of life for our citizens.

Funding: The City of Pueblo received a total of $66,501,920 in revenues in 2007 from a variety of sources including the following: General Taxes (property and sales) $57,886,928; Licenses & Permits $570,866; Intergovernmental Receipts $1,374,032; Charges for Services $3,172,608; Fines & Forfeitures $1,682,166; Other Revenues 1,815,320

Water Related Enterprise Fund Budgets: $8,877,942 Wastewater; $3,914,123 Stormwater Utility

Staffing: The City of Pueblo has 684 employees including 65 employees who are directly related to water functions within the city through the Stormwater Utility and the Wastewater Department.

Brief History: Pueblo is situated at the confluence of the Arkansas River and Fountain Creek 103 miles south of Denver. The area is considered to be semi-arid with approximately 14 inches of precipitation annually. Pueblo is an important part of the Front Range Urban Corridor. It is considered to be the economic hub of southeastern Colorado. Pueblo is one of the largest steel-producing cities in the United States, because of this Pueblo is referred to as the "steel city". The current city of Pueblo represents the consolidation of four towns: Pueblo, South Pueblo, Central Pueblo and Bessemer. The cities legally consolidated as the City of Pueblo in 1886 and Bessemer joined Pueblo in 1894. The mean annual flow of Fountain Creek has risen from a historical average of approximately 60 cubic feet per second (cfs) to greater than 230 cfs. While flow associated with extreme flood events has not statistically changed, there are increasing trends in both low and high streamflow records. An earthen levee was constructed above SH 47 during the 1930's through a federal WPA project. The Army Corps of Engineers built a flood control system along the banks of Fountain Creek through the central portion of Pueblo in 1989. Pueblo has a history of devastating floods that date back to floods in 1921, 1935 and 1965. In 1999 high water from Fountain Creek caused major damage in El Paso County and destroyed bridges and other structures in Pueblo County. Flooding and erosion within the Fountain Creek Basin have accelerated the loss of aquatic and wetland habitats, contributed to the loss of hundreds of acres of productive farmland, and caused the foundations of roads and homes to crumble. Fountain Creek is experiencing aggradation of sediments from the confluence with the Arkansas River north approximately three miles to the Highway 50 bridge. Sediment is transported from the subwatershed uplands to the Fountain Creek mouth at a greater rate than the system can handle. In recognition of the need to improve and update the city's stormwater infrastructure, the City established a Stormwater Utility in 2004. The funds collected are placed in an enterprise fund exclusively for the construction, operation and maintenance of stormwater and water quality facilities.

4. If the Contracting Entity is different then the Applicant (Project Sponsor or Owner) please describe the Contracting Entity here.

The City of Pueblo will be contracting the manufacturing and installation of a bedload sediment collector and sediment separation system for the demonstration project. The City of Pueblo will solicit proposals from private companies based on specific specifications and design parameters for the installation and operation of equipment utilized for the project. In June 2007, the Lower Arkansas Valley Water Conservancy District sponsored a small-scale test for a one-week period of time utilizing a two foot by four foot bedload collector within Fountain Creek. The project was contracted to Streamside Systems LLC who use alternative methods of cleaning up the earth's water resources. Streamside Systems uses a passive, selective sediment extraction and stream sediment separation system to remove bedload sediments. The demonstration project will utilize the Streamside System technology or a similar equally pre-qualified system. The contact information - Streamside Systems LLC, Attn: Randall Tucker, 7449 TWP Rd 95, Findlay, OH 45840, (419) 423-1290.

Part B. - Description of the Water Activity – Please Refer to Criteria and Guidance Document for Eligibly Requirements

1. Name of water activity/project:

Fountain Creek Project – Bedload/Sediment Collection and Removal Demonstration Project

What is the purpose of this grant application?

[ ] Environmental compliance and feasibility study

[ ] Technical Assistance regarding permitting, feasibility studies, and environmental compliance

[x] Studies or analysis of structural, nonstructural, consumptive, nonconsumptive water needs, projects

Study or Analysis of:

- [x] Structural project or activity
- [ ] Nonstructural project or activity
- [ ] Consumptive project or activity
- [x] Nonconsumptive project or activity

[ ] Structural and/ or nonstructural water project or activity

2. Describe how the water activity meets these **Threshold Criteria.**

1. The water activity meets the eligibility requirements outlined in Part 2 of the Criteria and Guidelines.

The City of Pueblo meets the eligibility requirements outlined in the Criteria and Guidelines. The City of Pueblo is defined as a Home Rule Municipality eligible to receive funding from the

Colorado Water Conservation Board Water Supply Reserve Fund. The proposed bedload sediment and collection demonstration project qualifies for funding as a water activity study or analysis of structural, nonstructural, and is a non-consumptive water project or activity. The water activity is consistent with Section 37-75-102 C.R.S. and Section 37-75-104 (2)(c).

Water activities are identified as Studies or analysis of structural, nonconsumptive water needs, projects, or activities; and Structural and nonstructural water projects or activities.

2. The water activity is consistent with Section 37-75-102 Colorado Revised Statutes. The requirements/language from the statute is provided in Part 3 of the Criteria and Guidelines.

   The bedload sediment demonstration project will not restrict, remove, or delay the supply of water flowing within Fountain Creek. The shareholders of water rights in the Fountain Creek and Arkansas River Basins will continue to use or dispose of water rights in any manner permitted under Colorado law. The project will not diminish, impair, or cause injury to any property or contractual right created by intergovernmental agreements, contracts, stipulations among parties to water cases, terms and conditions in water decrees, or any other similar document related to the allocation or use of water. Higher peak flows and velocity during storm events are occurring as a result of urbanized development within the watershed creating more impervious areas which historically absorbed much more of the water from storm events. This ongoing urbanization is resulting in more frequent runoff events with increased storm water flow volumes and rates, erosion, and sedimentation in Fountain Creek. The water quality issues within the Lower Fountain Creek Watershed include high concentrations of E. coli and other organics, and concentrations of naturally occurring selenium that are likely impacting fish and other macroinvertebrate species. The area most impacted by high sedimentation levels is the 2½-mile segment directly upstream of the confluence with the Arkansas River. The proposed location for the sediment demonstration project is 2,100 feet north of the confluence with the Arkansas River, within this 2½-mile segment of sediment-impacted stream.

3. The water activity underwent an evaluation and approval process and was recommended for approval to the Basin Roundtable (BRT) by the Arkansas Basin Needs Committee and the application includes a description of the results of the BRTs evaluation and approval of the activity. At a minimum, the description must include the level of agreement reached by the roundtable, including any minority opinion(s) if there was not general agreement for the activity. The description must also include reasons why general agreement was not reached (if it was not), including who opposed the activity and why they opposed it. Note- If this information is included in the letter from the roundtable chair simply reference that letter.

4. The water activity meets the provisions of Section 37-75-104(2), Colorado Revised Statutes. The requirements/language from the statute is provided in Part 3 of the Criteria and Guidelines.

3. For Applications that include a request for funds from the Statewide Account, describe how the water activity meets the **Evaluation Criteria**. See Part 3 of Criteria and Guidelines.

Promoting Collaboration

This project promotes collaboration and cooperation with the Lower Arkansas Valley Water Conservancy District (LAVWCD), State of Colorado, U.S. Bureau of Reclamation, Pueblo County, USGS, Colorado State University-Pueblo (CSU), and the U.S. Army Corps of Engineers.

Portions of the matching funds for this project are being funded through a Colorado Department of Health and Environment (CDPHE), EPA 319 Water Quality grant to assist in funding demonstration projects along Fountain Creek within Pueblo County. The bedload sediment demonstration project is one of the projects included for funding from the CDPHE.

The City of Pueblo is also working in cooperation with the LAVWCD in taking a leadership role in addressing the catastrophic storm water sedimentation and riparian damage issues in Fountain Creek and their direct impact on the water quality of the Lower Arkansas River Basin. The Fountain Creek Bedload - Sediment Collection and Removal Project is being coordinated with the efforts of the USGS, Colorado Springs Utilities, Fountain Creek Watershed, Fountain Creek Vision Task Force, the U.S. Army Corps of Engineers Albuquerque District in order to share the results of the demonstration project for the purposes of modeling efforts for Fountain Creek, removal of pollutants, and streambed geomorphology changes. This project addresses current water quality and improvements that will over time transform Fountain Creek from an impaired river system to an asset for the communities within the watershed. The Fountain Creek Bedload - Sediment Collection and Removal Project is the first major demonstration project to assess the benefits of specific BMP along Fountain Creek within Reach 2 of the watershed.

Macroinvertebrate surveys will be conducted by Professor Scott Herrmann with assistance from biology students in his classes at Colorado State University-Pueblo. General limnological water quality data will be generated each field trip. Those data include parameters such as temperature; specific conductivity; dissolved oxygen; pH; total, calcium, and magnesium hardness; total alkalinity; sulfate; nitrate/nitrite nitrogen; chloride and reactive phosphate. Temperature and dissolved oxygen profiles will be generated during the month of August. A qualitative evaluation of macroinvertebrates at the project site will be conducted from 2008 into 2011. The resulting species lists should reflect conditions before and after the sediment collector demonstration project.

The following local utilities and governments in Pueblo and El Paso Counties and throughout the region as members of the Fountain Creek Vision Task Force are interested in improvements to Fountain Creek including this proposed project:

City of Fountain
City of Colorado Springs
City of Pueblo
Pikes Peak Area Council of Governments
Pueblo County
Teller County
Colorado Open Lands
Colorado Springs Utilities
Department of Defense
Pueblo Area Council of Governments Technical Advisory Committee
Lower Arkansas Valley Water Conservation District
El Paso County
City of Pueblo residents
Pueblo Board of Water Works
Colorado Progressive Coalition

Facilitating Water Activity Implementation

The Fountain Creek Bedload/Sediment Collection and Removal Technology Project is supported by the Fountain Creek Vision Task Force, and the Fountain Creek Watershed comprised of member agencies of both the Pikes Peak and Pueblo Area Councils of Governments. The Lower Arkansas Valley Water Conservancy District and Colorado Springs Utilities are supportive of the water quality

demonstration project and are coordinating their efforts in developing a long-range plan for potential projects within the Fountain Creek Watershed. The outcome of this project is expected to provide a basis for the improvement of water quality, bank stabilization, bedload reduction, habitat improvement. In addition the project will provide sediment transport modeling criteria, as well as accelerate the restoration of channel stability and reduction of flooding along Fountain Creek and throughout the Arkansas River Basin.

The City of Pueblo has an excellent track record for the development, support, implementation, and completion of major community projects in the Pueblo region. Pueblo is known statewide, as well as nationally, as a city that gets things done. The Arkansas River Corridor Legacy Project, an $8.75 million combination of river habitat and recreation projects was completed in 2005. The Historic Arkansas Riverwalk Project (HARP), a $25 million project featuring park, economic development, and water quality improvements was completed in 2002 and continues to have ongoing improvements implemented by the City of Pueblo. These projects were completed in a timely and efficient manner.

4. Please provide an overview of the water project or activity to be funded including – type of activity, statement of what the activity is intended to accomplish, the need for the activity, the problems and opportunities to be addressed, expectations of the participants, why the activity is important, the service area or geographic location, and any relevant issues etc. Please include any relevant TABOR issues that may affect the Contracting Entity. Please refer to Part 2 of Criteria and Guidance document for additional detail on information to include.

Overview of Project

This is the second phase of a project that was initiated by the LAVWCD during the June 2007 on a smaller scale to evaluate the success of a Bedload Monitoring Collector system placed in Fountain Creek approximately ½-mile upstream of the confluence with the Arkansas River. The project will assess any changes in the water quality and any reductions in downstream sediment deposition, as well as the creek's ability to manage high-flow conditions (flood control). The improvements involve the placement of a pre-cast concrete sediment collector within Fountain Creek. The sediment collector will serve as a research tool to gage the transport rates of sediment captured by a large-scale collector, and to verify the system's ability to remove and classify by granule size the sediment for beneficial re-use by the City of Pueblo. This demonstration project will be conducted for a one-year period. The City of Pueblo owns the property where the demonstration project will be operated. The project includes monitoring to assess the success of the project in relationship to the removal of contaminants from Fountain Creek, impacts to sediment, and potential benefits in reduction of erosion and the re-establishment of a deeper, more stable thalweg within the creek channel.

Need for Project

Fountain Creek in recent years has been and currently is being analyzed and evaluated for the presence of pollutants that impact different segments of the watershed. The segments of the watershed (Segments 2-A and 2-B) within the City of Pueblo are classified as Aquatic Life Warm Water 2 and a Recreation E classification. Fountain Creek within these segments contains several pollutants of concern including organics, metals, and pollutants attached to the high levels of sediments carried in suspension within the creek, as well as pollutants attached to sediments passed along the streambed known as "bedload sediments." In a study done by Patrick Edelmann et al. (2001) entitled Evaluation of Water Quality, Suspended Sediment, and Stream Morphology with an Emphasis on Effects of Stormflow on Fountain and Monument Creek Basins, Colorado Springs and Vicinity, Colorado, 1981 through 2001, it was concluded that suspended sediment concentrations,

discharges, and yields associated with stormflow were significantly greater than during normal flow. Depending on the site and year, suspended-sediment concentrations associated with stormflow generally were 3 to 10 times greater than concentrations measured during normal flow, and suspended sediment discharges were usually more than 10 times greater during stormflow. This is important to the watershed since population growth has caused an increase in impervious surface area affecting peak quantity, frequency and velocity of flows within Fountain Creek during storm events.

Sedimentation

Sedimentation is a major concern affecting water quality within these reaches of Fountain Creek. Most of the soils found in the Fountain Creek Watershed are easily erodable and have high to moderate runoff potential, which can contribute to the increase in erosion and sedimentation damage in the watershed. The U.S. Army Corps of Engineers Albuquerque District has identified erosion and sedimentation in Fountain Creek as an important issue. In 2008, the Corps has identified a high priority need to complete an additional Fountain Creek Study for erosion and sedimentation to further evaluate flood control, erosion, sedimentation and environmental restoration problems related to Fountain Creek. As part of the Corps study information will be collected on the bedload sediments carried in Fountain Creek especially as they related to the increases in streamflow (Stogner – USGS study, 2000) generated by increased wastewater treatment plant discharges, importation of transbasin water, and management of the Fountain Creek transbasin return flow exchange decree.

Loss of Water Through Increased Vegetation

The additional sedimentation deposits in Fountain Creek especially nearer to the confluence with the Arkansas River are creating a condition where more vegetation is growing within these deposits. Most frequently, the vegetation is tamarisk (salt cedar) plants that absorb large quantities of Fountain Creek Basin water in Fountain Creek. This project will assess if a main channel can be established down stream of the sediment collector that will reduce the establishment of vegetation that takes water out of productive use. The project will evaluate if one of the major advantages for the use of the bedload sediment collector is to alleviate the loss water from phreatophyte absorption in plants.

Water Quality

In conjunction with the coordinated efforts to study and analyze the water quality concerns of Fountain Creek there is a significant need to initiate and evaluate on-site methods to improve water quality that addresses pollutants during storm events, removal of E. coli and other organics, and sedimentation pollution. The City of Pueblo is proposing to implement a Phase 2 demonstration project within and related to Fountain Creek. The project involves the placement of a bed load sediment removal system within Fountain Creek. The projects will include monitoring to assess the success and sustainability of the projects in relationship to the removal of contaminants from Fountain Creek, impacts to sediment, and potential benefits in reduction of erosion and the re-establishment of a stable creek channel. The findings from these on-the-ground demonstration projects will be able to be incorporated into the modeling and research, as well as the recommendations provided in the ongoing studies of Fountain Creek.

Project Location

The project location is 2,100 feet north of the confluence of the Fountain Creek and the Arkansas River. The project coordinates are as follows: LATITUDE: 38.15.50 LONGITUDE: 104.35.57. Please see Map 3, 4, and 5, as well as photographs of the project location and the Streamside System collector units included as Attachment 6.

TABOR Implications
The State of Colorado and all local governments are subject to the TABOR law; however, the City of Pueblo Stormwater Utility is created and operated as an enterprise fund and is excluded from the TABOR provisions. An enterprise as defined by TABOR is "a government-owned business authorized to issue its own revenue bonds and receiving fewer than 10 percent of annual revenue in grants from all Colorado State and local government combined."

5. Please summarize the proposed scope of work. Please refer to Part 2 of the Criteria and Guidance document for detailed requirements. On the following page there is an example format for the Scope of Work. You can use the example format or your own format, provided that comparable information is included.

   The scope of work should outline by task how the water activity will be accomplished. It is important that the scope of work detail the specific steps, activities/procedures that will be followed to accomplish the water activity and the specific products/deliverables that will be accomplished. The scope of work should include but not be limited to: task description, key personnel, budget, schedule and deliverables and the final report/project documentation upon completion of the water activity.

SCOPE OF WORK

I. **Goal 1**: To determine if removal of bedload sediments from Fountain Creek has a positive benefit to water quality, as well as benefit to creek's thalwag stability.

Objective: reduce sedimentation pollution between the bedload sediment removal system and the confluence with the Arkansas River.

Task: Complete Design, specifications, and permitting for construction of bedload sediment removal system demonstration project area.

Products: Pre-construction bid packet with designs and specifications, and permits from the U.S. Army Corps of Engineers and the Colorado Mined Land Reclamation Board.

Cost: $47,000

Task: Installation and operation of the bedload sediment removal sediment material collection systems.

Products: Full-scale sediment removal & collection system.

Cost: $340,000

Task: Test analyze and characterize the sediments removed through the sediment removal system to determine transport rates and types and amounts of pollutants removed from Fountain Creek. Analyze any reduction in bedload sediments and habitat improvement.

Products: Sediment transport modeling criteria, sediment chemical analysis data, spreadsheets, and comparative analysis and reports of sediment content above and below sediment collector. Analysis of stream thalwag changes below sediment collector and habitat improvement.

Cost: $120,000 ($75,000 in-kind provided by City of Pueblo)

Goal 2: To provide timely progress reports, final reports, as well as accurate and complete reimbursement requests for project expenses.

Objective: The City of Pueblo and contractors shall prepare and submit timely and accurate progress reports, final reports, and reimbursement requests for project expenses.

Task: Completion of administrative reports and requirements of grant agreement including of timely and accurate progress reports, final reports and reimbursement requests.

Products: Progress reports, final reports, and reimbursement requests.

Cost: $18,000

II. Personnel

The project will likely involve contracting with Streamside Systems LLC or a company with equal or greater experience in using passive, selective sediment extraction and in-stream separation of sediment materials. Streamside Systems LLC is developing cutting-edge technologies to provide the next generation of environmentally friendly sediment removal and treatment systems.
Streamside Systems LLC, 7440 Twp Rd 95, Findlay, OH 45840; Phone: (419) 423-1290
Randall Tucker, President

HDR Engineering, Inc., 303 East 17th Avenue, Ste 700, Denver, CO 80203-1256; Phone (303) 764-1520
HDR Engineering, Inc. partners with Streamside Systems LLC to provide engineering and environmental services for the installation, operation and permitting of the bedload sediment removal and material separation operation.

Dennis Maroney, Director City of Pueblo Stormwater Utility, 211 East "D" Street, Pueblo, CO 81003; Phone: (719) 553-2283

III. Budget

See Attachment 1 showing all projected and actual expenditures

IV. Schedule

A detailed project schedule including key milestones with anticipated completion dates is included as Attachment 2.

6. Water Availability and Sustainability – this information is needed to assess the viability and effectiveness of the water project or activity. Please provide a description of each water supply source to be utilized for, or the water body to be affected by, the water activity. For water supply sources being utilized, describe its location, yield, extent of development, and water right status. For water bodies being affected, describe its location, extent of development, and the expected effect of the water activity on the water body, in either case, the analysis should take into consideration a reasonable range of hydrologic variation.

The mean annual flow of Fountain Creek has risen from a historical average of approximately 60 cubic feet per second (cfs) to greater than 230 cfs. Fountain Creek Watershed consists of 927 square miles covering three counties: El Paso, Teller, and Pueblo. Fountain Creek drains to the Arkansas

River in Pueblo, Colorado to the south. The availability and sustainability of water for this project will be provided through the return flows from Colorado Springs Utilities and any other water flowing to the confluence within the Arkansas River within the Fountain Creek Drainage Basin. Implementation of this project will access the ability to remove bedload sediments from Fountain Creek and determine if stream capacity is improved, as well as vegetative habitat and stream hydraulics are improved between the bedload removal system and the confluence with the Arkansas River. The majority of the water flowing within Fountain Creek will pass over sediment collector and continue downstream. Any water that is collected with the sediment will be returned to Fountain Creek immediately downstream of the sediment collector.

7. Please provide a brief narrative of any related or relevant previous studies.

The Lower Arkansas Valley Water Conservancy District sponsored a Phase 1 demonstration of a the bedload/sidement collection and removal technology from Streamside Systems on June 11th through June 16th, 2007. The five (5) day demonstrations occurred adjacent to the 11th Street bicycle path east of Erie Street along Fountain Creek within the levee section in the City of Pueblo. The demonstration project included the installation and operation of a 2' by 4' bedload gage and collection system. This first phase was a near term demonstration of two small, man-portable bedload monitoring collectors to provide an opportunity to observe the collector technology first hand. The demonstration also allowed for the verification of the similar results and visual validation of the of the Colorado State University, Engineering Research Centers, Hydraulics Laboratory's controlled flume test facility results. Please see the Description of Installation for the Phase 1 demonstration included as Attachment 7 and the Sediment Collector System description included as Attachment 8.

8. Additional Information – If you feel you would like to add any additional pertinent information please feel free to do so here.

The above statements are true to the best of my knowledge:

Signature of Applicant: 

Print Applicant's Name: Dennis Maroney

Project Title: Project Administrator

Return this application to:

Mr. Rick Brown
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 600
Denver, CO 80203

To submit applications by Email, send to: rick.brown@state.co.us

ATTACHMENT 1

FOUNTAIN CREEK BEDLOAD SEDIMENT REMOVAL DEMONSTRATION PROJECT

Revised Budget 1-20-2010

	10-'11	11-'12	TOTAL COSTS	Cash Match & In-Kind	CWCB Funds
OBJECTIVE 1: Bedload sediment system					
(see Attachment 1A Bedload Collector Equipment Detail)					
Installation of Sediment Collector & Pump	$191,000	$29,000	$220,000	$92,000	$128,000
Pump Controller, Water Return & USGS Gage	$100,000		$100,000	$56,000	$44,000
Design & Specifications	$47,000		$47,000	$31,000	$16,000
Construction Management	$19,000	$1,000	$20,000	$12,000	$8,000
Subtotals	$357,000	$30,000	$387,000	$191,000	$196,000
OBJECTIVE 3:					
Monitoring Water Quality & Sediments					
Water Sample Collection & Analysis (in-kind)	$15,000	$60,000	$75,000	$75,000	$0
Macroinvertebrate Analysis	$5,000	$15,000	$20,000	$11,000	$9,000
Sediment System Collection & Analysis	$25,000		$25,000	$13,000	$12,000
Subtotals	$45,000	$75,000	$120,000	$99,000	$21,000
OBJECTIVE 4: ADMINISTRATIVE					
Progress Reports	$5,600	$8,800	$14,400	$6,400	$8,000
Reimbursement Requests	$400	$1,200	$1,600	$1,600	$0
Final Report/Grant Close-out		$2,000	$2,000	$2,000	$0
Subtotals	$6,000	$12,000	$18,000	$10,000	$8,000
TOTAL PROJECT BUDGET	$408,000	$117,000	$525,000	$300,000	$225,000

Attachment 1A - Bedload Collector Equipment Detail

1	Weldment	$16,000.00	$16,000.00		
1	Sand blasting	$2,000.00	$2,000.00		
1	Urethane coating	$16,000.00	$16,000.00		
1	Urethane internal Parts	$8,000.00	$8,000.00		
1	Urethane internal Pipes	$3,500.00	$3,500.00		
1	Urethane Grate	$18,000.00	$18,000.00		
1	Vibrators	$4,000.00	$4,000.00		
1	Air Compressor	$1,500.00	$1,500.00		
1	Shipping			$8,000.00	
				$69,000.00	$180,500.00
1	Pump Model #:(SBLH4S75-4T4/12.99) Gallons Per Minute:(800) Total Head:(121') Max Particle Size:(1-3/4")	$26,400.00	$26,400.00		
1	Pump base and subframe	$6,000.00	$6,000.00	$32,400.00	$38,880.00
1	Streamside Systems Pump Controller	$40,000.00	$40,000.00		
1	Internet interface to USGS Gage	$12,000.00	$12,000.00		
				$52,000.00	$62,400.00
1	36" x 25' FMW	$22,597.00	$22,597.00		
1	Modifactions for water return, pinch valve and electrical interface	$8,500.00	$8,500.00		
				$31,097.00	$37,316.40
					$319,096.40

ATTACHMENT 2

MILESTONES TABLE FOR FOUNTAIN CREEK BEDLOAD SEDIMENT DEMONSTRATION PROJECT

TASK/RESPONSIBLE ORGANIZATIONS	OUTPUT	QTY	YEAR 1				YEAR 2			
			03/10			2/11	03/11			2/12
Task 1 – ($47,000) Complete Design, specifications, and permitting for construction of bedload sediment removal system demonstration project area /City of Pueblo hired contractor	Construction design and specifications	1 1								
Task 2 – ($340,000) Installation of the bedload sediment system and sediment material collection system/City of Pueblo and hired contractor(s)	Full-scale sediment removal & collection system	1								
Task 3 - ($120,000) Monitor and test water quality and sediments/ City of Pueblo Stormwater and Wastewater departments & CSU Pueblo	Water quality and sediment monitoring									
OBJECTIVE 3 **Task 1 – ($18,000) Complete grant reports**	Administrative, grant progress and final report	12								

PROJECT MILESTONES

The project milestones include the completion of the design and specifications, construction of the project, ongoing water quality and sediment monitoring during the project, and completion of the grant progress reports, reimbursement requests and final grant closeout. The water and sediment monitoring will be completed on an ongoing basis over an eighteen month period with an annual report comparing the results of the testing. The administration of the grant and submittal of reports will be completed throughout the project with progress reports submitted quarterly, reimbursement requests submitted per the terms of the grant agreement, and a final report submitted at the completion of the project.

Bedload/Sediment Collect and Removal Technology Study
Supplemental Project Information

The information provided in this Supplemental Project Information addresses the areas in the grant application that were not fully addressed or needed additional clarification. These include the following:

- Connection to the Basin Roundtables consumptive and/or nonconsumptive needs within the Arkansas River basin
- The other important efforts underway associated with this project along Fountain Creek
- Additional information to address grant application criteria I through T

Project's Connection to the Basin Roundtables Consumptive and/or Nonconsumptive Needs with the Arkansas Basin

This project is identified as one of the Identified Plans and Projects (IP&P) within the "Projects & Methods to Meet the Needs of the Arkansas Basin", produced by the Arkansas Basin Roundtable, November 2009. An additional major IP&P's for the Arkansas Basin is the Southern Delivery System (SDS). While the SDS project does not create new water, it creates an increase in the physical supply of water in the basin. An end result of the SDS project is an increase in return flows in Fountain Creek to the Arkansas River. This project will provide a demonstration project to determine if improvements to the main channel can provide for the more efficient transport of return flows into the Arkansas River.

Another priority of the Arkansas Basin Roundtable is the maximum utilization of water to enhance the vitality of the environment. This project is located within the reach of Fountain Creek that has an environmental attributes rating of 2 out of a high rating of 4. Although the highest environmental significance of this reach of Fountain Creek is the protection and enhancement of critical wetlands along Fountain Creek. This project will analyze the potential for the improvement of stream morphology and channel restoration that will improve and sustain existing wetland communities. Wetlands are currently threatened by storm events that deposit large amounts of sediments resulting in significant damage to the wetland vegetation and wildlife habitat.

Explanation of Other Efforts Associated with the Fountain Creek Watershed Plans that Support the Removal of Bedload Sediment

Over the past several decades, multiple studies and work-products (from technical teams) have universally identified a series of issues that require mitigation. The Sixty-seventh General Assembly, State of Colorado enacted Senate Bill 09-141, led to the creation of the Fountain Creek Watershed, Flood Control, and Greenway District. The objective of this organization is to create an independent District, modeled on the Denver Urban Drainage District, for the Fountain

Creek Watershed: to address flooding, erosion, sedimentation, recreation, open space, wetlands, and parks. A resolution implementing an intergovernmental agreement (IGA) between the Lower Arkansas Valley Water Conservancy District, the City of Colorado Springs, and the Fountain Creek Watershed, Flood Control, and Greenway District was approved 10 September 2009. The Fountain Creek Water Shed Flood Control & Greenway District (the "District") has adopted the U.S. Army Corps of Engineers Watershed Study and the Fountain Creek Vision Task Force Plan as the documents to be used in evaluating and implementing project within the District's boundaries. Both studies identify the proposed Bedload Sediment Removal Project as a high priority project for implementation within Fountain Creek. The establishment of the District and IGA unified the proposed goals and efforts of the stakeholders and previous report recommendations. The following is a short summary list of key reports and efforts underway:

- Fountain Creek Watershed Forum (PPACG & PACOG, 1989)
- Impervious Surface Area Analysis Report (TAC, 1998)
- Reconnaissance Study (USACE, Nov. 2001)
- Fountain Creek Watershed Plan (PPACG & PACOG, 2003)
- Fountain Creek Watershed Study (Feasibility, USACE, 2004)
- Fountain Creek Hydrology Watershed Analysis (USACE, 2004)
- Fountain Creek Hydrology Report (USACE/URS, 2006)
- Fountain Creek Geomorphology Report (USACE/URS, 2006)
- Southern Delivery System Final Environmental Impact Statement (FEIS)(USBR, Dec. 2008)
- Record of Decision (ROD) for the Southern Delivery System Final Environmental Impact Statement (USBR, GP 2009-01, Mar. 2009)
- Fountain Creek Corridor Master Plan (In progress, Colorado Springs Utilities, Lower Arkansas Valley Water Conservancy District)[www.fountain-crk.org]
    - Goal: Regional solutions and funding for 44 miles of Fountain Creek. The following secondary goals are fully consistent with CWSI Water Management Objectives and Recommendations.
    - Identify solutions to reduce erosion, sedimentation & flooding (including the use of the Streamside Systems bedload collectors pursuant to the outcome of this City of Pueblo project)
    - Create healthy ecosystems
    - Sustain productive agricultural lands
    - Gain public and private support
    - Identify solutions to improve water quality
    - Identify Mitigation measures
    - Identified:
        - Concept Plans for 4 Demonstration Projects of which one, Confluence Park, specifies the use of Streamside Systems Collectors to remove sediment and beneficially reclaim a portion for development of this park.
        - Regional Support
        - Partial funding awarded ($300k from CSU, $50K/year from CSU and Lower Ark towards District staff)
    - Identify strategies for implementation:
        - Partnerships
        - Funding

    - Criteria/standards
- Fountain Creek Watershed Management Plan (USACE, Jan. 2009)
- Strategic plan for the Fountain Creek Watershed (FCVTF, Mar. 2009)
- Characterization of Stormwater and Wastewater Treatment-Plant Effluent Discharges on Water Quality, Suspended Sediment, and Stream Morphology for Fountain and Monument Creek Watersheds, Colorado, 198102006 (USGS, Scientific Investigations Report 2007-5104)

Consistent with all of these reports are the following findings and issues:

- Increased imperviousness/runoff and need for mitigation
- Increasing base and intermediate flows
- Bank erosion concerns
- **Increased sedimentation and need for mitigation**
- Habitat loss
- Water quality (e.g., e.coli, selenium)
- Impacts to recreational opportunities

From a regional point of significance, the increase in population and the advent of the Southern Delivery System (SDS) will have the following impacts from upstream activities on downstream neighbors:

- Flooding
- Sedimentation/Erosion
- Water Quality

Four step approach advocated by agencies to reduce flooding and sedimentation in Fountain Creek.

1. Detain stormwater adjacent to urban development areas to reduce peak flows or delay stormwater from entering Fountain Creek or tributaries during storm events.

2. Provide off-channel detention areas to divert peak flows during storm events and improve water quality.

3. **Re-establish main river channel (thalweg) within river channel to reduce sedimentation during normal and moderate storm events through the removal of bedload sediments.**

4. Removal of sediments deposited during major storm events outside of the main thalweg to restore the 100-year storm capacity within Fountain Creek.

Relationship of this Project to the Southern Delivery System (SDS) Project

The 1041 permit issued by Pueblo County requires Colorado Springs Utilities (CSU) to reduce sedimentation within Fountain Creek. This project will provide a demonstration project that for

the removal of sediment that will establish a more defined main creek channel. CSU is looking at utilizing traditional dredging methods within the over bank areas to re-establish a flood plain elevation equal to the elevation when the Fountain Creek flood levee project was completed in the mid 1980's. An estimated 2½' to 3' of sediment will be removed from the overbank areas within the Fountain Creek levee project area in Pueblo.

Relationship of this project to additional U.S. Army Corps of Engineers (USACE) project: Army Corps of Engineers Watershed Study – this project, promoted by Congressman John Salazar and funded by the Congressionally funded Water Resources Development Act (WRDA), is an adjunct to this proposed project which will generate sediment and bedload transport rate data that will be used to calibrate the Army Corps of Engineers, Sediment Impact Analysis Methods (SIAM), a computational sediment transport modeling software package within the Fountain Creek Basin. The goal of this project is to apply the SIAM model, developed by the USACE Arid Regions Lab, to an arid region undergoing urbanization and to assess the effects of urbanization on stream sedimentation. The outputs from this aligned study will have incalculable benefit throughout Colorado and the Western United States.

Project Evaluation Criteria I through T

Meeting Water Management Goals and Objectives and Identified Water Needs

i. **The water activity helps complete a needs assessment, including consumptive and/or nonconsumptive needs, that was not fully funded from other sources.**
Funding has been previously provided through the Army Corps of Engineers, Bureau of Reclamation, State of Colorado, Colorado Springs Utilities (CSU) and the Lower Arkansas Valley Flood Conservancy District to assess the geomorphic condition of Fountain Creek including changes in depth of sediment, areas where significant erosion is occurring, and the impact of new invasive plant growth along the banks and braided channel segments of the stream. Funding has not been previously provided for a large-scale demonstration project to determine the impact of removing sediment from the streambed and how that will affect the geomorphic condition. CSU is looking at implementing traditional dredging methods to lower the sediment deposits outside of the creek where overbanking during large storm events has left up to three feet of sediments inside the levee system. Traditional dredging will not address modifications to the stream thalweg. This is the first project along Fountain Creek focusing exclusively on impacts to the stream channel that will have a direct affect on the ability to convey water more efficiently downstream and the establishment of a more defined stream channel that could improve fish habitat and recreational opportunities within the stream. Funds from the Colorado Department of Public Health & Environment through the 319 EPA have already been secured to assess the impact of bedload sediment removal has on improving the health of Fountain Creek.

j. **The water activity meets one or more of the water management objectives identified in the Statewide Water Supply Initiative,3 helps implement projects and processes identified as helping meet Colorado's future water needs, and/or addresses the gap areas between available water supply and future need as identified in the Statewide**

Water Supply Initiative or a roundtable's basin-wide water needs assessment done in accordance with the Colorado Water for the 21st Century Act.
The overall objective of the SWSI is to ensure adequate water supply for citizens, the environment, and commerce. As part of the anticipated escalation of residential populations along the Front Range (almost 2.8MM) by 2030 (with an estimate 350-400K in the Fountain Creek Watershed alone), the Southern Delivery System (SDS) project was born out of necessity. The U.S. Bureau of Reclamation, Environmental Impact Statement (EIS) and Record of Decision (ROD) articulates the potential impacts to Fountain Creek from this escalation of water using population and effects from impervious surfaces and infrastructure on the return-flow into Fountain Creek (both stormwater and municipal treated waste water). Coupled to this, the projected higher amplitude storm events from Climate Change will result in fewer but more productive precipitation events. This project serves to ensure that Fountain Creek is better prepared to accept this higher flow rate through the reduction of sedimentation, aggradation, and improved water transmission capacity. The improved transmission capacity and reduction in sedimentation (caused by natural geologic/stratigraphic realities and enhanced erosion due to higher flow rates) will ensure sustainability of agricultural demand. The Colorado State University study on water availability of the Lower Arkansas Valley describes the current problems associated with aggradation of sediment, in that reach of the river, leading to problems associated with irrigation districts (system plugging) and the exacerbating effects from Arkansas River heightened benthic elevation and morphology changes (braided stream) that tends to further reduce capacity and velocity issues (compounding and causing further aggradation effects) – ultimately leading to inefficient irrigation supply. In order to optimize existing and future water supply for municipalities and agriculture, removal of the anthropogenic resultant sediment and bedload is imperative and releatedly cited in the numerous studies and recommendations (USACE, USGS, SCVTF, FCWFC&GD). Re-establishment of the historical thalweg, along with the improvement to the Fountain Creek's water quality, by removing what is arguably the number one pollutant (sediment TMDL), in concert with the S.B. 09-141 legislated establishment of the Fountain Creek Flood Control and Greenway District initiatives will greatly enhance recreation opportunities and re-connect the citizenry throughout the watershed with their historical and cultural connectivity to the Fountain Creek. And, the cost-effective beneficial reclamation of the sands and small aggregates from the Fountain Creek – utilizing a de minis carbon footprint technology (compared to traditional dredging) – will serve to conserve cost and produce a useable product needed to support the other watershed park and Greenway development projects. Lastly, the implementation of this innovative watershed management approach will demonstrate that full compliance with all applicable laws, rules, regulations, and water rights does not have to be onerous or costly.

There is an estimated 18% gap in available water and future supply needs for the Arkansas River Basin. This project addresses three of the following recommendations:

<u>Track and Support the Identified Projects and Processes</u>
This is an identified high priority project recommended in plans completed by the U.S. Army Corps of Engineers and the Fountain Creek Vision Task Force. These plans are being used by the Fountain Creek Watershed Flood Control & Greenway District in guiding the

evaluation and implementation of projects within the Fountain Creek Basin. This project addresses implementation issues that hopefully will lead to a multiple project benefit along Fountain Creek. The project will provide a monitoring mechanism to track outcomes of this project that if successful can be implemented in other locations along Fountain Creek and in other stream locations in Colorado with similar bedload sediment conditions.

Create a Common Understanding of Future Water Supplies
The project will more accurately assess the hydrologic conditions within the Fountain Creek Basin to determine the potential of improving flows to downstream users. In addition the project could identify whether water can be delivered more efficiently to downstream users if sediments that block and impair the delivery of water are reduced (i.e. blocked headgates or loss of capacity for water diversion structures).

Develop Implementation Plans towards Meeting Future Needs
This project will identify if sediment removal can improve the operation of existing downstream facilities that are primarily operated by agricultural users. In addition, it is likely that this type of project will require multiple types of permits that will serve as a benchmark for future project implementation that has the potential for providing multiple benefits and solutions.

k. The water activity promotes water conservation and efficiency.
The primary objective of this study is to validate that continuous bedload/sediment removal utilizing the Streamside Systems Collector technology is capable of stream morphology modifications that will lead to the development of a higher capacity thalweg. The establishment of a thalweg on Fountain Creek will serve to lower the benthic elevation; reduce the water surface area currently presented by the braided stream morphology thereby reducing evaporative loss; and development of a more efficient transmission of the in stream flow. By enabling the stream to effectively transmit smaller and more frequent storm event without creating overbanking conditions, more water is available for use (by agricultural users and municipalities) in the Lower Arkansas River Valley. Over bank conditions lead to localized infiltration, flow volume reduction, and pooling – all reducing the volume of water transmission on the Fountain Creek.

l. The applicant has an existing water conservation plan.
The Charter for the City of Pueblo establishes the Pueblo Board of Water Works (the "Board") as the supplier of municipal water for the residents of the city. The Board has an adopted water conservation plan from 1998 and is currently in the final staging of updating the conservation plan to comply with the standards and requirements stipulated in the 2004 Colorado Revised Statutes.

m. The water activity will make new water available for use.
The establishment of a thalweg on Fountain Creek will serve to lower the streambed elevation and reduce the braided stream morphology currently present that increases water evaporative losses (increases multi-fold the surficial gas-liquid interface area - resulting in drastically elevated evaporative flux loss and increases the exposed saturated sandy sediment -propagating capillary wicking and solar-enhanced resultant evaporative loss). The enhanced

thalweg will provide for a more efficient transmission of the in stream flow. The outcome of this project is to demonstrate that enabling the stream to effectively transmit water downstream without creating frequent overbanking conditions, more water is available for use (by agricultural users and municipalities) in the Lower Arkansas River Valley. The current over bank conditions lead to localized infiltration, flow volume reduction, and pooling – all reducing the volume of water transmission on the Fountain Creek.

n. The water activity involves reoperation, enlargement, or rehabilitation of existing facilities.

Not Applicable

The Water Activity Addresses Issues of Statewide Value

o. The water activity helps sustain agriculture, and open space, or meets environmental or recreational needs.

Implementation of this innovative approach (emerging technology) will serve to improve the overall management of the massive sediment and bedload transport in the Fountain Creek. While some sediment are needed to seal ditches to increase water delivery, the bedload sediments have been responsible for the plugging of virtually all of the agricultural irrigation canals fed by the Fountain Creek and Arkansas River. This has caused reduced water availability to agriculture, costly canal dredging for farmers, and impacts to farmer's secondary irrigation systems. It is anticipated that this demonstration project will increase the available water entering into the Arkansas River which could increase the possibility that owners of junior water rights will receive water more frequently. The current conditions do not provide many opportunities for holders of junior water rights to utilize water.

The establishment of a deeper, more defined thalweg for Fountain Creek should help to improve fish habitat by concentrates the flows in the channel during low-flow periods. An improved thalweg could also improve opportunities for water-based recreation that is not currently available due to the undefined braided condition of the streambed.

p. The water activity assists in the administration of compact-entitled waters or addresses problems related to compact entitled waters and compact compliance and the degree to which the activity promotes maximum utilization of state waters.

q. The water activity assists in the recovery of threatened and endangered wildlife species or Colorado state species of concern.

Both the U.S. Bureau of Reclamation and USACE Environmental Impact Study and analysis conclude that the area, proposed for the collector installation, is neither in nor proximal to a federal critical habitat. However, the Fountain Creek near the Arkansas River confluence is home to a candidate species for Federal listing and is considered a threatened species in Colorado – the Arkansas Darter. The Arkansas Darter Recovery Plan, 1994 (Loeffler and Krieger) concluded that habitat improvements for the Arkansas Darter population include protecting and improving riparian corridors; protecting springs, pool refugia, and

groundwater levels from depletion; removing introduced fish predators; and eliminating water pollution along occupied streams. Since this project will improve water quality and should improve stream habitat (degraded over recent years by flooding and stream bank erosion), it is anticipated that an overall benefit to the Arkansas Darter is anticipated. Stability in stream morphology coupled to the allied riparian improvement projects (not contemplated under this grant request) should have positive impacts on this organism.

r. **The water activity provides a high level of benefit to Colorado in relationship to the amount of funds requested.**

The innovative approach proposed utilizes the stream's energy to continuously deliver the sediment/bedload to the collector – which accounts for a significant reduction (and near elimination compared to traditional dredging operations) in the removal process carbon footprint. Employment of this technique is environmentally benign, aesthetically near invisible, and ecologically sensitive to the benthic fauna. Furthermore, the collector's operation does not interfere with stream recreation nor present noise, fugitive dust, or engine combustion emissions. The table below illustrates, comparatively, the benefits from the use of this innovative approach over traditional and, by necessity, recurring dredging. The system is designed to only remove the specified particle sizes and will not remove the critical larger aggregate, gravel, cobble, and river rock that is critical for benthic invertebrates and spawning areas. Traditional dredging destroys benthic habitat and is non-discriminatory in terms of beneficial aggregate, gravel, cobble, and river rock – all of which also serve to stabilize the stream bottom and improve flow characteristics/water transmission. Furthermore, once the harvested sediment is separated from the liquid phase, this river water is returned to a manifold servicing the bottom of the collector's hoppers for re-introduction into the hopper base. This quasi-closed-loop process ensures that there is no impingement (or pressure differential) across the grain-sizing grate. This is critical to ensuring that juvenile fish, macro-invertebrates, fish eggs, or other fauna are not drawn into the system.

As a benefit to other Colorado impact streams (Colorado Department of Public Health and Environment, Water Quality Control Commission, 5 CCR 1002-93, Regulation #93, Section 303(d)) and those other arid region streams with sediment impacts, the deployment/ performance envelop validation of this emerging/innovative technology to address these sediment impact issues will have direct value and applicability. Since the system is designed to continuously harvest the sediment/bedload, obvious further benefits over traditional recurring dredging – especially concerning cost-benefit. Parametrically applying a nominal sediment removal rate; including the capital equipment cost of ownership for the City of Pueblo; installation costs; liberally estimating standard utility and M&O; and not taking advantage of the value of the beneficially reclaimed material, the cost of removing the sediment with the bedload collector over a ten year period is $0.47 per cubic yard. Comparing USACE reported $2.50 per cubic yard cost [USACE, Albuquerque District, Fountain Creek Potential Projects, Flood Control and Channel Stability, 12 Dec. 2007] for a single proposed dredging operation on Fountain Creek (with maintenance dredging operations necessary afterwards), coupled with the aforementioned positive attributes, the cost benefit of our proposed approach is clear. Furthermore, by continuously harvesting the sediment, recurring dredging and braided stream morphology re-establishment are not a concern. Management of the harvested/beneficially reclaimed sediment is also enhanced

since it will be pumped from the collector and delivered via slurry pipeline to an out-of-flood plain repository for separation, stacking or containerization at a manageable rate. Incising downstream of the collector will promote the development of a stable thalweg and allow flushing flows to propagate this desirable stream morphology condition downstream. Since the collector technology is fully adjustable, the system can be tuned to allow a designated quantity of sediment to bypass collection. The system can also be turned off and re-started at a later point in time as it has a self-purging feature.

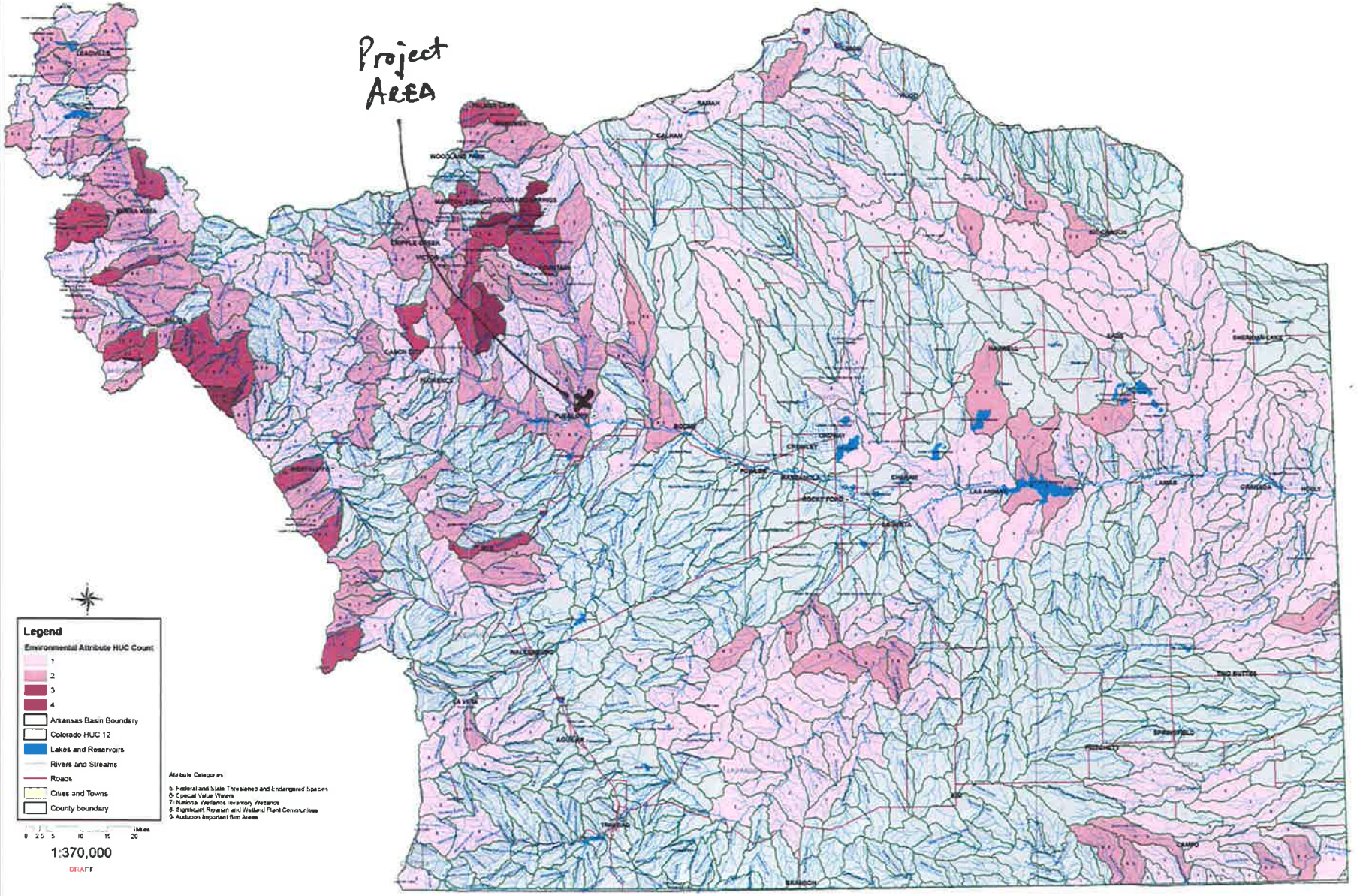
s. **The water activity is complimentary to or assists in the implementation of other CWCB programs.**
The Watershed Protection & Flood Mitigation Section of the Colorado Water Conservation Board has the duty and authority among other items, to "devise and formulate methods, means, and plans for... the prevention of flood damages... and to designate and approve storm or floodwater runoff channels or basins..." [37-60-106(1)(c) C.R.S.].

t. **The water activity helps support the State's economic vitality and competitiveness in national and international markets.**
Clearly, the improvement of water delivery (quantity and quality) to irrigation districts downstream and reduction of costly maintenance dredging and secondary irrigation equipment repair will have a significant positive impact on the State's agricultural economic vitality and assured competitiveness with national and international agricultural markets. Sedimentation and bedload management issues exist throughout Colorado's rivers and streams and this highly structured demonstration project will validate the performance of this emerging technology's utility in arid and sandy streams throughout the Fountain Creek Watershed and other Colorado watersheds. Understanding the flexible performance of this system may also benefit Colorado waterways as an emergency response device should there be a significant solid waste spill (similar to last year's Tennessee TVA disaster) or in dealing with the perennial traction and wind-born sand impact issues in our cherished sport fly fishing streams and fisheries. Having this new methodology proven, to enhance streams in an economically viable way, will well serve the State of Colorado to improve water quality and habitat and have second order positive effects in support of recreation and the tourism industry.

Comparison of the Positive and Negative Impacts of Sediment Removal from a Stream by Dredging and with the Streamside Bedload Sediment Collector System

Effects of Operation	Suction Dredging and/or Drag lining	Streamside System Collectors
Habitat damage via Indiscriminate removal of desirable streambed gravel and cobble	Yes	No
Biological damage via direct removal and destruction of fish eggs, redds, invertebrates, and organic matter	Yes	No
Reduced water quality (high turbidity) via substrate disruption and/or onsite screening, and washing operation	Yes	No
Morphology damage and channel incision that can cause headcutting throughout the watershed	Yes	No
Equipment serves as a grade control structure to stabilize the channel and prevent headcutting	No	Yes
Physical disruption over large area, with visual and aesthetic impacts	Yes	No
Equipment and/or operation may create a hazard and/or obstruction to river recreational users (fishing & boating)	Yes	No
Selective removal of fine sediments that are generally considered harmful	No	Yes
Increase substrate median particle size and improve benthic habitat for fish spawning and for sensitive invertebrates	No	Yes
Passive and non-invasive operation	No	Yes
Selective removal of clean-washed product (e.g. sand), with no increase in turbidity over ambient	No	Yes

Arkansas Basin Nonconsumptive Needs Assessment
Environmental Priorities
HUC 12 Watershed Based Environmental Attributes Prioritization



Arkansas Basin Nonconsumptive Needs Assessment
Environmental Priorities
HUC 12 Watershed Based National Wetlands Inventory Wetlands