RECLAMATION
Managing Water in the West

Rock Creek Fish Barrier
Feasibility Investigations

Final Report for Central Arizona Project Fund Transfer Program Task 4-46

Submitted to:

U.S. Fish and Wildlife Service
Tonto National Forest

Submitted by:

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I. Introduction

Reclamation is pursuing construction of a fish barrier within the Tonto Creek basin to prevent nonnative fishes and other aquatic organisms from invading high-priority streams occupied by extant and repatriated native fishes. This action is one of a suite of conservation measures being implemented by Reclamation to compensate for transfers of nonnative aquatic organisms into the Gila River basin via the Central Arizona Project. Highest-priority streams under Reclamation's fish barrier construction program are those that can be secured to prevent extinction and stabilize rare stocks of native fishes, or that can be protected and renovated to replicate rare stocks of native fishes. A protected stream within the Tonto Creek drainage is intended to serve as a replication site for a White River population of loach minnow *Tiaroga cobitis* and an undetermined population of spikedace *Meda fulgida*.

In April and May of 2006, Reclamation investigated several stream systems within the Tonto Creek drainage for potential emplacement of fish barriers, including Greenback Creek, Gun Creek, Houston Creek, Spring Creek, Buzzard Roost Canyon, and Rock Creek. Based on biological value of the streams for native fishes, length of stream protected behind a barrier, physical site characteristics, and other considerations, Reclamation is proposing to advance one of the sites on Rock Creek for emplacement of a reinforced-concrete fish barrier. Rock Creek is in Gila County and within the Tonto National Forest. The perennial stream is a tributary to Spring Creek, which flows into Tonto Creek. The perennial stream Buzzard Roost Canyon is a tributary to Rock Creek. Rock Creek has not been renovated and harbors nonnative brown trout *Salmo trutta* and green sunfish *Lepomis cyanellus*, as well as native populations of headwater chub *Gila nigra*, desert sucker *Pantosteus clarki*, speckled dace *Rhinichthys osculus*, and possibly longfin dace *Agosia chrysogaster* and Sonora sucker *Catostomus insignis*, It has strong potential to serve as a replication stream for threatened loach minnow and spikedace.

This feasibility investigation evaluates fish barrier options on Rock Creek at a site immediately upstream from Brushy Canyon, a short distance upstream from its confluence with Spring Creek. This report describes the construction features, and provides feasibility level cost estimates. These details will allow further evaluation by all affected parties before a decision is made to proceed or not with National Environmental Policy Act and other environmental compliance and barrier construction.

II. Study Area

The potential fish barrier site described in this report is located between Payson and Young, within the southeast quarter of Section 1, Township 8 North and Range 12 East (Figure 1). The site is on the USGS Buzzard Roost Mesa quadrangle map and is about 2,000 feet upstream of the Rock Creek and Spring Creek confluence. The site is located at approximate UTM coordinates 3,768,600 N, 493,200 E (latitude 34° 3' 0" N, longitude 111° 3' 30" W).

The Rock Creek study area is about elevation 4,400 ft. There are about 3 miles of perennial stream upstream of the study area. The stream is ungaged, but streamflow during the site visit was estimated to be about 1 cubic foot per second.

The stream channel is generally gravel alluvium with riffle pool sequences. Alluvium is interrupted periodically by bedrock intrusions. The site described in this report has solid rock channel and banks, swept clean of alluvium.

III. Methods

On April 24 and 25, 2006, Reclamation and contract biologists evaluated the entire length of Rock Creek for potential fish barrier sites. During that investigation, the site described in this report was identified.

On October 16, 2006 the site was thoroughly examined by Reclamation staff for biological, NEPA, and engineering characteristics. Investigative activities included surveys, field measurements, photographs, evaluation of construction and access issues, and determination of biological impacts expected from construction.

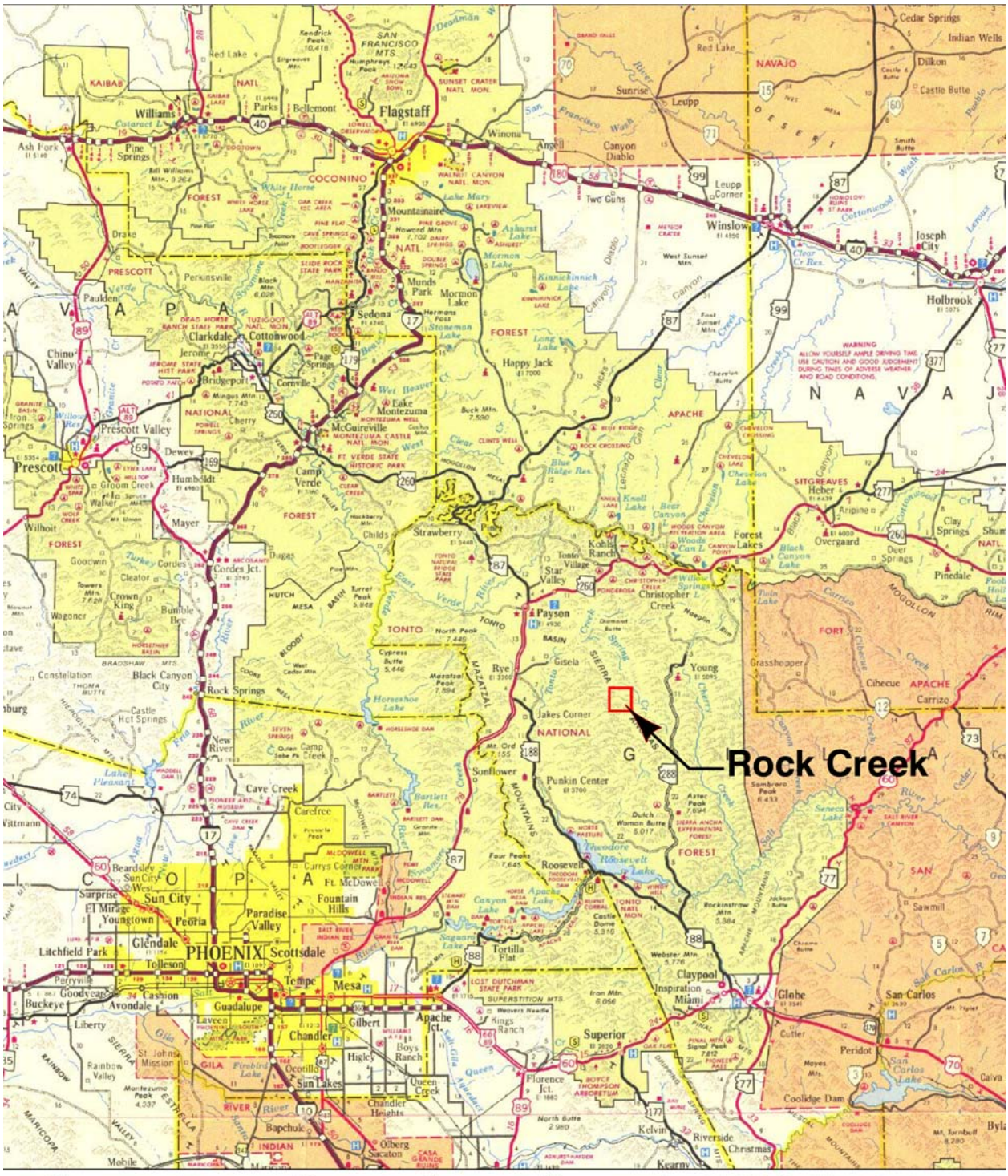
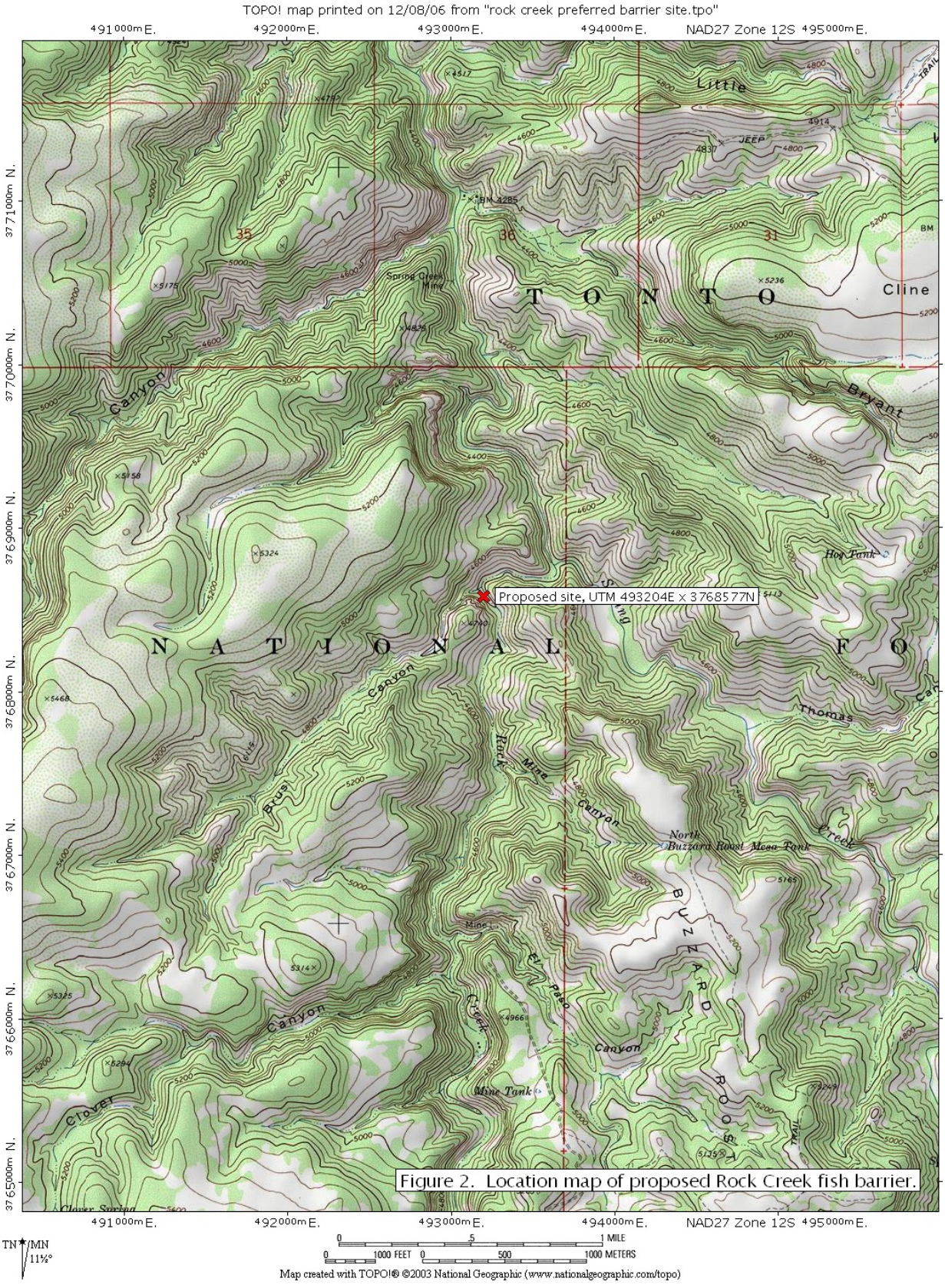


FIGURE 1


TOPO! map printed on 12/08/06 from "rock creek preferred barrier site.tpo"
491000mE.
492000mE.
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494000mE.
NAD27 Zone 12S
495000mE.
3771000m N.
3770000m N.
3769000m N.
3768000m N.
3767000m N.
3766000m N.
3765000m N.
Proposed site, UTM 493204E x 3768577N
Figure 2. Location map of proposed Rock Creek fish barrier.
TN
MN
11½°
0 .5 1 MILE
0 1000 FEET 0 500 1000 METERS
Map created with TOPO!® ©2003 National Geographic (www.nationalgeographic.com/topo)

IV. Results

A. General Design Considerations – The fish barrier site is located at a solid bedrock outcrop. The stream runs over clean bedrock for about 50 feet. Rock continues up banks and abutments well above the high flow levels. The site is approximately 2,000 feet upstream of Spring Creek and about 40 feet higher in elevation.

A fish barrier at this location would be constructed of reinforced concrete and would consist of a 4-foot drop, and a sloping splash pad or apron (see Figure 3). The total height of the structure above the existing thalweg would be about 5 feet. The length of the structure across the stream would be about 10 feet. Anchor bars would be drilled and grouted into the rock to ensure the structure is securely tied to the rock channel. A center notch would be constructed to ensure base flows achieve a full 4-foot drop and impinge on the downstream apron. Base flow and up to about 15 cfs would be contained within the center notch. Aesthetic work to the concrete, such as coloring and texturing, is possible and needs to be discussed with Tonto National Forest.

A small channel on the left abutment may need to be modified to ensure fish movement is prevented across the entire channel. A 3-foot high by 3-foot long wall, or possibly just filling a scour hole will be considered.

The site provides competent bedrock to tie into across the stream channel and up the banks, thereby eliminating scour concerns. The splash pad located immediately below the barrier crest is necessary to eliminate the potential for a scour pool to develop that could facilitate fish leaping attempts over the barrier. In addition, the slope of the splash pad will ensure shallow depths and high velocities immediately downstream of the barrier, making it difficult for fish to reach the face of the barrier.

There are several sources of concrete in the Payson area and two at Young. Some research should be done to determine the reliability of these plants, from a production and quality standpoint. Those plants meeting the necessary criteria should be listed in the construction specifications as approved sources.

After the constructed fish barrier has experienced several floods, the upstream side of the barrier is expected to fill with sediment up to the crest of the structure. The 5-foot raise in the thalweg profile combined with the trapped sediment will create a higher water surface profile in a localized area upstream of the barrier. There are no improvements that would be affected by this increased upstream flooding. Due to the steep stream channel gradient, these effects would not continue upstream any significant distance.

The design flood will likely correspond with the 100-year flood.

B. Construction Issues - There are no roads accessing the site. The nearest roads end about 2 miles from the site, with difficult terrain between. Pioneering a road to the site would be too costly and disruptive to consider. The lack of access essentially dictates the use of helicopters.

There are a wide variety of activities that would likely rely on helicopters, including transporting labor and materials to the site, and long-lining concrete for the structure. A Bell Long Ranger

would be adequate for this type of work, although the final decision would rest with the contractor. Bell helicopters have load capacities from 800 to 1,000 pounds. They cost approximately $1,200/hr and are readily available. The construction cost estimate assumes the use of a Bell helicopter.

If concrete is supplied from Young, transit mixers would need to be driven about 8 miles on gravel roads to a desirable helicopter staging area, which is about 2 miles from the site. Concrete from Payson would need to be driven through Young, or taken to a helicopter staging area near Tonto Creek, about 13 air miles from the site.

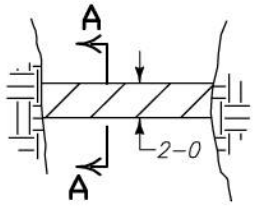
The following is a list of construction equipment that would be expected on-site at times during construction. The equipment actually used may vary somewhat depending on the contractor's approach to the work and equipment availability.

Helicopter
Generator(s)
Pumps (electric or gasoline)
Rock drills
Power saws and other hand held power tools
Concrete vibrators

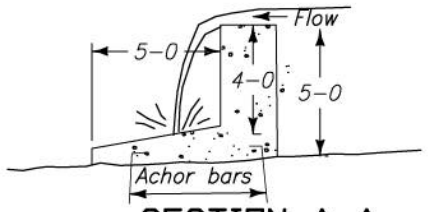
Generators and fuel containers will need to be kept above flood flow levels to ensure hydrocarbons are not released into the stream.

It is expected that the contractor will want to camp near the work site. Work camp issues need to be worked out with Tonto National Forest. The camp will need to be at a location that allows the helicopter to drop supplies.

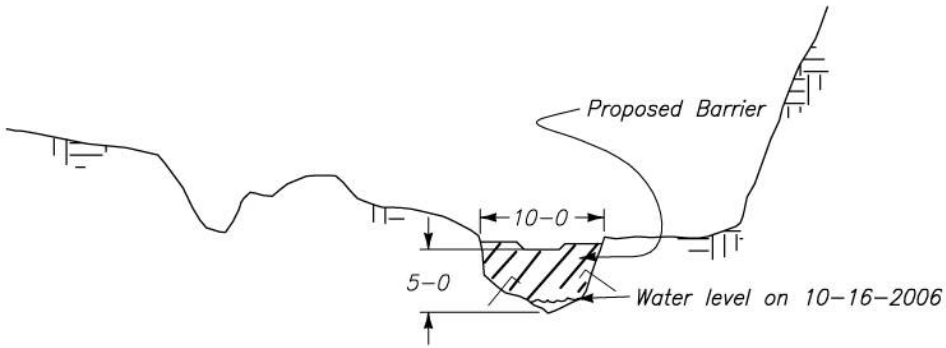
The cost of construction for this site is estimated at $201,000.



PLAN VIEW OF BARRIER



SECTION A-A



ELEVATION VIEW, LOOKING DOWNSTREAM

FIGURE 3

C. Construction Cost Estimate:

Assumptions for constructing a barrier at this site include: 1) materials and equipment will be brought in by helicopter; 2) concrete will be batched at an off-site location, slung to the site, and placed using helicopter; and 4) weights of construction materials are approximately:

(6 yds^3 of concrete)(4,000 lb/cy) = 24,000 lb
1,770 lb rebar and anchors
1,000 lb forming materials
4,000 lb miscellaneous tools, tool boxes, generators, pumps, etc.
Total weight = 30,800 lb

Helicopter days required - 2 days for mobilization + 3 days for weekly transport of people and materials + 2 days for concrete + 1 day demob = 8 days

- Helicopter work - (8 days)(8 hr/day)($1,300 hr)	$ 83,200
- Materials and equipment	$ 5,325
- Labor and per diem	$ 40,700
SUBTOTAL	$129,225
Contingencies (25% of Subtotal 2)	$ 32,306
	$ 161,531
Profit (15%)	$ 24,230
	$185,761
Tax, bonds (8%)	$ 14,861
TOTAL	$200,622

Say $201,000

VI. Environmental Compliance

Consideration of a Rock Creek fish barrier beyond the feasibility stage must include provisions for compliance with National Environmental Policy Act (NEPA), Endangered Species Act (ESA), and Clean Water Act (CWA). The NEPA process entails writing draft and final Environmental Assessments of the preferred project and its considered alternatives, and potentially presenting the preferred and alternative projects at public meetings. The NEPA process can take 6-12 months to complete. If Reclamation were to undertake the NEPA compliance, our costs to perform this work is estimated at approximately $50,000, depending on the proposed action selected. We assume that Tonto National Forest would be a co-lead with Reclamation on NEPA compliance.

ESA compliance likely will involve writing a Biological Assessment that determines effects of the project to federally-listed species and designated critical habitat for species. As the project is for the benefit of native fishes, consultation with FWS should proceed smoothly, as it did with Reclamation's Aravaipa Creek and Fossil Creek fish barrier projects. Reclamation estimates that ESA compliance activities should not take more than 3-6 months, depending on the priority it receives from FWS. Estimated costs for ESA compliance is approximately $20,000.

The acquisition process for a 404 permit under requirements of CWA includes determining the impact footprint of the barriers (flooding, sedimentation, and construction zones), receiving a jurisdictional delineation from U.S. Army Corps of Engineers, and further processing of a 404 permit application. Identification of mitigation for impacts to "waters of the US" for this barrier has already been completed through Reclamation acquisition of stream/riparian habitat along the San Pedro River. Processing time for CWA compliance will be 3-6 months. Reclamation estimates that compliance costs associated with CWA regulations would be approximately $10,000.

V. Recommendations

Based on a combination of factors including the biological value of the stream for native fishes, length of stream protected behind a barrier, and other considerations, Rock Creek is a strong candidate for the placement of a fish barrier. It has the potential to serve as a replication stream for threatened loach minnow and spikedace.

The proposed site offers a stable foundation and allows a relatively small structure to be built. The main negative associated with the site is the lack of access, which increases the construction cost, but provides stream protection with little human influence.

Reclamation supports proceeding with investigations at this site, and recommends developing a schedule for design and construction activities.

VI. Photos

Figure 4 - Proposed fish barrier location, looking downstream

Figure 5 - Proposed fish barrier location, looking upstream