Wightman Fork, Tributary to the Alamosa River. Summitville is in the background.

Alamosa River Instream Flow Project:

Terrace Reservoir Hydrologic Modeling,

Site Survey, and Mapping

Rio Grande Basin

P R O P O S A L

Alamosa Riverkeepers®

December 4, 2006

Mike Gibson, Chairperson
Rio Grande Basin Round Table
415 San Juan Avenue
Alamosa, CO 81101

Dear Mr. Gibson:

Alamosa Riverkeepers® is requesting $64,500 for the Terrace Reservoir Hydrologic Modeling, Site Survey, and Mapping. These studies are a critical component of the Alamosa River Instream Flow Project.

The Colorado State Engineer has determined that the existing Terrace Reservoir spillway has insufficient capacity to pass the Probable Maximum Flood. Consequently, a storage restriction has been placed on the reservoir. In order to implement the Alamosa River Instream Flow Project, spillway capacity must be increased and the storage restriction must be lifted to accommodate water rights that will be stored and released for instream flow purposes. Specific spillway improvements cannot be determined until a site-specific Probable Maximum Flood analysis has been performed. However, any spillway improvements are expected to occur in the vicinity of the existing spillway and discharge channel. Topographic mapping of the area encompassing the Terrace Reservoir dam and spillway is a first and essential step toward the design and construction of any spillway improvements required by the State Engineer.

We believe our request complements the Rio Grande Roundtable goal of achieving projects of sustainability and public benefit. Senate Bill 04-222 allows formation of a sub-district of the Rio Grande Conservation District to stabilize the underground aquifers. Instream flow will help recharge the confined aquifer, will take some farmland out of production, and will thereby help to stabilize the aquifer.

The Instream Flow Project serves multiple natural resource benefits. Instream flow will help with the development of a fishery, will restore operational flexibility and storage capacity at Terrace Reservoir, and will enhance riparian habitat, while also improving wildlife resources and recreational use.

Thank you for the opportunity to apply for funding.

Sincerely,

Cindy Medina, Alamosa Riverkeeper

Figure ES-7. Terrace Reservoir Spillway from Downstream

Conducting a site-specific Probable Maximum Flood study will potentially reduce the cost of restoring Terrace Reservoir's spillway capacity.

COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
2006-2007 GRANT APPLICATION FORM

Alamosa River Instream Flow Project: Terrace Reservoir Hydrologic Modeling, Site Survey, and Mapping / Rio Grande Basin

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

Amount of Funds Requested	Please Check Applicable Box		Approval Letter Signed By Roundtable Chair and Description of Results of Evaluation and Approval Process
$64,500.00	X	Basin Account	Yes
		Statewide Account	No

*** 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 should be emailed, typed, or printed neatly. 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 October 2006

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

1. Applicant Name(s): Alamosa Riverkeepers®

Mailing address: P.O. Box 223, Capulin, CO 81124

Taxpayer ID#: 84-1175938 Email address: cindymed@fone.net

Phone Numbers: Business: (719) 274-4298

Home:

Fax: (719) 274-4298

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

Name: Cindy Medina

Position/Title Project Manager and Riverkeeper

3. Provide a brief description of your organization below: Refer to Part 2 of criteria and guidance for required Information. Attach additional sheet(s) as needed.

Alamosa Riverkeepers® (ARK)is requesting $64,500. Our mission is “to strive for a clean, functional river system which benefits the economic, ecological and recreational needs of the community.” ARK operates under the auspices of the Valle del Sol Community Center (The Center), a federal nonprofit 501(c)(3)organization founded in 1989 in Capulin, a town in the Alamosa River Watershed which has been environmentally impacted by the initial cyanide spill and by subsequent heavy metals contamination from Summitville Mine. In 2001, a Natural Resource Damage settlement was reached with Robert Friedland. Five million dollars of the settlement was set aside for physical improvements in the Alamosa River watershed and for acquisition of “equivalent natural resources”. ARK spearheaded the formation of a local group, the Alamosa River Foundation (the Foundation), to represent stakeholders in the Alamosa River watershed. In 1999 ARK was accepted into the Waterkeeper Alliance, an international nonprofit organization comprised of 153 member programs throughout the world, with combined stewardship of more than 67,000 miles of rivers, streams and shorelines. ARK serves the communities of Capulin and La Jara, in Conejos County, which is 57% Latino and has double the State’s number of people living below poverty. ARK is in partnership on this project with Terrace Irrigation Company, a Colorado nonprofit with approximately 30 shareholders. The company owns and operates Terrace Reservoir, which stores runoff during winter months and releases water in priority during the irrigation season for agricultural use. The contact person for Terrace Irrigation Company is Rodney Reinhardt at 719-589-2128.

Water Supply Reserve Account – Grant Application Form

Form Revised October 2006

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

1. Name of water activity/project:

Alamosa River Instream Flow Project: Terrace Reservoir Hydrologic Modeling, Site Survey, and Mapping

2. What is the purpose of this grant application? Check one.

- [ ] Environmental compliance and feasibility study
- [ ] Technical assistance regarding permitting, feasibility studies, and environmental compliance
- [X] Studies or analysis of structural, activities: Terrace Irrigation Company will conduct hydrologic modeling, site survey, and mapping of Terrace Reservoir for spillway rejuvenation.
- [ ] Structural and/or nonstructural water project or activity

3. Please provide an overview of 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. Please refer to Part 2 of criteria and guidance document for additional detail on information to include. Attach additional sheets as needed.

Type of Activity: Terrace Irrigation Company will conduct hydrologic modeling, site survey, and topographic mapping of Terrace Reservoir.
Purpose: The Terrace Reservoir Hydrologic Model, Survey and Mapping project is a critical component of the Alamosa River Instream Flow Project. This funding application requests funds for hydrologic modeling, a site survey and topographic mapping. The complete Alamosa River Instream Flow Project includes: (1) Acquiring senior irrigation water rights on the Alamosa River; (2)Improving the Terrace Reservoir spillway to remove the State-imposed storage restriction; (3)Transferring the irrigation water rights to the Colorado Water Conservation Board (CWCB) for storage in Terrace Reservoir and instream flows in the downstream Alamosa River; and (4)Operating Terrace Reservoir to store and release CWCB flows in accordance with an instream flow program. The full Alamosa River Instream flow project resulted from the Summitville Mine disaster and conclusions reported in the Colorado Water Conservation Board's *Alamosa River Watershed Restoration Master Plan and Environmental Assessment Final Report*. Specifically, the Master Plan identified improving the Terrace Reservoir spillway in connection with the acquisition of water rights for instream flow purposes as two preferred solutions to watershed health.
Need: The Colorado State Engineer has determined that the existing Terrace Reservoir spillway has insufficient capacity to pass the probable maximum flood. Consequently, a storage restriction has been placed on the reservoir. In order to implement the Alamosa River Instream Flow Project, spillway capacity must be restored and the storage restriction must be lifted to accommodate water rights that will be stored and released for instream flow purposes. Specific spillway improvements cannot be determined until a site-specific Probable Maximum Flood analysis has been performed. However, any spillway improvements are expected to occur in the vicinity of the existing spillway and discharge channel. Topographic mapping for the area encompassing the Terrace Reservoir dam and spillway is a first and essential step toward the design and construction of any spillway improvements required by the State Engineer. The photograph in Figure ES-7 shows the current condition of Terrace Reservoir Spillway. Because of these deficiencies there is presently a 2,000 acre feet State restriction on Terrace storage. After the proposed modifications to the spillway and the lifting of this storage restriction, 2,000 acre feet of storage capacity in Terrace Reservoir will be dedicated to instream flow.
Objective: Our Instream Project will purchase one or more senior irrigation water rights, remove that water from farming, place it into a storage-and-release plan at Terrace Reservoir, and thus restore the instream flow and improve the natural environment in the Alamosa River channel. Hydrologic modeling, site survey, and topographic mapping of Terrace Reservoir are required to meet these objectives.

[CONTINUED ON PAGES 4a]

Water Supply Reserve Account
Grant Application Form

#3 Continued….

Urgency: The Colorado Water Conservation Board's extensive Alamosa River Master Plan documents the Alamosa River watershed's history, geology, and hydrology. The Master Plan confirmed the impacts of Summitville's operations and determined that a river reach near Capulin, within the alluvial fan, is left dry for much of the year. Recent droughts have exacerbated the environmental impacts on wildlife, vegetation, riparian groundwater levels and water quality. The Master Plan designates top priority and most urgent projects as being in "Tier 1", and the Instream Flow Project is in that category. Improving the Terrace Reservoir spillway to remove the State-imposed storage restriction is critical and strategic, as Terrace Reservoir is our only option for a storage-and-release plan to restore instream flow to the Alamosa River.

Problems: From the beginning, over five years ago, ARK and the Foundation recognized the inherent complexity of this project. The Master Plan's requirement for the careful timing and coordination of events is therefore not to be taken lightly. Two factors will determine the magnitude of benefits produced by the Alamosa River Instream Flow Project: the nature of the specific water rights acquired (each water right will differ in amount, seniority, and place of diversion), and the specific operation plan for Terrace Reservoir. With so many mutually dependent and emerging elements, the best method for evaluating potential benefits from water right transfers and reservoir operation plans is through a computer-simulated model. This allows us to simulate expected stream flows and reservoir operations; to analyze the interplay of such complex elements as inflows, regulated outflows, spills, storage accounts, and evaporation; and to account for diversions on the Alamosa River and its operation according to the State's priority system. Such a model also allows us to account for other factors such as losses due to seepage.

Opportunities: This project opens the way to transferring irrigation water rights to the Colorado Water Conservation Board (CWCB) for storage in Terrace Reservoir so we can improve instream flows in the downstream river. Senate Bill 04-222 requires the confined aquifer to be maintained within the levels from 1978-2000. This Instream Flow Project will help by recharging the confined aquifer, thereby helping to stabilize the aquifer.

Expectations: The deliverables from the Terrace Reservoir Hydrologic Model project will include: Draft and final reports documenting development and application of the Terrace Reservoir hydrologic model for the Alamosa River Instream Flow Project. Deliverables from the site surveying and topographic mapping task will include: (1) Descriptions of ground control points used for establishing survey control and (2) Topographic mapping in AutoCad or MicroStation digital format. This first step in our Instream Flow Project initiates the Master Plan's whole-system strategy, improving the Terrace Reservoir spillway so that we can realistically acquire the water rights we need for instream flow purposes.

In Section 3.1.1 the Master Plan summarizes our vision for the Alamosa River watershed in terms of resource category to include: a naturally functioning channel system; a balance between competing human and environmental uses of water; water quality that supports beneficial uses; Terrace Reservoir utilized reliably to its fullest capacity; a sustainable fishery on the Alamosa River and quality terrestrial and avian habitat; restoration of riparian habitat; efficient use of agricultural water from the Alamosa River; and recreational opportunities that benefit the public.

Service area/geographic location: The Alamosa Watershed, located in Rio Grande and Conejos Counties, comprises 148 square miles in the San Luis Valley of south–central Colorado. The mainstem of the Alamosa River is 51 miles long, extending from near the Continental Divide to east of La Jara. Elevations vary from over 13,000 feet to about 7,600 feet where the river ends at the Lowland and Head Overflow ditch headgates just east of Highway 285. Primary tributaries to the Alamosa River include Treasure Creek, Iron Creek, Alum Creek, Bitter Creek and Wightman Fork. Several smaller tributaries also drain into the Alamosa River.

4. Please provide a brief narrative of any related or relevant previous studies. Attach additional sheets as needed.

In July 2005 MWH Americas, Inc., in association with Agro Engineering, Lidstone & Associates and SWCA, and under contract to the Colorado Water Conservation Board, produced the *Alamosa River Watershed Restoration Master Plan and Environmental Assessment Final Report.* The Bibliography (Section 6.0) of the Master plan provides a detailed listing of the multiple, extensive, and inter-related studies of current environmental conditions and proposed solutions for identified problems in the Alamosa River basin. These are summarized below.

The incentive for the Master Plan was provided by a legal settlement over impacts of the Summitville Mine Superfund Site. That settlement also provided funding for the study and mitigation measures to be developed by the Master Plan. The scope of the Master Plan includes the entire watershed (not just the area directly affected by Summitville Mine), and covers a broad array of natural resources and watershed functions and values. The result is a multi–disciplinary approach to watershed assessment that has produced a prioritized plan for watershed restoration and enhancement. Specific projects are identified, along with potential financing sources, including funds from the Summitville legal settlement. The Master Plan is available on the web at: http://mountain-prairie.fws.gov/nrda/SummitvilleColo/Summitville.htm

Existing watershed conditions are described in Section 2.0:

- Channel of the Alamosa River and major tributaries
- Surface water quantity
- Surface water quality
- Groundwater
- **Terrace Reservoir (p. 2-104 to 2-121)**
- Sediments
- Riparian habitat (vegetative communities)
- Biological resources (wildlife resources)
- Agricultural uses
- Recreational uses

[CONTINUED ON PAGES 5a and 5b]

Water Supply Reserve Account
Grant Application Form

#4 Continued….

Development of the watershed restoration strategy and proposed actions (Section 3.0) was a systemic community process conducted in cooperation with the Trustee Council and stakeholders, with its final plan discussed in a public meeting on September 15, 2004.

Evaluation of natural resources impacts (Section 3.2) divided the Alamosa River watershed into stream segments and subwatersheds, analyzing each segment by natural resource impacts due to human activities. Figure ES-5 is a map of these segments, showing the critical role of Terrace Reservoir.

Water Quantity Improvement (Section 3.5)- In this study all the segments downstream of Terrace Reservoir were given a poor rating for surface water quantity. Proposed water quantity projects in this study focus on extending the period of flow in the Alamosa River downstream of Terrace Reservoir. **This study directly addresses the Master Plan's InStream Flow Project (pages 3-17 to 3-25)and details the Terrace Reservoir improvements and aquifer storage (3-25 to 3-32) forming the basis of this proposal.**

MWH Americas, Inc. is a recognized international leader in water, wastewater and environmental services with 200 offices in 34 countries. Its Denver office includes experts in dam design, wastewater treatment, watershed management, water supply planning, water treatment, environmental permitting, stormwater management, mine reclamation, and water infrastructure design. As the lead firm in preparation of the *Alamosa River Watershed Restoration Master Plan* and the *Rio Grande Headwaters Restoration Project*, MWH understands the water resource issues of the San Luis Valley. Resumes of key MWH staff assigned to this project are provided in Appendix A of the Master Plan. Contact: Chip Paulson. www.mwhglobal.com

Agro Engineering Since 1982, Agro Engineering has specialized in the transfer of sustainable agricultural and water resource technologies through its consulting services and training programs. Its interdisciplinary team of engineers, agronomists, entomologists and other experts provides a systems approach to analyzing and developing solutions to agricultural and water resource problems.

Agro Engineering provides agronomic and water management services for 40,000 to 50,000 acres of cropland in the San Luis Valley each year.

Colorado Water Trust is a private 501 (c)(3) nonprofit organization which acquires, or assists others in acquiring, water rights or interests in water rights, using voluntary approaches from willing owners, for conservation benefits. The Colorado Water Trust Board of Directors includes former Directors of the Colorado Department of Natural Resources, former Colorado Water Conservation Board Directors, the Dean of the University of Colorado Law School, water attorneys, water engineers, scientists and irrigators from across the State. Contact is John Carney, Executive Director, at 720-570-2897.

Colorado Water Conservation Board's mission is to "conserve, develop, protect and manage Colorado's water for present and future generations." In 1973 the Colorado legislature recognized the need to "correlate the activities of mankind with some reasonable preservation of the natural environment" and passed Senate Bill 97 creating the State's Instream Flow Program. This program, one of the first of its kind, vested the CWCB with exclusive authority to protect streamflow through a reach of stream rather than just at a point, and to protect levels in natural lakes. Under the Water Acquisitions Program, the CWCB can acquire "water, water rights or interests in water" to preserve or improve the natural environment, to a reasonable degree. Information is at www.cwcb.state.co.us and contact person is Linda Bassi at 303-866-3263.

The Colorado Division of Water Resources administers most day-to-day water rights and includes the Office of the State Engineer. The Rio Grande Basin Division Engineer Office is located in Alamosa. The Division offices employ water commissioners who work in the field allocating water, issuing shut-down orders, collecting water use and/or diversion data, and enforcing the decrees and water laws of the State of Colorado. The State Engineers Office is also responsible for inspecting dams and approving designs of new and modified dams. Contact person is Joe McCann at 719-589-6683.

5. Please provide a copy of the proposed scope of work. Please refer to Part 2 of the criteria and guidance document for detailed requirements. Attach additional sheets as needed.

The Terrace Reservoir Hydrologic Modeling, Site Survey, and Mapping Project proposal is part of the Alamosa River Instream Flow Project. Funding from the Rio Grande Basin Roundtable will provide critical match toward the 2.4 million dollars of funding for the overall Alamosa River Instream Flow Project, applied for through the Summitville Mine Natural Resource Damages Fund. Additional matching funds and in-kind services will total over 4 million dollars. A revised copy of the timeline in that study is included on "Page B.5" with item 10-02 being the EPAT Analysis; 11-04 is the hydrologic model; and 12-01 is the site work and preliminary design.

A. Probable Maximum Flood Analysis (rounded) $ 7,500.00

Product: Report including Extreme Precipitation and Probable Maximum Flood data for Terrace Reservoir spillway design and restoration. EPAT software will be used to estimate Extreme Precipitation data as an input to the HEC-1 flood hydrology model, which will estimate the Probable Maximum Flood.

EPAT Precipitation Analysis Software			$ 700
Hours Principal Engr.	3 at	$165/hr	495
Hours Engineer	18 at	$100/hr	1,800
Flood Hydrology Analysis			
Hours Principal Engr.	2 at	$165/hr	330
Hours Engineer	42 at	$100/hr	4,200

B. Site survey & Mapping (rounded) $20,000.00

Product: Descriptions of ground control points used for establishing survey control, and topographic mapping in AutoCad or MicroStation digital format.

Travel			$ 500
Hours Senior Engineer	17 at	$120/hr	2,040
Hours Technician	20 at	$ 75/hr	1,500
Surveying Subcontractor			16,000

C. Hydrologic Model of Terrace Reservoir (rounded) $37,000.00

Product: Report documenting development and application of the Terrace Reservoir model for the Alamosa River Instream Flow Project.

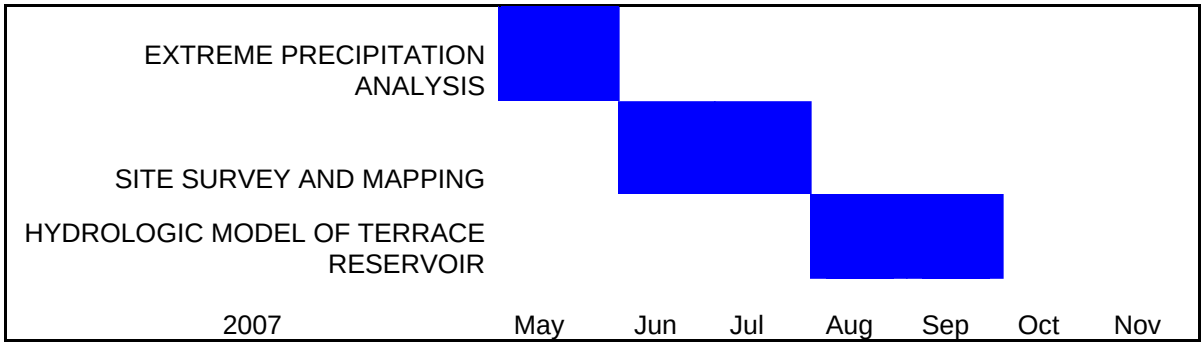
Hours Principal Engineer	40 at	$165/hr	$ 6,500
Hours Engineer	244 at	$100/hr	24,400
Hours Technician	80 at	$ 75/hr	6,000

Resumes of key personnel are attached.

RIO GRANDE ROUND TABLE FUNDING REQUEST TOTAL: $64,500.00

Water Supply Reserve Account
Grant Application Form

#5 Continued – Scope of work



The hydrologic model for Terrace Reservoir (A) will be developed using the MODSIM water resources simulation software developed by Colorado State University. MODSIM is capable of simulating water rights, diversions, native stream flows, reservoirs, and exchanges. The model will be developed month by month using existing hydrologic data available from the State and other sources. The model time period will be determined based on the availability of historical data. Simulations will be performed to determine:

- The amount of time the acquired water rights will be in priority
- The rate, volume and timing of water from the acquired water rights that can be left in the stream or stored in Terrace Reservoir
- The optimal plan for operating Terrace Reservoir to accommodate the needs of Terrace Irrigation Company as well as the instream flow program
- The effect of the instream flow program on Alamosa River stream flows and any junior water rights in the watershed

New topographic mapping(C) of the potential construction area will include the entire side of the dam containing the existing spillway, and the discharge area between the spillway and the downstream Alamosa River channel.

Mapping will be used for developing conceptual spillway improvement options, selecting a preferred spillway design, and preparing construction plans (B). The proposed surveying and topographic mapping project will include the following activities:

- Establishment of ground control
- Surveying for spot elevations of critical existing features
- Development of 1-ft contour maps at a scale of 1 inch = 40 feet in digital format.

Topographic mapping could be developed using either all field surveying methods or a combination of field surveys and aerial photogrammetry, depending on the least-cost method as determined by local surveyors.

6. List the names and addresses of any technical or legal consultants retained to represent the applicant or to conduct investigations for the water activity/project.

Name	Address/Phone Number
Chip Paulson and Tracy Wilcox	MWH Americas 1801 California Street, 29th floor Denver, CO 80202 (303) 291-2132
John Carney	Colorado Water Trust 1430 Larimer Street, Suite 300 Denver, CO 80202 (720)570-2897
Linda Bassi	Colorado Water Conservation 1580 Logan St., Suite 750 Denver, CO 80203 303-866-3263
Mike Sullivan, Division Engineer	State Engineers Office Division 3 301 Murphy Drive P.O. Box 269 Alamosa, CO 81101 719-589-6683
Rodney Reinhardt	Terrace Irrigation Company 10299 County Road DD La Jara, CO 81140 719-589-2128

7. 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. Attach additional sheets as needed.

Most of the watershed upstream of Terrace Reservoir is in the Rio Grande National Forest. Another portion is part of the Bureau of Land Management's San Luis Resource Area. The land in the valley below Terrace Reservoir is primarily privately owned and is used for agricultural purposes. Some of Colorado's oldest and predominantly Hispanic communities are located in the Alamosa River watershed, including La Jara and Capulin. The economy of these towns and of Conejos County depends primarily on agriculture. Census figures rank this County among the poorest in the State. Attached maps show the service area of this project.

Terrace Reservoir (State Dam ID No. 210102) is located on the Alamosa River about 12 stream miles upstream of Capulin. Terrace Reservoir is owned and operated by the Terrace Irrigation Company (TIC). The principal purpose of the reservoir is to store water for agricultural uses. There are approximately 30 shareholders and 831–7/8 shares of stock. The TIC sets an annual assessment to be paid by the shareholders. On average, 15,339 acre–feet of water is diverted by the TIC through Terrace Main Canal and the Alamosa Creek Canal during any given year (CWCB, 2004). The reservoir has a storage capacity of about 15,200 acre–feet at normal operating pool (elevation 8,571) and a corresponding footprint of about 300 acres. The reservoir is impounded by a large earth and rockfill dam constructed across a narrow canyon cut down by the river through volcanic rocks. The various phases of the dam construction began in 1903, and construction was completed in 1912.

[CONTINUED ON PAGE 8a]

8. If you have not specifically and fully addressed the Evaluation Criteria found in Part 3 of the criteria and guidance document please provide additional detail here. Attach additional sheet(s) if needed.

The project applicant is an eligible entity, being a 501(c)(3); the project requests funding for eligible water activities, which include "Studies or [analyses] of structural nonstructural, consumptive, and nonconsumptive water needs, projects or activities"; the project meets the sustainability criteria of the Rio Grande Round Table; and, pending final approval, the project is supported by the Rio Grande Roundtable.

Water Supply Reserve Account
Grant Application Form

#7 Continued….

The principal spillway is a masonry block chute structure with a concrete ogee crest control 99.5 feet in width, located on a saddle in the east abutment. The spillway is located in glacial end moraine deposits reportedly deposited on top of latite tuft. The condition of the concrete ogee crest is marginally acceptable. The masonry chute structure has been overlaid with concrete. The condition of the overlay concrete is extremely poor with the concrete deteriorating along the length of the chute and in several areas the spillway chute has been undermined. Soundings done on the overlay with a hammer revealed a “drummy sound” when the concrete was struck with the hammer, indicating the overlay is delaminating and/or the concrete is deteriorating. The overall condition of the spillway is poor and it should be replaced or extensively rehabilitated. There is no emergency spillway for the reservoir.

9. Additional Information – If you feel you would like to add any additional pertinent information please feel free to do so here. Attach additional sheets as needed.

The funding we seek will make a critical difference. We believe our request complements the Rio Grande Roundtable's goals of sustainability and public benefits. Senate Bill 04-222 allows formation of a sub-district of the Rio Grande Conservation District to stabilize the underground aquifers. The successful completion of the Instream flow will help to recharge and stabilize the confined aquifer.

The Instream Flow Project serves multiple natural resource benefits. Instream flow will help with the development of a fishery, restore operational flexibility and storage capacity at Terrace Reservoir, and enhance riparian habitat, while also improving wildlife resources and recreational use. The funding we are requesting gets us the most bang for our buck because it sets up what we need in the very beginning – studies which give flexibility and stability to the entire project, leading to a sustainable and healthy Alamosa River watershed.

In concept, in planning, and in execution, every aspect of the Instream Flow Project has been a community-wide effort. The genesis of this process began with the collaboration of all the stakeholders on the Alamosa River. Together, with the guidance and management of the Colorado Water Conservation Board, we produced the Alamosa River Watershed Master Plan.

Obviously, we all know that nothing can happen without water, so restoring an enduring instream flow was identified as a "Tier I" or high priority project.

Terrace Irrigation Company and Alamosa Riverkeepers teamed up to take the lead. We brought farmers, ranchers, environmentalists, scientists, and fishermen together around the same table, month after month for more than four years. With so many different perspectives, and not always easily, we have come together to make one vision a reality: The Alamosa River will flow again with life.

We have the expertise, the political and community support, the organizational capability, and we have identified the matching funds to implement the Instream Flow Project. There is every reason to move forward now.

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

Signature of Applicant:

Print Applicant's Name:

Project Title: **Alamosa River Instream Flow Project: Terrace Reservoir Hydrologic Modeling, Site Survey, and Mapping**

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

Water Supply Reserve Account – Grant Application Form

Form Revised October 2006

The following information is available via the internet. The reference information provides additional detail and background information regarding these criteria and guidelines and water policy issues affecting our state.

Colorado Water Conservation Board Policies

Loan and Grant policies and information are available at - http://cwcb.state.co.us/Finance/

Water Supply Reserve Account Criteria and Guidelines –

http://cwcb.state.co.us/IWMD/tools.htm#Water_Supply_Reserve_Account

Interbasin Compact Committee and Basin Roundtables

Interbasin Compact Committee By-laws and Charter –

http://dnr.state.co.us/Home/ColoradoWaterforthe21stCentury/Interbasin+Compact+Committee/IbccHomePage.htm

Basin Roundtable By-laws –

http://dnr.state.co.us/Home/ColoradoWaterforthe21stCentury/IbccHome.htm

Legislation

House Bill 05-1177 - Also known as the Water for the 21st Century Act –

http://cwcb.state.co.us/IWMD/statutes.htm

House Bill 06-1400 – Adopted the Interbasin Compact Committee Charter –

http://cwcb.state.co.us/IWMD/statutes.htm

Senate Bill 06-179 – Created the Water Supply Reserve Account –

http://cwcb.state.co.us/IWMD/statutes.htm

Statewide Water Supply Initiative

General Information - http://cwcb.state.co.us/IWMD/

Phase 1 Report - http://cwcb.state.co.us/IWMD/PhaseIReport.htm

Abstract

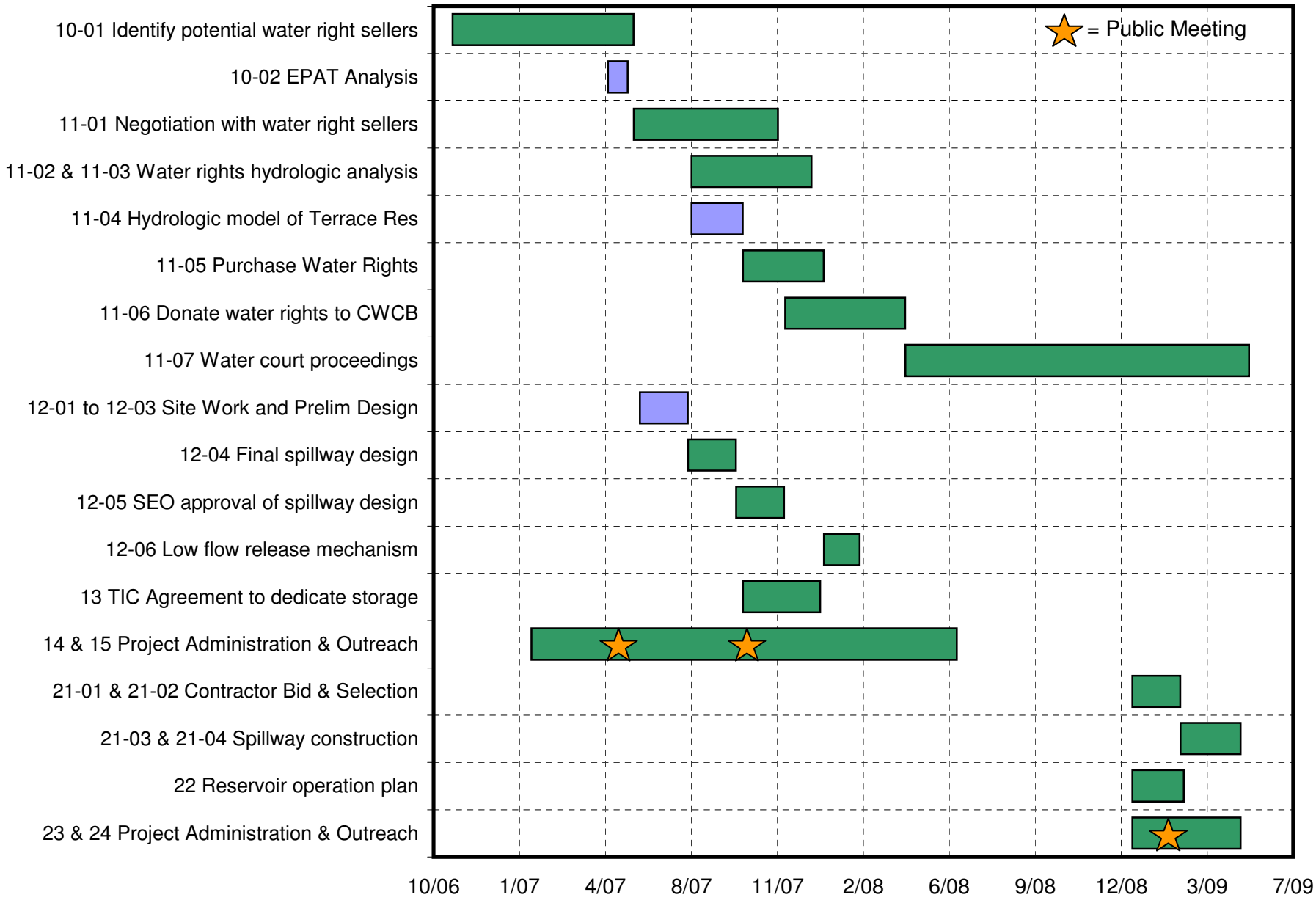
John F. Henz, CCM, Senior Project Manager, HDR Engineering, Inc.
Jack G. Byers MS PE, Deputy State Engineer, Colorado Division of Water Resources
Robert M. Rahrs, Meteorologist, HDR Engineering, Inc.

Extreme Precipitation Analyses Tool (EPAT) for use in Dam Safety and Rehabilitation Studies

The Colorado Division of Water Resources and HDR Engineering Inc. have developed an Extreme Precipitation Analyses Tool (EPAT). The EPAT is GIS-based new application technology for identification of maximized extreme precipitation events, a replacement for the probable maximum precipitation determined from the NOAA Hydrometeorological Report's and 20 plus year old storm data, the application program uses standard meteorologic application procedures integrated with current storm data and GIS technology. The application uses objective analyses methodology along with an enhanced state and standardized storm library, and site specific probable maximum precipitation analyses techniques. The EPAT is intended for use on basins of less than 150 square miles of drainage area.

The first development of the EPAT for Colorado is west of the Continental Divide. The project gathered the information associated with important extreme precipitation events into an objective and informational database that is directly accessed by the EPAT. The program is be set up for a ArcGIS 9 operating system with a spatial analyst extension. The multi-step process guides the user through a series of user interface decision steps to identify the appropriate storm event, determine the in-place moisture maximization, perform necessary elevation adjustment and transpose and orient the extreme storm over the dam watershed taking into consideration the low level inflow and steering winds and barrier depletion adjustment of the event.

Overall Alamosa River Instream Flow Project Schedule



Schedule Revised: 12/1/2006

John A. Carney

Executive Director
Colorado Water Trust
1430 Larimer Street, Ste. 300
Denver, CO 80202
(720) 570-2897
jcarney@coloradowatertrust.org

Employment

Colorado Water Trust, Inc. Denver, Colorado.
Executive Director, January 2003 to present.
Responsible for all aspects of the organization. I work with the Colorado Water Trust (CWT) Board President, the full Board, and Board committees to fulfill the mission of acquiring water rights for conservation benefits. Solicit and negotiate water rights donations, negotiate acquisitions, and secure water user and community support for water rights acquisitions. Responsible for obtaining and managing pro bono and legal support for our transactions. I work with the CWT Board and other water professionals to provide technical assistance requested by land trusts and local government open space programs. I coordinate CWT activities with federal and state agencies particularly, the Colorado Water Conservation Board, plus nonprofit conservation organizations. I act as the spokesperson for CWT, I represent CWT to water providers, state agencies, conservation organizations, the public, and the press. I am also responsible for fundraising, including a $150,000 revolving fund for transactions, and for all aspects of administration.

Ducks Unlimited, Inc. Denver, Colordo office for Great Plains Regional Office, Bismarck, North Dakota.
Conservation Program Manager, June 2000 to December 2002.
Managed and conducted conservation real estate transactions designed to protect wetlands and the water rights that help create wetlands. Over two years, successfully negotiated the bargain sale or donation of conservation easements that protected over 7,000 acres of critical wetland and waterfowl habitat in the San Luis Valley and along the South Platte River. Acquired fee simple interest for wetland habitat on behalf of the Colorado Division of Wildlife and the U.S. Fish and Wildlife Service. Responsible for full spectrum of fundraising from foundations to federal programs and including private major donors. Successfully applied a one million dollar NAWCA grant, for a $200,000 GOCO grant, and successfully requested corporate donations. Managed grant compliance for state and federal grant awards. Responsible for improving the public profile of Ducks Unlimited, Inc. Colorado conservation efforts; developed strong connections and partnerships with Ducks Unlimited members, conservation organizations, state agency employees, and federal agency employees, across the state.

Colorado Open Lands, Lakewood, Colorado.
Land Protection Fellow, January 1999 to June 2000.
Participated in full range of conservation real estate transactions on behalf of statewide land trust. Negotiated conservation easement donation and/or sale. Performed pre-acquisition work for conservation easements and fee simple acquisitions, including drafting easements and deeds, contracting and reviewing appraisals, title documents, environmental assessments, and preparing baseline documentation reports. Participated in conservation easement monitoring and easement violation assessment. Key projects and accomplishments: Wrote successful grant applications to Great Outdoors Colorado for conservation easement purchases; grant awards totaled over $500,000. Secured two conservation easement donations and two easement sales totaling over 20,000 acres. Worked with local government officials (City of Lakewood, Pueblo City and Pueblo County, Las Animas County) to market COL's expertise and to identify and pursue conservation transactions. Assisted western Pueblo County ranchers and landowners in formation and direction of the Wet Mountain Open Space Coalition.

Catspaw Ranch, Inc. Chromo, Colorado**, Pu`u O Hoku Ranch, Ltd.** Molokai, Hawaii.
Conservation Projects Manager, 1998.
Assisted with conservation management of over 35,000 acres of private ranch land in Colorado and Hawaii. Worked with national and local conservation groups to develop conservation and business plans for both ranches. Plans addressed a variety of issues including: maintaining agricultural tax status, maintaining and increasing water rights, wildlife management, forestry and restoration forestry. Participated in real estate transactions that consolidated conservation holdings. Acted as liaison for owners with individual property managers, ranch neighbors, and community interest groups. Negotiated with community groups, state government, and local officials for public use of private land. Worked in partnership with local officials and the National Trust for Historic Preservation to prevent federal government condemnation of private land containing ancient Hawaiian burial sites.

Colorado Natural Heritage Program, Colorado State University, Ft. Collins, Colorado.
Field Ecologist, 1997.
Conducted comprehensive biological assessment of Upper Purgatoire River watershed in Las Animas County, Colorado. Biological assessment identified land with highest conservation values and was used in design of conservation transactions by the Conservation Fund, Las Animas County, the State of Colorado, the Rocky Mountain Elk Foundation, and Montana Power.

Colorado Natural Areas Program, Colorado State Parks. Southwestern Colorado.
Field Ecologist**,** 1995.
Evaluated Research Natural Area nominees for the U.S. Forest Service. Updated established Colorado Natural Area characterizations. Conducted rare plant monitoring projects.

Boulder County Parks and Open Space Department. Boulder, Colorado.
Public Information Consultant, 1992-1993.
Compiled articles, edited and wrote for the department publications. Also managed production, assisted in layout and contributed photography to County publications.

Environmental Defense Fund. New York, New York.
Public Information Officer and Membership Associate 1990-1991.
• Managed public information department including three full-time staff members. Developed a process for promptly responding to over 1,000 requests per month. Interacted extensively with all programs in the organization to acquire and maintain information necessary for responses. Improved organization's response time by 80%. Reduced department costs by 20%.
• Assisted membership officer in maintaining membership records for over 200,000 members.

Board Membership

Colorado Coalition of Land Trusts. Denver, Colorado.
Served on Board of Directors since 2000. Treasurer 2001-2003, Secretary 2004 to present.
"The Colorado Coalition of Land Trusts is a not-for-profit organization that promotes and supports land conservation excellence in Colorado through leadership, advocacy, education, and outreach."

Education and Course work

Colorado Foundation for Water Education, Water Leader Course, Denver, Colorado. January 2006 to present.

National Conservation Training Center, Land Conservation Leadership Program, Shepardstown, West Virginia. May 1998.
Continuing education course, "Conserving Land by Acquisition of Fee Simple Interest."

University of Vermont, Burlington, Vermont.
Master of Science in Botany, Field Naturalist Program, 1998.

- R.K. Mellon Graduate Fellowship both years.
- Teaching Fellow (1997) "Field Ecology and Natural History" a basic ecology and field science course for undergraduate students.

University of Colorado, Boulder, Colorado.
September 1992-May 1994.
Earned course/credit equivalent of bachelor's degree in biology.

- Research Assistant and Instructor, Institute for Arctic and Alpine Research-University of Colorado. Hood River, Northwest Territories, Canada. Summers, 1994 and 1998.
- Undergraduate Teaching Assistant (1993) "Plant Kingdom" an upper-level undergraduate botany course with laboratory.

University of Michigan, Ann Arbor, Michigan.
Bachelor of General Studies (B.A.), 1988.
English Literature Concentration.

Publications

Carney, J. 1997. Herbicide Legislation Covers Vermont in Controversy. Vermont Woodlands. **4**:20-22.

_____ 1996. Herbicide Hearings. Vermont Woodlands. **3**:10.

_____ 1994. Brochures for Denver Botanic Gardens: Plants of Africa. Winter; Collection Guidelines for Colorado Wildflowers. Spring; Suggestions for Low-Impact Hiking. Summer.

_____ 1992. BFI Landfill Stopped in Arizona. LAW Notes, Newsletter of the Land and Water Fund of the Rockies. **3**:1,8.

EDWIN G. PAULSON

EDUCATION M.S., Water Resources Engineering, University of California, Los Angeles
B.A., Applied Mechanics and Engineering Science, University of California, San Diego

LICENSE Professional Engineer (Civil) in California, #32044
Professional Engineer (Civil) in Colorado, #33108
Professional Engineer (Civil) in Nevada, #13839

SUMMARY

Mr. Paulson is a Principal Engineer with MWH Americas, Inc. He has 27 years of experience conducting and supervising work related to water resources, hydrology, hydraulics, floodplain management, geomorphology, stormwater quantity and quality control, environmental evaluations, flood control design, and other aspects of civil engineering.

EXPERIENCE

River Corridor and Watershed Studies

Mr. Paulson has been involved in multi-disciplinary studies of watersheds and river corridors. Competing objectives have included floodplain management, geomorphic stability, water conveyance, water quality, habitat, recreation, irrigation diversions, and erosion control.

- Project manager for Alamosa River Watershed Restoration Master Plan, Colorado, to develop a plan for using Natural Resource Damage Program funds to restore stream and watershed habitats damaged by historical mining activities
- Project manager for Rio Grande Headwaters Restoration Project, Colorado, to enhance 55 miles of stream for stream stability, flood protection, riparian habitat, delivery of Rio Grande Compact flows, and irrigation diversions.
- Project engineer for preliminary design of restoration of 10 miles of the Provo River in central Utah to improve fishery habitat, wetland values, river mechanics, and recreation opportunities (hydrology, floodplain analysis, river system design)

Water Resources

Mr. Paulson has been involved with regional water resource investigations involving surface- and ground-water inventories, future demand projections, and water resource modeling. Representative projects include:

- Project manager for miscellaneous water resources investigations for Colorado Springs, Colorado focusing on developing new water supplies and improving operation of existing systems

- Project manager for Northern Integrated Supply Project, a regional water development plan for northeastern Colorado
- Project engineer for Technical and Environmental Studies for Arkansas River basin water development projects, CO
- Project engineer for the Colorado Water Development Study, summarizing statewide water supplies and demands through the year 2100

Dams and Reservoirs

Mr. Paulson has carried out analyses of existing and proposed reservoir systems for the purpose of determining potential water supply and hydropower availability. He has investigated drought conditions in a river-reservoir system, and evaluated dam spillways with respect to their capability to handle severe flood events such as the probable maximum flood. He has also completed dambreak inundation studies and associated Emergency Action Plans. Completed projects include:

- Project manager for Probable Maximum Flood determinations for Amistad and Falcon Dams on the lower Rio Grande in Texas
- Project manager for evaluation and design of spillway modifications at Lake Las Vegas, NV
- Project manager for dambreak inundation studies for Littlerock Dam near Palmdale, California; Henshaw Dam and Lake Wohlford in San Diego County, California; and Bishop Creek Dam and Lundy Lake in Owens Valley, California.

Environmental Assessments and Impact Studies

Mr. Paulson has prepared environmental assessments and technical portions of environmental impact studies for a variety of water resources projects, including:

- Technical lead for water resources disciplines (surface water, ground water, water quality, geomorphology) for Southern Delivery System EIS for U.S. Bureau of Reclamation and Colorado Springs, CO
- Technical lead for water resources disciplines (surface water, ground water, water quality, geomorphology) for Long-Term Excess Capacity Contract Environmental Assessment for U.S. Bureau of Reclamation and Aurora, CO
- Project engineer for technical and environmental studies (engineering, water quality, socioeconomics, cultural resources, biology) for alternative water storage projects in the Arkansas River Basin, Colorado

CRAIG HARRIS, P,E.

MWH

Years Experience

27

Education/Training

M.S., Civil Engineering, Cornell University

B.S., Civil Engineering, University of Akron

Registration/Certifications

Professional Engineer – CO

Summary | Mr. Harris has 27 years professional engineering experience, primarily in the planning, design, and construction of dams, hydroelectric, and water resources projects. He is MWH's manager of Dams and Hydropower for the Rocky Mountain Region in the Denver office. His key areas of expertise are dam rehabilitation and modifications; earth and rockfill dam planning, engineering, design, and construction; dam foundation engineering; geotechnical engineering and design; dam safety inspections; security risk assessments; and hydroelectric project planning and design. He has worked on more than 100 dam projects, including dam rehabilitations, raw water storage reservoirs, reservoir lining projects and design of a large rockfill dam that recently survived a major earthquake. He has written national dam safety guidelines, managed a nationwide concrete dam stability study, authored a variety of papers on dam stability, and developed the computer program that the US Bureau of Reclamation uses for calculating earth dam displacement during earthquakes.

Relevant Project Experience

Project Manager/Principal Engineer, Pillones Dam Modifications Project, Sociedad Minera Cerro Verde

Arequipa, Peru

Mr. Harris was responsible for evaluation, design, and construction of modifications to the Pillones Dam near Arequipa Peru. The 27-meter-high, concrete-faced, sand and gravel dam was under construction during the latter half of 2005. Remedial work included a seismic trench and berm, a 3.4-meter dam raise, and remedial grouting.

Project Manager, Main Cooling Reservoir Spillway Modifications

South Texas Project Nuclear Operating Company

Mr. Harris led a team in evaluating the adequacy of and modifications to the spillway for the main cooling reservoir. The objective of the project is to return the spillway to operation and allow the reservoir to be filled to its design capacity.

Dam and Materials Specialist, Mangla Dam Raising Project

Pakistan

Mr. Harris was dam and materials specialist for the construction phase of the 30-foot raise to the zoned dams. The dams included the 454-foot-high Main Dam, the 144-foot-high Sukian Dike, and the 274-foot-high Jari Dam.

Risk Assessment Task Manager, Falcon Dam and Hydroelectric Project, International Boundary and Water Commission

United States Section, TX

Mr. Harris was responsible for a probabilistic risk assessment of the effect of proposed natural gas well drilling on an existing 150-foot-high, zoned embankment dam and appurtenant facilities.

Field Support, Emergency Underwater Repairs, Seneca Pumped-Storage Hydroelectric Project

FirstEnergy Corporation, PA

Mr. Harris provided field support for emergency underwater repairs to the asphalt liner of the 120-foot-high earth dam forming the upper reservoir. He prepared the refilling plan, inspected the dam, and evaluated its behavior during refilling to return the plant to partial service until an outage could be scheduled for more permanent repairs.

Quality Assurance Review, McAllen Northwest Water Treatment Plant

City of McAllen, TX

Mr. Harris provided quality assurance review of preliminary and final design of a raw water storage reservoir for this 40-mgd water treatment plant and consultation on design changes to address seepage concerns.

Project Manager, Dam Safety Modifications, AuTrain Hydroelectric Project

Upper Peninsula Power Company, MI

Mr. Harris was responsible for dam safety modifications of this 30-foot-high embankment dam with central concrete overflow spillway and 4,500-foot-long saddle dike. The project included hydrologic and hydraulic studies, inundation mapping, concrete and embankment dam stability analyses, and preliminary and final design of a toe drain for the main embankment to control seepage and modifications to the saddle dam to pass the PMF.

Project Manager, Spillway Modifications, Prickett Hydroelectric Project

Upper Peninsula Power Company, MI

Mr. Harris managed this project, which included spillway modifications of the 55-foot-high multiple arch buttress dam with earthen wing dams. The team developed conceptual designs and evaluated alternatives for repair of scour hole downstream of spillway and constructing a stilling basin; prepared final design and bid documents; and provided engineering support during construction.

Project Engineer, Pisgah Dam

Otter Tail Power Company, MN

Mr. Harris evaluated high piezometric readings at this 40-foot-high embankment dam. He reviewed the instrumentation and monitoring program, conducted site reconnaissance, and prepared a letter report.

Project Engineer, Green Lake No.2

City of Boulder, CO

Mr. Harris prepared conceptual designs and an evaluation of alternatives to repair a 40-foot, steel-faced rockfill dam that had been breached due to seepage.

Project Engineer, Goose Lake Dam

City of Boulder, CO

Mr. Harris evaluated alternatives, developed final design, and prepared bid documents for an upstream rockfill berm with geosynthetic membrane to control seepage for this 30-foot-high timber crib dam.

Project Engineer, Logan First Dam

Utah State University

Mr. Harris evaluated alternatives and prepared a feasibility design for a downstream rockfill buttress to support this 30-foot-high concrete gravity and buttress dam to protect against overtopping from PMF, seismic loading from MCE, and up to 6 feet of displacement along fault in foundation.

MIKE MILLER, P.E.

MWH

Years Experience

15

Education/Training

M.S., Civil Engineering, Michigan State University

B.S., Civil Engineering, Michigan State University

Registration/Certifications

Professional Engineer – CO

Summary | Mr. Miller has 15 years of experience as a geotechnical engineer. He has been involved in more than 25 dam rehabilitation projects, many of them in Colorado. His roles in these projects ranged from engineer of record to project engineer. Duties on these projects include conducting and supervising field investigations, analyses and design of rehabilitation options, preparation of construction plans and specifications, preparation of construction cost estimates, and construction management and inspection during construction. He has authored several technical publications for presentation at professional seminars.

Relevant Project Experience

Design Engineer, Gross Dam-Outlet Works Rehabilitation

Denver Water, CO

Mr. Miller was responsible for the design of rock anchors used to secure a thrust block, constructed under 340 feet of water, used to jack a new upstream inlet pipe into place for the existing 340 foot high gravity arch dam. He also was responsible for the development of specifications for conducting backfill grouting activities underwater to grout the outside annulus of pipe and the existing outlet works tunnel/pipe.

Design Engineer, Puddingstone Dam-Stilling Basin Modifications

Colorado

Mr. Miller was responsible for preparing plans and specifications for construction of a 60-foot-deep cutoff wall at the end of a stilling structure where back cutting of the structure had occurred. Designs for both secant pile and structural slurry walls were included in the construction documents.

Design Engineer, AuTrain Hydroelectric Project-Spillway Modifications

Upper Peninsula Power Company/Wisconsin Public Service, MI

Mr. Miller was responsible for the design and preparation of construction documents for the rehabilitation of AuTrain Dam. The project included the rehabilitation of a 40-foot-high embankment dam with a concrete gravity overflow spillway section; design of a 14-foot-high emergency fuse plug spillway; concrete repairs to the valve house; and a new toe drain system for the main dam.

Design Engineer, Green Ridge Glade Reservoir Enlargement-Outlet Works Modifications

City of Loveland, CO

Mr. Miller was responsible for modifications to the existing outlet works. He also served as senior reviewer for the design of a cement grouting program consisting of a double row grout curtain for the dam and a stitch grouting program of the dam foundation at the geologic contact of sedimentary and metamorphic formations.

Project Manager, Long Lake Dam-Outlet Works Replacement

City of Steamboat Springs/Mt. Werner Water, CO

Mr. Miller managed the rehabilitation of Long Lake Dam to eliminate safety deficiencies. The project entailed the design of a new outlet works with a solar powered operator capable of being operated remotely from the Steamboat Springs filtration plant about 10 miles from the dam. The outlet was designed to pass snowmelt floods that had previously caused the dam to overtop on three occasions. He also was responsible for preparing filling and long-term monitoring plans for the dam.

Construction Manager and Engineer of Record, Leyden Dam-Overtopping Spillway and Outlet Works Modifications

City of Arvada, CO

Mr. Miller served as construction manager and engineer of record during the construction of an RCC spillway rehabilitation project to eliminate dam safety deficiencies for a 45-foot-high homogeneous embankment dam. The project involved placement of approximately 10,000 cubic yards of RCC, construction of a new intake tower, and a new outlet structure.

Engineer of Record, Lake Henry Dam-Toe Drain and Buttress

Lake Henry Reservoir Company, CO

This project involved design of the rehabilitation of Lake Henry Dam. The project included the design of a new toe drain system and the buttressing of the downstream slope to stabilize the west dam to stabilize the structure and to reduce seepage.

Engineer of Record, Lake Meredith Dam Rehabilitation

Colorado Department of Transportation/Lake Meredith Reservoir Company, CO

This project included design and construction of riprap energy dissipater for the dam outlet, armoring of the downstream toe of the dam and outlet channel, an 18-foot high MSE retaining wall, and reconfiguring the downstream slope of the dam where Colorado SH-71 crosses the dam. All construction documents and construction management activities were in accordance with CDOT standards. The project involved extensive coordination with two state agencies and a local irrigation district.

Project Design Engineer, Construction Manager and Engineer of Record, Tucker Lake Dam-Embankment and Spillway Repairs

Denver Reservoir and Irrigation Company, CO

Mr. Miller provided services during construction for the rehabilitation of a 26-foot-high embankment dam in Jefferson County. The project included the raising the crest and flattening the upstream slope of the north and south embankments, construction of an 8-foot-high saddle dike, and reconstruction of the drop inlet spillway structure. He was responsible for preparing construction plans and specifications, assisting the irrigation district in the bidding phase, and managing the contract during construction.

Resident Engineer, Ketner Dam-Outlet Works Modifications

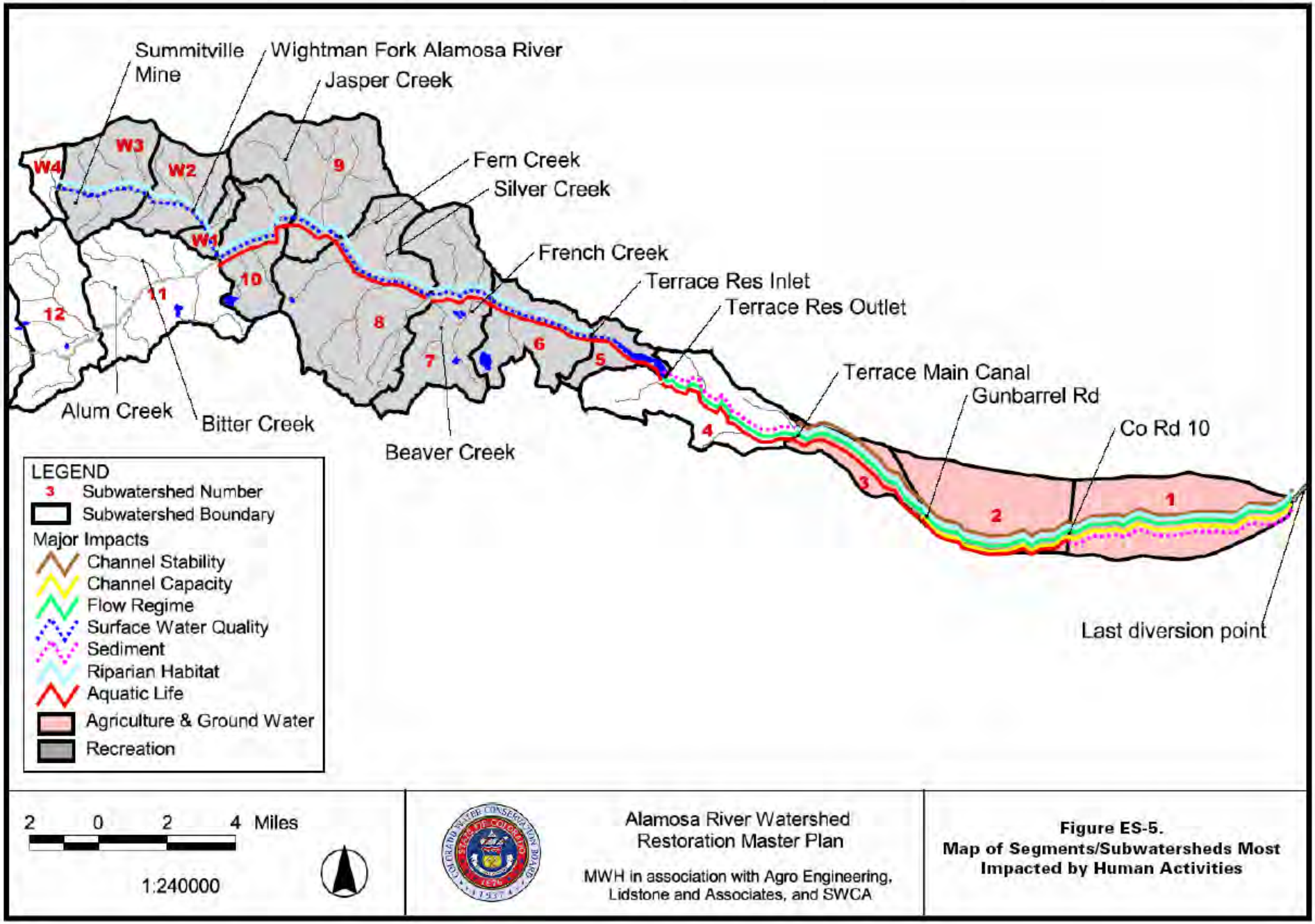
City of Westminster, CO

Mr. Miller was resident engineer during the rehabilitation of the low-level outlet works. The project consisted of relining the existing corrugated metal outlet works that had collapsed with a new cured-in-place liner (in-situform).

Senior Review, Fish Creek Dam

City of Steamboat Springs/Mt. Werner Water, CO

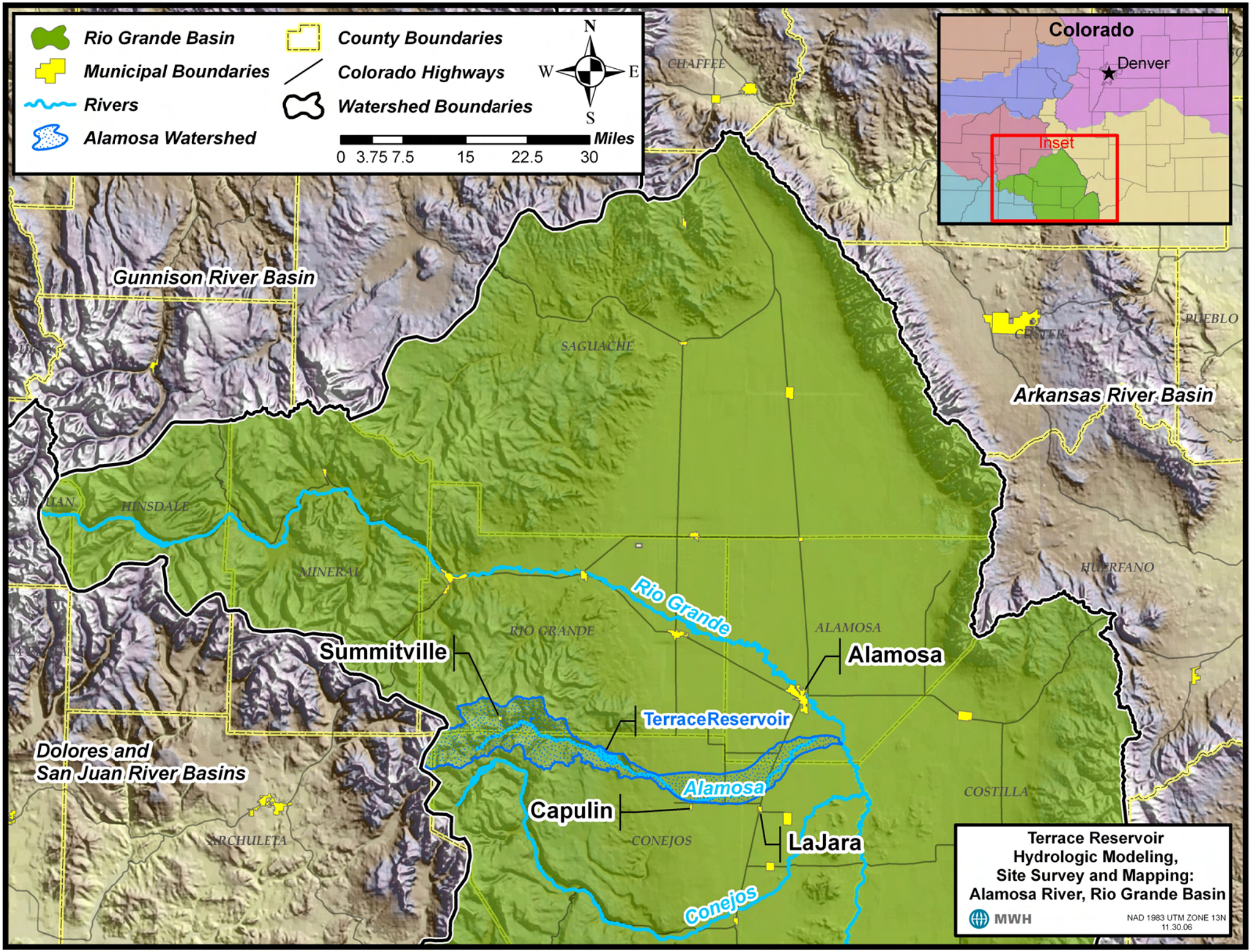
Mr. Miller provided senior review of the construction of a double row grout curtain using microfine and Portland cement grouts for construction of a 75-foot-high embankment dam. He also was responsible for design and inspection of modifications to the existing low-level outlet, which included the grouting of a new, 24-inch-diameter steel pipe within the existing 36-inch-diameter outlet pipe.



Alamosa River Watershed Restoration Master Plan

MWH in association with Agro Engineering, Lidstone and Associates, and SWCA

Figure ES-5.
Map of Segments/Subwatersheds Most Impacted by Human Activities


Rio Grande Basin
Municipal Boundaries
Rivers
Alamosa Watershed
County Boundaries
Colorado Highways
Watershed Boundaries
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W
E
S
Miles
0 3.75 7.5 15 22.5 30
Colorado
Denver
Inset
Gunnison River Basin
Arkansas River Basin
Dolores and
San Juan River Basins
CHAFFEE
SAGUACHE
CUSTER
PUEBLO
HINSDALE
MINERAL
RIO GRANDE
ALAMOSA
HUERFANO
COSTILLA
CONEJOS
ARCHULETA
Rio Grande
Summitville
Alamosa
TerraceReservoir
Alamosa
Capulin
LaJara
Conejos
Terrace Reservoir
Hydrologic Modeling,
Site Survey and Mapping:
Alamosa River, Rio Grande Basin
MWH
NAD 1983 UTM ZONE 13N
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