The Alamosa River Watershed Restoration Project

Maintenance Project 2008

Funded by the

Colorado Water Conservation Board

January, 14th, 2009

This report is Supplement to the

FINAL REPORT

Produced by the

Alamosa River Watershed Restoration Foundation

Submitted In

January, 2007

Summary

The ARWRF hired the Capulin Construction Company, LLC (CCC) during the fall of 2008 to repair and reconstruct approximately 4,800 feet of stream in the Alamosa River above the Capulin Bridge, County Road 8. Black Creek Hydrology, LLC (BCH) was hired during this maintenance phase to train the CCC crew in proper rock structure construction, river alignment procedures, and to oversee and approve the overall maintenance program. This stream segment was initially constructed in 2005 during Phase II of the Alamosa River Riverbank Stabilization Project. Details are presented in the final report.

The Capulin Construction Co., LLC is a locally owned construction company which was established in 2007 specifically to complete the final 2.8 miles of stream in the upcoming Phase III portion of this project. Black Creek Hydrology, (BCH) was hired during Phase I (2003) to survey the stream and BCH eventually became the principal designer and construction overseer in that 1.5 mile section. BCH will also be the overseer during Phase III. The CCC agreed to forgo wages during this maintenance project while BCH trained the principal operators. The maintenance funds were used for CCC's operating costs.

The entire job required about two months to complete. The reach required an additional 400 cubic yards of rock material over and above the rock that was already in the stream structures. This rock was purchased and hauled to the river by the Porco Quarry.

Background

Phase I of the Alamosa River Riverbank Stabilization Project (2003) involved the construction and restoration of 1.5 miles of stream. The structures and river design from Phase I have held up against 5 runoff years with relatively good success.

During Phase II, Riverbend Restoration, LLC, an engineering firm, was hired to oversee the design and implementation, while SLV Earth Movers, a different construction firm from Phase I, was hired to do the river work. Phase II completed another 1.7 miles of stream.

Since 2005 and after three consecutive runoffs, damage to the rock structures within the entire 8,900 foot Phase II reach has become significant. Upon inspection in 2008, it was determined that 75% of the rock vane and cross vane structures would need either minor adjustments or would have to be dismantled completely and reconstructed. Structure failure was usually caused by an absence of footer rocks or by footer rocks not being placed deep enough into the stream bed. Fitting of the rocks was inadequate and small gaps between the rocks were allowed to exist. The flows eventually washed the small material out from between the boulders and the boulders fell forward into the river. All the rock vanes or barbs that required re-building lacked enough rock material to make them stable, causing them to fall into the middle of the river. They lost their function and were actually creating more instability to the river banks. Many of the huge boulders, some ranging up to 3 tons, were left hanging precariously from the river banks, posing a safety hazard.

Through speculative observation, the previous designer miscalculated the correct dimensions of the stream. The bends were built very narrow and riffle sections were over-widened intentionally. This is

opposite of what occurs in natural streams. The design limits the stream flow capacity around the bend, which then creates shear stress against the outside bank. It creates a trapezoidal channel around the inside bend, which in turn disconnects the floodplain from the river. The added shear stress, undoubtedly, aggravated the rock structure failures.

When the damage became apparent, the ARWRF requested that both Riverbend Restoration and SLV Earth Movers return and fix the problems, which the ARWRF felt should fall under their warrantee. They failed to negotiate a suitable agreement and decided instead to use the available maintenance funds to hire a more qualified designer and a different construction crew to fix the problems.

The ARWRF prioritized the 4,900 feet segment because it is located near populated areas, it involves 5 diversion structures and a Conejos County Bridge, and it suffered the most damage. The ARWRF is weighing other funding possibilities to conduct maintenance in the remaining 4,000 foot reach. The work there will not be that extensive.

Reconstruction and Maintenance Activities

There were 6 cross vanes constructed within the 4,900 foot stretch. Five were located at irrigation diversion head gates. Four of the diversion structures have senior rights and one is a junior water right. Because of the inadequate design implemented in 2005, the senior rights had not been able to withdraw their water decree during low water flows. The diversion on the junior right was built too narrow and the plunge pool which developed undercut the footer rocks, so the rock structure tumbled in upon itself. Over the course of time, sediment accumulated against the headgate, burying most of it and making it impossible to open.

The Miller Diversion was dismantled, the correct elevation was determined and the rock material properly fitted to take the lower flows of the stream under the oversight of Black Creek Hydrology. The thalweg or the main current was relocated to direct the flows into the headgate. This will help clean the sediment and maintains a natural flow to the headgate. The same practice was used on all the other rebuilt diversion structures. This practice is something unique to the Black Creek Hydrology Design and was not implemented in the 2005 design.

The Rivera Diversion, a junior right, was dismantled and lowered overall. It was designed as a diversion and as a grade control structure.

The San Jose # 1 had a long history of being unstable. Most diversion structures in the Alamosa River, when they were originally established, were placed on the outside bends to take advantage of natural stream dynamics. The San Jose # 1 was placed in the middle of a riffle section. Many problems are associated with this design flaw. First, it is difficult to maintain proper elevations of the bottom of the river and the bottom of the headgate, usually because of the aggregating of river cobble. The 2005 construction tried to build their structures while keeping the diversion within the riffle section, and it immediately failed during the first runoff. Another problem facing the San Jose #1 water users was the headgate was perched 2 feet above river bottom preventing, them from taking advantage of lower stream flows (See Chart 1).

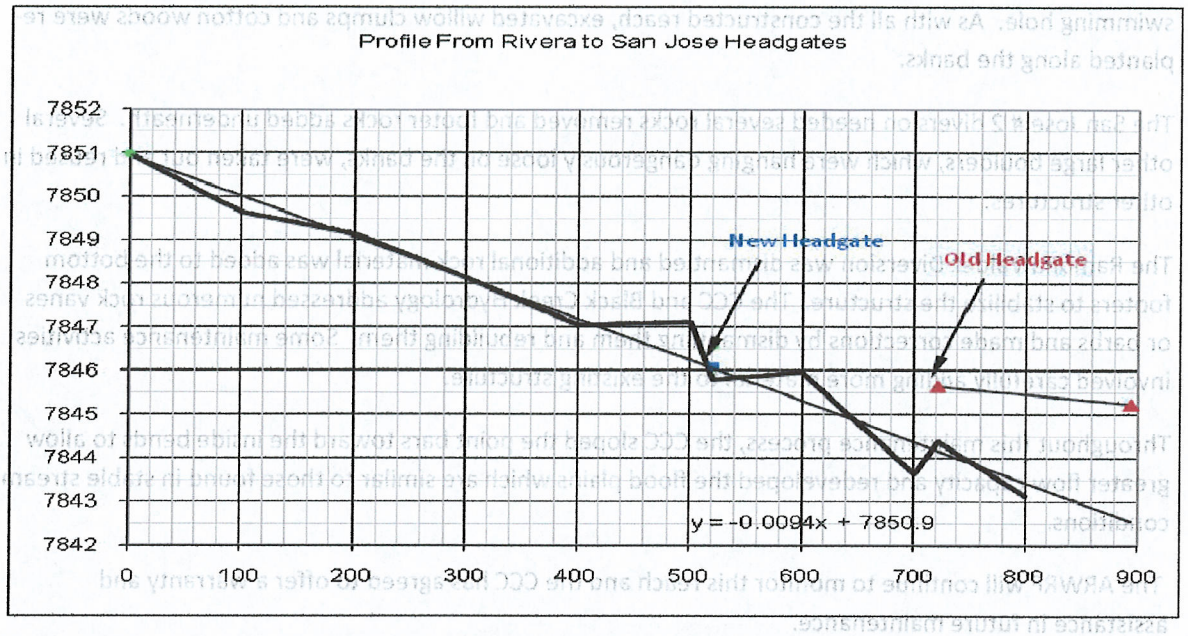

Chart 1: Profile around the San Jose Diversion. Note the elevation of the old location to river bottom vs. new location to river bottom.

The river drops 4 feet in elevation from the San Jose # 1 structure to just beyond the San Jose #2 structure, a distance of 275 feet. The desired grade of the Alamosa River in this section is around 0.7%, but the existing grade is 1.5 %. The main factor contributing to this anomaly is that the stream is actively down cutting. This much slope creates an extraordinary amount of shear stress on any feature in the stream. The previous designer compensated for this grade change by adding several feet of gravel material to the bottom of the stream bed downstream of the San Jose #2. The gravel material quickly washed away during the first runoff.

To compensate for this steep grade, Black Creek Hydrology designed a drop/pool sequence by adding 2 more cross vanes, for a total of 4 cross vanes, at designated elevations. Two of the cross vanes are incorporated as diversion structures for the San Jose #1 and San Jose #2. The San Jose #1 is the first cross vane in this drop/pool sequence. To accomplish this, it was first necessary to excavate the San Jose # 1 metal headgate/sluice gate structure and relocate it 200 feet upstream on an outside bend. The CCC and Black Creek Hydrology were able to attain permission and support from the water users and the Division of Water Resources to accomplish this task. This task also involved excavating 600 feet of new ditch to reconnect it to the original laterals.

Another cross vane was constructed almost halfway between the San Jose #1 and San Jose #2 and designed strictly as a grade control structure. The footer rocks in this structure are buried 8 to 9 feet below river bottom. In comparison, footers for normal grade control structures are buried 3 to 4 feet below river bottom. This structure required about 180-200 cubic yards of rock and will likely be the largest grade structure to be built in the stream. It's built to withstand a plunge pool effect which is calculated to scour down at least 7 feet. Subsequently, this will create a much welcome fishing and

swimming hole. As with all the constructed reach, excavated willow clumps and cotton woods were re-planted along the banks.

The San Jose # 2 diversion needed several rocks removed and footer rocks added underneath. Several other large boulders, which were hanging dangerously loose on the banks, were taken out and reused in other structures.

The Ramona Valdez Diversion was dismantled and additional rock material was added to the bottom footers to stabilize the structure. The CCC and Black Creek Hydrology addressed numerous rock vanes or barbs and made corrections by dismantling them and rebuilding them. Some maintenance activities involved carefully adding more material to the existing structure.

Throughout this maintenance process, the CCC sloped the point bars toward the inside bends to allow greater flow capacity and redeveloped the flood plains which are similar to those found in stable stream conditions.

The ARWRF will continue to monitor this reach and the CCC has agreed to offer a warranty and assistance in future maintenance.

Figure 1 Structure failure near County Road 8

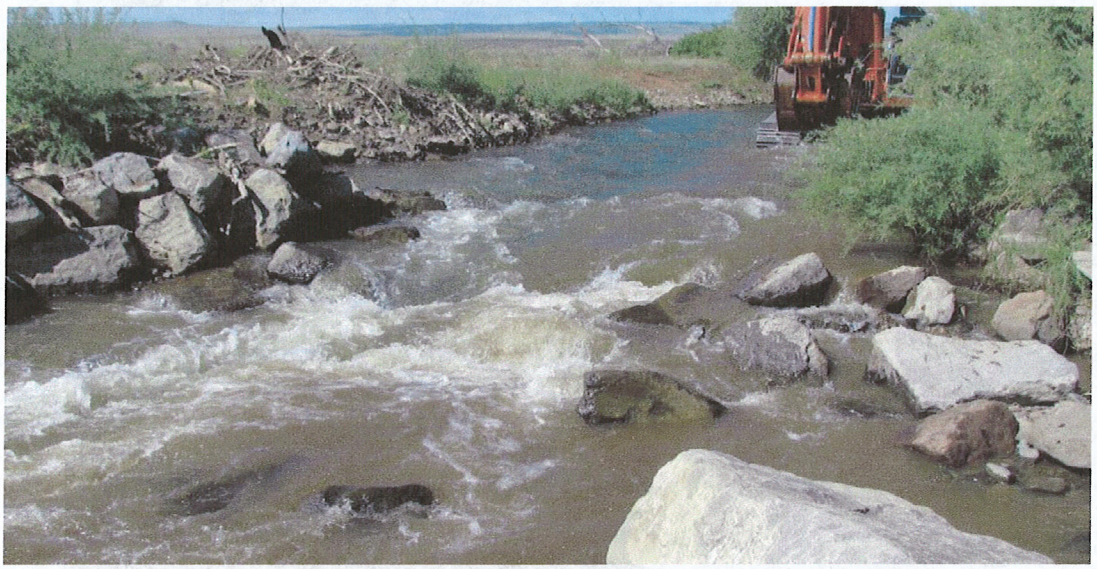

Figure 2. Before Photo. Emergency Repair. The San Jose #1 washing out during summer of 2008

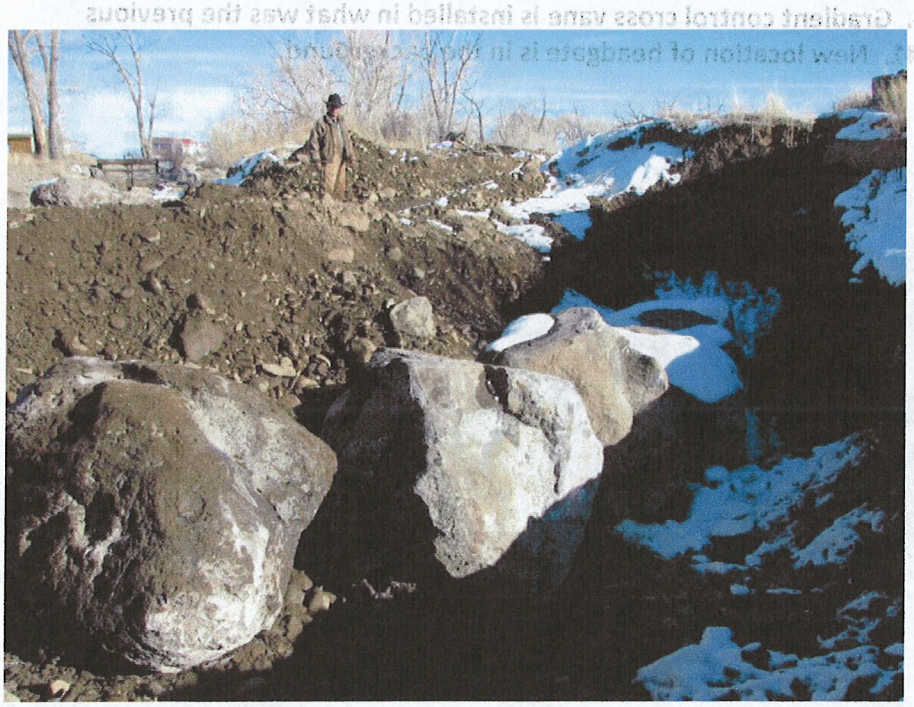

Figure 3: Building a gradient control cross vane. Setting in footer rocks at the old location of the San Jose #1.

Figure 4: After Photo. Gradient control cross vane is installed in what was the previous location of San Jose #1. New location of headgate is in the background.

Figure 5: Failed Vane Structure

Figure 6: Ramona Valdez diversion.

Figure 7: Failed Structure. Lack of proper footers.

Figure 8: Failed Structure. Lack of footers.

Figure 9: Failed Structure

Figure 10: Lack of footers and gaps between rocks caused this failure

Figure 11: Example of reconstructed Vane Structure. One of many.

Figure 12: Rivera Irrigation Diversion. Lack of footers and gaps in-between rocks combined with the entire structure built narrow. Great fish habitat but poor irrigation diversion.

Figure 13: New Rivera structure before back filled.

Figure 14: Rivera Structure completed and back filled.

Figure 15: Re-setting the San Jose #1 head gate

Figure 16: Steve Belz (Black Creek Hydrology) checks correct elevation

Figure 17: Randy Porco, Equipment operator, Capulin Construction Co. fills gaps.

Figure 18: Steve Belz instructs Randy of proper installation of cross vane structure.

Figure 19: Completed Cross Vane on San Jose #1 prior to backfilling

The Alamosa River Watershed Restoration Project
Scope of Work

Exhibit A
(Description of Project location)

The project area begins above the Capulin Bridge, County Road 8 on the Alamosa River in Conejos County, State of Colorado and proceeds westward for approximately 2,500 feet. The San Jose #2 and the Roman Valdez diversion structures are situated in this area.

Exhibit B
(Description of Work)

The Capulin Construction Company, LLC (CCC) will dismantle the San Jose #2 and the Ramona Valdez diversion structures and reconstruct the rock cross vane to the specified elevations which will be directed by Black Creek Hydrology, LLC (Steve Belz) on the property described in Exhibit A. Waste gravel will be blended on the property from which it came or stockpiled on such property, at the discretion of the landowner, if any waste gravel is generated by channel shaping or placement of rocks. Further disposal of waste gravel off site is not part of this agreement but the CCC will orchestrate with Conejos County Road and Bridge Dept. with its removal.

Inspections of the other rock vanes will be conducted and if time allows, before high water runoff, will be constructed. If the river flow conditions prevent work on the river, the CCC will wait until such time as flows allow and return to the stream and continue construction.

Restoration will take place along the following parameters:

Purchase and deliver 60 cubic yards of material to the San Jose #2 diversion structure and the Ramona Valdez diversion structure.

Purchase and deliver another 254 cubic yards of material to be stock piled for other vane construction.

Dismantle and reconstruct Cross Vane Diversion Structure on the San Jose #2 and the Ramona Valdez.

Inspect 2,500 linear feet of river and modify rock vanes structures if and where needed.

The Construction rate will be charged at $5.60 per linear foot.

Rocks will be purchased at $27.00 a cubic yard from the Porco Quarry.

This agreement shall not exceed $26,000.00 and shall be completed by June 30, 2009. The grantee will bill the CWCB when the project is complete.

Estimated time to complete maintenance	11 months (due to possible weather delays)
Linear feet of river maintenance	2,700
Cost per linear foot	$5.60
Total Construction Costs	$15,120.00
Oversight hydrologist (Black Creek Hydrology) for 6 days this includes expenses	$3,520.00
Purchase of rocks at $27.00/yard for 314 cubic yards.	$7,360.00
Total Expense	$26,000.00

WATER CONSERVATION BOARD
1313 SHERMAN STREET, ROOM 721
DENVER, CO 80203

Buyer: MAGGIE VAN CLEEF
Phone Number: 303-866-4188
Agency Contact: STEVEN SHULL
Phone Number: 303 866 3441

DATE: 07-24-08

IMPORTANT
The PO# and Line # must appear on all invoices, packing slips, cartons and correspondence

ACC: 07-23-08

PURCHASE ORDER
STATE OF COLORADO

P.O. # OE PDA 09000000003 **Page#** 01

State Award #

BID #

FEIN 841588141 **Phone:** 719-274-5590
Vendor Contact:
Purchase Requisition #:

VENDOR
ALAMOSA RIVER WATERSHED RESTORATION

PO BOX 255
LA JARA CO 81140

Invoice in Triplicate
To: DIVISION OF WATER CONSERVATION
1313 SHERMAN STREET, ROOM 721
DENVER, CO 80203

Payment will be made by this agency

Ship To: DIVISION OF WATER CONSERVATION
1313 SHERMAN STREET, ROOM 721
DENVER, CO 80203

Delivery/Installation Date: 06-30-09
F.O.B. DESTINATION STATE PAYS NO FREIGHT

INSTRUCTIONS TO VENDOR:

1. If for any reason, delivery of this order is delayed beyond the delivery/installation date shown, please notify the agency contact named at the top left. (Right of cancellation is reserved in instances in which timely delivery is not made.)
2. All chemicals, equipment and materials must conform to the standards required by OSHA.
3. NOTE: Additional terms and conditions on reverse side.

SPECIAL INSTRUCTIONS:
GOODS ARE NOT TO BE DELIVERED, OR SERVICES PERFORMED PRIOR TO 07/01/08

LINE ITEM	COMMODITY/ITEM CODE	UNIT OF MEASUREMENT	QUANTITY	UNIT COST	TOTAL ITEM COST
001	91843000000				$26,000.00

RESTORATION ON THE ALAMOSA RIVER AT COUNTY ROAD 8, PER EXHBIT A SCOPE OF WORK.

437

DOCUMENT TOTAL = $26,000.00

THIS PO IS ISSUED IN ACCORDANCE WITH STATE AND FEDERAL REGULATIONS
This PO is effective on the date signed by the authorized individual.
EPSFO PAA

FOR THE STATE OF COLORADO

Authorized Signature

7/26/08
Date

DP-01 (R-02/06)

REQUEST FOR REIMBURSEMENT FROM THE DEPT. OF NATURAL RESOURCES AND THE CWCB

TO: Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

FROM: Alamosa River Watershed Restoration Foundation
P.O. Box 255
La Jara, CO. 81140

ALAMOSA RIVER WATERSHED RESTORATION PROJECT

Federal Tax ID # 84-1588141

Expenditures From

Contract Number: C150037

Goal, Objective or Task Number	Check or PO#	Date	Name of Payee	Description of Expenditures	Total Cost	To be Reimbursed by CWCB
Rock purchase		04/29/08	Porco Quarry	Purchased Rock (314 cubic yards)	7,360.00	7,360.00
				TOTALS	$ 7,360.00	$ 7,360.00

I hereby certify that all contract requirements
have been met and the amounts billed are correct.
Payment is authorized for amount indicated.

Director or Authorized Designee_____. Date ___/___/___.

WE ARE REQUESTING REIMBURSEMENT FOR ABOVE EXPENSES, WHICH WERE INCURRED PER CONTRACT: C150037

Signature (Contractor) Lorraine Galbraith Date 6/3/08

Request # 27

REQUEST FOR REIMBURSEMENT FROM THE CWCB

TO: Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

FROM: Alamosa River Watershed Restoration Foundation
P.O. Box 255
La Jara, CO 81140

Federal Tax ID: 84-1588141

Alamosa River Watershed Restoration Foundation

PO # 09-03

Task	Check	Date	Name of Payee	Description of Expenditures	Total Cost	To be Reimbursed by CWCB	
Work on River		7/31/2008	Capulin Construction Comp	Mobilization and excavation	$1,200.00	$200.00	
Work on River		7/13/2008	Capulin Construction Comp	Excavator and gravel removal	$400.00	$200.00	
TOTALS						**$400.00**	

I hereby certify that all contract requirements have been met and the amounts billed are correct.
Payment is authorized for amount indicated.

Director or Authorized Designee_____. Date____/____/____.

WE ARE REQUESTING REIMBURSEMENT FOR ABOVE EXPENSED, WHICH WERE INCURRED PER CONTRACT: C150037

Signature (Contractor)_____. Date___/___/___.

Request # 28

REQUEST FOR REIMBURSEMENT FROM THE CWCB

TO: Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

FROM: Alamosa River Watershed Restoration Foundation
P.O. Box 255
La Jara, CO 81140

Federal Tax ID: 84-1588141

Alamosa River Watershed Restoration Foundation

Contract # C150037 PO # 09-03

Task	Check Date	Name of Payee	Description of Expenditures	Total Cost	To be Reimbursed by CWCB	
Work on River		Capulin Construction Comp	Maintenance work	$9,550.00	$9,550.00	
Work on River		Black Creek Hydrology,LLC	Maintenance work	$1,007.55	$1,007.55	
TOTALS					**$10,557.55**	

I hereby certify that all contract requirements have been met and the amounts billed are correct.
Payment is authorized for amount indicated.

Director or Authorized Designee_____. Date___/___/___.

WE ARE REQUESTING REIMBURSEMENT FOR ABOVE EXPENSED, WHICH WERE INCURRED PER CONTRACT: C150037

Signature (Contractor)_____. Date___/___/___.

OK to pay 11/24/08
Chris Sturm
(Chris Sturm)
(Tom Browning)

Black Creek Hydrology, LLC

10998 Patterson Ct.
Northglenn, CO 80234

Invoice

Date	Invoice #
11/6/2008	269

Bill To
ARWRF c/o Rodger Gallegos State Hwy 15 La Jara, CO 81140

P O No	Terms	Project

Quantity	Description	Rate	Amount
1	Mobilization	200.00	200.00
10	Miller Ditch: Reset vein structures	170.00	1,700.00
35	San Jose #1: Remove headgate and place upstream, repair rock structures	170.00	5,950.00
10	Reset Rock Structures	170.00	1,700.00

Thank you!

Total $9,550.00

Bill To
Alamosa Rvr Watershed Restoration Found c/o Alan Miller P.O. Box 255 La Jara, CO 81140

P.O. No.	Terms	Project
	Due on receipt	Misc Assistance

Quantity	Date	Description	Item	Rate	Amount
2	10/13/2008	Site Assistance - Work on headgates	Alamosa River Maintenance	75.00	150.00
8	10/14/2008	Site Assistance - Work on headgates	Alamosa River Maintenance	75.00	600.00
510	10/15/2008	Mileage to/from Alamosa River 10/13-10/15/2008	Mileage 0.505	0.505	257.55

Thank you
Tax ID 84-1521023

Total $1,007.55

Capulin Construction Company

20758 County Road 10
La Jara, CO 81140

Invoice

Date	Invoice #
11/5/2008	5

Request # 29

REQUEST FOR REIMBURSEMENT FROM THE CWCB

TO: Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

FROM: Alamosa River Watershed Restoration Foundation
P.O. Box 255
La Jara, CO 81140

Federal Tax ID: 84-1588141

Alamosa River Watershed Restoration Foundation

Contract # C150037

Task	Check	Date	Name of Payee	Description of Expenditures	Total Cost	To be Reimbursed by CWCB	
Work on River			Capulin Construction Comp. LLC	Maintenance work	$2,800.00	$2,800.00	
Work on River			Black Creek Hydrology,LLC	Maintenance work	$2,325.20	$2,325.20	
			TOTALS			**$5,125.20**	

I hereby certify that all contract requirements have been met and the amounts billed are correct.
Payment is authorized for amount indicated.

Director or Authorized Designee_____. Date___/___/___.

WE ARE REQUESTING REIMBURSEMENT FOR ABOVE EXPENSED, WHICH WERE INCURRED PER CONTRACT: C150037
Signature (Contractor)_____. Date___/___/___.

OK to pay
(Chris Sturm
1/9/09
Tom B 1/9/09

Bill To
Alamosa Rvr Watershed Restoration Found c/o Alan Miller P.O. Box 259 La Jara, CO 81140

P.O. No	Terms	Project
	Due on receipt	Misc Assistance

Quantity	Date	Description	Item	Rate	Amount
4	11/7/2008	Site Assistance	Alamosa River Maintenance	75.00	300.00
8	11/8/2008	Site Assistance	Alamosa River Maintenance	75.00	600.00
8	11/9/2008	Site Assistance	Alamosa River Maintenance	75.00	600.00
8	11/10/2008	Site Assistance	Alamosa River Maintenance	75.00	600.00
	12/3/2008	Mileage to/from Capulin 11/7-11/11/08 580 miles		225.20	225.20

Steven White
12/3/08

Thank you
Tax ID 84-1521023

Total $2,325.20

Capulin Construction Company

Invoice

20758 County Road 10
La Jara, CO 81140

Date	Invoice #
12/4/2008	2

Bill To
Alamosa River Watershed Restoration Found % Rodger Gallegos La Jara Co 81140

P.O. No.	Terms	Project

Quantity	Description	Rate	Amount
5	Reconstruct damaged Vanes below San Jose 2	400.00	2,000.00
1	Ramona Valdez	800.00	800.00

12/4/08

Total $2,800.00

Request # 30

REQUEST FOR REIMBURSEMENT FROM THE CWCB

TO: Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, CO 80203

FROM: Alamosa River Watershed Restoration Foundation
P.O. Box 255
La Jara, CO 81140

Federal Tax ID: 84-1588141

Alamosa River Watershed Restoration Foundation

PO # 09-03

Task	Check	Date	Name of Payee	Description of Expenditures	Total Cost	To be Reimbursed by CWCB	
Work on River			Capulin Construction Comp. LLC	Maintenance work	$1,217.25	$1,217.25	
Work on River			Porco Rock Querry	rock	$1,340.00	$1,340.00	
				TOTALS		**$2,557.25**	

I hereby certify that all contract requirements have been met and the amounts billed are correct.
Payment is authorized for amount indicated.

Director or Authorized Designee_____. Date___/___/___.

WE ARE REQUESTING REIMBURSEMENT FOR ABOVE EXPENSED, WHICH WERE INCURRED PER CONTRACT: C150037

Signature (Contractor)_____. Date___/___/___.

3/16/09
Ok to pay
(chris sturm)
(tom B) 3/16/09

5375

DATE: 11/10/08

NAME: Ralph Porco

ADDRESS: 11150 FOR 255

Ladara CO 81140

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE RTD.	PAID OUT

QUANTITY		DESCRIPTION	PRICE	AMOUNT
110	1	C4 Rock	30.00	
	2		C4	
	3			3300 00
	4	Paid		1960 00
	5			
	6			
	7			
	8			
	9			
	10	Rodger Gallegos		
	11			
	12	Blance Due		1340 00

CUSTOMERS ORDER NO.

RECEIVED BY:

KEEP THIS COPY FOR YOUR RECORDS

Capulin Construction Co., LLC

20758 County Road 10
La Jara, CO 81140

Phone: (719)274-5430
Fax: (877) 451-7725
E-mail:

Statement

Statement #: 5
Date: March 12, 2009
Customer ID: 2

Bill To: ARWRF
St. Hwy 15
La Jara, CO. 81140

Date	Type	Invoice #	Description	Amount	Payment	Balance
3/10/2009	River Work		5 Replace vane structures	$ 1,217.25		$ 1,217.25
					Total	$ 1,217.25

Reminder: Please include the statement number on your check.

Terms: Balance due in 30 days.

REMITTANCE

Customer Name: Alamosa River Wathershed Restoration Foundation
Customer ID: 2
Statement #: 5
Date: March 12, 2009
Amount Due: $1,217.25
Amount Enclosed: