Phase II final report
River Restoration Project 2008
Blanco river
Near Pagosa Springs, co

Submitted To:

Colorado Water Conservation Board

July 28 , 2009

Submitted By:

Lower Blanco Property Owners Association

Riverbend Engineering, LLC

Lower Blanco River Restoration Project Summary
2008 Phase IV

Project Purpose:

The Lower Blanco River Restoration Project seeks to restore some of the aquatic life functions that were lost when a major portion of the river's historic flow was diverted to New Mexico to meet Colorado River Water Compact obligations

Project Statistics:

Location	Section 32, T34N, R1W, NMPM; 37.08'45"N 106.58"26"W	
County	Archuleta	
Water Division	7	Water District 29
Project Length:	6000 Linear Feet	
Adjacent Property Owners:	25	
Begin Construction:	8/1/08	
End Construction:	8/19/08	
Rock Installed:	2500 CY	*(15 Cross Vanes, 17 J hooks, 6 Deflectors, 71 Habitat Rocks, 30 Sill Rocks)*
Channel Shaping	1500 CY	

Project Cost:

Engineering Support	$7,875.00
Construction Management	$13,739.00
Rock	$91,200.00
Construction	$69,005.00
Project Total	$181,818.00

Project Funding Sources:

NRCS EQIP Grant Reimbursement	$95,000
Colorado Water Conservation Board	$30,000
Southwest Water Conservation District	$25,000
San Juan Water Conservation District	$20,000
Lower Blanco POA	$12,000
Archuleta County	$1,500

Future Phases:

The Lower Blanco River Valley is about 9.0 miles in length, and there are 5.0 miles of river work completed so far. The preliminary design for the remaining 4 miles is complete and the LBPOA is seeking funding to complete the restoration project for Lower Blanco River Valley.

INTRODUCTION:

The Lower Blanco River Restoration Project seeks to restore some of the aquatic life functions that were lost when a major portion of the river's historic flow was diverted to New Mexico to meet Colorado River Water Compact obligations. The San Juan-Chama Diversion project came on-line in 1971, and since that time the Lower Blanco River has been reduced to small flows in an over-wide stream bed. The river no longer has the seasonal flows to shape the channel bed, create scour pools and maintain spawning gravel beds. In many locations the mature riparian vegetation is not next to the flowing water. Wetland features at the margins of the channel are infrequent. Water temperatures are elevated in the summer months because of shallow & wide flow conditions. There is only limited habitat available for salmonids and other aquatic species.

The condition of the Lower Blanco River after the San Juan-Chama Diversion was of great concern to property owners along the river. The LBPOA was formed in 1985, and one of its early initiatives was to start looking for help to fix the River. There was little help offered by the Federal agencies administering the Diversion project, but the State of Colorado through the CWCB was forthcoming with assistance. The science of river restoration was still in its infancy, however the CWCB saw the need and was willing to provide grant funding to plan for and implement a river restoration Demonstration Project on the Lower Blanco River. A "Restoration and Fish Habitat Enhancement Plan" was prepared by Dave Rosgen in 1992, which provided a detailed analysis of the changed hydrologic and aquatic conditions in the river, and made specific recommendations on how to rehabilitate stream and aquatic functions within the limitations of a reduced hydrologic regime. Implementation of the restoration work began in 1993, and after monitoring of the work for several years, a second phase of implementation was undertaken in 1996. Phase 1, 2 and 3 were complete by 2002 and had completed work on approximately 2.75 miles of the river. After a several year hiatus where the POA continued to seek funding for the project, implementation work began again in 2007. In the Fall of 2007 a single private landowner near the bottom of the Lower Blanco valley funded restoration work on his 1.0 mile of the river. Then in 2008 the LBPOA completed another 1.25 miles of river restoration (phase 4) with funding assistance from the NRCS, the SW Conservation District and the San Juan Water Conservancy District. The Lower Blanco River valley is about 9.0 miles in length, and there are 5.0 miles of river work completed so far.

PROJECT GOALS:

Poor aquatic habitat and severely reduced flows have impacted all aspects of the Lower Blanco River. Restoration of a healthy river means making changes to the river's cross

section, so that the best use can be made of the available water. The restoration objectives defined in 1992 remain the same today.

Project goals include:

Improve the natural stability of the Lower Blanco River
Improve fish habitat and spawning locations
Improve water quality
Improve riparian and floodplain functions
Improve visual values
Maintain channel capacity for flood hazard reduction
Maintain or improve domestic well water levels

PROJECT DESIGN:

Hydrology

The completion of the Chama San Juan diversion project in the early seventies has had a significant impact on the hydrology of the Blanco River. The diversion has decreased the duration and magnitude of the channel forming flows downstream. The pre-diversion "bankfull" discharge based on a stochastic analysis of peak discharges from 1935-1971 show a 1.5 year return frequency flow of 726 cfs. The post diversion peak discharge analysis of 1971-2000 gives 1.5 year return frequency flow of 463 cfs. This is 36% reduction in the 1.5 year return frequency flow value (Kurz and Rosgen 2002).

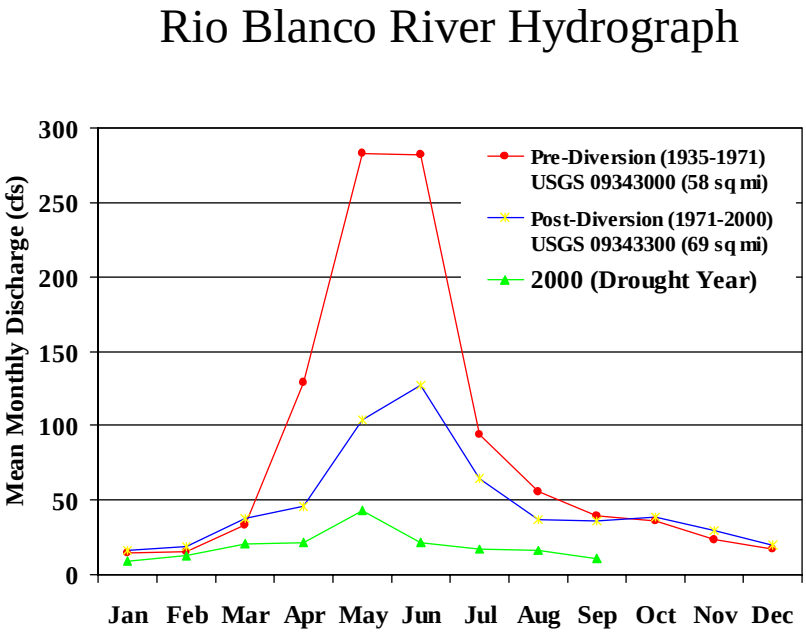
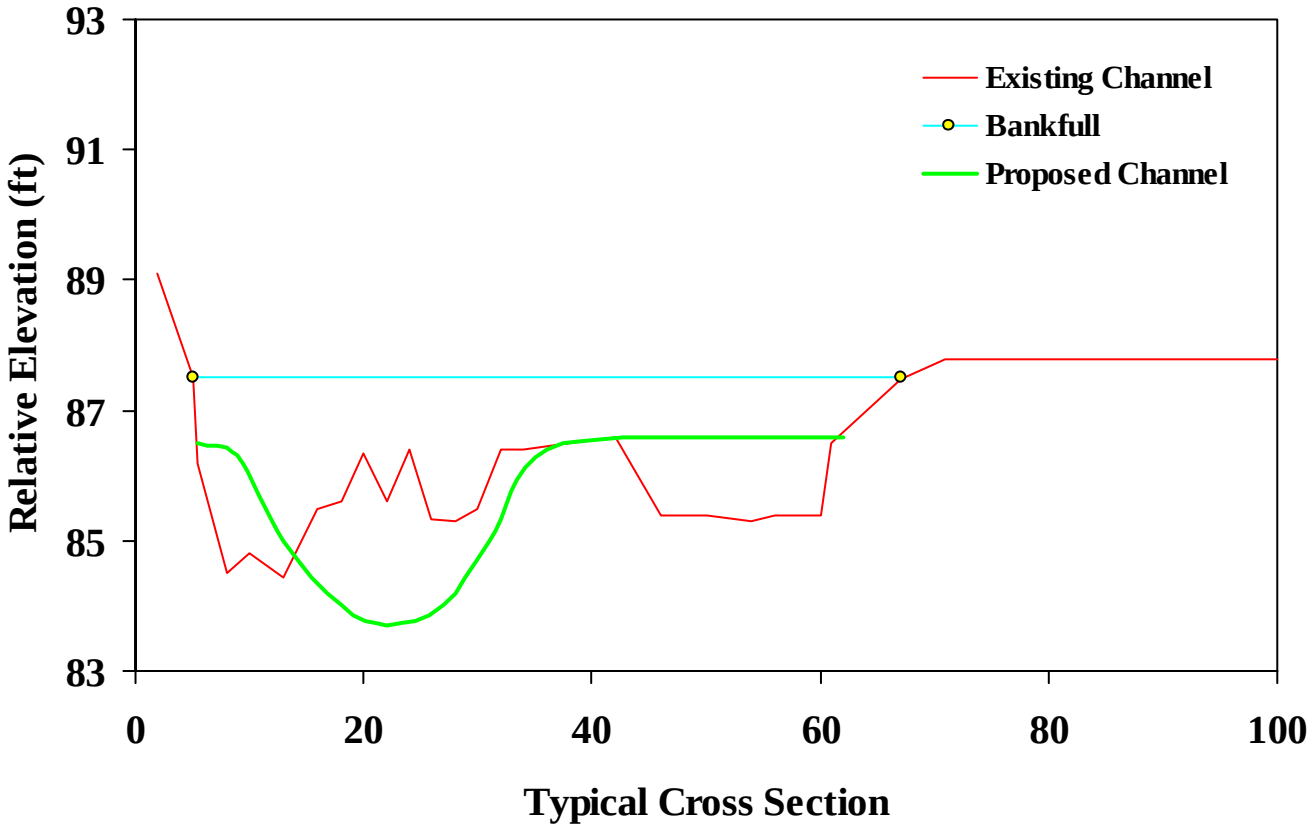


Photo 1. Wide shallow channel.

The change in the river hydrology has had a significant impact on the overall health of the Blanco River system. The wide shallow channel lacks the shear stress required to move the larger sediment particles in the system. This has contributed to sediment deposition, increased erosion, and could potentially increase flood stages. The water quality is compromised by an increase in temperature due to wide shallow stream segments. Increased water temperatures lead to a decrease in dissolved oxygen. The fish habitat is negatively affected due to lack of deep cool water and the accumulation of fine sediment in potential spawning gravels during low flow. To offset the effects of the change in river hydrology and resulting changes in river form, the project design consists primarily of channel shaping and fish habitat construction.

Channel Shaping

The channel shaping will rearrange the river alluvium at locations where a deeper pool form is likely to be sustained. This could be near a rock structures convergence of flow creates a scouring condition, or where secondary currents cause by the turning of water on the outside of natural bend maintains a deeper water condition.



Within the river's cross section, channel shaping will not result in a decrease of the effective cross section for flood conveyance purposes. As depicted in the graphic above, the channel shaping will simply re-arrange the distribution of material to create better use of the available water at low flow conditions. With reduced width of flow and increased depth, we expect to see decreased summer water temperatures and increased holding capacity for fish. A narrower/deeper channel form will help with sediment movement in the system, because when higher flows do occur, the shear stress will be concentrated in areas where sediment can be routed through the system.

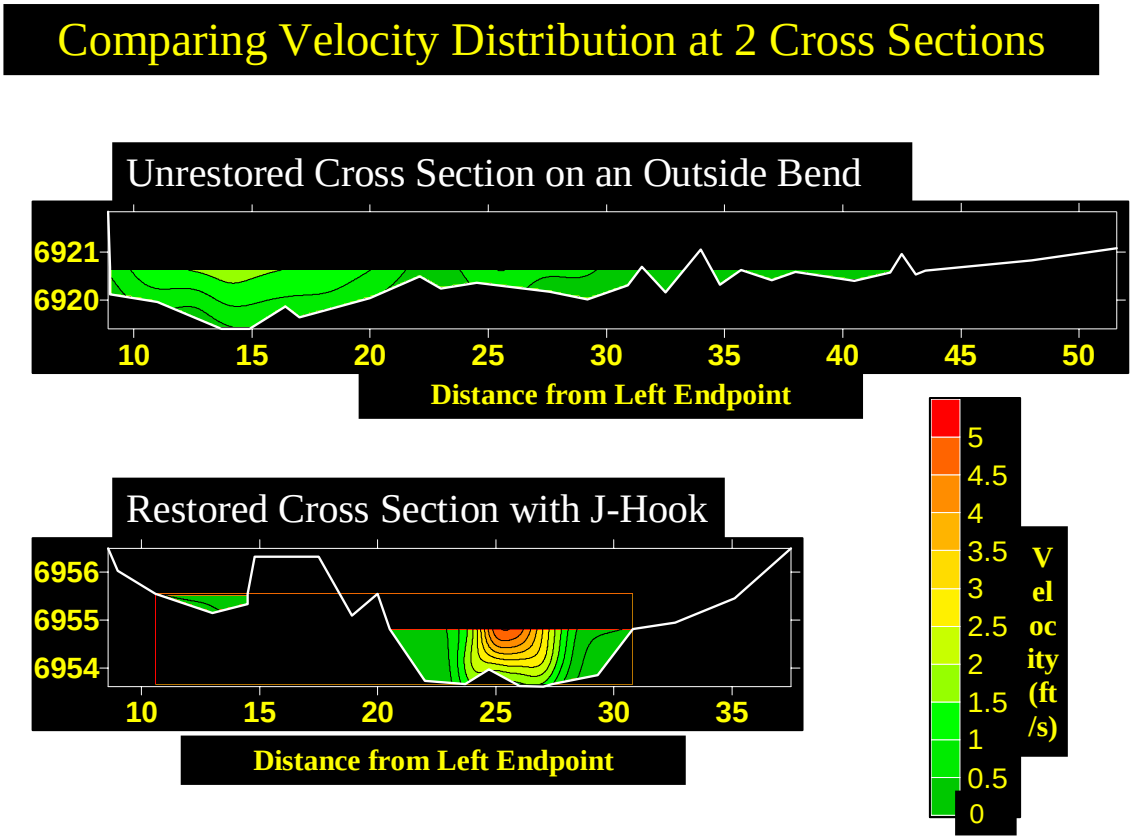


Figure 1. From Kurz & Rosgen, 2002.

Shaping of alternating side bars along the river will encourage the colonization of riparian vegetation, helping to bring improved shade to the river and improved vegetation cover that will enhance fish holding capacity. Improved fish habitat will mean improved recreation opportunities in this river. A strong riparian vegetation community means better cover for terrestrial species that use the river for water and for its riparian forage potential. Dense riparian vegetation encourages deposition of fine grained sediment for soil building, and also creates backwater areas that are the genesis of obligate wetland communities. These transitional areas along the river's margins are important habitat for amphibian species, like the spotted leopard frog (species of concern). Dense riparian vegetation also provides the cover that upland species need to feel safe when coming for water. In this manner it can be seen that the in-stream river improvements have a beneficial impact on the whole ecosystem of the Lower Blanco River valley.

Photo 2. Photo of newly constructed alternating bar with dense bank vegetation. Note the rock structure and deeper water river-left, creating good fish holding potential beneath the overhanging Alder bushes.

Constructed Rock Habitat

The various rock structures used for erosion protection and habitat enhancement are described below:

Cross Vanes: These rock structures extend across the active channel. They create a funneling effect at higher flows that concentrates the higher velocity flow in the center of the river where a scour hole is formed and will remain deep water.

J-hooks: A rock structure on one side of the channel that starts at "bankfull" stage and extends upstream towards the invert of the channel bed. This structure reduces high shear stress along the river's bank, and concentrates that energy towards the center of the river where a smaller scour pool can be sustained.

Short Vanes: Similar to a J-Hook, but focused primarily on bank erosion mitigation, not fish habitat creation.

Rock Deflectors: A pile of large rocks placed against one bank of the river, which forces the water to flow around. Some scour can be observed at the tip of the deflector were flow convergence is greatest.

Habitat Rocks: Single large boulders or groups of 2-3 boulders placed in the active channel so that the current flows around and/or over the boulder. These rocks create complexity of currents within the river, including eddy currents behind the boulders where fish can rest mid-channel but still have easy access to the feeding lanes.

Floodplain Considerations

Aquatic habitat improvements accomplished with this project should not adversely impact the river's ability to pass an extreme flood event. A natural river has an active floodplain that allows floodwater to move down valley and limits shear stress values in the river channel for all flows above the "bankfull" stage. The design of these river improvements will retain all of the active floodplains that existed prior to construction. We expect that flood events will occur, and expect that some repair work will be needed from time to time. This is because habitat improvement structures and channel shaping are not intended to withstand extreme flood events. Large flood events may result in some damage but rarely result in a complete loss of improvements. Natural rivers do show changes in a 100-yr event. This is a necessary component of keeping the Lower Blanco River as natural as possible.

Placement of large boulders for in-stream habitat structures is offset by the removal of a similar volume of gravel where the boulders are placed. The design takes advantage of side channels at split flow locations, and converts these side channels to spawning channel habitats. At flood stage these side channels will be active conveyances for flood waters, since the inlet constraints are limited in height. Establishment of a single primary channel will ensure continuity of sediment transport down the river, and will prevent aggradation during a flood event that might exacerbate flood stages. Macro-invertebrates rely on a regular re-arrangement of bed sediments, and this restoration work will improve these conditions.

PROJECT MONITORING:

Project monitoring data was collected before construction and after construction on the Phase IV work area. This data included geomorphic measurements, photographic documentation of site conditions, and qualitative assessments of riparian and aquatic conditions. The data will be assembled in annual monitoring reports as part of the Section 404 Permit requirements from the US Army Corp of Engineers. Monitoring data is not included in this project report, but is available from the POA upon request.

FUTURE PROJECTS:

Phase V of the Blanco River restoration Project is planned for the 2009 construction season (late Summer & Fall). It is anticipated that another 1.0 to 1.5 miles of river can be improved. This work will begin where the Phase IV project ended and will continue downstream. Phase VI (still in the planning steps) hopes to continue where Phase V leaves off, and depending upon the funding that can be obtained, Phase VI may be close to finishing the full 9.0 miles of restoration work on the impacted section of the river.

APPENDIX A

Before and After Photo Comparison

BEFORE: Over-wide braided into 3 channels

AFTER: Single channel with rock bank protection and habitat rock

BEFORE: Wide shallow and straight low flow channel

AFTER: Rock diversion controlling flood water into side channel, channel narrowing and induced meandering downstream

BEFORE: Over-wide low flow channel with shallow flow and limited habitat

AFTER: Enhanced point bar to promote deeper narrower channel with short rock vane for habitat and increased bank stability.

BEFORE: Over-wide low flow channel limited habitat

AFTER: Constructed channel bar to promote deeper narrower channel with cross vane for habitat and bank stability.

APPENDIX B

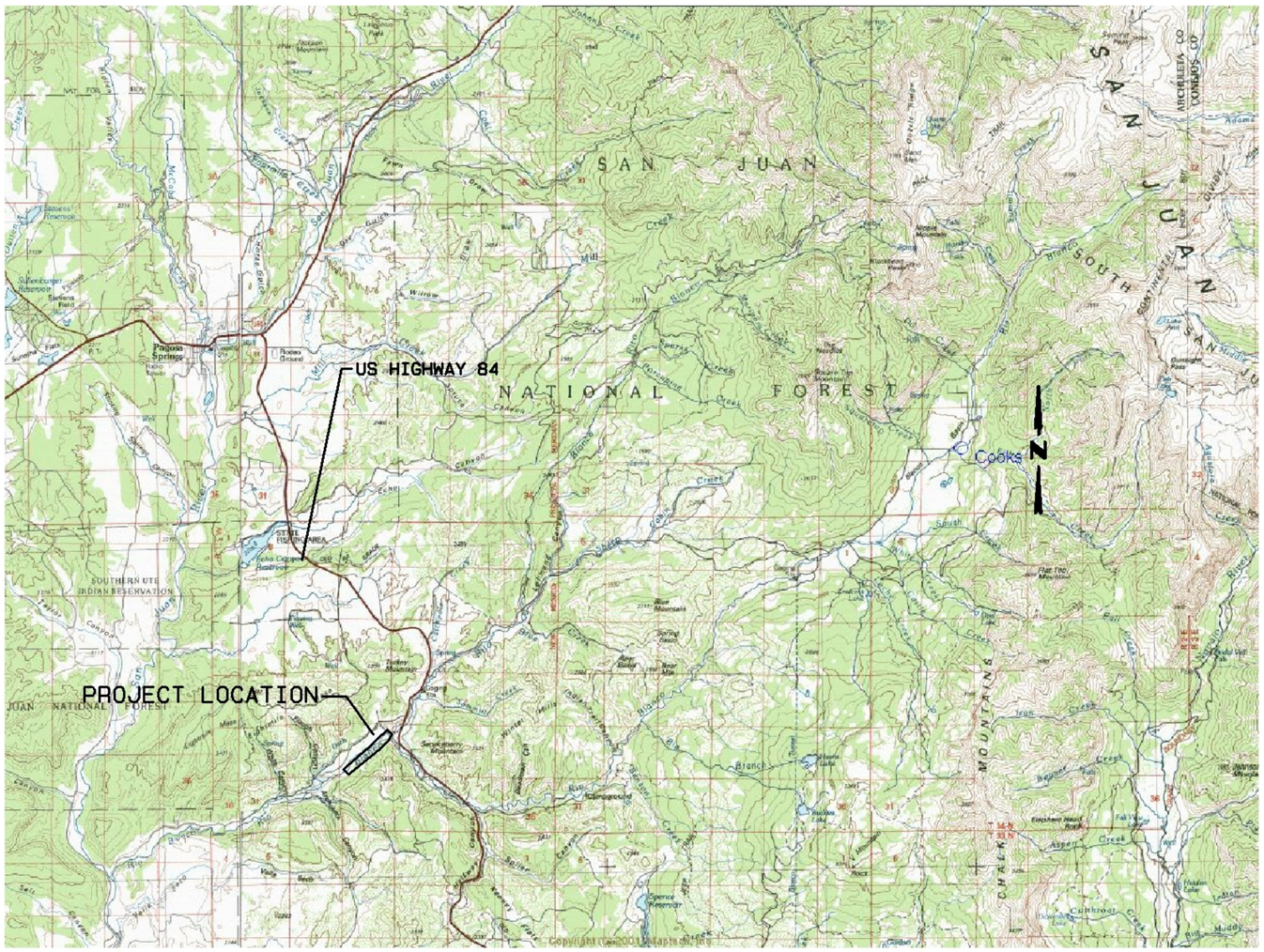
As Built Plan Set

River Restoration Plan
As Built Drawings

Lower Blanco River
Archuleta County, Colorado

Prepared for

LOWER BLANCO PROPERTY OWNERS ASSOCIATION



VICINITY MAP

Index of Drawings

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LOWER BLANCO POA	Sheet
PAGSOA SPRINGS COLORADO	
COVER SHEET, VICINTY MAP, AND SHEET INDEX	of
AS BUILT DRAWINGS	
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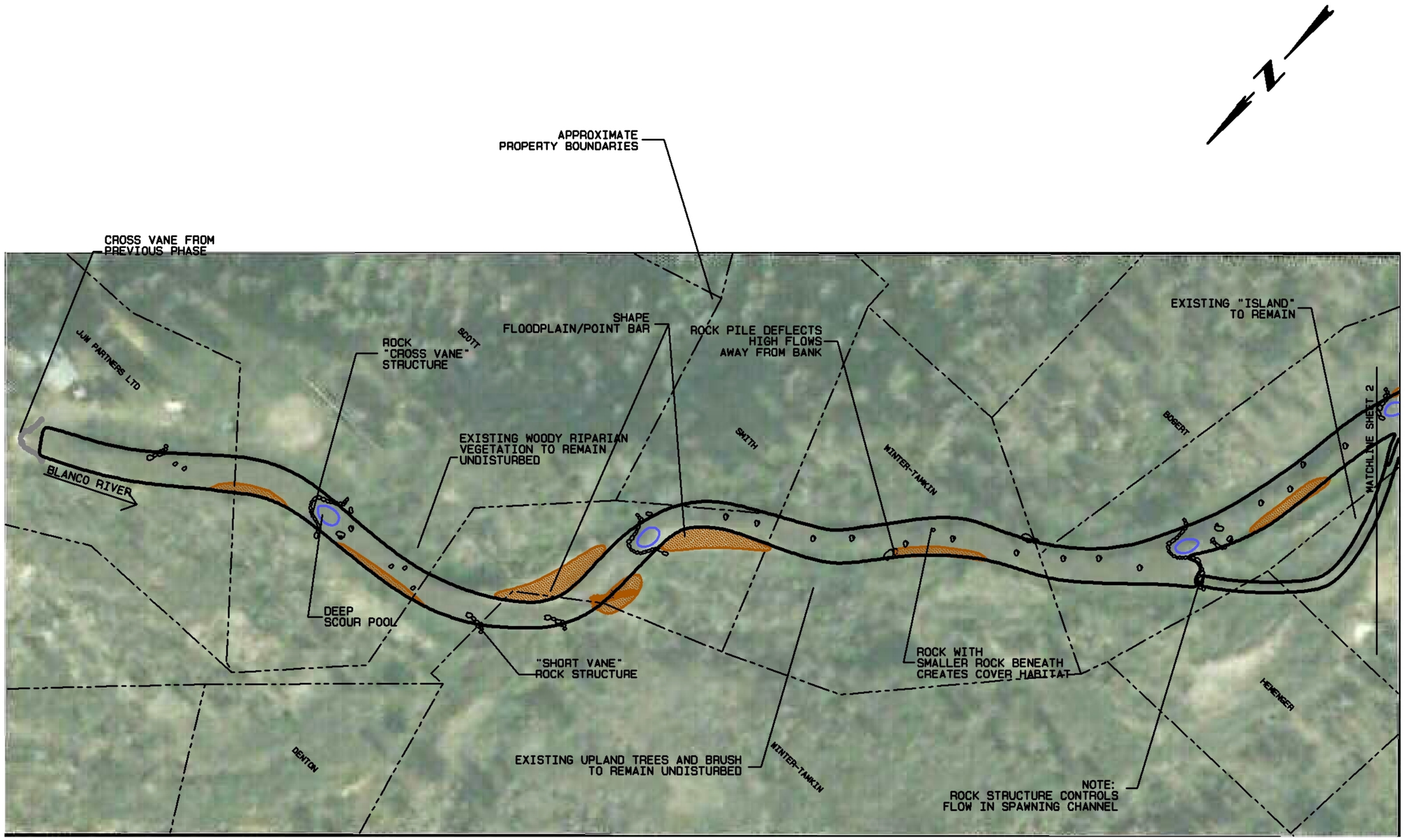

GENERAL NOTE: RIVER CHANNEL AS SHOWN IS 40 FT NOMINAL WIDTH. WIDER AREAS ARE SHOWN WITH FILL TO NARROW THE CHANNEL AND OPTIMIZE SEDIMENT TRANSPORT AND AVAILABLE WATER AT LOW FLOW PERIODS. THE PLAN DOEST NOT CONTEMPLATE REMOVAL OF EXISTING RIPARIAN VEGETATION TO ACHIEVE THE NOMINAL DESIGN WIDTH.

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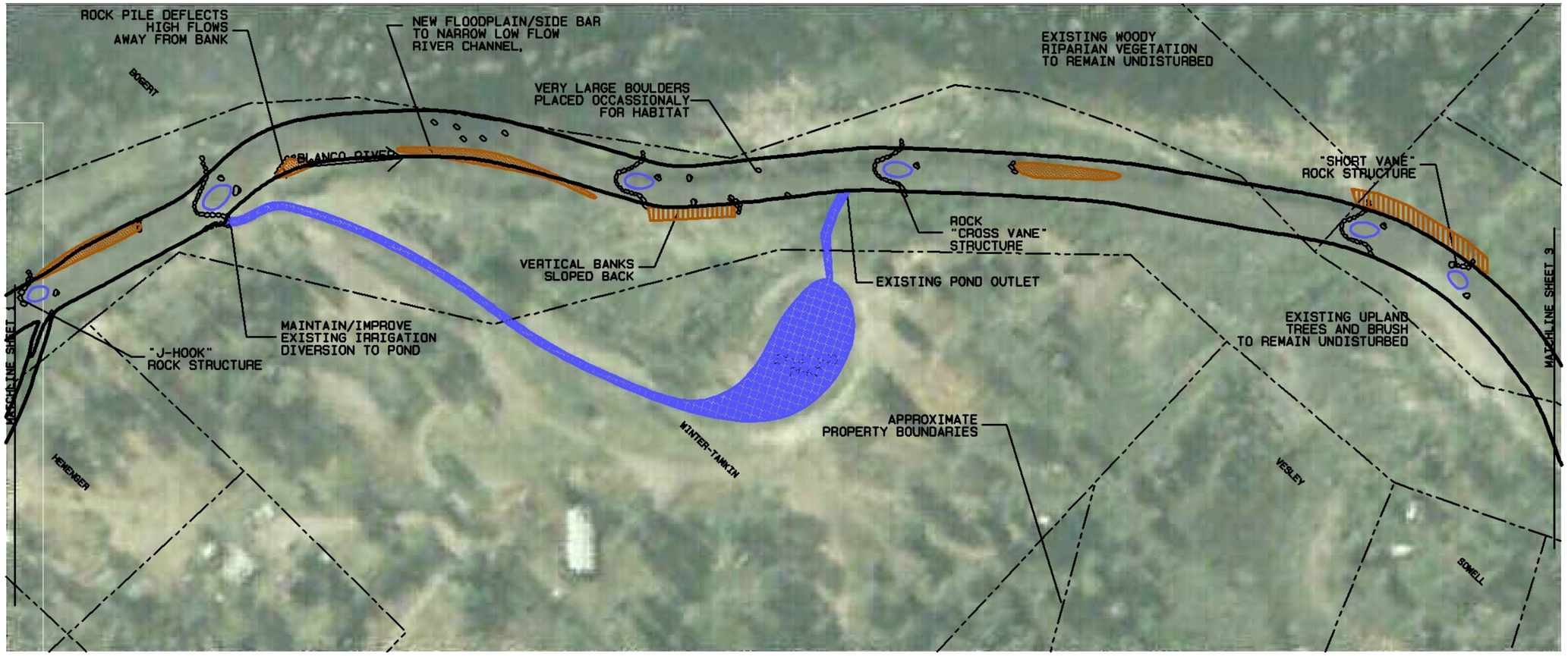
RIVER RESTORATION AND HABITAT ENHANCEMENT PLAN	of 3
AS BUILT DRAWINGS	
8/14/08	



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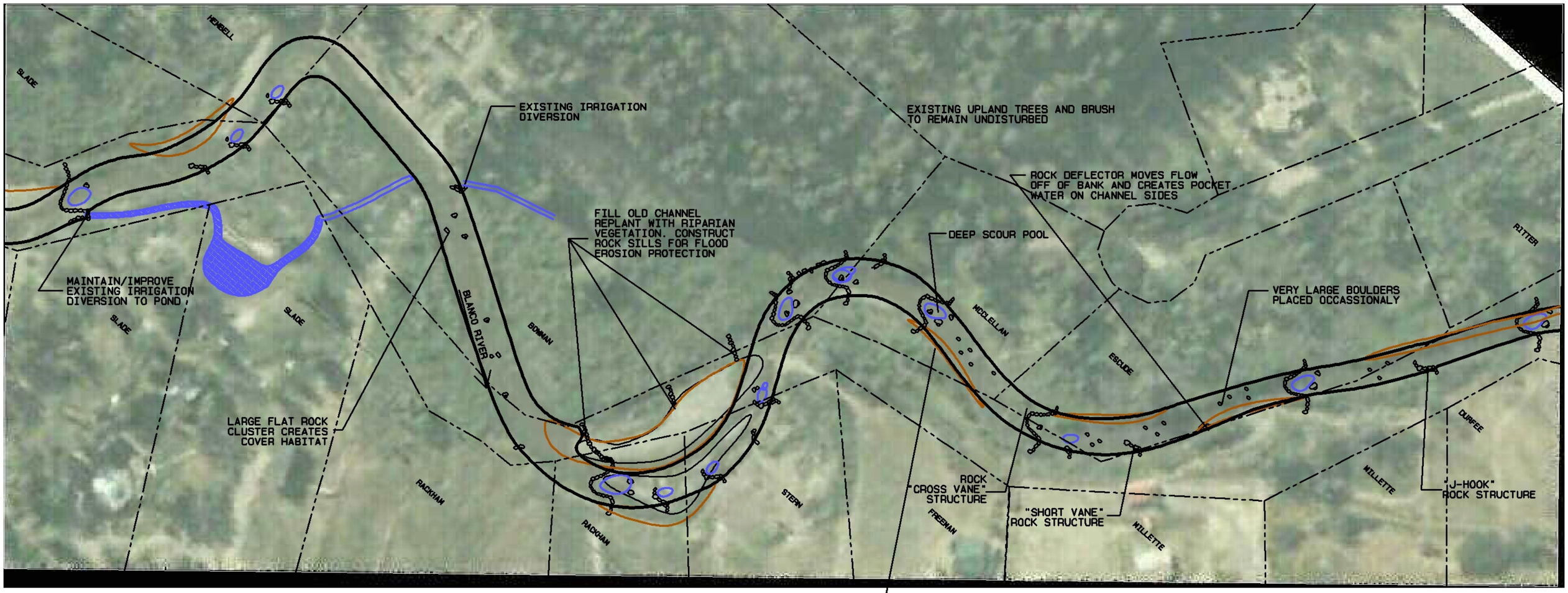

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