# MIDDLE RIO GRANDE
# RIVERINE RESTORATION PROJECT PHASE II
# ENVIRONMENTAL ASSESSMENT

Prepared for

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# 1.0 PURPOSE AND NEED FOR ACTION

## 1.1 INTRODUCTION

The New Mexico Interstate Stream Commission (NMISC) seeks to implement part of the Reasonable and Prudent Alternative (RPA) in the March 2003 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (2003 BiOp) for Reclamation's Water and River Maintenance Operations, the U.S. Army Corps of Engineers' Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico, 2003 (USFWS 2003) and to address priority habitat restoration goals of the Middle Rio Grande Endangered Species Act Collaborative Program (Collaborative Program). Under the Collaborative Program, both governmental and nongovernmental entities work cooperatively to address Endangered Species Act (ESA) issues in the Middle Rio Grande (MRG). The NMISC is proposing to implement river restoration activities for the benefit of the federally listed Rio Grande silvery minnow (*Hybognathus amarus*; silvery minnow), specifically activities to improve adult and juvenile over-wintering habitat and silvery minnow egg retention and rearing habitat within the Albuquerque Reach of the Rio Grande. Restoring the riverine habitats that support the silvery minnow is considered to be an essential element for recovering the species.

Changes in riverine ecosystem processes and habitats have been linked to declines in silvery minnow, the last remaining member of a guild of small, pelagic spawning minnows native to the Rio Grande (Sublette et al. 1990; Bestgen and Platania 1991). Restoring specific riverine habitats that support the silvery minnow in river reaches where flow is more assured is a priority for the Collaborative Program (Collaborative Program Request for Proposals, October 2004; Collaborative Program Request for Proposals, November 2005).

This project, termed the Middle Rio Grande Riverine Habitat Restoration Project Phase II (Project), is led by the NMISC and proposes to apply several habitat restoration techniques in four subreach locations of the river in the Albuquerque Reach of the MRG to enhance, restore, and create habitat for silvery minnow. The Collaborative Program primarily funds the Project, with partial funding by the State of New Mexico. This Environmental Assessment (EA) has been conducted to evaluate the impacts of these riverine habitat restoration techniques associated with the Project on other resources and their relationship to other projects and undertakings in compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4331-4335). In addition, note that during December 2005 a final EA was completed for the Middle Rio Grande Riverine Habitat Restoration Project Phase I and a Finding of No Significant Impact (FONSI) was signed December 8, 2005 (Reclamation. 2005). While the Proposed Action and many of the habitat restoration techniques proposed herein are similar to those completed in Phase I, this Project seeks to employ additional restoration techniques. Phase II is the second phase of the four-phase restoration project to be completed by the NMISC.

## 1.2 PROPOSED ACTION

The Proposed Action involves the design and implementation of various habitat restoration/rehabilitation techniques intended to enhance, restore and/or create aquatic habitat for the benefit of the silvery minnow within the river in the Albuquerque Reach of the MRG (Figure 1.1). The proposed rehabilitation and restoration would occur within the river floodway at the following four locations: (1) from U.S. Highway 550 to approximately 1,200 m downstream (550

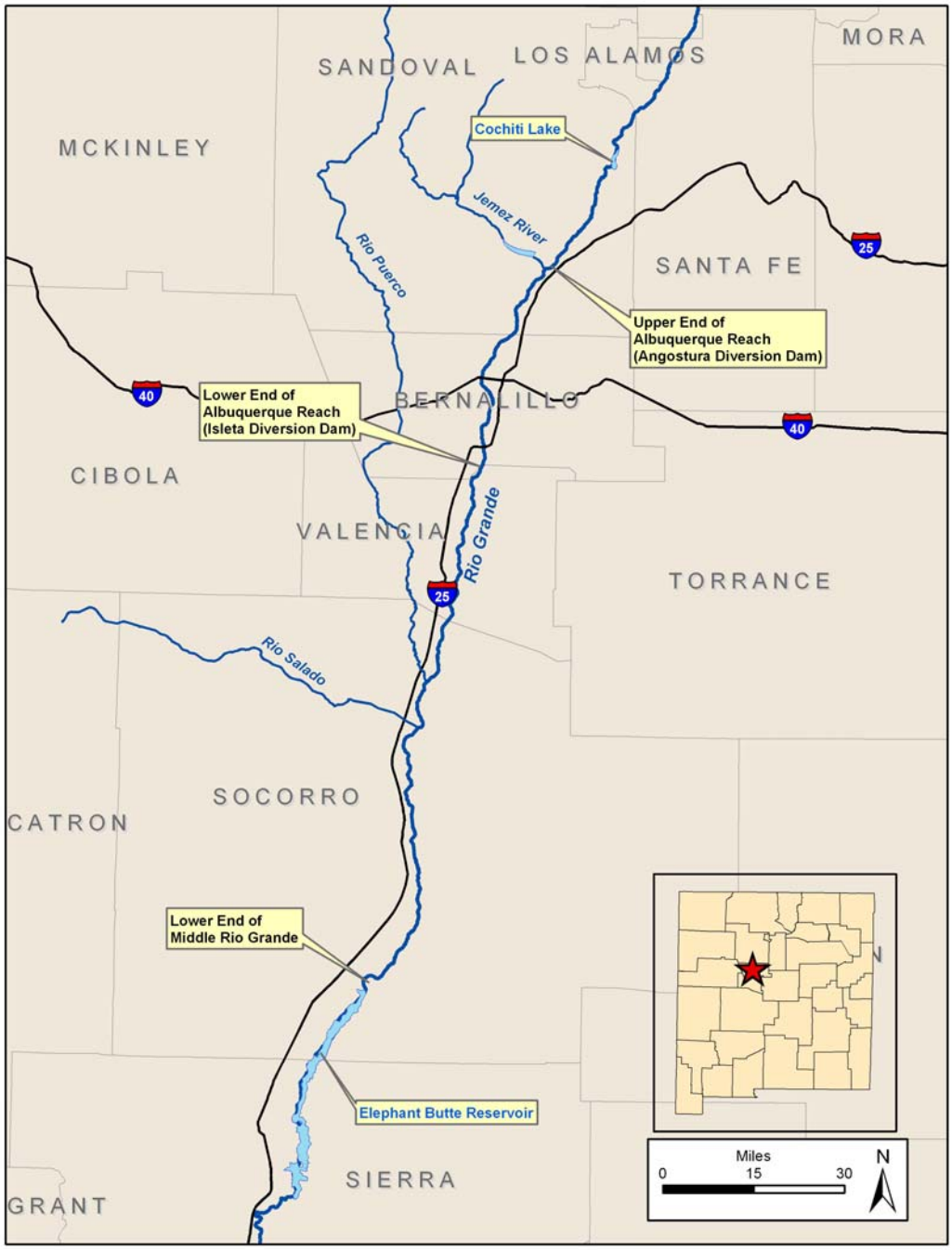


**Figure 1.1.** Project location map.

Subreach); (2) from Paseo del Norte to Montaño Road (PDN Subreach); (3) from I-40 to approximately 1,015 m downstream of Central Avenue (I-40 Subreach); and (4) from the South Diversion Channel to I-25 (SDC Subreach) (Figure 1.2). Projects at specific sites on vegetated islands, bars, and riverbanks would be implemented to test the efficacy of the selected techniques (Figures 1.3 – 1.7) (Table 1.1). Techniques would be implemented to evaluate the river's ability to naturally mobilize sediments and create silvery minnow habitat under a variety of flow conditions.

This is Phase II of a four-phase project. Phase I began in 2006 and Phase IV will continue through 2009 (Reclamation 2005). Approximately 75–90 acres would be treated during Phase II, with treatment areas that include islands, bars, banks, and a diversion structure. A phased approach would be applied to future restoration activities, with monitoring and evaluation of the outcomes utilized in subsequent phases. This EA evaluates and analyzes potential impacts of the Project on resources that may occur within the Project area during Phase II of the Project, which will take place between January 2007 and April 2008.

## 1.3 PURPOSE AND NEED

The proposed action is to develop and construct silvery minnow habitat within the Albuquerque Reach of the Rio Grande to provide adult and juvenile over-wintering habitat and silvery minnow egg retention and rearing habitat. The Project would also evaluate the efficacy of each restoration technique and its contribution in situ to the riverine and riparian environment and the overall recovery goals for the silvery minnow in the Albuquerque Reach of the MRG.

The proposed action is needed to satisfy federal requirements under the 2003 BiOp. The BiOp requires the funding and collaborative execution of habitat restoration projects on the MRG that will improve survival of all life stages of the endangered silvery minnow, as specified in RPA Element S:

> In consultation with the [U.S. Fish and Wildlife] Service and appropriate Pueblos and in coordination with parties to the consultation, action agencies shall conduct habitat/ecosystem restoration projects in the Middle Rio Grande to increase backwaters and oxbows, widen the river channel, and/or lower river banks to produce shallow water habitats, overbank flooding, and regeneration stands of willows and cottonwood to benefit the silvery minnow, the flycatcher, or their habitats. Projects should be examined for depletions. It is the Service's understanding that the objective of the action agencies and parties to the consultation is to develop projects that are depletion neutral. By 2013, additional restoration totaling 1,600 acres (648 hectares) will be completed in the action area. In the short term (5 years or less), the emphasis for silvery minnow habitat restoration projects shall be placed on river reaches north of the San Acacia Diversion Dam. Projects should result in the restoration/creation of blocks of habitat 24 hectares (60 acres) or larger [USFWS 2003:95–96].

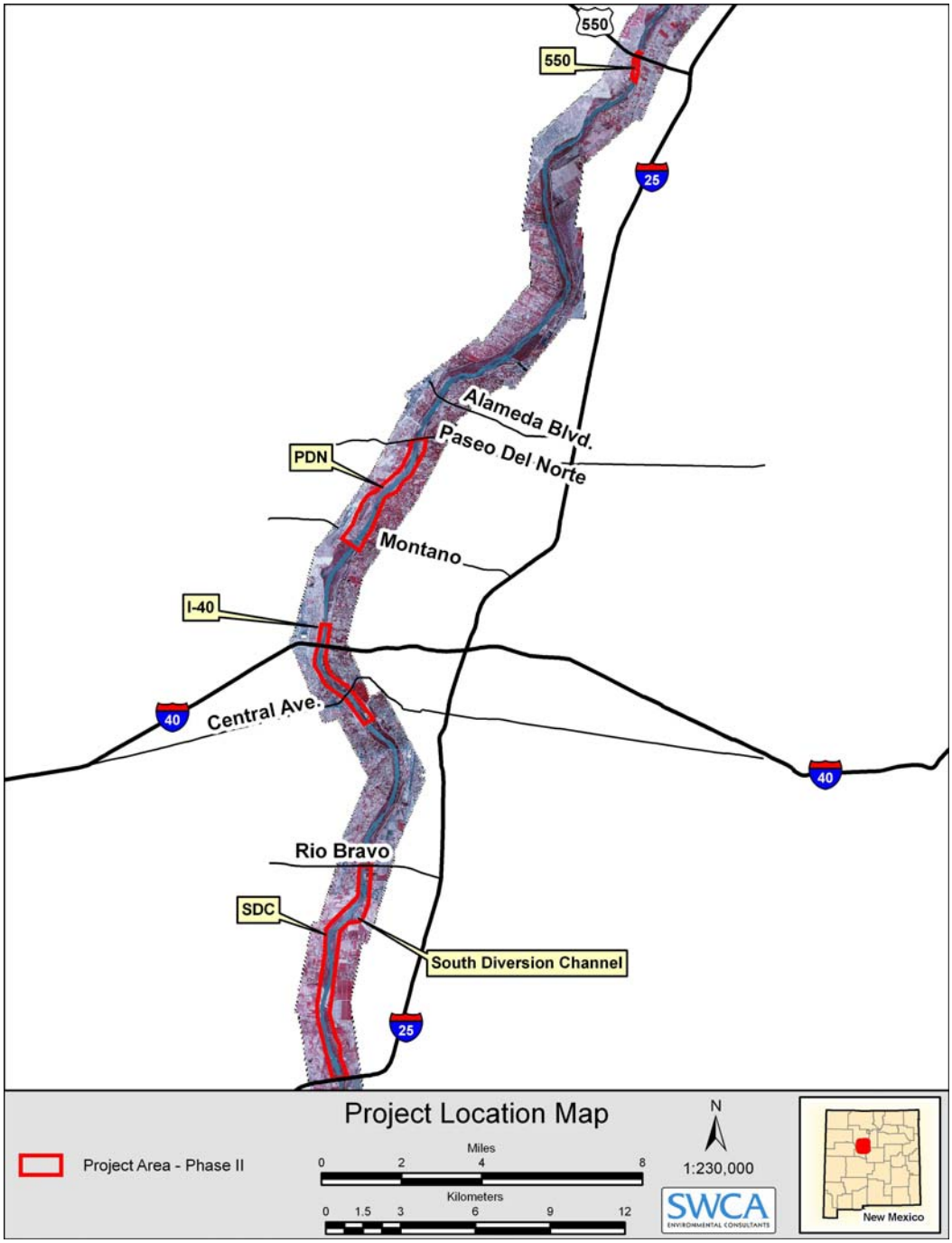


**Figure 1.2.** Proposed riverine habitat restoration subreaches.

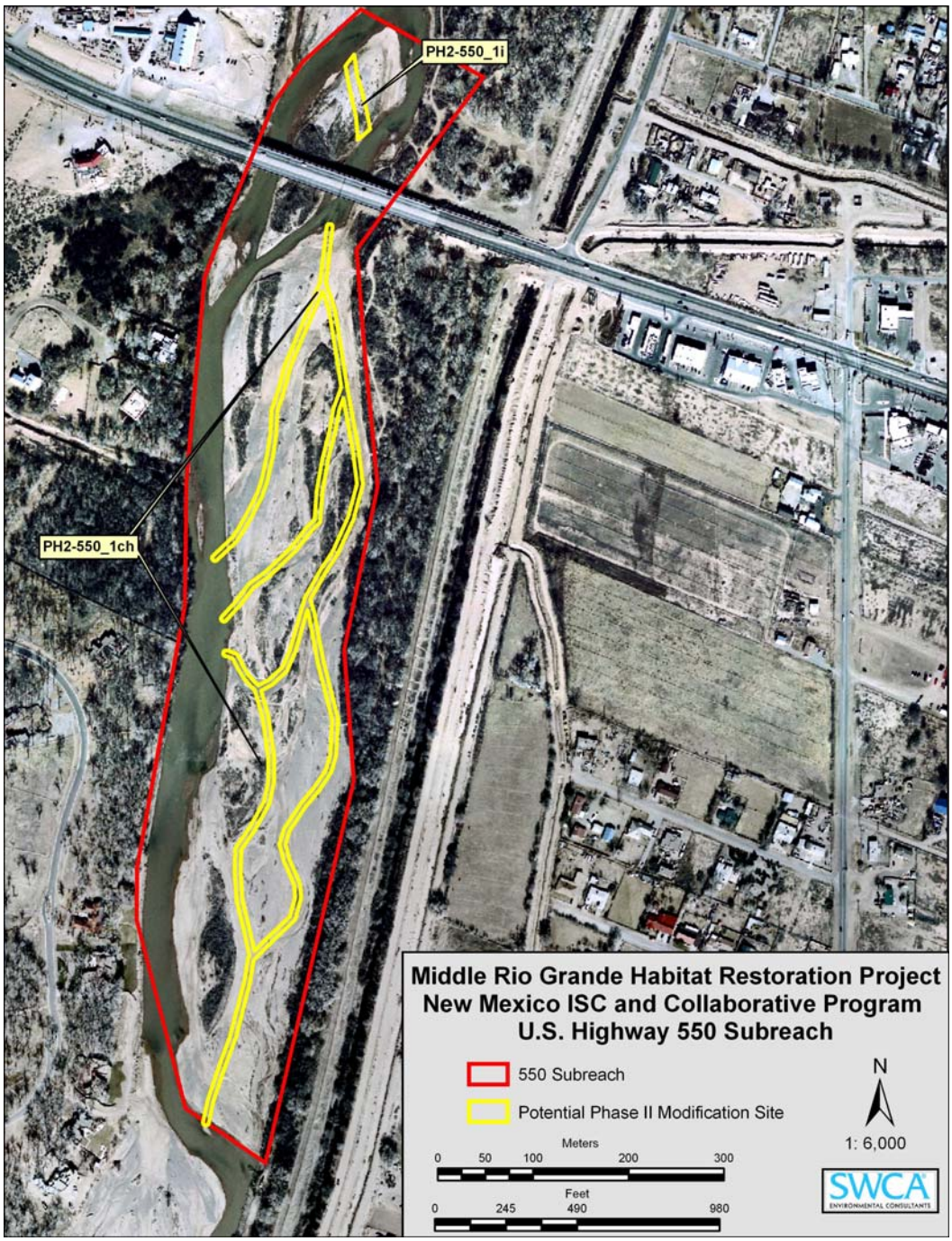


**Figure 1.3.** U.S. 550 Subreach treatment locations.

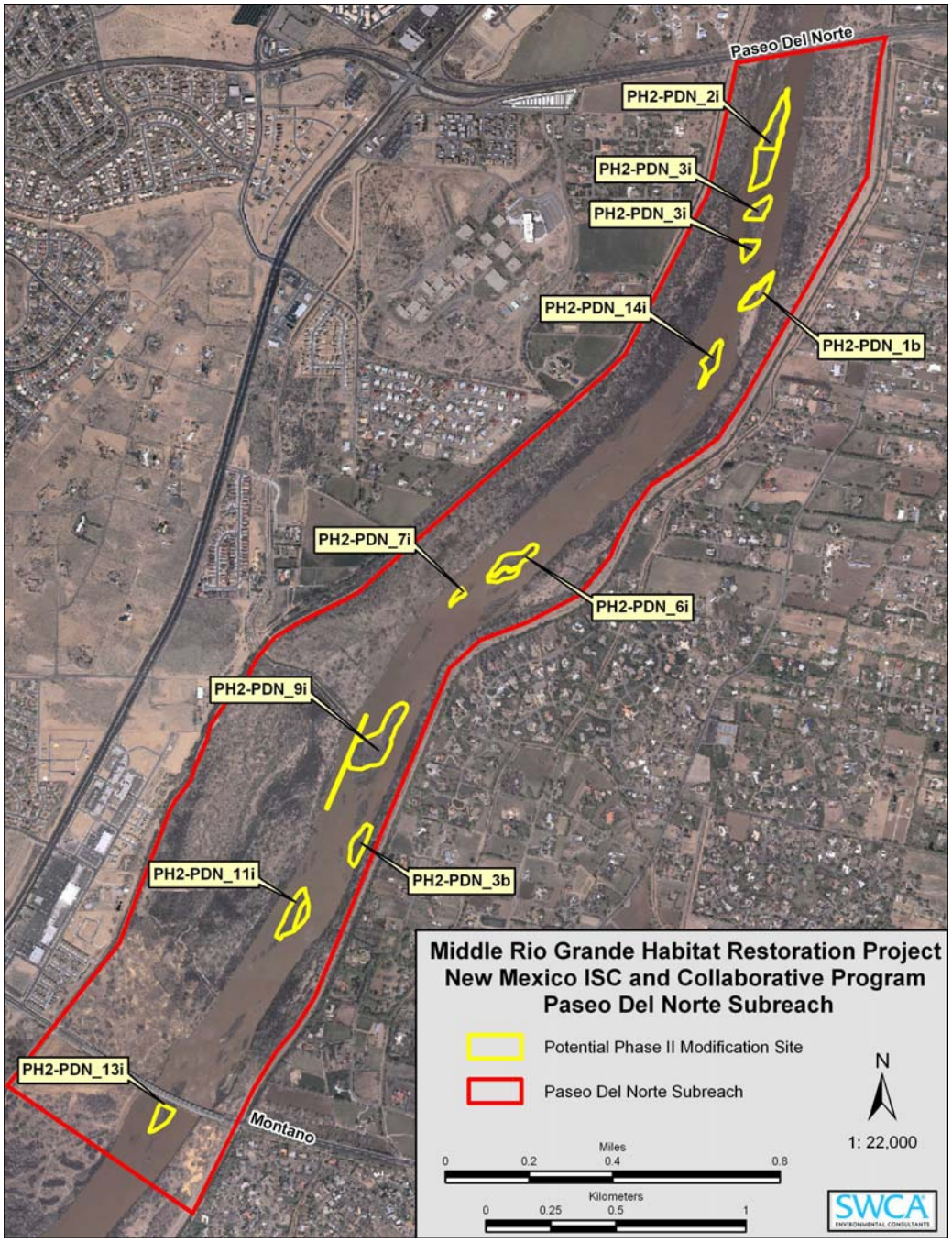


**Figure 1.4.** Paseo del Norte Subreach treatment locations.

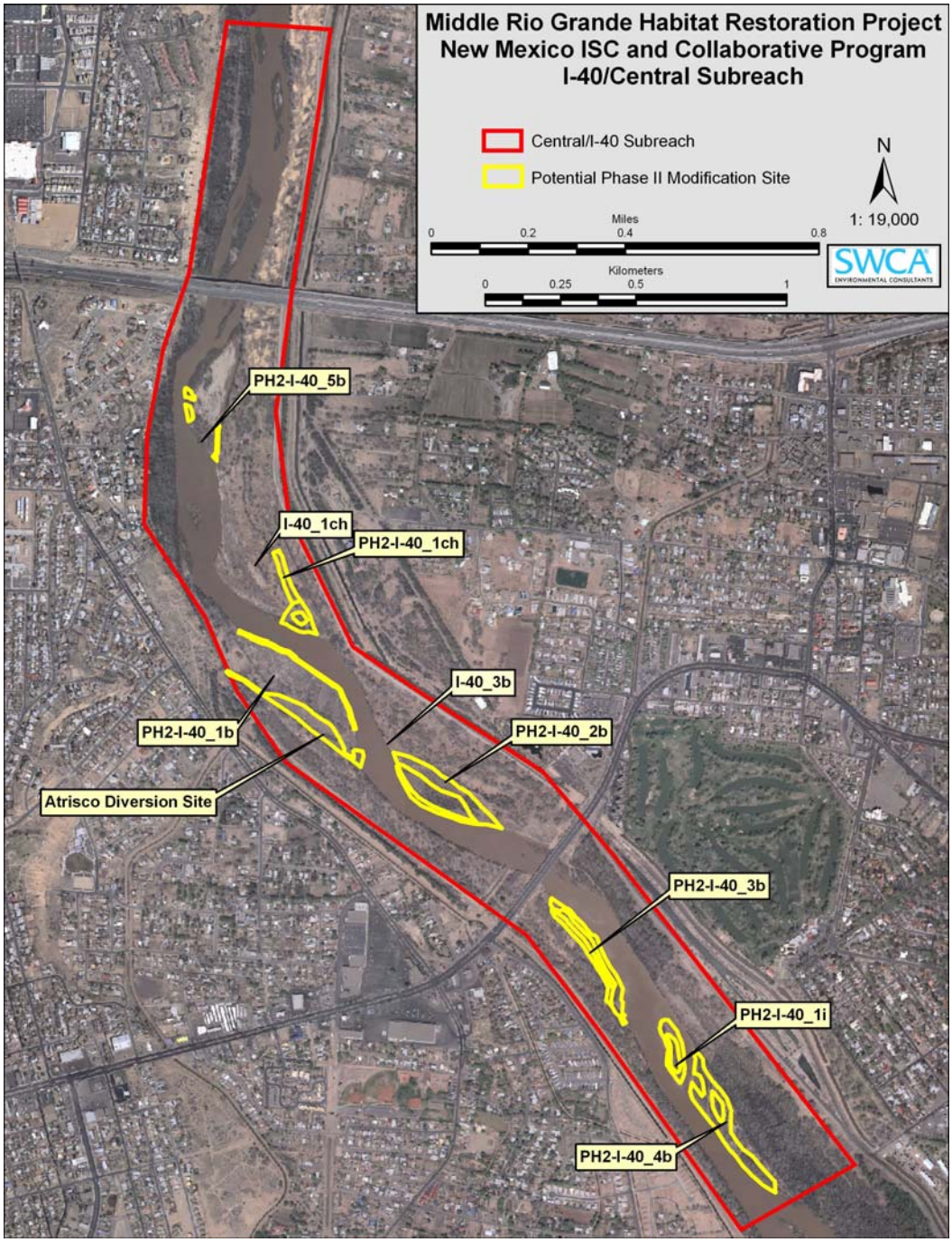


**Figure 1.5.** I-40 Subreach treatment locations.

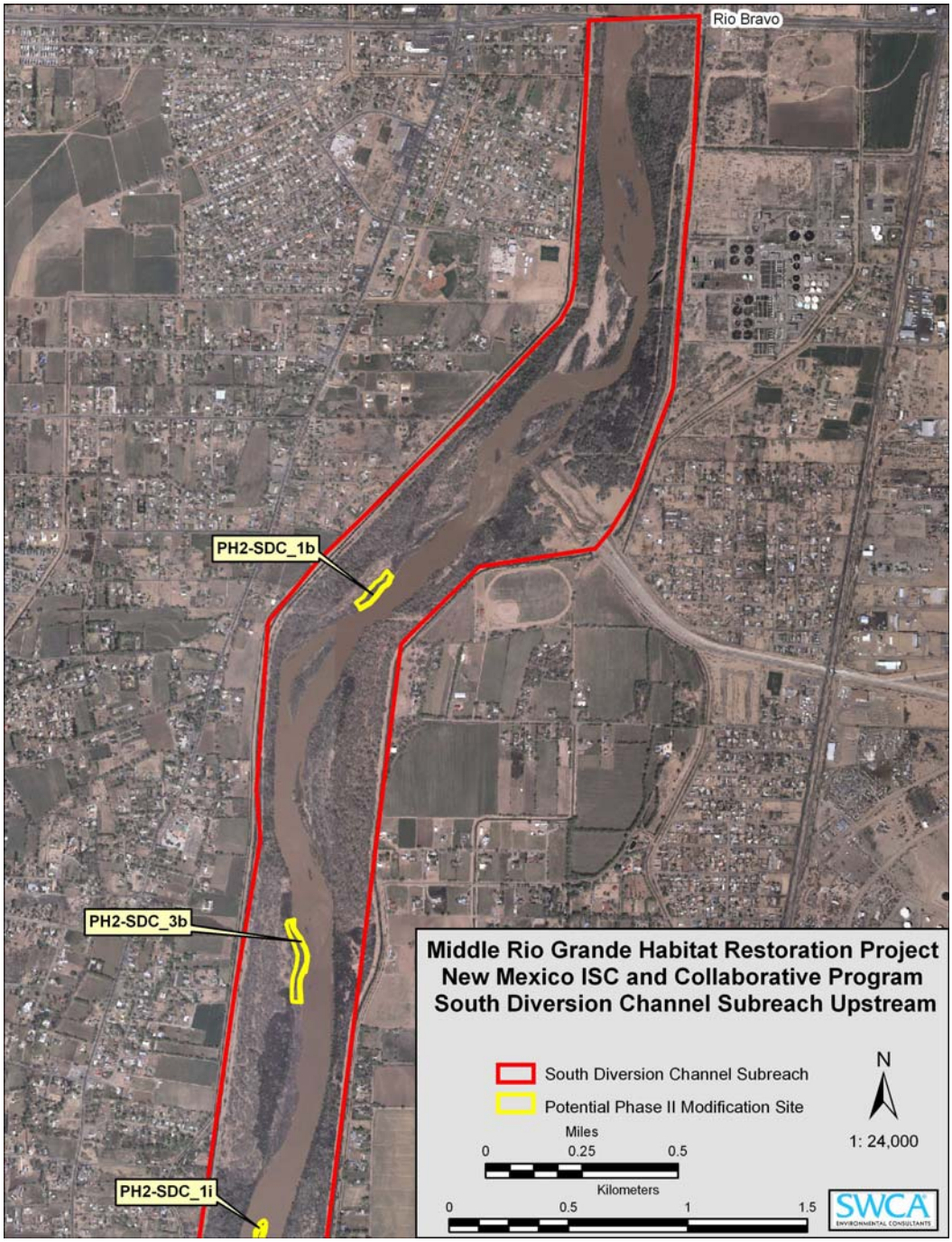


**Figure 1.6.** South Diversion Channel Subreach treatment locations, upstream section.

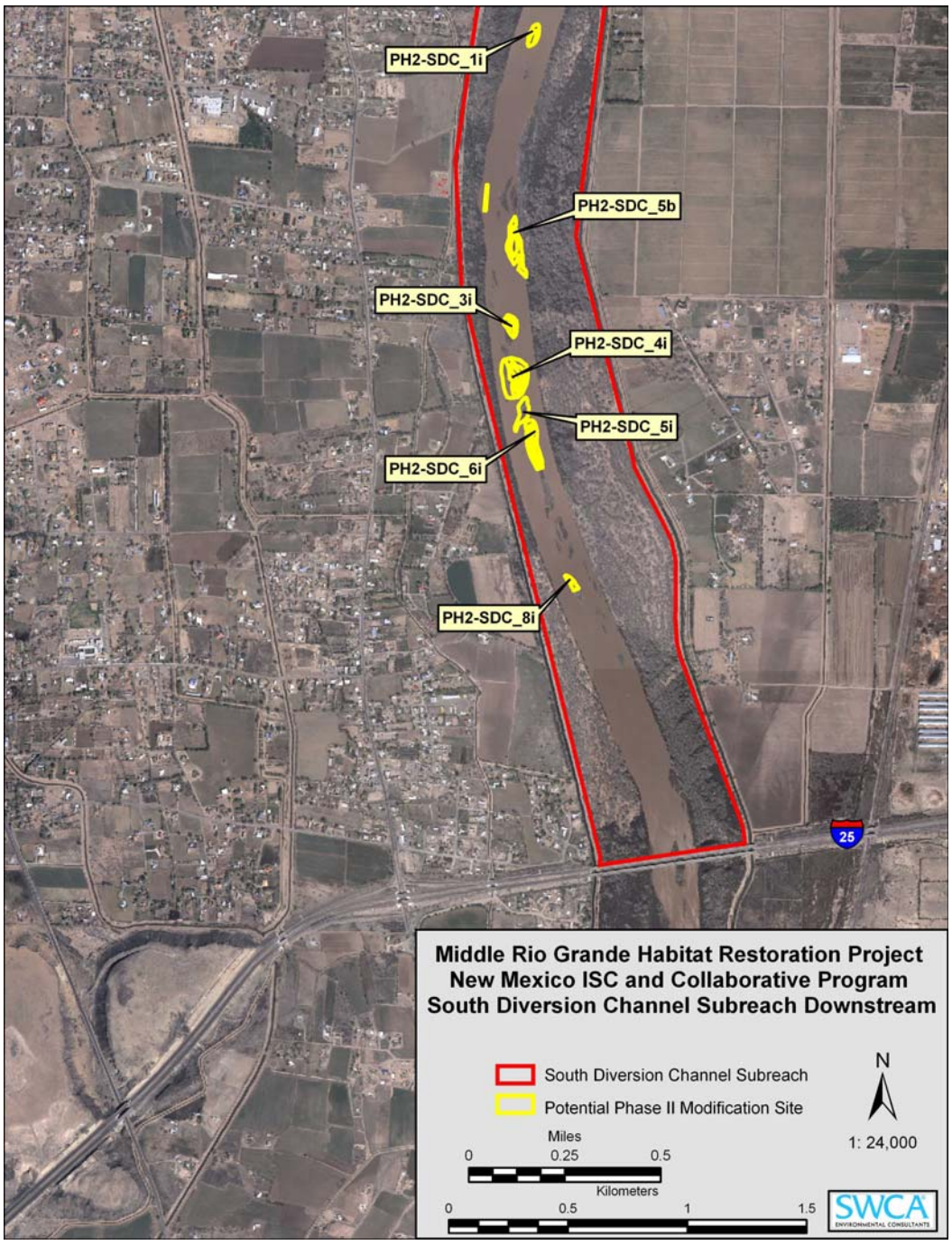


**Figure 1.7.** South Diversion Channel Subreach treatment locations, downstream section.

**Table 1.1.** Proposed Restoration Techniques, Estimated Costs, and Number of Sites

| Restoration Technique | Proposed Phase II Sites (2006–2007) | Phase II Acres Treated (Approx.) | Phase II Locations and Costs | | | |
|---|---|---|---|---|---|---|
| | | | U.S. 550 | Paseo del Norte | I-40/Central | |
| Vegetated Island Modification and Evaluation | 16 Islands | 35.2-40.0 | Yes | Yes | Yes | |
| Backwater Channels and Embayments | 3 Sites | 5.0-5.3 | No | No | Yes | |
| Large Woody Debris | Multiple Sites | TBD | Yes | Yes | Yes | |
| Bank Modification | 11 Sites | 32.2–32.8 | No | Yes | Yes | |
| Removal of Lateral Confinements | 2 Sites | 0.5 | No | Yes | No | |
| Drain Enhancement | 1 Site | 7.1 | No | No | Yes | |
| Ephemeral Channels | 4 Sites | 4.3 | Yes | Yes | No | |
| ***State of NM Component:*** | | | $68,500 | $150,000 | $530,000 | |
| ***Collaborative Program Component:*** | | | $68,500 | $450,000 | $1,277,000 | |
| ***TOTAL ESTIMATED COSTS:*** | | | $137,000 | $600,000 | $1,807,000 | |

## 1.4 ISSUES

Ecological Values

The Rio Grande floodplain, including the riparian corridor (bosque) and river channel, is highly valued by the residents of the City of Albuquerque (City) and all of New Mexico for its natural beauty, recreational opportunities, importance as a refuge for birds and other wildlife, and the presence of rare and protected species. The majority of the Project area is located within part of the Rio Grande Valley State Park (RGVSP), which is managed cooperatively by the City Open Space Division and the Middle Rio Grande Conservancy District (MRGCD). Only the 550 Subreach is located outside of the RGVSP. The 4,300-acre park extends south from Sandia Pueblo through Albuquerque to the northern boundary of Isleta Pueblo. Restoration activities within the RGVSP can be controversial for residents because of competing interests.

Economic Commitments for Endangered Species Recovery

The 2003 BiOp requires the funding and collaborative execution of habitat restoration projects to improve survival of all life stages of the silvery minnow and other endangered species to aid in their recovery. Reclamation has been the primary source of federal funding for the Collaborative Program, which has approved federal funding for this Project through its proposal process. The State of New Mexico is managing the Project and is contributing funding as part of a nonfederal cost share for the Collaborative Program. The use of state and federal funds for this Project could be an issue for some citizens.

Net Water Depletions

The Rio Grande Compact limits the amount of water that can be depleted (consumed) in the MRG (Rio Grande Compact 1939). In keeping with the Rio Grande Compact, RPA Element S of the 2003 BiOp states, "projects should be examined for depletions. It is the Service's [USFWS] understanding that the objective of the action agencies and parties to the consultation is to develop projects that are depletion neutral." In addition, the Office of the State Engineer (OSE) has determined that the MRG is fully appropriated. Therefore, any increase in water use in one sector must be offset by a reduction in use in another sector to ensure that senior water rights or New Mexico's ability to meet its downstream delivery obligations are not impaired. Additionally, the New Mexico State Water Plan (OSE/NMISC 2003) states that habitat restoration projects should not increase net water depletions, or that should depletions occur they would be offset through a permitting process established by the OSE.

# 2.0 ALTERNATIVES

## 2.1 INTRODUCTION

In this context the MRG is defined as the Rio Grande and its tributaries from the New Mexico–Colorado state line downstream to the inflow of Elephant Butte Reservoir, equaling the elevation at Elephant Butte Dam spillway crest (4,450 feet above mean sea level). The aquatic habitat restoration techniques provided in the habitat restoration plan prepared by Tetra Tech, Inc. (2004) are the recommended techniques for improvement of silvery minnow habitat within the Rio Grande river system from Cochiti Dam to Elephant Butte Reservoir; however, the plan does not provide specific recommendations for any location along the river corridor. Tables 2.1 and 2.2 summarize the suite of recommended techniques. The objective of each technique varies, with most serving to impact multiple processes and functions of the riverine and riparian system to improve or create additional silvery minnow habitat (Tetra Tech 2004).

## 2.2 ALTERNATIVES CONSIDERED BUT ELIMINATED

Four other techniques—arroyo connectivity, gradient-control structures, sediment management, and fish passage (Table 2.2)—were eliminated from consideration during the evaluation process. Although these techniques may have positive habitat implications, they have been eliminated from the Project Action Alternative because of lack of feasibility or because these techniques would not meet the desired Project objectives.

## 2.3 ACTION AND NO ACTION ALTERNATIVES

Two alternatives, an Action Alternative and a No Action Alternative, are analyzed in detail in this EA.

### 2.3.1 ACTION ALTERNATIVE

The Action Alternative for the Project is the modification of islands, bars, and banklines within four subreaches: U.S. Highway 550, Paseo del Norte, I-40, and SDC (Figures 1.2 – 1.7). Modifications would utilize the following habitat restoration techniques: passive restoration, evaluation and modification of islands and bars, creation of high-flow ephemeral channels, high-flow back water channels and embayments, terrace and bank lowering, removal of lateral confinements, and the addition of woody debris. In addition, a historic diversion channel would be enhanced using a combination of restoration techniques (Table 2.1). Several of these techniques are combinations or modifications of techniques provided in Tetra Tech's (2004) habitat restoration plan, as described in Sections 2.4.1 and 2.4.2. Bank lowering and large woody debris techniques remain as described in Table 2.1. The high-flow ephemeral channel technique is designated herein as ephemeral channel construction and would be applied within mid-channel islands, on attached bars, and/or within historic channels now separated from the river channel. Main-channel widening and removal of lateral confinements would be achieved as part of bank scouring, bank lowering, and island modification activities.

**Table 2.1.** Proposed Habitat Restoration Techniques

| Restoration Technique | Description | Benefits of Technique |
|---|---|---|
| 1. Passive restoration | Allows for higher-magnitude peak flows to accelerate natural channel-forming process and improve floodplain habitat. | Increases sinuosity and allows for development of complex and diverse habitat, including bars, islands, side channels, sloughs, and braided channels. |
| 2. Evaluation and modification of islands and bars | Physical disturbance (disking, mowing, root-plowing, raking) of islands or bars to remove vegetation, allowing for the mobilization of island features during periods of high flow. | Creates more complex habitat for silvery minnow by reducing average channel depth, widening the channel, and increasing backwaters, pools, eddies, and runs of various depths and velocities. Increased inundation will benefit native riverine vegetation, potentially increasing habitat for southwestern willow flycatcher (flycatcher). |
| 3. High-flow ephemeral channels | Construction of ephemeral channels on inlands and islands to carry flow from the main river channel during high-flow events. | Creates shallow, ephemeral (normally dry), low-velocity aquatic habitats important for silvery minnow egg and larval development during high flow time periods. Increased inundation will benefit native vegetation, potentially increasing habitat for flycatcher. |
| 4. High-flow bank-line backwater channels and embayments | Areas cut into banks where water enters, primarily during high-flow events, including spring runoff and floods. | Intended to retain drifting silvery minnow eggs and to provide rearing habitat and enhance food supplies for developing silvery minnow larvae. Increased inundation will benefit native vegetation, potentially increasing habitat for flycatcher. |
| 5. Terrace and bank lowering | Removal of vegetation and excavation of soils adjacent to the main channel to create potential for overbank flooding. | Could provide for increased retention of silvery minnow eggs and larvae. Increased inundation will benefit native vegetation, potentially increasing habitat for flycatcher. |
| 6. Removal of lateral confinements | Reduction or elimination of structural features and maintenance practices that decrease bank erosion potential. | Creates wider floodplain with more diverse channel and floodplain features, resulting in increased net-zero and low-velocity habitat for silvery minnow. |
| 7. Woody debris | Placement of trees, root wads, stumps, or branches in the main river channel or along its banks. | Creates slow-water habitats for all life stages of silvery minnow, provides shelter from predators and winter habitat, and provides structure for periphyton growth to improve food availability for silvery minnow. |

**Table 2.2**. Techniques Eliminated from Further Study

| Technique | Description | Benefits of Technique | Reason for Elimination |
|---|---|---|---|
| Arroyo connectivity | Clearing of vegetation and/or excavation of pilot channels to bring stranded arroyos to grade with the mainstem Rio Grande. | Could re-establish eddies associated with the mouths of arroyos, which may help to retain silvery minnow eggs and larvae, and increases the supply of sediment to the river. | Technique does not meet Project objectives. |
| Gradient-control structures | Low head weirs constructed perpendicular to the channel with aprons to simulate natural riffles. | Creates aquatic habitat diversity by producing variable flow velocities and depths. | Technique does not meet Project objectives. |
| Sediment management | Increased sediment supply through mobilization behind dams, arroyo reconnection, or introduction of spoils. | Silvery minnow is most commonly observed in areas where the bed is predominantly silt and sand. | Technique does not meet Project objectives. |
| Fish passage | Installation of fish-passage structures at impoundments to improve longitudinal connectivity of river. | Allows upstream movement of silvery minnow and reduces habitat fragmentation. | Fish passages are not feasible in the proposed locations; objective is accomplished through other techniques in proposed locations. |

### 2.3.2 NO ACTION ALTERNATIVE

The No Action Alternative assumes that no anthropogenic changes would be made to islands, bars, shoreline environments, and the riverine habitats available to the silvery minnow in the Albuquerque Reach at the proposed Project locations. Current river operations, as well as trends in riverine habitat quality and quantity, with the exception of other habitat restoration projects in the reach, would remain dominant under the No Action Alternative.

## 2.4 PREFERRED ALTERNATIVE

The Preferred Alternative is the Action Alternative, which implements the restoration techniques described in Table 2.1 with the goal of enhancing, restoring, and/or creating aquatic habitat for the benefit of the silvery minnow in the Albuquerque Reach of the MRG. The proposed rehabilitation and restoration would occur within the river floodway at the following four locations: (1) from U.S. Highway 550 to approximately 1,200 m downstream (550 Subreach); (2) from Paseo del Norte to Montaño Road (PDN Subreach); (3) from I-40 to Central Avenue (I-40 Subreach); and (4) from the South Diversion Channel (SDC) to I-25 (SDC Subreach) (Figure 1.2). Projects at specific sites on vegetated islands, bars, and riverbanks would be implemented to test the efficacy of the selected techniques (Figures 1.3 – 1.7). Photographs of some of the proposed action areas within the four selected subreaches are provided in Appendix A. Figures 2.1–2.8 show detailed sketches of the Project elements proposed for implementation within each subreach. Phase I of the Project treated approximately 35 acres, while Phase II would treat approximately 75–90 acres. As envisioned, the entire Project (Phases I–IV) would treat a total of 180–360 acres.

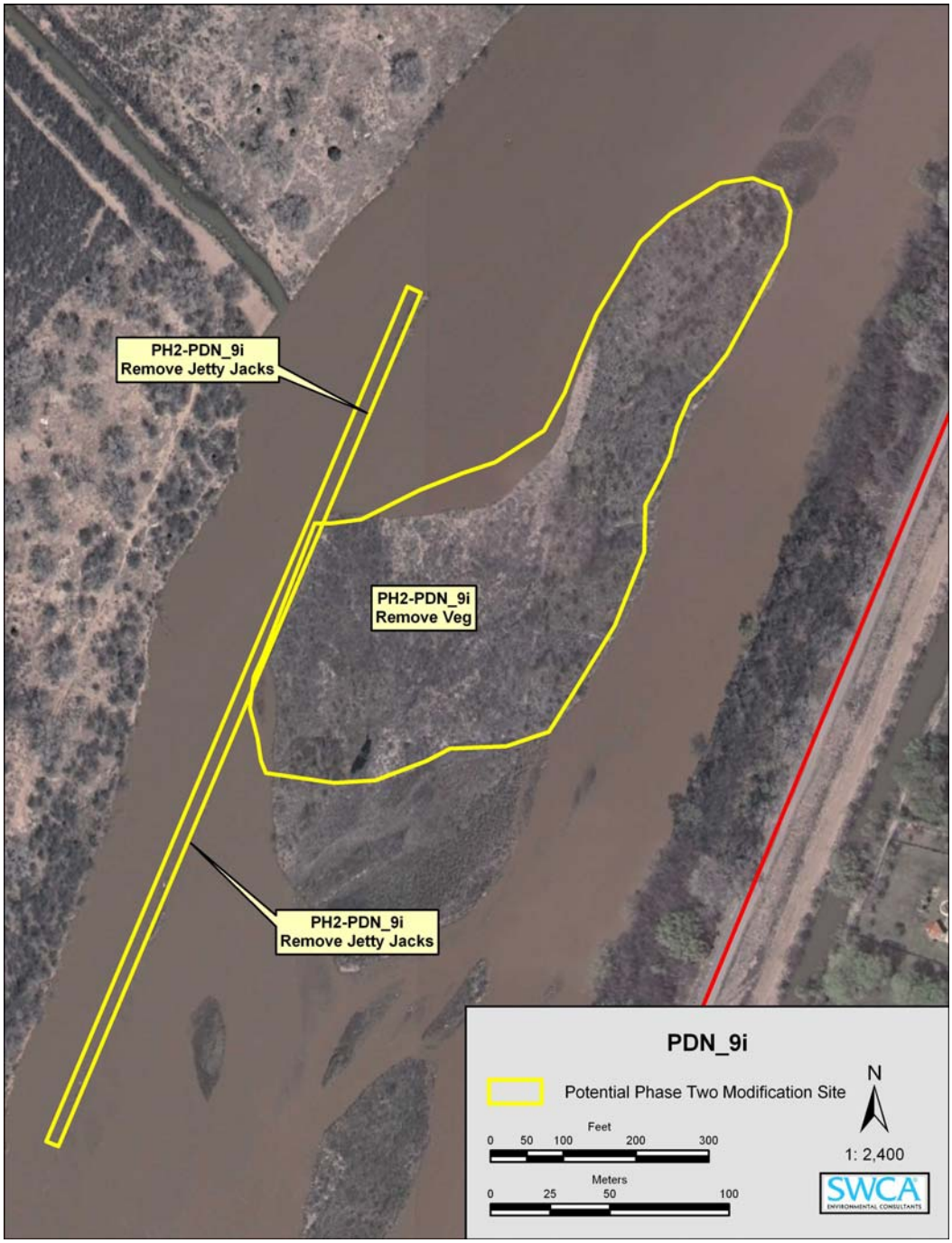


**Figure 2.1.** In-channel jetty jack removal locations.

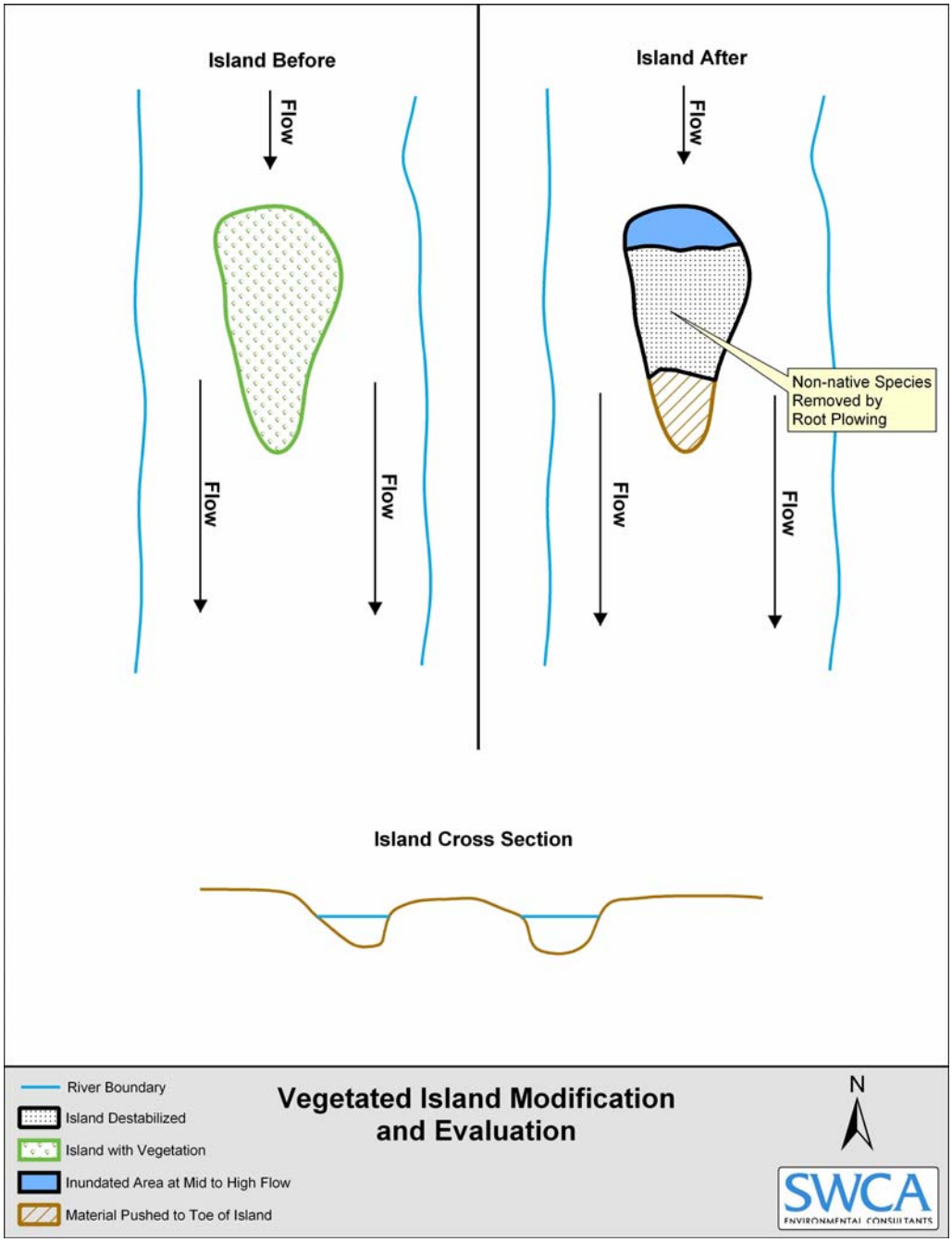


**Figure 2.2.** Schematic of the vegetated island modification and evaluation technique.

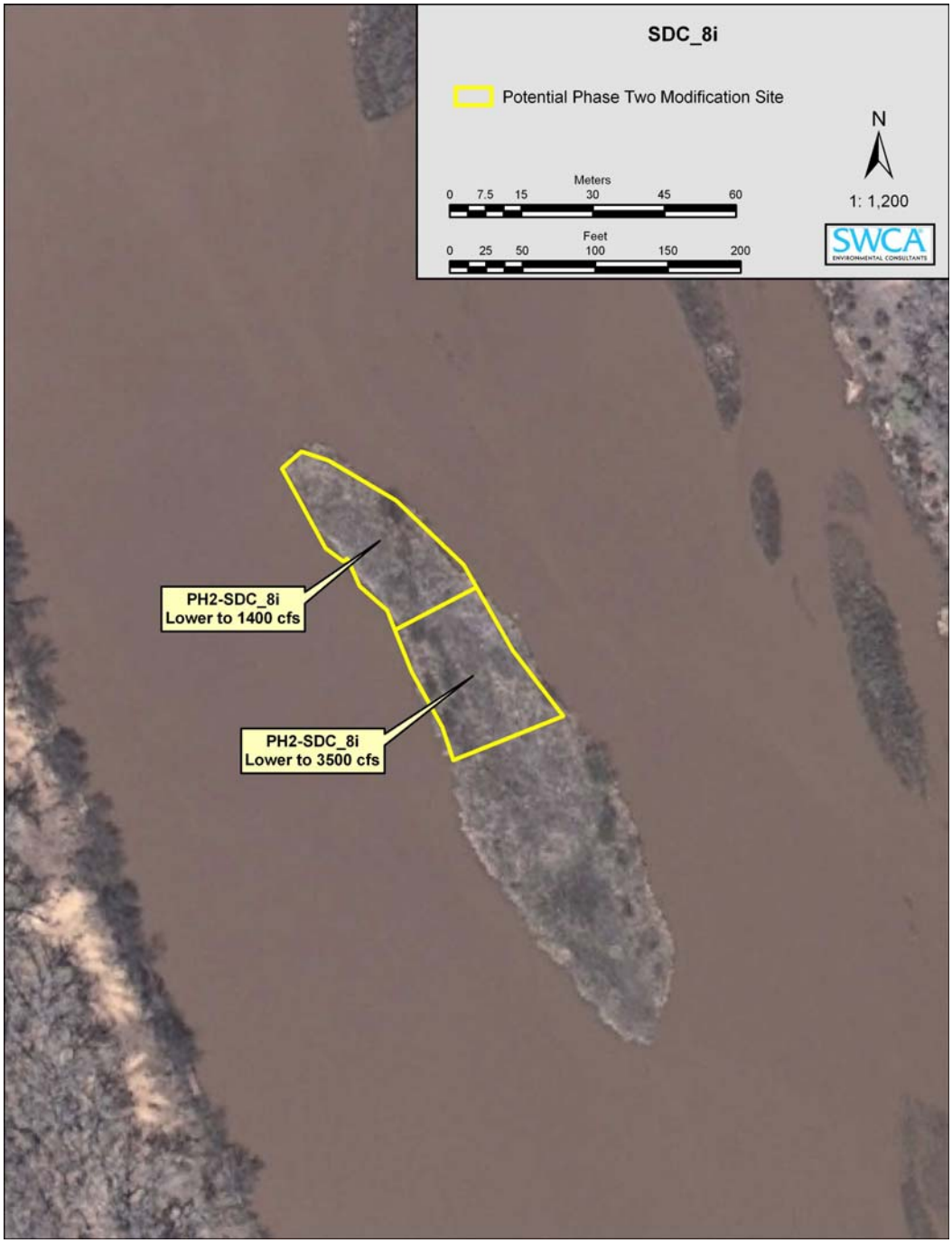


**Figure 2.3.** Example of the vegetated island modification and evaluation technique.

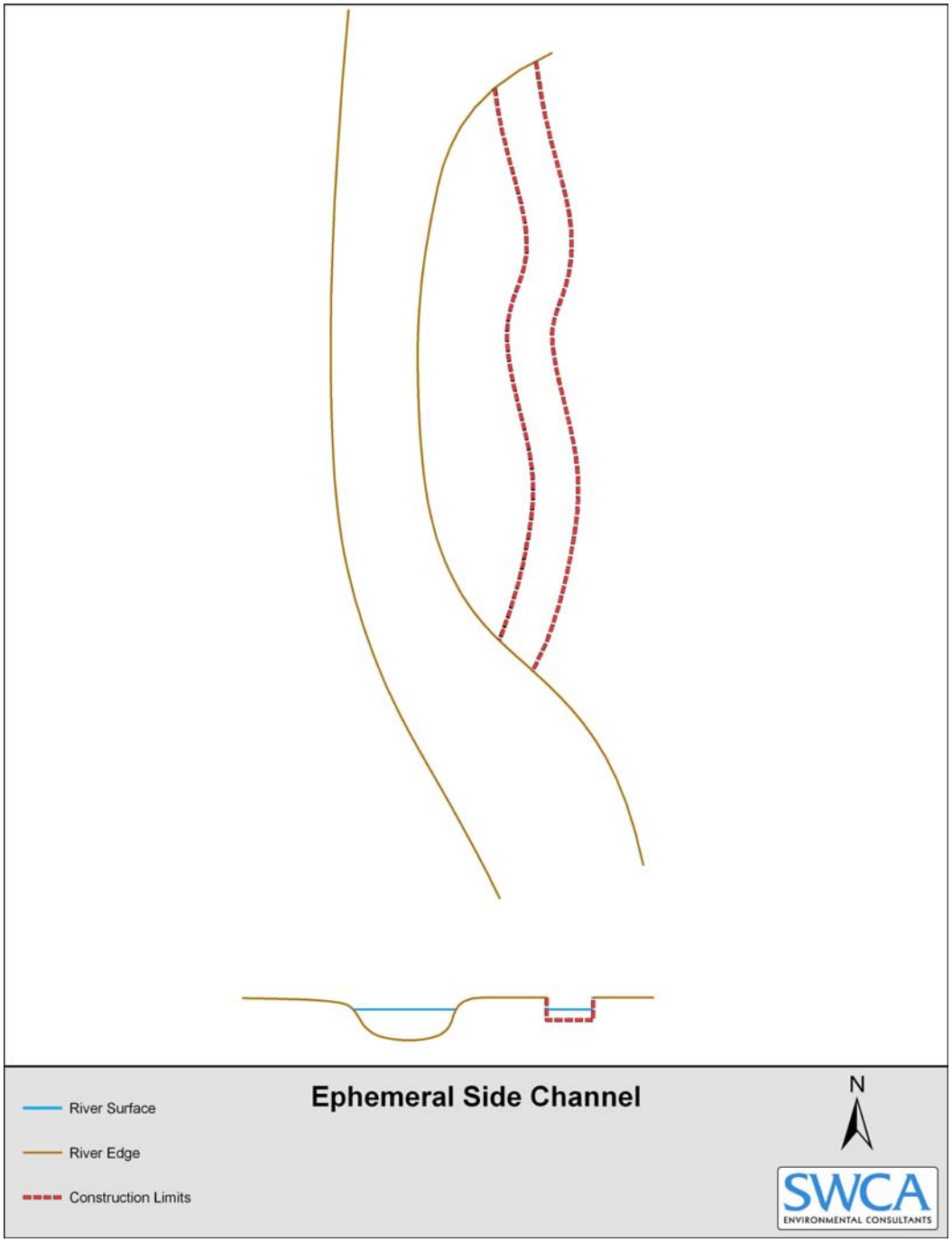


**Figure 2.4.** Schematic of the ephemeral channels technique.

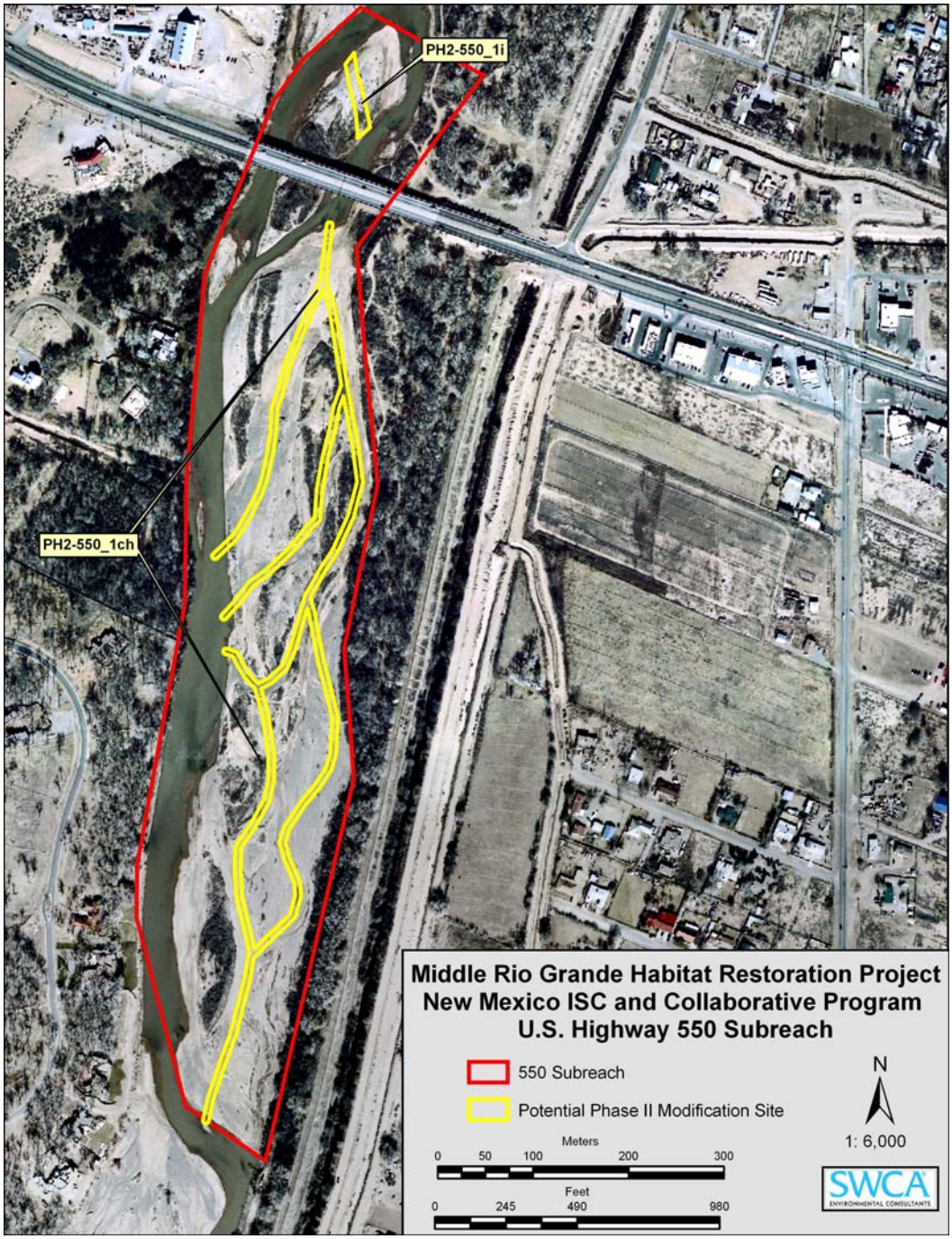


**Figure 2.5.** Example of ephemeral side channel.

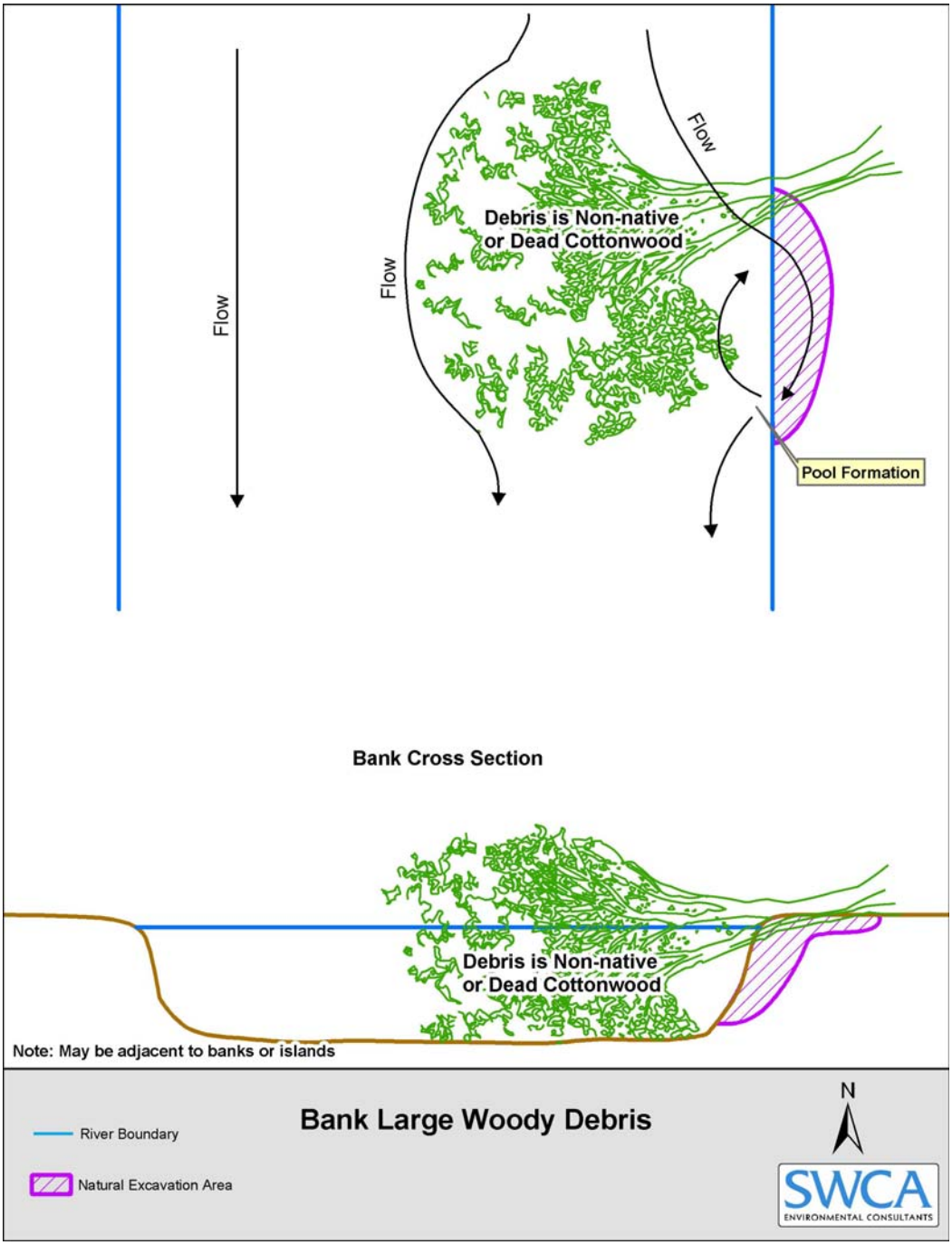


**Figure 2.6.** Schematic of the large woody debris technique used along bank line.

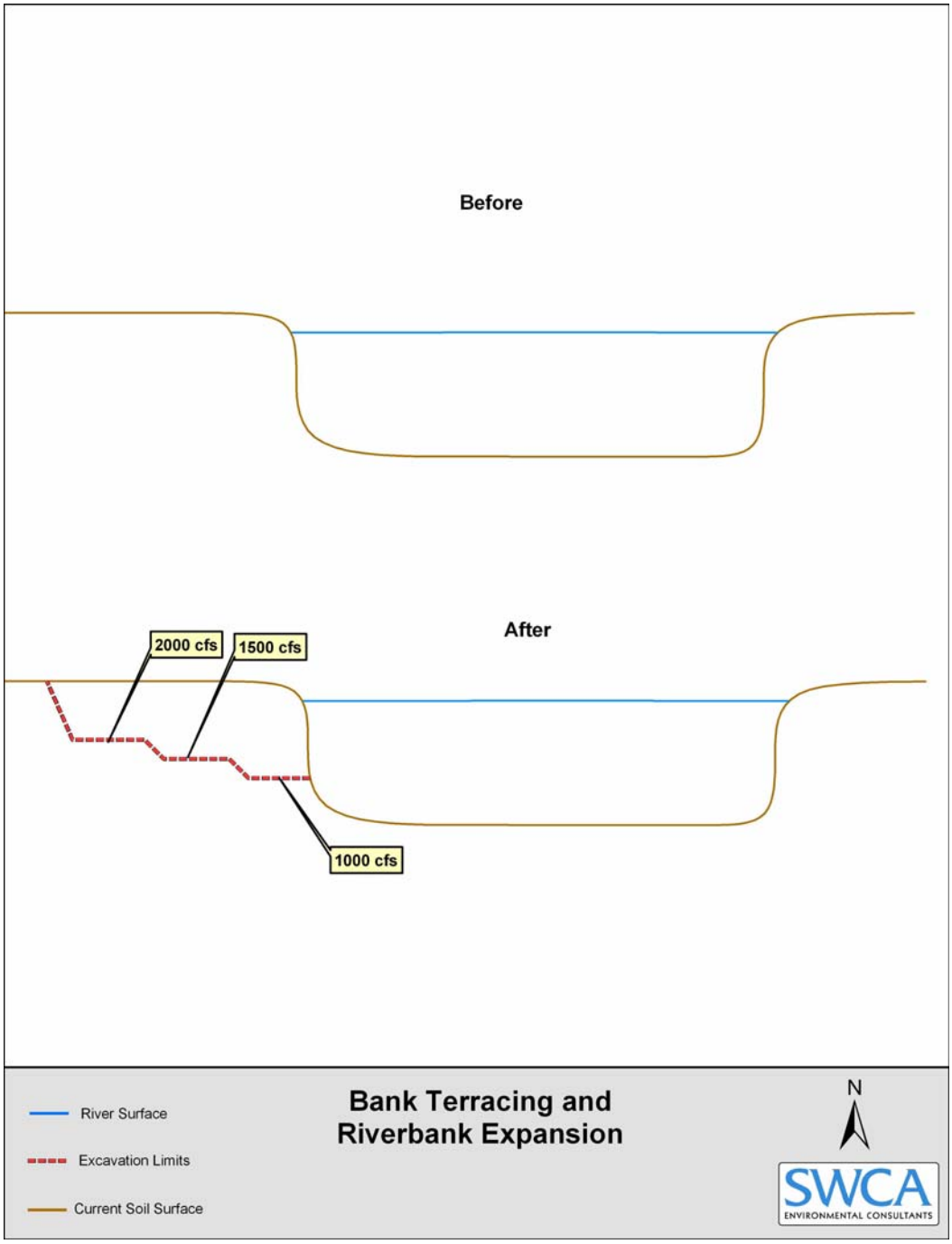


**Figure 2.7.** Schematic of the bank lowering and terracing techniques.

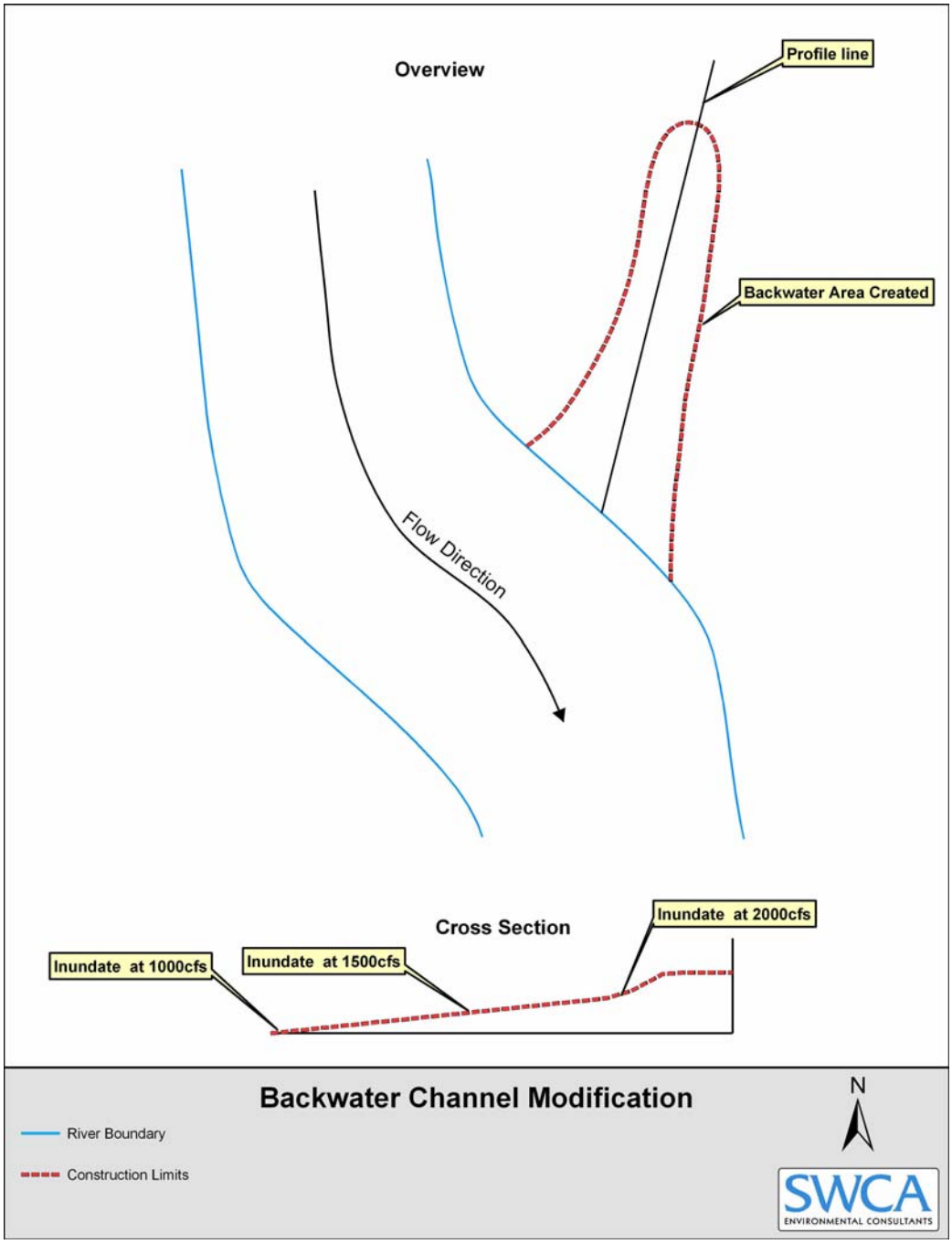


**Figure 2.8.** Schematic of the high-flow backwater technique.

The MRG in its current state, while it remains a dynamic system, has diminished variability in flow and lateral movement in comparison to its historic condition before the construction of flood control and irrigation structures, including diversions and dams. Restoration, to the extent possible, of that natural variability within current geopolitical constraints is the ultimate goal of this Project. The Project would allow increased development of natural riverine and floodplain features, including temporary bars and islands and ephemeral secondary channels, and the lateral migration of the river channel across modified bars and islands. The proposed work is described in the following sections in terms of the various techniques.

**Technique 1. Passive Restoration Techniques**

Passive restoration can include both curtailing human actions that have a negative impact on the river and removing installations that were part of earlier efforts to stabilize the channel and that have interfered with the river's natural flow. Passive restoration encourages the river to shape itself through natural riverine processes, such as the transport of sediment during flood events or the scouring of riverbanks, without human intervention. The passive restoration techniques considered herein would not cause a major shift in present river management practices, but would instead utilize current management trends to help restore natural riverine processes within the MRG.

Active restoration practices are engineered approaches to artificially replace some aspect of lost ecosystem structure or function. Active restoration techniques depend more on human intervention and less on natural riverine processes to repair habitat dysfunction (Tetra Tech 2004). Though active strategies rely on mechanical means to achieve the desired habitat restoration results, most of these techniques would also incorporate components of passive restoration. Active restoration would be implemented both in the channel and along the river's banks.

**Technique 2. Evaluation and Modification of Islands and Bars**

The Rio Grande historically formed and shaped islands. Prior to the building of Cochiti Dam and Lake on the main stem of the Rio Grande, this island formation was a dominant characteristic of the MRG. Vegetated islands naturally contracted and expanded in response to flow and sediment changes within the river. Due to regulated discharges, as well as drier climatic conditions since the mid 1990s, high, sustained seasonal flows have been mostly absent, causing islands to become permanent, large, vegetated features that create narrower and deeper channels within the river (Fluder 2004).

Island modification, particularly on islands that have the potential to become or have become permanent channel features, may assist in alleviating adverse changes to silvery minnow critical habitat and improving the quality and quantity of available habitat (USFWS 2003). Island modification can be accomplished by planned physical disturbance, such as removing vegetation and destabilizing soil and sediment, mowing vegetation, root-plowing vegetation and sediment, and raking vegetation and surface sediment (Tetra Tech 2004). In this Project, several different island modification methods would be evaluated to test their efficacy for restoring treated islands to a condition in which they would become inundated at moderate to high seasonal flows.

Selected treatments would be applied to 16 islands within the four Project subreaches. The conceptual design for vegetated island modification and evaluation (Figures 2.2 and 2.3) takes into account potential increased sediment retention in modified portions of the river, as well as potential flow-through at a range of velocities and depths. The treatments applied to selected island modification sites involve cutting vegetation and excavating a portion of the island or the entire island. Vegetation removal would be accomplished by root-plowing the island in the treatment area to a depth that would remove all vegetation in that area. The ground surface of the excavated area would be such that inundation during lower river flows would provide habitat over a wider range of flows.

**Techniques 3: High-flow Ephemeral Channels Bank-line Modifications**

Ephemeral channels are low-velocity, flow-through channels that are connected to the main river channel across bars and islands. These channels are normally dry but carry high-discharge flows from the main channel, characteristically during spring snowmelt and summer monsoon events. These channels typically carry water at lower velocities than the main channel and may include mesohabitats suitable for silvery minnow, such as pools and backwaters.

Construction of an ephemeral channel requires removing vegetation, most likely along the edges of vegetated islands that are not connected to the bank, and disturbing sediment or soil. The channels would be cut through islands to a depth that would allow water to flow at moderate to high river flows (Figures 2.4 and 2.5). Channels may also be cut through sediment bars that are now connected to the banks.

Ephemeral channels with sufficient periods of inundation provide excellent habitat for larval development and a refuge for young silvery minnows. While channels of this kind are proposed primarily to enhance silvery minnow habitat, they also promote riparian functionality and interconnectedness.

**Technique 4: High-flow Bank-line Backwater Channels and Embayments**

The creation of moderate- to high-flow backwater channel and embayment areas would involve the removal of riverbank and inland vegetation, and the excavation of soils to prescribed depths. Backwater channels (no upstream inlet) would be constructed on the bottom of large point bars (at existing low velocity areas) at a range of elevations that would allow for inundation at a range of river flows (Figure 2.8). Backwater channels would slope slightly, with the downstream end lower in elevation than the upstream end, thereby increasing the amount of habitat opportunities at a range of river flows.

This technique would be used to increase the amount of low- and no-flow habitat areas available to the silvery minnow. The technique is intended to retain drifting silvery minnow eggs, to provide silvery minnow rearing habitat, and to provide shallow, low-velocity habitats with abundant food supplies for developing silvery minnow larvae.

**Technique 5: Terracing and Bank Lowering**

In the MRG, and especially in the Albuquerque Reach, the historic floodplain is disconnected from the channel and, given current channel conditions, the opportunity for overbank flooding of the historic floodplain is small and rarely occurs. The riverbanks that define the active Rio Grande channel are vertical and composed primarily of sand and silt sediments. As a

consequence, bank line boundaries are easily modifiable. Bank terracing and lowering techniques would be applied only in areas where such actions would not increase flood risk or the damage to levee systems.

Bank lowering involves the removal of bank-line vegetation and excavating soils to increase the potential for lateral movement of the river and create overbank flooding (Figure 2.7). The target elevation for excavating and terracing banks varies depending on the height of the bank and the bank-full level. To the extent possible, bank lowering would be performed in areas where the river channel currently is deeply incised and the potential for overbank flooding is low. Areas where banks are lowered and terraced would be inundated during different stages of moderate- to high-flows (not annual events). Lowering and terracing the bank would increase the frequency and duration of inundation. However, the overbank areas would not remain flooded for significant periods of time and are not intended to provide mesohabitat for adult silvery minnow, but rather to provide necessary conditions for other processes that would result in overall habitat improvement.

This technique would be evaluated to determine if lateral migration occurs within the confined boundary of the existing the channel. It would be applied only in areas where there is no increase of flood risk. Lateral migration would remove dense bank-line vegetation on islands or shorelines and increase deposition of fresh sediment. Lateral migration and overbank flooding would allow the river to create ephemeral nursery habitat for retention of silvery minnow eggs and larvae.

**Technique 6: Removal of Lateral Confinements**

Lateral confinements, such as jetty jacks and non-native vegetation, decrease the potential for lateral migration of the channel and natural bank erosion processes, ultimately creating a more narrow, more linear, and deeper river channel. Removal of in-channel jetty jacks is proposed in three specified areas adjacent to selected island treatment areas, as shown in Figure 2.1. Jetty-jack extraction would reduce the number of structural features that decrease lateral migration of in-channel bar and island features, creating a wider, more diverse channel and floodplain features that would increase low-velocity habitat for all life stages of the silvery minnow.

Removal of jetty jacks from the channels would be accomplished using an amphibious excavator. The jetty jacks would be placed on the bank and later removed from the bosque.

**Technique 7: Large Woody Debris**

Large woody debris (LWD) has been identified as suitable habitat for silvery minnow (USFWS 2003). The placement of LWD is a technique that involves setting root wads, trees, and large branches in the main channel or near the bank to create aquatic habitats. LWD would be unanchored and placed on or near the riverbank or on islands and bars likely to be transported as flows increase. LWD may be placed in high-density location-specific areas or dispersed throughout subreaches.

Prior to the 1930s, conditions in the MRG naturally provided large quantities of LWD to the channel as stream banks eroded and the river routinely migrated laterally across the floodplain, removing and transporting LWD from the riparian zone. While modification of the river channel

and construction of upstream dams for flood control and water delivery is largely responsible for stabilizing the river channel and floodplain, channel incision has essentially eliminated the possibility of overbank flow in the Albuquerque Reach, thus reducing the amount of LWD available in the river channel. The result of channel stabilization, combined with the absence of overbank flooding, has resulted in the lack of LWD in the present-day river channel.

In this Project, LWD would be placed in, but not anchored to, selected locations near planned riverbank modification areas (Figure 2.6). The purpose of this technique is to enhance the food supply and the mesohabitat available to the silvery minnow.

**Historic Atrisco Diversion Structure**

The NMISC also proposes to complete approximately 7.1 acres of restoration at this historic diversion structure, including the overbank area, as part of the Action Alternative. Planning and design would include a detailed topographic survey for accurate grade control and placement of water-control structures. Civil engineering (grading, cut and fill, excavation disposal areas, etc.), structural engineering (water control structures), and river geomorphology engineering would be performed as part of the Project design. The design would take into account and incorporate current and planned uses of the area, historic landmarks and artifacts, and sensitivity to neighboring landowners.

The diversion no longer serves any irrigation function in the MRGCD system. The proposed Project would utilize the various restoration techniques described above to create a backwater channel to the river at this location. A groundwater well would be used to supply and regulate discharge and stage in channel and backwater areas. The diversion and access channels would be reconnected to provide backwater areas for egg and larvae retention during spring runoff and refugia for silvery minnow during low-flow periods. The site could be used to rear and acclimate silvery minnow that have been salvaged from other reaches of the Rio Grande.

Potential restoration techniques would include:

- High-flow embankment cuts along the bank line to create embayments or backwaters during floods and runoff events. These cuts would be sloped to the river to prevent stranding while allowing for retention of silvery minnow eggs/larvae and providing rearing areas.

- Excavation of banks to provide lateral expansion of the river channel. This activity would create a wider floodplain, resulting in lower velocity and better access to embayments and overbank areas for silvery minnow egg/larva retention and grow-out. Excavation and lateral cuts into vegetation would allow for natural processes to reduce depositional area and create more habitat diversity.

- The existing channel entrance would function in moderate to high river flows after accumulated sediment has been removed to allow reconnection to the river. The reconnection of the diversion (Figures 2.9 and 2.10) would require structural reconstruction and excavation work. A second channel would be added by removing sandy sediment between the existing unlined channel and the thalweg of the river to allow connection with the river during low-flow periods.

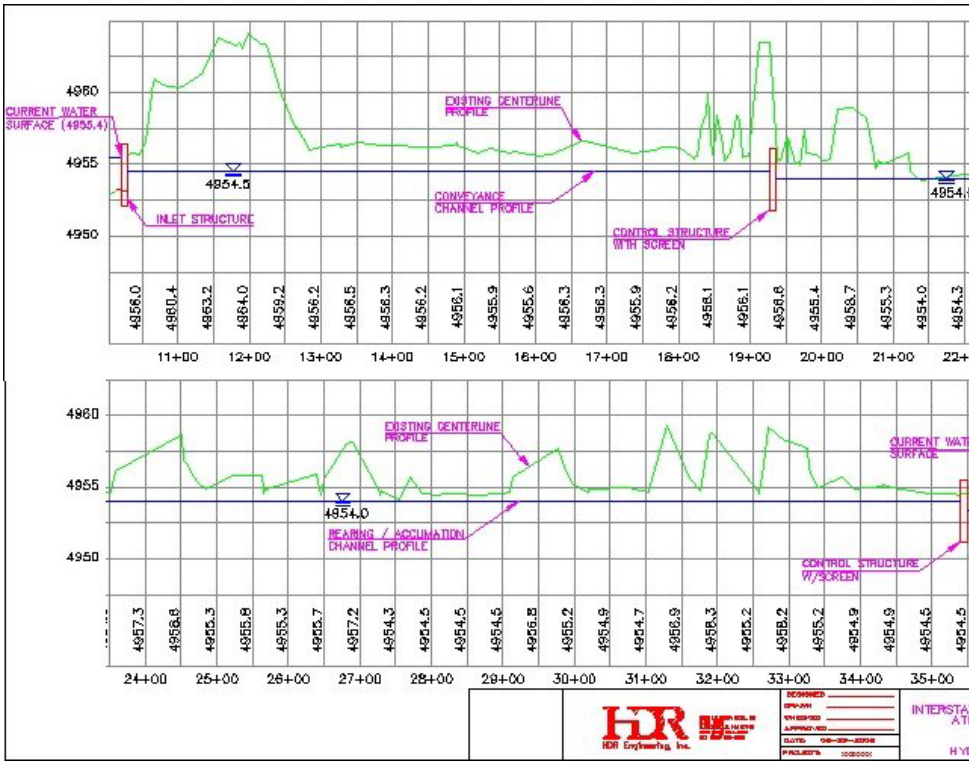


**Figure 2.9.** Atrisco Diversion restoration schematic (profile view).

**Comment:** Page: 29
Joseph to include updated map

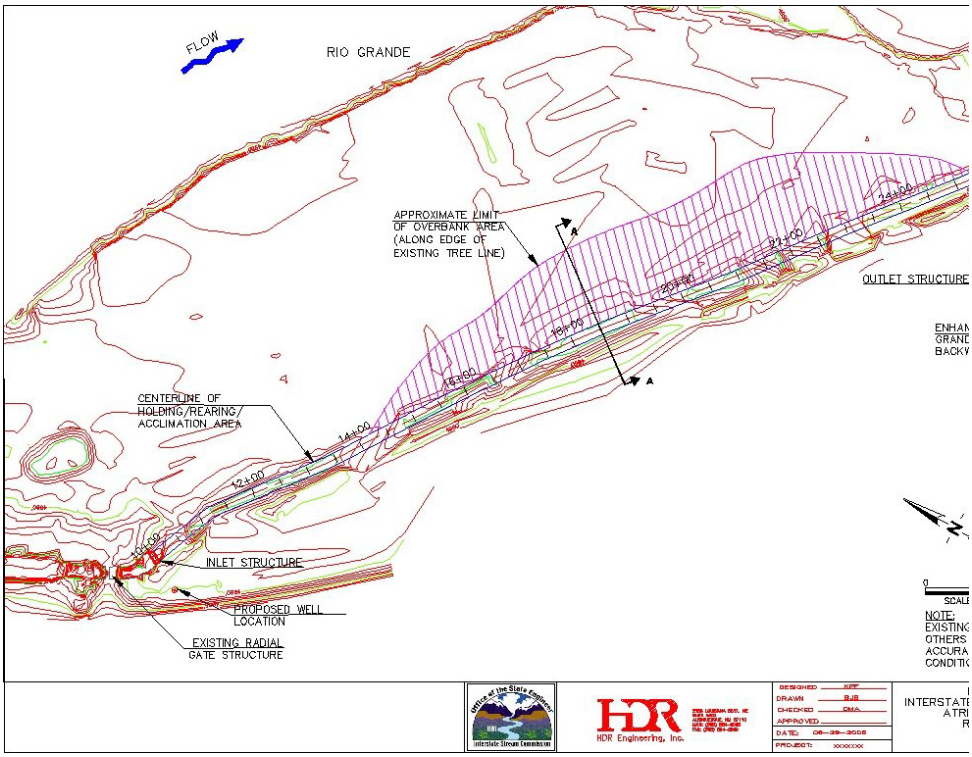


**Figure 2.10.** Atrisco Diversion restoration schematic (aerial view).

# 3.0 AFFECTED ENVIRONMENT

## 3.1 INTRODUCTION

This section describes the current condition of resources in the study area that may be affected by the Proposed Action. Resources and related topics include geomorphology and soils, hydrology and hydraulics, water quality, cultural resources, air quality and noise, fish and wildlife, vegetation and wetlands, threatened and endangered species, socioeconomics, visual and aesthetic resources, net water depletions, environmental justice, and Indian trust assets.

The Albuquerque Reach of the MRG extends from the Angostura Diversion Dam to the Isleta Diversion Dam (Figure 1.1). This area has been identified by Reclamation and the NMISC, as well as the Collaborative Program, as a segment of the river where habitat/ecosystem restoration projects would be highly beneficial to all life stages of the silvery minnow.

## 3.2 GEOMORPHOLOGY AND SOILS

The MRG lies in an asymmetric, elongated valley along the Rio Grande Rift (Hawley 1978; Chapin 1988). Connected alluvium-filled sub-basins defined by normal faulted mountain ranges dominate the rift valley. The land flanking the Rio Grande Basin on the east is predominantly mountainous, with merging colluvial-alluvial fans and stream terraces sloping down and westward toward the Rio Grande. The geologic surface west of the river is ancestral Rio Grande alluvial deposits with isolated volcanic cones and bedrock covering the fluvial sediments. West of Albuquerque, the land surface gently slopes up toward the watershed divide with the Rio Puerco (this surface is known as the Llano de Albuquerque) (Bartolino and Cole 2002). The river channel flows in a wide valley with a fertile but narrow (2–3 miles wide) floodplain that has been cultivated for centuries.

Historically, the Rio Grande has continuously reworked valley deposits on the active floodplain. However, in the twentieth and twenty-first centuries, floodway constriction and channel stabilization projects have confined the natural course of the river. For example, dams, levees, and jetty jacks have been used to create channel banks that control the location of the river, preventing flow from reaching the historic floodplain and causing sediment to accumulate within the levees (Mussetter Engineering, Inc, [MEI] 2003). In the Albuquerque Reach, the historical floodplain has become completely disconnected from the river (MEI 2003).

Geomorphology plays an important role in describing the evolution of the Rio Grande and in influencing the spatial extent and species diversity of vegetation in riparian areas. The present-day Albuquerque channel is composed of clay, silt, sand, and gravel, similar to the composition of ancestral river deposits. In addition to the erosion and transport of sediment through the main-stem channel, tributary streams can contribute large volumes of sediment to the system.

The soils of the Rio Grande valley floor are generally derived from recent alluvial and arroyo deposits. The two soil-mapping units that occur within the proposed Project area are the Vinton and Brazito Soils, which are occasionally flooded, and the frequently flooded Torrifluvents (U.S. Department of Agriculture 1977). There is a wide range of soil textures but most are

characterized by sand, silt, loamy sand, or sandy loam. Also, these soils range from slightly saline to strongly saline and are moderately alkali affected.

## 3.3 HYDROLOGY AND HYDRAULICS

The MRG, as defined in the Collaborative Program, is the portion of the Rio Grande from the Colorado/New Mexico state line southward to the headwaters of Elephant Butte Reservoir, and includes the Rio Chama watershed. Most of the annual flow and discharge of the Rio Grande that reaches the MRG is generated in the headwaters of the river basin in Colorado and in the Rio Chama in northern New Mexico.

Most of the discharge volume of the Rio Grande is derived from late spring snowmelt and summer monsoon events, which in some years produce large volumes of runoff that briefly alter the hydrograph of the river. The moderate and high flows associated with the seasonal snowmelt and monsoon events have the capacity to carry high sediment loads. However, human activities have produced significant changes in the hydrology of the Rio Grande during the past century. The operations of Cochiti Dam since 1973 have greatly reduced the total available supply of sediment throughout the Albuquerque Reach (S.S. Papadopulos & Associates [SSPA] 2004).

The operation of numerous upstream dams (Heron, El Vado, and Abiquiu Reservoirs on the Rio Chama, Jemez Canyon Dam on the Jemez River, and Cochiti Dam on the Rio Grande) have significantly affected flows in the river by storing and releasing water in a manner that generally decreases the spring flood peaks and alters the timing of the annual hydrograph. Of the 100 greatest daily discharges since 1942 at the Central Gage (08330000), all have occurred prior to the construction of Abiquiu (1963) and Cochiti (1975) Dams (U.S. Geological Survey [USGS] 2003). However, these operations do not cause significant changes in the average annual flow volumes, but seem only to affect the timing and duration of peak flows. According to USGS gage data, average daily flow for the Central Gage from 1942 to 1974 was 1042.70 cubic feet per second (cfs), while average daily flow from 1975 to 2002 was 1395.75 cfs.

## 3.4 WATER QUALITY

Current information for the water quality of the river system in the MRG is available from the USGS, the U.S. Army Corps of Engineers (USACE), Reclamation, the University of New Mexico (UNM), the New Mexico Environment Department, and the USFWS, as well as other sources. Water quality constituents that are typically monitored include surface water temperature, pH, turbidity, dissolved oxygen (DO), suspended sediments (SSED), conductivity/total dissolved solids (TDS), and fecal coliform. These data may be collected in the Rio Grande, in adjacent canals, or within reservoirs. Typically, personnel at specific riverine, canal, or reservoir locations collect the data with automatic data logging devices at stream gage stations. The available data for the Albuquerque Reach are characterized by a high degree of seasonal variability for several water quality measures, as detailed in Table 3.1.

**Table 3.1.** Average Water Quality Data by Constituent for the Central Avenue Gage (1975–2001) (USGS 2003)

| Season | Turbidity (NTU) | DO (mg/L) | pH | Conductivity (mg/L) | Water Temp (°C) | TDS (mg/L) | Fecal coliform (col/100mL) | SSED (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Nov-Feb** | 9.12 | 10.19 | 8.08 | 391.86 | 6.66 | 255.08 | N/A | 539.01 |
| **Mar-June** | 45.57 | 8.66 | 7.97 | 359.11 | 15.90 | 209.74 | 82.50 | 1167.12 |
| **July-Oct** | 25.67 | 8.03 | 8.13 | 387.95 | 18.89 | 273.17 | 8.00 | 2114.67 |

NTU=nephelometric turbidity unit; DO=dissolved oxygen; TDS=total dissolved solids; SSED=suspended sediments

New Mexico Environment Department (NMED) water quality standards exist for stream and river reaches throughout the State of New Mexico. The water quality standards (Appendix B) are from the New Mexico Water Quality Control Commission, as amended through May 23, 2005, and are for two reaches: (1) the main stem of the Rio Grande from the headwaters of Elephant Butte reservoir upstream to the Alameda Bridge (New Mexico Water Quality Standards [20.6.4.106]) and (2) the main stem of the Rio Grande from Alameda Bridge upstream to the Angostura diversion works (New Mexico Water Quality Standards [20.6.4.105]). The Alameda to Angostura Reach includes the 550 Subreach; the Elephant Butte to Alameda Reach encompasses the PDN, I-40, and SDC Subreaches. General criteria established to sustain and protect existing or attainable uses of surface waters of the state are found in the New Mexico Administrative Code (NMAC) 20.6.4.13. These general criteria apply to all surface waters of the state at all times.

## 3.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

Cultural History

Cultural resources include archaeological sites, sites eligible for the State Register of Cultural Properties and/or the National Register of Historic Places (NRHP), and properties of traditional religious or cultural importance (traditional cultural properties [TCPs]).

The indigenous population in the Rio Grande valley of New Mexico dates back at least 12,000 years (Cordell 1997:67–68). The steady influx of people of European descent into the Rio Grande valley of present-day New Mexico from the sixteenth century onward has given rise to a diverse cultural mosaic and has left a multitude of varied cultural resources that are more than 50 years old. The state was part of the Spanish Colonial Empire until Mexico won its independence in 1821. Twenty-five years later, in 1846, New Mexico was claimed by the United States. These successive cultures have left archaeological sites (habitation, mining, industrial, and other), standing structures, bridges, utilities, and a network of irrigation canals and acequias more than 50 years old (Arrowsmith 1963; Cordell 1997:67–68; Rivera 1998; Van Citters 2003).

Archaeological resources in the Albuquerque Reach of the Rio Grande floodplain are limited because of poor preservation, the result of flooding episodes and a long history of agricultural use of the valley floor, and development of the metropolitan area (for the most part on private lands) prior to the existence of a preservation ethic. Historical records emphasize protohistoric and historic settlement in the North Valley between Albuquerque and Bernalillo (Sargeant 1985;

Campbell 2001), and archaeological work on the West Mesa has contributed a great deal to our understanding of regional prehistory (Schmader 1991, 1994).

Archaeological resources that are listed on or eligible for the NRHP are protected under the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470). To determine if any cultural resources sites known to be listed on or eligible for the NRHP are within the Project area, SWCA conducted a records search for the proposed Project in the Archaeological Records Management Section (ARMS) database of the New Mexico Historic Preservation Division (HPD). Thirteen archaeological sites are within one-half mile of the boundaries of the Project area (Table 3.2). Sites outside the Project area are found on the edge of the floodplain (outside the artificial levees) or, more commonly, on benches or mesa surfaces just outside the floodplain.

Traditional Cultural Properties

Reclamation has consulted with Native American Tribes and Pueblos that may have an interest in the Project and Project area to determine if there are any TCPs that must be considered in the decision-making process. Because of the sensitive nature of the Rio Grande and its islands for Native Americans, no decision would be made regarding this proposed action prior to conclusion of the Tribal consultations.

## 3.6 VEGETATION AND WETLAND RESOURCES

The riverbank ecosystems found directly along the main channel of the MRG consists of open sand bars, riverbank areas with herbaceous and shrubby vegetation, and small seasonally saturated or inundated areas characterized by a variety of hydrophytic wetland flora. Open sand bar areas are subject to frequent disturbance from erosion caused by flood events and typically have little or no vegetation establishment. Sparse growth on sand bars of young cottonwood (*Populus deltoides*), coyote willow (*Salix exigua*), tamarisk (*Tamarix ramossisima*), and a variety of herbaceous vegetation is occasionally found following reduced river flows, but because these areas are prone to frequent disturbance during moderate- and high-flow events, the vegetation typically does not have the opportunity to mature.

Herbaceous and shrubby vegetation is common along the riverbank in areas where the river channel has become deeply incised. Riverbank vegetation has successfully established in these locations because of a lack of scouring, displacement, and removal of substrate immediately adjacent to the riverbank, all common processes seen during overbank flooding. The root structures of the riverbank vegetation serve to reinforce the riverbank, causing less erosion, deeper channel incision, and a decrease in the potential for lateral river migration.

**Table 3.2.** Archaeological Sites within the Project Area by Subreach

| Subreach | LA No. | UTM Zone 13 NAD 1927 | Legal | Site Affiliation, Age, Type | Determination of E | |
|---|---|---|---|---|---|---|
| 550 Bridge | — | — | — | — | — | |
| Paseo del Norte | 143458 | 347145 E 3889696 N | Unplatted | Hispanic, A.D. 1706–1930, Albuquerque Acequia Madre, Campbell Ditch, Candelaria Ditch | None entered | |
| | 145194 | 348047 E 3891348 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1900–1945, Duranes Ditch | Eligible under Criter (HPD Log No. 7613 | |
| | 145200 | 349762 E 3892774 N | Unplatted | Hispanic/Anglo, A.D. 1928–1945, dike segment, concrete culvert, outlet valve, drainage ditch | None entered | |
| I-40 | 138855 | 345697 E 3885113 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1881–1945, flood control feature at North Atrisco | None entered | |
| | 138856 | 346738 E 3884217 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1930–1983, remnant of 1930 Central Avenue Bridge | Not Eligible (HPD Log No. 7029 | |
| | 138858 | 346481 E 3884313 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1846–1960, post-frame diversion work | Not Eligible (HPD Log No. 7029 | |
| | 138859 | 346450 E 3884340 N | Unplatted | Hispanic, A.D. 1706–1933, Atrisco and Ranchos de Atrisco Irrigation Canals, Pre-Conservance | Not Determined (HPD Log No. 7029 | |
| | 138860 | 345560 E 3885200 N | Unplatted | Euroamerican, A.D. 1933–1978, Atrisco Header and Diversion Works | Eligible under Criter (HPD Log No. 7029 | |
| | 139208 | 345815 E 3885002 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1881–1891, Old Town Bridge on Perea Road Alignment | Not Determined (HPD Log No. 7029 | |
| | 145561 | 346773 E 3889008 N | Unplatted | 500-m-long ditch, 11 earthen berms, discontinuous levee | None entered | |
| South Diversion Channel | 118060 | 347710 E 3877080 N | T9N, R3E, Sec. 7 | Anglo/Euroamerican, A.D. 1947–1997, Atchison, Topeka & Santa Fe Railway Spur | Not Determined | |
| | 145559 | 346888 E 3875447 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1846–1930, decommissioned drainage ditch | None entered | |
| | 145560 | 345804 E 3872496 N | Unplatted | Hispanic/Anglo/Euroamerican, A.D. 1852–1945, two ditches, gate/bridge, berm/headgate | Eligible under Criter (HPD Log No. 7613 | |

Information accessed at the HPD ARMS database, Santa Fe, by remote terminal (2006).

Wetland vegetated areas are located adjacent to the riverbank and are typically found in areas that are frequently saturated and/or inundated for at least a portion of the growing season. While still present, the number of these areas present within the riparian ecosystem of the Rio Grande has substantially decreased, probably due to the lack of overbank flooding and lateral migration, and the increase in river channel incision. Common wetland vegetation in the Project area includes common three-square (*Scirpus americanus*), narrowleaf cattail (*Typha angustifolia*), softstem bulrush (*Scirpus validus*), Baltic rush (*Juncus balticus*), and coyote willow.

Like the riverbank riparian vegetation, characteristics of vegetated islands within the river channel have changed significantly, perhaps due in part to the lack of flood peaks during the current drought. Because of the lack of peak flows that alter island morphology and periodically remove island vegetation, vegetated islands currently support upwards of 18 percent of the vegetation throughout the Albuquerque Reach (Milford et al. 2003). The increase in the long-term establishment and maturation of vegetation on islands has been linked to the islands becoming more permanent features of the river channel (Fluder 2004). Because of the stability provided by the vegetative root structure of plants (especially large, woody species) found on islands, the potential for lateral migration of the river channel has been dramatically decreased, while the potential for continued incision of the river channel has increased.

An increase in non-native vegetation has been identified as the most significant indicator of failing ecological health in the riparian ecosystem. Species such as tamarisk, Russian olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) have more extensive reproductive cycles than native riparian species, allowing them to out-compete the native species in many locations. The fact that flood peaks have been reduced and the river has incised through the Albuquerque Reach also factors into the transformation of riparian forests, since the non-native species do not rely on yearly high-volume flow events to complete their reproductive cycles.

Despite the considerable attention that has been devoted to the ecology and biodiversity of the neighboring riparian bosque (Hink and Ohmart 1984; Crawford et al. 1993), little is known about the in-channel bars, which are perhaps its most diverse and biologically active component. These dynamic environments support young wetland and riparian vegetation along with most of the natural regeneration of Rio Grande cottonwoods in the river corridor (Milford and Muldavin 2004).

## 3.7 FISH AND WILDLIFE

Decreases in the river elevation relative to the floodplain, changes in the hydrologic and sediment regime, and the introduction of predatory species (game fish) have significantly impacted the fauna of the Rio Grande. The Rio Grande drainage in New Mexico historically supported at least 21 and perhaps 24 native fish species, representing nine or ten families (Propst 1999). Since the beginning of European settlement along the Rio Grande, this system has lost a larger proportion of its native fish fauna than any other major drainage in New Mexico. Shovelnose sturgeon (*Scaphirhynchus platorhynchus)*, longnose gar (*Lepisosteus osseus*), American eel (*Anguilla rostrata*), speckled chub (*Machrybopsis aestivalis aestivalis*), and Rio Grande shiner (*Notropis jemezanus*) have been extirpated from the Rio Grande in New Mexico, and blue catfish (*Ictalurus furcatus*), if it persists, occurs only in Elephant Butte Reservoir. Rio

Grande bluntnose shiner (*Notropis simus simus*) and phantom shiner (*Notropis orca*) are extinct. Rio Grande silvery minnow (*Hybognathus amarus*) is the only state and federally protected fish species currently inhabiting the Rio Grande, but Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*) may warrant state protection (Propst 1999).

Common fish species of the MRG include river carpsucker (*Carpiodes carpio*), flathead chub (*Platygobio gracilis*), common carp (*Cyprinus carpio*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Platania 1993). Less common fish species present in the system are channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys cataractae*), white sucker (*Catostomus commersoni*), and the silvery minnow. Western mosquitofish, white sucker, and common carp are introduced species that are now common throughout the MRG.

In addition to the aquatic ecosystem of the Rio Grande, the riparian corridor of the MRG historically supported a wide diversity of herpetological species. Prior to increased anthropogenic control, the river system periodically spilled into the floodplain, contributing both water and nutrients that supported a number of reptilian and amphibian species that no longer inhabit the area. In the most intensive biological survey of the MRG to date, Hink and Ohmart (1984) found 18 different species of amphibians and reptiles in the MRG. Eastern fence lizard (*Sceloporus undulatus*), New Mexican whiptail (*Aspidoscelis neomexicanus*), and Woodhouse toad (*Bufo woodhousii*) were common and widespread. Several species common to the MRG, such as bullfrogs (*Rana catesbeiana*), leopard frogs (*Rana pipiens*), and Woodhouse toads, are ubiquitous throughout the state. Others, like the chorus frog (*Pseudacris triseriata*) and the common garter snake (*Thamnophis sirtalis*), are unique to the MRG (Hink and Ohmart 1984).

Throughout the year, riparian communities of the MRG provide important habitat during breeding and migration for many bird species. Hink and Ohmart (1984) recorded 277 species of birds within 163 miles of MRG bosque habitat. Stahlecker and Cox (1997) documented 126 species in the Rio Grande Nature Center State Park and estimate that 60–65 species of birds breed in the park in most years (Stahlecker and Cox 1997). The 10 most common species during the winter of 1996–1997 were dark-eyed junco (*Junco hyemalis*), American crow (*Corvus brachyrhynchos*), American goldfinch (*Carduelis tristis*), white-crowned sparrow (*Zonotrichia leucophrys*), American robin (*Turdus migratorius*), Canada goose (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), mallard (*Anas platyrhynchos*), European starling (*Sturnus vulgaris*), and house finch (*Carpodacus mexicanus*). The 10 most common species in the bosque during the summer of 1997 were black-chinned hummingbird (*Archilochus alexandri*), red-winged blackbird, black-headed grosbeak (*Pheucticus melanocephalus*), spotted towhee (*Pipilo maculatus*), brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), Bewick's wren (*Thryomanes bewickii*), black-capped chickadee (*Poecile atricapillus*), cliff swallow (*Petrochelidon pyrrhonota*), house finch, and European starling (Stahlecker and Cox 1997). The most abundant bird species found along the river in winter were mallard, Canada goose, and wood duck (*Aix sponsa*). Red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), western screech-owl (*Otus kennicottii*), and great horned owl (*Bubo virginianus*) also occur in the proposed Project area (Stahlecker and Cox 1997).

Hink and Ohmart (1984) recorded 35 mammal species in their study of the MRG, and Campbell et al. (1997) observed 14 mammal species in their survey of the Albuquerque Reach. Based on

both surveys, the most common small mammals in the proposed Project area include white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), and house mouse (*Mus musculus*) (Hink and Ohmart 1984; Campbell et al. 1997). Large mammals in the area include coyotes (*Canis latrans*), raccoons (*Procyon lotor*), beavers (*Castor canadensis*), muskrats *(Ondatra zibethicus*), pocket gophers (*Thomomys bottae*), and rock squirrels (*Spermophilus variegates*). Several species of bats also utilize the MRG.

## 3.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

The agencies that have primary responsibility for the conservation of plant and animal species in New Mexico are the USFWS, under authority of the ESA; the New Mexico Department of Game and Fish (NMDGF), under authority of the New Mexico Wildlife Conservation Act of 1974; and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act. These agencies maintain lists of plant and animal species that have been classified, or are potential candidates for classification as Threatened or Endangered (Table 3.3).

Protection from harassment, harm, or destruction of habitat is granted to species protected under the ESA. The New Mexico Wildlife Conservation Act and New Mexico Endangered Plant Species Act protect state-listed species by prohibiting taking without proper permits.

### 3.8.1 FISH

Rio Grande Silvery Minnow *(Hybognathus amarus)*

The silvery minnow is a moderate-sized, stout minnow, reaching 3.5 inches in total length, that spawns in the late spring and early summer, coinciding with high spring snowmelt flows (Sublette et al. 1990). Spawning also may be triggered by other high-flow events such as spring and summer thunderstorms. The species is a pelagic spawner, producing neutrally buoyant eggs that drift downstream with the current (Platania 1995). The eggs hatch in 2 to 3 days, and the larvae may continue to drift or become retained in backwaters or embayments. The species normally lives about 2 to 3 years in the wild. Natural flow regimes, movement within their limited remaining range, and habitat diversity are important to completion of the life cycle.

In 1994, the silvery minnow was classified as Endangered by the USFWS (FR 1994a) and has been considered Endangered at the state level since 1979. Historically, the silvery minnow was one of the most widespread and abundant fishes in New Mexico. The species has declined as a result of impacts from dewatering, channelization and flow regulation for irrigation, diminished water quality, and competition/predation by non-native species. The species is endemic to New Mexico, where it historically occupied large rivers with shifting sand substrates. In the Rio Grande, the silvery minnow ranged from the confluence of the Rio Chama near Española to the Gulf of Mexico, and in the Pecos River from near Santa Rosa to its confluence with the Rio Grande (Propst 1999). The silvery minnow currently occupies less than 10 percent of its historic range and is found only in the Rio Grande from Cochiti Reservoir downstream to Elephant Butte Reservoir (Propst 1999).

**Table 3.3.** Threatened (T), Endangered (E), Species of Concern (S), and Candidate (C) Plant and Wildlife Species Known to Occur within Bernalillo and Sandoval Counties, New Mexico.

**Comment:** No Proposed species on the list

*Note:* Animals and plants that could occur in the Project area are shown in boldface.

| **Common Name (*Scientific name*)** | **Status** | | **General Habitat** |
|---|---|---|---|
| | **FED** | **STATE** | |
| ***Invertebrates*** | | | |
| William Lar's tiger beetle (*Cicindela fulgida williamlarsi*) | S | – | Montane alkali flats |
| San Ysidro tiger beetle (*Cicindela willistoni funaroi*) | S | – | Montane alkali flats |
| Slate millipede (*Comanchelus chihuanus*) | S | – | Plains mesa grassland |
| New Mexico silverspot butterfly (*Speyeria nokomis nitocris*) | S | – | Alpine and streamside meadows with significant violet crop |
| Wrinkled marshsnail (*Stagnicola caperatus*) | – | E | Ditches, streams, and marshes of the Jemez Mountains |
| ***Amphibians*** | | | |
| Jemez Mountains salamander (*Plethodon neomexicanus*) | S | T | Shady, wooded montane litter |
| ***Fish*** | | | |
| Rio Grande sucker (*Catostomus plebeius*) | S | – | Cool, mid-elevation streams with rocky substrates |
| **Rio Grande silvery minnow (*Hybognathus amarus*)** | **E** | **E** | **Silt and sand substrates within slow backwaters** |
| Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*) | S | – | Cool, high-gradient, high-elevation streams |
| ***Birds*** | | | |
| Northern Goshawk (*Accipiter gentilis*) | S | – | Dense coniferous and mixed-woodland areas |
| Baird's Sparrow (*Ammodramus bairdii*) | S | T | Winters in prairie areas |
| Western Burrowing Owl (*Athene cunicularia hypugea*) | S | – | Semi-arid grasslands and prairies, often associated with prairie dog towns |
| **Common Black-Hawk (*Buteogallus anthracinus*)** | **–** | **T** | **Woodlands along lowland streams** |
| Mountain Plover (*Charadrius montanus*) | S | – | Semiarid grasslands and plains |
| Black Tern (*Chlidonias niger*) | S | – | Vegetated marshes |
| **Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)** | **C** | **–** | **Dense riparian shrub** |
| Broad-billed Hummingbird (*Cynanthus latirostris magicus*) | – | T | Low-elevation riparian woodlands |
| White-eared Hummingbird (*Hylocharis leucotis borealis*) | – | T | Montane riparian areas |
| **Southwestern Willow Flycatcher (*Empidonax traillii extimus*)** | **E** | **E** | **Dense riparian groves of willow or salt cedar** |
| American Peregrine Falcon (*Falco peregrinus anatum)* Arctic Peregrine Falcon; listed for "similar appearance" (*F.p. tundrius*) | S | T | Montane species; prefers to perch in open areas, often near water. |

**Table 3.3.** Threatened (T), Endangered (E), Species of Concern (S), and Candidate (C) Plant and Wildlife Species Known to Occur within Bernalillo and Sandoval Counties, New Mexico, continued

| Common Name (*Scientific name*) | Status | | General Habitat |
|---|---|---|---|
| | FED | STATE | |
| ***Birds (cont.)*** | | | |
| Whooping Crane (*Grus americana*) | E | E | Marshes and prairie potholes |
| **Bald Eagle (*Haliaeetus leucocephalus*)** | **T** | **T** | **Winters along shores of rivers and lakes** |
| Neotropic Cormorant (*Phalacrocorax brasilianus*) | - | T | Rivers, lakes, and reservoirs with adjacent wooded areas |
| Mexican Spotted Owl (*Strix occidentalis lucida*) | T | – | Mature mixed-conifer and pine-oak forests |
| Bell's Vireo (*Vireo bellii*) | – | T | Riparian areas, piñon-juniper woodland, and Chihuahuan desert scrub |
| Gray Vireo (*Vireo vicinior*) | – | T | Open woodlands with well-developed grasses |
| ***Mammals*** | | | |
| Townsend's big-eared bat (*Corynorhinus townsendii*) | S | – | Caves and rocky outcroppings in scrub deserts and piñon-juniper woodlands |
| Spotted bat (*Euderma maculatum*) | – | T | Rocky outcroppings, mature forests, caves |
| American marten (*Martes americana*) | – | T | Spruce-fir forests |
| Goat Peak pika (*Ochotona princeps nigrescens*) | S | – | Steep, rocky banks and hillsides above 8,000 feet |
| Black-footed ferret (*Mustela nigripes*) | E | – | Prairies; associated with prairie dogs |
| Pecos River muskrat (*Ondatra zibethicus ripensis*) | S | – | Riparian areas in Chihuahuan desert scrub and piñon-juniper woodlands |
| **New Mexican jumping mouse (*Zapus hudsonius luteus*)** | **S** | **T** | **Forb-grass communities in Jemez Mountains** |
| ***Plants*** | | | |
| Plank's catchfly (*Silene plankii*) | – | S | Rock outcrops |
| Santa Fe milkvetch (*Astragalus feensis*) | – | S | Sandy benches, gravelly hillsides, granitic and metamorphic rocks in juniper savanna or on barren areas |
| Knight's milkvetch (*Astragalus knightii*) | S | S | Dakota sandstone rimrock ledges in piñon-juniper woodlands |
| La Jolla prairie clover (*Dalea scariosa*) | – | S | Sandy clay banks and bluffs, often disturbed |
| Sapello Canyon larkspur (*Delphinium sapellonis*) | – | S | Montane areas in the Sandia Mountains |
| Sandia Mountain alumroot (*Heuchera pulchella*) | – | S | Rock outcrops in montane areas |
| Gypsum phacelia (*Phacelia* sp. nov.) | S | – | Gypsum outcrops |
| Parish's alkali grass (*Puccinellia parishii*) | S | E | Alkali springs, seeps, and drainages |
| Gypsum Townsend's aster (*Townsendia gypsophila*) | S | S | Weathered gypsum outcrops, gypsiferous soils |

Information taken from NMDGF 2004a; New Mexico Rare Plant Technical Council 1999; Sublette et al. 1990; USFWS 2004.

Natural habitat for the Rio Grande silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are lower than in the main channel. Areas with detritus and algal-covered substrates are preferred. The lee sides of islands and debris piles often serve as good habitat. Stream reaches dominated by straight, narrow, or incised channels with rapid flows are typically not occupied by the silvery minnow (Sublette et al. 1990; Bestgen and Platania 1991). Critical habitat for the silvery minnow was designated by the USFWS from the Highway 22 Bridge downstream to the headwaters of Elephant Butte Reservoir, including the Albuquerque Reach, effective February 19, 2003 (FR 2003b). Constituent elements of critical habitat required to sustain the Rio Grande silvery minnow include, in brief: "(1) a hydrologic regime that provides sufficient flowing water [to maintain] a diversity of aquatic habitats; (2) the presence of eddies...that provide a variation of habitats; (3) substrates of predominantly sand or silt; and (4) water of sufficient quality to maintain...variable water temperatures" (USFWS 2003:22).

The BiOp released by the USFWS in 2003 covering Reclamation's water and river maintenance operations, the USACE's flood control operations, and related non-federal actions on the MRG (USFWS 2003) requires habitat restoration projects on the MRG that will improve survival of all life stages of the endangered silvery minnow and other endangered species. The BiOp also identified the need for increased availability of low-velocity habitat and silt and sand substrates to provide food, shelter, and sites for reproduction for silvery minnow and thereby alleviate jeopardy to the continued existence of the species in the MRG.

Silvery minnow populations within this reach have been monitored on an ongoing basis by UNM and the USFWS. Generally, the data collected indicate that silvery minnow are rare throughout the reach, and many of the individuals collected are adults (Dudley et al. 2003). This data set indicates that the population may benefit by retaining eggs, larvae, and juveniles in upstream areas like the Albuquerque Reach, where they can contribute to silvery minnow population growth and aid in the recovery of the species. In 2004, an increased abundance of silvery minnows was observed, which is a positive sign but does not eliminate the threats that currently endanger this species (Dudley et al. 2005).

### 3.8.2 BIRDS

Common Black-Hawk *(Buteogallus anthracinus)*

The common black-hawk is listed as Threatened by the State of New Mexico and may occur in the Albuquerque Reach (NMDGF 2004b). Though the common black-hawk is considered rare in Bernalillo County, nesting was observed in the Isleta Reach during the summer of 2003 (Williams 2003). The species primarily occupies riparian woodlands, particularly areas with well-developed cottonwood galleries, or a variety of woodland and marsh habitats along permanent lowland streams. Breeding black-hawks require mature riparian forest stands near permanent water. Most birds winter south of the U.S., although some records report occurrences within southern Arizona and the Gulf coast in Texas. The diet of this riparian-obligate species consists mainly of fish, insects, crayfish, amphibians, and reptiles, but occasionally they will take small mammals and birds. Loss of riparian habitat poses the greatest risk to the species. In 1996 the NMDGF estimated 60 to 80 breeding pairs in the state.

Western Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*

The western yellow-billed cuckoo is a USFWS Candidate subspecies that occurs locally along riparian corridors throughout New Mexico. Ideal habitat appears to be dominated by cottonwood canopy with a well-developed willow understory. Yellow-billed cuckoo diet consists mainly of caterpillars but may also include various insects, some fruit, and the occasional lizard or frog (NMDGF 2004c). The breeding range of yellow-billed cuckoo extends from California and northern Utah north and east to southwestern Quebec and south to Mexico. In New Mexico, historical accounts indicate that the yellow-billed cuckoo was locally very common along the Rio Grande but rare statewide (NMDGF 2004c). Both Hink and Ohmart (1984) and Stahlecker and Cox (1997) reported yellow-billed cuckoo as a nesting bird in the bosque of the MRG.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

The southwestern willow flycatcher (flycatcher) is considered Endangered by both the USFWS and the State of New Mexico. The subspecies is restricted to dense riparian vegetation along select waterways in New Mexico, Arizona, western Texas, southern Utah, Nevada, and California. The decline of the species has been attributed to loss of riparian habitat, brood parasitism, and lack of adequate protective regulations. The historic range of flycatchers included riparian areas throughout Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Critical habitat was designated for the flycatcher in 1997 (FR 1997) along 599 miles of streams and rivers in California, Arizona, and New Mexico, but was later withdrawn. In October 2004, the USFWS proposed a new designation of critical habitat for the flycatcher (FR 2004) that was finalized in October 2005. The southwestern willow flycatcher prefers dense riparian thickets, typically willows with a scattered cottonwood overstory. Dense riparian woodlands are particularly important as breeding habitat.

In New Mexico, the flycatcher occupies riparian habitat along the Rio Grande, Rio Chama, Zuni River, San Francisco River, and Gila River drainages and is generally found within 150 feet of a water source. During spring and fall migration the species occurs statewide, although migration patterns are not well understood. On the Rio Grande, the subspecies occurs near Velarde, Isleta, the Sevilleta National Wildlife Refuge (NWR), the Bosque del Apache NWR, San Marcial, and Fort Selden.

Bald Eagle (*Haliaeetus leucocephalus*)

This species is listed as Threatened by both the USFWS and the State of New Mexico. Bald eagles are associated with habitats near open water. In New Mexico, bald eagles commonly winter adjacent to rivers and lakes, or where carrion is available. The major food items of bald eagles in New Mexico are waterfowl, fish, and carrion (NMDGF 2004d). Bald eagles are uncommon during the summer and have limited breeding sites in New Mexico, though nests have been documented in the extreme northern and western portions of the state. The number of birds wintering in the state has been steadily increasing. Important wintering areas include the upper Rio Grande, and to a lesser extent the MRG. The bald eagle commonly winters along the Rio Grande between the Buckman diversion point and Cochiti Reservoir.

### 3.8.3 MAMMALS

New Mexican Jumping Mouse (*Zapus hudsonius luteus*)
The New Mexican jumping mouse (*Zapus hudsonius luteus*), also known as the New Mexico meadow jumping mouse, is listed by the USFWS as a Species of Concern and is considered Threatened by the State of New Mexico. The species is endemic to New Mexico and Arizona. It is restricted to mesic habitats, preferring permanent streams, moderate to high soil moisture, and dense and diverse streamside vegetation consisting of grasses, sedges, and forbs (NMDGF 2004e). In the Rio Grande valley, the species occurs mainly along the edges of permanent ditches and cattail stands. The proposed Project area does not contain any wetland areas with cattails or dense herbaceous vegetation. Recent surveys (Hink and Ohmart 1984) have failed to detect the New Mexican jumping mouse north of Isleta Marsh. It is therefore unlikely that the species occupies either the riparian floodplain or any in-channel islands of the MRG.

## 3.9 SOCIOECONOMICS

This analysis does not focus on all aspects of economics within the proposed Project area, but considers only the projected economic costs of the Preferred Alternative and economic statistics at the state, county, and local levels to describe the economic context of the Project.

The proposed Project location encompasses Bernalillo and Sandoval Counties in the State of New Mexico. According to the 2000 Census, New Mexico had a population of 1,819,046, with 556,678 persons residing in Bernalillo County and 89,908 persons in Sandoval County. Bernalillo County is approximately 1,166 square miles in area, with an average of 477 persons per square mile, and is considered urban in character. Sandoval County is considered rural in character, with one minor urban center. The Town of Bernalillo (6,611) and the City of Rio Rancho (51,765) had a combined population of 58,376 in 2000.

In 2000, Bernalillo County had a per capita personal income (PCPI) of $27,253 and Sandoval County had a PCPI of $22,247. The average PCPI for the State of New Mexico was $21,931, which was 75 percent of the national average of $29,469 (U.S. Census Bureau 2004a, 2004b). Average annual growth in PCPI was 3.9 percent for the State of New Mexico and 4.2 percent nationwide.

Federal expenditures in the State of New Mexico accounted for $17.478 billion in 2002 (U.S. Census Bureau 2002). State expenditures amounted to $63.611 million in 2002 (New Mexico Department of Finance and Administration 2002). The estimated cost of the Proposed Action is $3.03 million, depending on funding availability.

## 3.10 VISUAL AND AESTHETIC RESOURCES

The bosque area within Albuquerque and Bernalillo is valued for the visual and aesthetic appeal of mature forest and flowing water in an arid landscape. The riparian areas are designated as the Rio Grande Valley State Park through the Park Act of 1983, which is managed by the City Open Space Division and the MRGCD. The 5,000-acre RGVSP extends through the City, from Sandia Pueblo on the north to the Pueblo of Isleta on the south (RGVSP 2004). Although no work would

be conducted on Pueblo lands, the Project may still be visible from various locations at the Pueblos. Sandia and Isleta Pueblo lands are managed and controlled by the individual pueblos.

The bosque and river are visible to the public from many bridge crossings, such as the U.S. 550 Highway Bridge, Alameda Bridge, Montaño Bridge, Central Avenue Bridge, César Chavez Bridge, and Rio Bravo Bridge. These bridge vistas of the river and bosque provide thousands of urban residents with a regular and important visual aesthetic experience. The bosque and river are also visible and enjoyed for their aesthetic value from many foot and horse trails. Trails within the Rio Grande Bosque exist on both sides of the river, with a 16-mile-long paved trail on the east side of the river within Albuquerque. Recreation activities include, but are not limited to, walking, jogging, bicycling, roller-blading, horseback riding, fishing, and wildlife watching. No motorized vehicles except maintenance and emergency vehicles are allowed in the bosque, making the aesthetic experience of the recreating public one of a forest and riverside that is full of the sounds and sights of water and forest.

## 3.11 AIR QUALITY AND NOISE

The proposed Project area lies within New Mexico's Air Quality Control Region No. 152. This region includes Sandoval County and most of Valencia County, which are in attainment for all criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides) of the National Ambient Air Quality Standards (New Mexico 2004). Bernalillo County also falls in Region No. 152 and is in attainment for all priority pollutants except carbon monoxide, which is presently in maintenance status (F. Macias, City of Albuquerque Air Quality Monitoring, personal communication 2005). The closest Class I area (a national park or wilderness area) is Bandelier National Monument, 50 miles north of the proposed Project area. Air quality in the Project area is considered to be good. Due to inversions and an increase in the use of wood-burning stoves, carbon monoxide and airborne particulates are occasionally high in the Rio Grande valley during winter months. All vehicles involved in Project activities would have emission control equipment that has passed City emissions tests. A fugitive dust permit would be obtained from the City if necessary, and Best Management Practices (BMPs), such as wetting down disturbed areas to minimize dust, would be followed during Project activities.

Noise levels are limited to 90 decibels A-weighted (dBA) averaged over an 8-hour day by the Occupational Safety and Health Administration (29 CFR 1910.95). No worker may be exposed to 115 dBA averaged over an 8-hour day without hearing protection. City of Albuquerque noise standards require that powered equipment be operated only between the hours of 7 am and 10 pm Monday through Saturday and 9 am to 10 pm on Sundays (City of Albuquerque 1975).

## 3.12 NET WATER DEPLETIONS

The Rio Grande Compact (1939) limits the amount of surface water that can be depleted annually in the MRG based upon the natural flow of the river measured at the Otowi gage near Los Alamos. In addition, the OSE has determined that the MRG is fully appropriated. Therefore, any increase in water use in one sector must be offset by a reduction in use in another sector to ensure that *Indian Water Rights*, nor New Mexico's ability to meet its downstream delivery obligations are impaired. Additionally, the New Mexico State Water Plan

(OSE/NMISC 2003) states that habitat restoration projects should not increase net water depletions, or that if depletions should occur they would be offset through a permitting process established by the OSE.

## 3.13 ENVIRONMENTAL JUSTICE

Executive Order 12898 (FR 1994b), Environmental Justice in Minority and Low-Income Populations, requires consideration of adverse impacts that would disproportionately affect minority and low-income populations. Compared to demographics on the national level, the population of Sandoval and Bernalillo Counties has proportionately more persons of Hispanic and Native American background and fewer persons of African-American or Asian background. Ethnic populations in the State of New Mexico are proportionally similar to those in Sandoval and Bernalillo Counties. It should be recognized that persons of Hispanic background might also claim identification with another ethnic group as well.

## 3.14 INDIAN TRUST ASSETS

Indian trust assets (ITAs) are legal interests in assets held in trust by the United States Government for Indian tribes or Indian individuals. Some examples of ITAs are lands, minerals, water rights, hunting and fishing rights, titles, and money. ITAs cannot be sold, leased, or alienated without the express approval of the U.S. Government. Secretarial Order 3175 and Reclamation ITA policy require that Reclamation assess the impacts of its projects on ITAs. An inventory of all ITAs within the proposed Project area is required. If any ITAs are impacted, mitigation or compensation for adverse impacts to these assets is required.

# 4.0 ENVIRONMENTAL CONSEQUENCES

## 4.1 INTRODUCTION

This section of the EA evaluates direct, indirect, and cumulative impacts to all resources described in Section 3, Affected Environment. Environmental commitments, which would provide ongoing guidance for the proposed Project, are summarized at the end of the section.

## 4.2 GEOMORPHOLOGY AND SOILS

Under the No Action Alternative, the geomorphology of the Rio Grande is expected to remain relatively stable, though it may be exacerbated by drought conditions, which could cause channels between islands to narrow and deepen. In the absence of frequent and sustained high discharges, the river in this reach would continue to have high velocities and would have limited meandering capability, a process that is important in moving and redefining islands and bars. Channels within the river are expected to degrade, resulting in high banks and islands that are rarely inundated. Islands and bars would be stabilized with increasingly mature vegetation, predominantly non-native species. The geomorphic trends produced under No Action are unfavorable for the Rio Grande silvery minnow because of decreased capacity for egg retention or larval success and decreased presence of quality mesohabitat.

Under the Proposed Action, the Project would undertake actions to alter the islands and bars within the channel as well as parts of the channel banks to create the desired habitat types. In doing so, the current local geomorphology is anticipated to change. Changes in local geomorphology would facilitate an increase in the amount of habitat necessary for egg retention, rearing of larvae, and survival of young-of-year. Under the Proposed Action there would be minimal to moderate soil and sediment disturbance levels. The overall effects would be monitored and quantified, but are expected to be beneficial and completely within normal parameters for a sand-bed river system.

Before the initiation of construction activities, environmental protection measures would be reviewed at a pre-Project meeting. All activities would be in compliance with local, state, and federal regulations. To mitigate negative effects from erosion, native herbaceous communities may be planted.

## 4.3 HYDROLOGY AND HYDRAULICS

Under both the No Action and the Proposed Action there would be no change in the amount or duration of flow in the river. However, the Proposed Action would cause decreased flow velocities in some restoration locations, but is not expected to significantly alter the hydrologic conditions of the river on a broader scale. The Proposed Action would work with the existing hydrologic conditions to develop the desired habitat types.

## 4.4 WATER QUALITY

The No Action Alternative and Proposed Action would not result in negative changes to water quality where it currently meets applicable standards for physical constituents, such as surface

water temperature, pH, turbidity, DO, SSED, conductivity/TDS, and fecal coliform. There would be a temporary and localized change in turbidity and TDS under the Proposed Action because of the mobilization and dispersal of sediments within the river channel during excavation work.

The Clean Water Act (CWA) provides protection for wetlands and waters of the United States from impacts associated with dredged or fill material in aquatic habitats, as defined under Section 404(b)(1). CWA compliance is required of all aspects of the Project, and since most work associated with the Proposed Action would be completed within jurisdictional areas, a 404 permit from the USACE and 401 permits from the State of New Mexico and Sandia Pueblo are required. Compliance with the CWA would ensure that the Proposed Action would have no adverse effect on the water quality of the MRG. Water quality would be monitored and evaluated for the duration of the Project.

The Proposed Action would result in temporary and localized changes in the measures for physical constituents, particularly for turbidity and TDS, because of the mobilization and dispersal of sediments within the river channel. Short-term and localized adverse effects to water quality may result, but are not expected to exceed applicable standards. The techniques to be tested would depend on high-flow events to release and redistribute sediments within the floodplain. The high-volume flows would be expected to dilute the effects of added sediment load on water quality standards.

## 4.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

Under the No Action there would be no change to cultural resources and traditional cultural properties.

Under the Proposed Action, the Project would utilize the historic Atrisco Diversion and related diversion works, which no longer function, to create backwater habitat for the silvery minnow. The diversion works were completed in 1933 as part of an MRGCD project to provide a permanent header diversion for irrigation in the Atrisco area. Because of changes in the river channel and sedimentation, the Atrisco siphon replaced the original system in 1955 (Marshall 2003). Today the site consists of a wood-plank and metal header surrounded on both sides by concrete, a largely deteriorated wood and metal catwalk, and an earthen berm running south of the header approximately 300 meters to a large, concrete-framed gate and metal drop structure. When the system was in use, at the drop structure water was diverted to the Main Arenal Canal or continued south down the wasteway (outside the site boundary) 500 meters, where it rejoined the Rio Grande. The current Project would avoid the catwalk and the concrete-framed gate and drop structure; no adverse impacts to the catwalk or the diversion works would occur.

No other archaeological resources were found inside the levees where the Proposed Action would take place. Should archeological resources be found during construction at staging areas, access locations, or proposed construction sites, work in that area would stop and the proper authorities would be informed. A cultural resources survey is not proposed as part of the Proposed Action because the Project area is contained completely within the active floodplain of the Rio Grande. Project activities would be restricted to islands within the channel of the Rio Grande and to the banks of the river. Access to the channel would be wherever it is possible, but

most likely along existing access routes. Therefore, no adverse impacts would occur to known archaeological resources from the Proposed Action.

Tribal entities have been contacted to determine whether any TCPs occur within or near the proposed action areas. If TCPs are identified, mitigation will be implemented to preclude any adverse impacts.

## 4.6 VEGETATION AND WETLAND RESOURCES

Under the No Action Alternative there may be an increase in vegetation, particularly of non-native species on islands and bars. Overbank flooding would remain very limited under current conditions. Under the Proposed Action there would be some overbank flooding and an increase of over-island flooding. Riparian vegetation is, by definition, subject to intermediate levels of disturbance from flooding. Reduced levels of annual maximum flows under the No Action Alternative have reduced these natural processes. Under the Proposed Action, some native and non-native vegetation would be disturbed by mechanical means during the implementation of the restoration techniques. The estimated acreage impact to riparian vegetation during implementation of Phase II is shown in Table 4.1.

**Table 4.1.** Effects of Proposed Restoration Techniques on Vegetation

| Restoration Technique | Potential Phase II Treated Acres | Relative Cover of Potentially Affected Vegetation * | | | |
|---|---|---|---|---|---|
| | | Bare Ground or Open Water | Herbaceous/ Grasses | 1–5 m Woody Vegetation (Native) | 5–15 m Woody Vegetation (Mixed Native & Non-Native) |
| Vegetated Island Modification | 35.2–40.0 | 1% | <1% | 27% | 69% |
| Backwater and Embayments | 5.0–5.3 | None | <1% | 36% | 64% |
| Large Woody Debris | TBD | 100% | <1% | None | None |
| Bank Modification | 32.2–32.8 | 16% | <1% | 63% | 20% |
| Removal of Lateral Confinements | 0.5 | 88% | <1% | None | 12% |
| Drain Enhancement | 7.1 | 37% | <1% | 43% | 20% |
| Ephemeral Channels | 4.3 | 59% | <1% | 36% | 5% |

*Any impacts to dense woody vegetation more than 3 meters in height would be avoided wherever possible during construction.

The proposed techniques have different levels of potential impact on riparian vegetation. All vegetative communities, native and non-native, would be altered on selected vegetated islands under the Proposed Action. Dead and downed native woody species may be used for in-channel placement to create large woody debris areas. Living native deciduous species would be avoided to the extent possible. Some herbaceous floodplain species may be trampled during construction, but impacts would be moderate.

The Rio Grande, including the proposed Project locations, is a USACE jurisdictional waterway. Executive Order 11990 (Protection of Wetlands; FR 1977a) requires the avoidance of short- and long-term adverse impacts associated with the destruction, modification, or other disturbance of wetland habitats. Compliance with Sections 404/401 of the CWA will prevent the permanent loss of wetlands associated with Project actions. The Proposed Action would disturb jurisdictional wetland areas; however, these impacts would be temporary, and full wetland function should be restored during the following growing season. Following construction, an increased amount of substrate would have the potential to be inundated and/or saturated for significant time periods, which should lead to a net gain in both the area and function of wetlands. Executive Order 11988 (Floodplain Management; FR 1977b) provides federal guidance for activities within the floodplains of inland and coastal waters and requires federal agencies to "ensure that [their] planning programs and budget requests reflect consideration of flood hazards and floodplain management." Proposed modification to riverbanks and islands would not result in significant changes in flooding patterns outside the existing floodplain.

## 4.7 FISH AND WILDLIFE

Short-term impacts to fish and wildlife resources would not occur under the No Action Alternative. Long-term adverse effects on breeding and foraging fish, avian species, and mammals, however, are gradual and difficult to quantify. They result from long-term reduction in riparian ecological processes, encroachment of non-native species, increased fire hazard, and increased depth to groundwater.

By comparison, the Proposed Action would produce short-term direct impacts on wildlife in the immediate area of disturbance, and long-term beneficial effects on fish and riparian wildlife from improved ecological function and increased aquatic habitat. To avoid direct impact to migratory birds protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703, ET seq.), clearing and grubbing of woody vegetation would be scheduled between August 15 and April 15, outside of the normal breeding season for many avian species. Should vegetation removal and construction take place between April 15 and August 15, pre-construction nesting bird surveys should be conducted to identify potential MBTA issues. Any positive pre-construction survey results or observations would be brought to the attention of the USFWS in order to determine methods of MBTA impact avoidance.

Other wildlife species inhabiting vegetated islands, such as amphibians, reptiles, and mammals, would be temporarily displaced and may experience mortality during the implementation of the Proposed Action. The short-term effects would be outweighed by the long-term benefits of a healthier riparian ecosystem that includes aquatic habitat creation and increased food abundance within mesohabitats.

## 4.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

Rio Grande Silvery Minnow *(Hybognathus amarus)*

The No Action Alternative would continue the trends of population decline for this species in the Albuquerque Reach. The channel in the Albuquerque Reach is incised, and degradation is expected to continue (Porter and Massong 2004). The silvery minnow is known to occur within the defined Project area, and fish obtained from recent salvage operations conducted during river

intermittency have been stocked in the Albuquerque Reach (M. Hatch, personal communication 2004). In past years, rescued silvery minnow have been released near Alameda Bridge and Central Avenue, between the 550 and PDN Subreaches. Increasing the amount and/or quality of suitable riverine habitat is essential for application of rescue and recovery efforts associated with successful silvery minnow population management.

The Proposed Action may affect, but is not likely to adversely affect designated silvery minnow critical habitat. The primary objective of the Proposed Action is to enhance, restore, and/or create mesohabitat for the silvery minnow at various life stages. The Proposed Action is expected to provide beneficial effects on silvery minnow and their critical habitat, including improved egg and larva retention, increased recruitment rates, and the increased survival of young-of-year and adult silvery minnow in the Albuquerque Reach of the MRG.

Silvery minnow critical habitat encompasses the entire Project area (FR 2003b). Short-term effects to silvery minnow critical habitat may occur following habitat restoration activities, as discussed in the Biological Assessment (SWCA 2006). Portions of the work associated with construction activities would take place within the river channel. Developed BMPs would be strictly enforced to minimize erosion and sediment inputs into the river during construction.

The short-term construction activities and the deposition of sediment in shallow water (current habitat areas) of the Proposed Action may adversely affect silvery minnow and lead to take. In 2005 the USFWS issued a Biological Opinion and an Incidental Take Statement for Phase I of the Habitat Restoration Project, pursuant to sections 7(a)(2) and 7(b)(4) of the ESA. The BiOp determined that short-term direct effects are likely to occur from operation of heavy equipment in the channel where silvery minnow are known to occur, but that these effects would be minimal and not likely jeopardize the continued existence of the species (USFWS 2005). Reclamation has initiated consultation with the USFWS for Phase II.

Western Yellow-billed Cuckoo (*Coccyzus americanus occidentalis*)

The No Action Alternative would not cause changes in the riparian habitats utilized by this species, and no effects would occur.

The Proposed Action may affect but is not likely to adversely affect the Western yellow-billed cuckoo. To minimize impact on this and other riparian species, clearing and grubbing of woody vegetation would be scheduled to take place between August 15 and April 15. Should vegetation removal and construction be implemented during the breeding season (April-August), pre-construction breeding bird surveys would be conducted and monitoring would be performed to assure avoidance of impacts. Any positive pre-construction survey results or observations of affected species during construction would be discussed with the USFWS to coordinate nesting area avoidance.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)

A vegetation survey was conducted to evaluate the potential suitability of habitats for flycatchers in the Project area. Vegetation of suitable height and density to support flycatcher breeding was not found in any areas to be impacted by the Project. Without existing suitable habitat for or records of breeding, the No Action Alternative would have no effect on the species.

The Proposed Action would temporarily disturb or remove riparian vegetation, which might support migrating flycatchers in the Project area. Since the proposed construction would take place outside of the breeding season for southwestern willow flycatcher, no adverse effects to the species are anticipated. The Proposed Action may affect but is not likely to adversely affect southwestern willow flycatcher migratory stop-over habitat. To minimize impact on this and other riparian species, clearing and grubbing of woody vegetation would be scheduled between September and April. Should vegetation removal and construction be implemented during the breeding season (April-August), pre-construction breeding bird surveys would be conducted and monitoring would be performed to assure avoidance of impacts. Any positive pre-construction survey results or observations of affected species during construction would be discussed with the USFWS to coordinate nesting area avoidance.

Bald Eagle (*Haliaeetus leucocephalus*)
The No Action Alternative would not disturb the riparian vegetation where this species may occur; therefore, this alternative would have no effect on the species.

The Proposed Action may have short-term potential effects on bald eagles during construction, related to temporary noise and other disruptions. Removal of woody vegetation and other construction activities may take place during the winter months when bald eagles may be in the proposed Project area. Guidelines would be employed to minimize the potential for disturbing bald eagles. If a bald eagle is visible within 0.25 mile of the proposed Project area in the morning when activity starts, or arrives during breaks in activity, the contractor would be required to suspend all construction activity until the bird leaves on its own volition, or the Project biologist, in consultation with the USFWS, determines that the potential for harassment is minimal. However, if a bald eagle arrives during construction activities, or is observed 0.25 mile or more from the construction site, activity would not be interrupted. The Proposed Action may affect but is not likely to adversely affect the bald eagle.

Common Black-Hawk *(Buteogallus anthracinus)*
The No Action Alternative would not cause any changes to riparian vegetation used by this species; therefore, no adverse impacts to the species and its habitats would occur.

The Proposed Action would include clearing of woody vegetation but not mature gallery trees. In addition, areas proposed for vegetation clearing and disturbance are not vegetated with mature forest habitats. Therefore, the Proposed Action should have no adverse impact on the common black-hawk. As a precautionary measure, the contractor or Project biologist would follow the same protocol as that for bald eagles during construction activities.

New Mexican Jumping Mouse (*Zapus hudsonius luteus*)
Lack of suitable habitat in the Project area makes it unlikely that either the No Action Alternative or the Proposed Action would have an adverse effect on the New Mexican jumping mouse.

## 4.9 SOCIOECONOMICS

The long-term economic consequences of the No Action Alternative are unknown at this time and difficult to assess. These impacts may be greater than the Proposed Action due to the

significant costs of other silvery minnow habitat restoration options that have been proposed by the Collaborative Program.

The Proposed Action would not adversely affect current economic and socioeconomic conditions within Bernalillo and Sandoval Counties. Depending upon available funds, the cost of the Proposed Action is estimated at $3.03 million. This amount is relatively low in comparison with combined state and federal expenditures in Bernalillo and Sandoval Counties and would not adversely affect current economic conditions.

## 4.10 VISUAL AND AESTHETIC RESOURCES

The No Action Alternative and Proposed Action would not produce any long-term changes in the visual and aesthetic experience of the river user. The Project would imitate the natural processes of shifting channel configuration, islands and bars, and vegetation mosaic that are part of the river's aesthetic value. Channel and bank modifications may be visible to pedestrians using bridges, trails, and the river edge, or to adjacent homeowners along the river edge during Project implementation. The proposed construction may be visible from bridge crossings at the U.S. Highway 550, Paseo del Norte, Montaño, I-40, Central, Rio Bravo, and I-25 bridges. Visual and aesthetic impacts of the proposed Project would be brief and limited.

## 4.11 AIR QUALITY AND NOISE

The Project area is a natural area and a park with nature trails and other recreational uses in which a quiet atmosphere is expected. The No Action Alternative would hold ambient noise and air quality levels to this level.

The Proposed Action is not anticipated to generate ambient noise that exceeds the City of Albuquerque Noise Ordinance. Construction equipment to be used during the Proposed Action would create temporary variable noise levels that would likely exceed allowable ambient noise levels of 80 dBa in the immediate vicinity of the restoration site. All construction sites are anticipated to be more than 500 feet from any sensitive noise receptors. The nearest noise receptors would include the recreating public on nearby trails and residents of nearby homes outside the levees. Under the Proposed Action, noise impacts during heavy equipment use would be short term, and heavy equipment would be used only during normal business hours to minimize noise disturbance. The riparian vegetation and levee would abate some of the noise generated by the equipment. A Construction Noise Permit may be issued by the City if sensitive noise receptors are identified within 500 feet of restoration construction sites.

Under the Proposed Action, construction equipment would temporarily generate fumes and air emissions under the Proposed Action. The level of air emissions is anticipated to be low and in compliance with local and federal air emission standards.

## 4.12 NET WATER DEPLETIONS

Depletions are projected to remain neutral in the Albuquerque Reach under the No Action Alternative (SSPA 2004). The Proposed Action may increase depletions at two site locations: (1) the Atrisco Diversion Project site and (2) the I-40 Subreach 1ch site (Figure 1.5). The site

locations for all additional work would occur on islands and bars that are temporary in nature and located within the 660-foot-wide active river channel. Based on discussions with the OSE as part of the Phase I Riverine Habitat Restoration Project, work within the active river channel would not require an OSE permit. However, the Atrisco Diversion Project site and the I-40 ch1 site do not meet this criterion. The NMISC would submit a permit application or applications, including the EA and other pertinent documentation as necessary, for these two locations. Work would not occur at locations where permits are needed until the necessary permits have been secured. Work at locations where OSE permits are not required would be phased for initial construction.

## 4.13 ENVIRONMENTAL JUSTICE

Under the No Action there would be no change to environmental justice.

The Proposed Action is in compliance with Executive Order 12898 (FR 1994b), Environmental Justice in Minority and Low-Income Populations. The proposed Project is located on the active floodplain of the Rio Grande, between the flood control levees and within the Albuquerque Reach of the river. Outside of the levees, nearby land use along this reach of the river includes residential neighborhoods of all economic strata, agricultural land, and commercial and industrial uses.

Regardless of their level, impacts would be similar throughout the Albuquerque Reach of the river and would affect a diverse group of communities and populations. There would be no disproportionately high or adverse human health or environmental effects on minority or low-income populations from the proposed Project.

## 4.14 INDIAN TRUST ASSETS

Consultation has taken place to identify any ITAs in the Project area and to assess potential impacts, in accordance with Secretarial Order 3175 and Reclamation ITA policy. No ITAs were identified. Therefore, no impacts are anticipated from the No Action Alternative or the proposed Project.

## 4.15 IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Project may result in unavoidable harm to the silvery minnow. While this result would represent a loss to the species, the USFWS did not anticipate that similar activities conducted under Phase I of the Project would jeopardize the species' continued existence (USFWS 2005). Implementation of the Project would also result in the commitment of resources such as fossil fuels, construction materials, and labor. In addition, state and federal public funds would be expended for the construction of the proposed Project.

## 4.16 CUMULATIVE IMPACTS

NEPA defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable

future actions regardless of what agency or person undertakes such other actions" (42 U.S.C. 4331-4335). Cumulative environmental impacts associated with the Rio Grande, including islands and riparian areas, have been evaluated for the following projects relative to the Proposed Action.

Middle Rio Grande Endangered Species Act Collaborative Program

The Collaborative Program has solicited and funded multiple habitat restoration projects, including City of Albuquerque and USACE restoration projects near the Proposed Action (Reclamation 2002). Silvery minnow augmentation funded by the Collaborative Program should provide positive synergistic interactions with habitat that would be created by this Project.

Upper Rio Grande Water Operations Environmental Impact Statement

Currently, the USACE, the NMISC, and Reclamation are signatories of a Memorandum of Agreement to develop integrated water operations rules for several dams on the Rio Grande upstream of the Project area (URGWOPS 1999).

City of Albuquerque San Juan–Chama Drinking Water Project

The City will begin construction of a diversion dam in the Rio Grande south of the Alameda Bridge to divert San Juan–Chama water for the City's drinking water supply. The City is currently constructing water intakes and a crossing of the Rio Grande at Campbell Road for that project. Several proposed habitat restoration projects are specified for the Albuquerque Reach as mitigation of adverse effects from the San Juan–Chama Project (Reclamation 2004).

Middle Rio Grande Bosque Wildfire Project and Wetland Restoration Project

The USACE is involved in a Bosque Wildfire Project throughout the Albuquerque Reach of the Rio Grande, thinning riparian vegetation at selected locations adjacent to the river. The USACE is also involved in Ecosystem Restoration projects at the Albuquerque Biologic Park and the Wetland Restoration Project south of Central Avenue within the City (USACE 2000).

NMISC Silvery Minnow Habitat Restoration Projects

Currently, the New Mexico Water Trust Board and the NMISC are conducting projects to improve silvery minnow habitat. These projects include increasing scientific knowledge of available food for aquatic species within the MRG and incorporating large woody debris for improved mesohabitat (Tetra Tech 2004). Phase I construction for the habitat restoration projects included modification of 37 acres within three subreaches in the Albuquerque Reach of the MRG using many of the techniques outlined in this EA. Phase II of that project would incorporate preliminary findings and information from Phase I to best plan and design treatments.

Bureau of Reclamation River Maintenance Projects

Reclamation has authority for river-channel maintenance on the Rio Grande and regularly monitors changes in the channel to keep track of priority maintenance sites where there is concern about possible damage to riverside facilities. At the Bernalillo Priority Site, the planned maintenance action is to install bendway weirs, realign the main channel of the Rio Grande at the project site, and create a secondary channel to reduce erosion potential on the east bank.

Analysis of Cumulative Impacts

The cumulative effects of the Proposed Action plus the described related projects may produce short-term changes in several aspects of the existing hydrology, hydraulics, and fluvial geomorphology throughout the Albuquerque Reach. The Proposed Action may affect other specific downstream restoration projects by changing local fluvial geomorphology and hydrology. Other projects described here may affect the Proposed Action by altering physical processes upon which the proposed techniques depend. Changes in upstream water operations may augment and improve or may decrease the effectiveness of proposed projects.

All treatment and control areas would be monitored for two years to determine the effectiveness of the methods implemented during Phase II of the Proposed Action and the potential hydrologic and geomorphic alterations to the Project area. Long-term monitoring, up to ten years, and adaptive management would be a coordinated effort with the Collaborative Program and would incorporate interagency objectives to assess the self-sustaining and successfully regenerating ability of restoration treatments. After monitoring and natural reshaping, the remaining island areas void of native vegetation may be replanted with appropriate native species to stabilize the contours to the extent possible. Following restoration, the treated islands are expected to have a surface elevation suitable for inundation at moderate to high river flows. Revegetation, whether natural or planted, would also provide suitable roughness to decrease flow velocities and increase egg and larva retention.

Geomorphic, vegetation, and fisheries monitoring would be components of the monitoring plan. Geomorphic monitoring would occur at least once a year following spring runoff or summer monsoons. Hydrologic events would constitute the need for additional geomorphic monitoring efforts. Vegetation monitoring would occur twice on an annual basis. Fisheries monitoring would focus on presence/absence of silvery minnow. The Collaborative Program is currently working to finalize a fishery-monitoring plan for the purpose of monitoring presence/absence of silvery minnow eggs, larvae, and adults.

All participants to the various activities on the Rio Grande recognize the need for dramatic change in the riverine ecosystem to provide better support for the endangered silvery minnow; however, the complex cumulative outcome of multiple actions is unpredictable and potentially adverse to water quality and various indicators of silvery minnow reproductive success. The only effective means of assessing complex cumulative effects on ESA critical habitat and species is to have group participation among all involved parties. Sound scientific measurement of baseline parameters most closely associated with silvery minnow success needs to be developed and a detailed silvery minnow monitoring protocol implemented.

## 4.17 SUMMARY OF EFFECTS AND SITE SUITABILITY

Different techniques considered for habitat restoration within the Albuquerque Reach would have short-term effects on environmental resources but long-term beneficial effects on biological resources, including silvery minnow and silvery minnow critical habitat. The four subreaches considered for the different restoration techniques are not equally suitable. The overall effects of the proposed restoration techniques are summarized in Table 4.2.

**Table 4.2.** Environmental Consequences of Proposed Restoration Techniques and No Action Alternative

| Environmental Resources | Proposed Action | No Action |
|---|---|---|
| Geomorphology and Soils | Short-term adverse impact to channel and bank characteristics; long-term beneficial effects on these altered channel features | Development of channel features that are unfavorable for silvery minnow egg retention and larval and adult success would continue |
| Hydrology and Hydraulics | Short-term minimal adverse impact to hydrology; long-term positive effect | No change in the amount or duration of flows in the Albuquerque Reach |
| Water Quality | Short-term effects within applicable water quality standards; no long-term adverse effects | No change in levels of constituents such as pH, DO, temperature, and turbidity |
| Cultural Resources and TCPs | No adverse effects on archaeological resources or TCPs are anticipated | No change in cultural resources and traditional cultural properties |
| Vegetation and Wetlands | Limited short-term effects on vegetation, including some wetlands, no adverse effect on dense, native woody vegetation >3 m tall | Continued trends in vegetation, such as increases in non-native species and woody vegetation on islands |
| Fish and Wildlife | Short-term adverse impacts; long-term positive effect on fish and wildlife abundance and diversity from habitat improvements are anticipated | Continued adverse trends toward decreased fish and wildlife abundance and diversity |
| Threatened, Endangered, and Special Status Species | Short-term direct effects my occur from the operation of heavy equipment in the channel where the silvery minnow is known to occur, but effects would be minimal and not likely to jeopardize the continued existence of silvery minnow; may affect but not likely to adversely affect southwestern willow flycatcher, yellow-billed cuckoo, and bald eagle | Continued adverse trend toward decreased habitat for silvery minnow |
| Socioeconomics | No adverse effects; the costs of implementing the Project are within the annual range of variability for federal and state expenditures for Bernalillo and Sandoval Counties | No short-term change in socio-economics is anticipated |
| Visual and Aesthetic Resources | Short-term negative impacts; long-term positive effect | No long-term or short-term changes in the visual and aesthetic experience |
| Air Quality and Noise | Short-term adverse impact from increased ambient noise levels | No change in air quality or noise |
| Net Water Depletions | No adverse effects anticipated, further evaluation required | No change in net water depletions |
| Environmental Justice | No adverse effect | No change in environmental justice |
| Indian Trust Assets | No ITAs identified; no adverse effects | No change in ITAs |

Multiple site assessments were completed at the 550 Subreach to examine appropriate restoration sites and techniques. Determination of proper treatments was based on multiple field visits involving numerous GPS data collection points, photographs, historic channel locations, and the location of other projects within the vicinity of this subreach. Proposed restoration techniques include the creation of an ephemeral channel on one island, and the creation and enhancement of a series of braided channels on an attached bar downstream of the island. Access would be via existing levee roads in the vicinity of the U.S. Highway 550 Bridge. Proposed access and staging areas would be coordinated with the City Open Space Division, Reclamation, and MRGCD.

Modification to islands and banks was identified as the most practicable and potentially effective restoration technique in the Paseo del Norte Subreach. Multiple site assessments, which included the collection of GPS data, photographs, and vegetation data, were completed between the Paseo del Norte and Montaño Bridges. Work at this location would help create a variety of silvery minnow habitats over a wide range of flows. Equipment and personnel access and staging areas would be via existing levee roads and storm drain channels. Proposed access and staging areas would be coordinated with the City Open Space Division, Reclamation, and the MRGCD.

Bar enhancement, the creation of backwater and embayment areas, bank terracing, and the modification of islands would be utilized within the I-40 Subreach. Multiple site assessments were completed, including the collection of photographs, GPS data, and vegetation data, to evaluate this subreach. Work at this location would create essential habitat for the early life stages of the silvery minnow and promote increased egg retention during periods of high flow. Equipment access would come from the South Diversion Channel, and proposed staging and access would be coordinated with the City Open Space Division, Reclamation, and the MRGCD.

Bank-line modification, the development/enhancement of the historic Atrisco Diversion with control structures, and the creation of a backwater habitat would be implemented at the Atrisco site of the I-40 Subreach. Multiple site assessments were completed, including the collection of photographs, GPS data, and vegetation data, to evaluate this subreach. Work at this location would create essential habitat for the early life stages of the silvery minnow and promote increased egg retention during periods of high flow. Equipment access would come from the South Diversion Channel, and proposed staging and access would be coordinated with the City Open Space Division, Reclamation, and the MRGCD.

Island modification and evaluation techniques, the creation and enhancement of ephemeral channels, bank-line modification, and the removal of lateral confinements would be implemented in the SDC Subreach. Multiple site assessments were completed in this subreach, including GPS data collection, vegetation surveys, and photographs. Access would be from the Southern Diversion Channel, and proposed staging and access would be coordinated with the City Open Space Division, Reclamation, the MRGCD, and the Albuquerque Metropolitan Arroyo Flood Control Authority.

## 4.18 ENVIRONMENTAL COMMITMENTS

All applicable permits will be obtained by the NMISC prior to implementation of each phase of the Project, including but not limited to:

- Landowner access permissions
- Clean Water Act (CWA), Section 404
- State Water Quality Certification under CWA, Section 401
- Pueblo of Sandia Water Quality Certificate under CWA, Section 401
- Temporary Construction Noise Permit, City of Albuquerque Environmental Health Department
- National Pollutant Discharge Elimination System (NPDES) Permit
- Storm Water Pollution Prevention Plans

In addition to obtaining these permits, the following environmental commitments are to be undertaken by the NMISC:

- Avoiding construction or location of staging areas in jurisdictional wetlands.

- Avoiding impacts to birds protected by the Migratory Bird Treaty Act by scheduling construction outside of the normal bird breeding and nesting season (April 15 through August 15) for most avian species or conducting pre-construction breeding bird surveys and monitoring if construction were to occur during the breeding and nesting season and consultation with the USFWS if affected species are observed.

- Implementing specific mitigation measures to avoid impacts to threatened or endangered species and their habitats identified in the Project area, as identified in the Biological Opinion for Phase II from the USFWS

- Avoiding any Traditional Cultural Properties identified in the Project area identified during previous consultation with the State Historic Preservation Officer and tribal entities.

- Implementing measures to stop work and notify the Reclamation Area Archaeologist in the event that prehistoric or historic remains, human burials, or other archaeological resources are discovered during construction or monitoring.

- Water depletions for each site will be assessed. If increases do occur, they would be offset through a permitting process established by the Office of the State Engineer.

- Silt curtains and fences will be used to minimize any potential increases in turbidity in the river during and immediately after construction-related activities.

- Monitoring would be performed as described in the ten year monitoring plan at each site to ensure that project goals are met.

# 5.0 PREPARERS AND CONTRIBUTORS

## 5.1 SWCA PREPARERS

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# 6.0 CONSULTATION AND COORDINATION

Agencies and other entities contacted formally or informally to coordinate efforts in preparation of this EA include:

Albuquerque Metropolitan Arroyo Flood Control Authority
Bernalillo County
City of Albuquerque
City of Albuquerque Open Space
Hawks Aloft
Isleta Pueblo
Middle Rio Grande Endangered Species Act Collaborative Program
Middle Rio Grande Conservancy District
New Mexico Department of Game and Fish
New Mexico Environment Department
New Mexico Office of the State Engineer
New Mexico State Historic Preservation Division
Sandia Pueblo
Santa Ana Pueblo
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
University of New Mexico Heritage Program

Copies of the Public Draft EA were made available for a 30-day public inspection and review at the following locations in Albuquerque, Bernalillo, and Santa Fe:

- Albuquerque Main Library: 501 Copper NW, Albuquerque, NM 87102 (505) 768-5141
- Taylor Ranch Library: 5700 Bogart NW, Albuquerque, NM 87120 (505) 897-8816
- Bureau of Reclamation: 555 Broadway, Suite 100, Albuquerque, NM 87102 (505) 462-3540
- Santa Fe Library: 145 Washington Ave., Santa Fe, NM 87501 (505) 955-6780

Town of Bernalillo Library: 134 Calle Malinche, Bernalillo NM 87004 (505) 867-1440

The Final EA will be available for public inspection online at:
http://www.usbr.gov/uc/albuq/envdocs/index.html

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# APPENDIX A

# SITE PHOTOS

**Photo A.1:** Looking west from the riverbank at 550_1i. Note the vegetation density and height of the shrubs and trees on this island, indicating the permanence of this river feature. June 2006.

**Photo A.2:** Looking south from the northeast end of 550_1ch. Notice the abundance of non-native vegetation (tamarisk) established on the island. June 2006.

## Paseo del Norte to Montaño Subreach

**Photo A.3:** Looking south at PDN_7i. Notice the young vegetation in the foreground, indicating recent disturbance, and the more permanent vegetation in the background. The restoration effort will focus on destabilizing the vegetation and sediment on the southern half of the island. April 2006.

**Photo A.4:** Looking south along the western riverbank at the PDN_3b proposed restoration site. Notice the establishment of tamarisk along the elevated bank. June 2006.

**Photo A.5:** Looking south from the north end of I-40_1i. Notice the tall, woody vegetation on the interior of the island, indicating that the island is not prone to regular disturbance and has become a permanent channel feature. June 2006.

**Photo A.6:** Looking north at a variety of native shrubs and trees in the vicinity of the 1_40_1ch restoration site. The proposed backwater channel would be constructed in the clearing between the cottonwood trees. June 2006.

## South Diversion Channel Subreach

**Photo A.7:** Looking northwest at the unvegetated exterior (foreground) of SDC_5i and the heavily vegetated island interior. The large woody vegetation present on the island interior indicates that the island is not prone to regular disturbance and has become a permanent river feature. June 2006.

**Photo A.8:** Looking south at the heavily vegetated riverbank at SDC_5b. Notice the abundance of non-native Russian olive trees along the riverbank. This area has been disconnected from the historic floodplain and is no longer prone to overbank flooding. June 2006.

# APPENDIX B

# NEW MEXICO ENVIRONMENT DEPARTMENT

# WATER QUALITY STANDARDS

**NEW MEXICO WATER QUALITY STANDARDS FOR THE ELEPHANT BUTTE TO ALAMEDA BRIDGE REACH (NMAC 20.6.4.105):**

**A.** Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat, and secondary contact.

**B.** Criteria:

**(1)** In any single sample: pH within the range of 6.6 to 9.0 and temperature 32.2°C (90°F) or less. The use-specific numeric standards set forth in NMAC 20.6.4.900 are applicable to the designated uses listed above in Subsection A of this section.

**(2)** The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100mL or less (see Subsection B of 20.6.4.14 NMAC)

**(3)** At mean monthly flows above 100 cfs, the mean monthly average concentration for: TDS 1,500 mg/L or less, sulfate 500 mg/L or less, and chloride 250 mg/L or less.

**NEW MEXICO WATER QUALITY STANDARDS FOR THE ALAMEDA TO ANGOSTURA REACH (NMAC 20.6.4.106):**

**A.** Designated Uses: irrigation, marginal warmwater aquatic life, livestock watering, wildlife habitat, and secondary contact.

**B.** Criteria:

**(1)** In any single sample: dissolved oxygen greater than 5.0 mg/L, pH within the range of 6.6 to 9.0 and temperature less than 32.2°C (90°F). The use-specific numeric standards set forth in 20.6.4.900 NMAC are applicable to the designated uses listed above in Subsection A of this section.

**(2)** The monthly geometric mean of E. coli bacteria 126 cfu/100 mL or less; single sample 410 cfu/100mL or less (see Subsection B of 20.6.4.14 NMAC)

**(3)** At mean monthly flows above 100 cfs, the mean monthly average concentration for: TDS 1,500 mg/L or less, sulfate 500 mg/L or less, and chloride 250 mg/L or less.

**GENERAL CRITERIA FOR WATERS OF THE STATE OF NEW MEXICO (NMAC 20.6.4.13):**

**A.** Bottom Deposits and Suspended or Settleable Solids:

**(1)** Surface waters of the state shall be free of water contaminants including fine sediment particles (less than two millimeters in diameter), precipitates or organic or inorganic solids from other than natural causes that have settled to form layers on or fill the interstices of the natural or dominant substrate in quantities that damage or impair the normal growth, function or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.

**(2)** Suspended or settleable solids from other than natural causes shall not be present in surface waters of the state in quantities that damage or impair the normal growth, function or reproduction of aquatic life or adversely affect other designated uses.

**B.** Floating Solids, Oil and Grease: Surface waters of the state shall be free of oils, scum, grease and other floating materials resulting from other than natural causes that would cause the formation of a visible sheen or visible deposits on the bottom or shoreline, or would damage or impair the normal growth, function or reproduction of human, animal, plant or aquatic life.

**C.** Color: Color-producing materials resulting from other than natural causes shall not create an aesthetically undesirable condition nor shall color impair the use of the water by desirable aquatic life presently common in surface waters of the state.

**D.** Organoleptic Quality:

**(1)** Flavor of Fish: Water contaminants from other than natural causes shall be limited to concentrations that will not impart unpalatable flavor to fish.

**(2)** Odor and Taste of Water: Water contaminants from other than natural causes shall be limited to concentrations that will not result in offensive odor or taste arising in a surface water of the state or otherwise interfere with the reasonable use of the water.

**E.** Plant Nutrients: Plant nutrients from other than natural causes shall not be present in concentrations that will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.

**F.** Toxic Pollutants:

**(1)** Except as provided in 20.6.4.16 NMAC, surface waters of the state shall be free of toxic pollutants from other than natural causes in amounts, concentrations or combinations that affect the propagation of fish or that are toxic to humans, livestock or other animals, fish or other aquatic organisms, wildlife using aquatic environments for habitation or aquatic organisms for food, or that will or can reasonably be expected to bioaccumulate in tissues of fish, shellfish and other aquatic organisms to levels that will impair the health of aquatic organisms or wildlife or result in unacceptable tastes, odors or health risks to human consumers of aquatic organisms.

**(2)** Pursuant to this section, the human health criteria shall be as set out in 20.6.4.900 NMAC. For a toxic pollutant for human health not listed in 20.6.4.900 NMAC, the following provisions shall be applied in accordance with 20.6.4.11, 20.6.4.12 and 20.6.4.14 NMAC.

**(a)** The human health criterion shall be the recommended human health criterion for "consumption of organisms only" published by the U.S. Environmental Protection Agency pursuant to Section 304(a) of the federal Clean Water Act. In determining such criterion for a cancer-causing toxic pollutant, a cancer risk of 10-5 (one cancer per 100,000 exposed persons) shall be used.

**(b)** When a numeric criterion for the protection of human health has not been published by the U.S. Environmental Protection Agency, a quantifiable criterion may be derived from data available in the U.S. Environmental Protection Agency's Integrated Risk Information System (IRIS) using the appropriate formula specified in *methodology for deriving ambient water quality criteria for the protection of human health (2000)*, EPA-822-B-00-004.

**(3)** Pursuant to this section, the chronic aquatic life standard shall be as set out in 20.6.4.900 NMAC. For a toxic pollutant for aquatic life with no chronic standard listed in 20.6.4.900 NMAC, the following provisions shall be applied in sequential order in accordance with 20.6.4.11, 20.6.4.12 and 20.6.4.14 NMAC.

**(a)** The chronic aquatic life criterion shall be the "freshwater criterion continuous concentration" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act; 20.6.4 NMAC 11

**(b)** If the U.S. environmental protection agency has not published a chronic aquatic life criterion, a geometric mean LC-50 value shall be calculated for

the particular species, genus or group that is representative of the form of life to be preserved, using the results of toxicological studies published in scientific journals.

**(i)** The chronic aquatic life criterion for a toxic pollutant that does not bioaccumulate shall be 10 percent of the calculated geometric mean LC-50 value; and

**(ii)** The chronic aquatic life criterion for a toxic pollutant that does bioaccumulate shall be: the calculated geometric mean LC-50 adjusted by a bioaccumulation factor for the particular species, genus or group representative of the form of life to be preserved, but when such bioaccumulation factor has not been published, the criterion shall be one percent of the calculated geometric mean LC-50 value.

**(4)** Pursuant to this section, the acute aquatic life criteria shall be as set out in 20.6.4.900 NMAC. For a toxic pollutant for aquatic life with no acute criterion listed in 20.6.4.900 NMAC, the acute aquatic life criterion shall be the "freshwater criterion maximum concentration" published by the U.S. environmental protection agency pursuant to Section 304(a) of the federal Clean Water Act.

**(5)** Within 90 days of the issuance of a final NPDES [National Pollutant Discharge Elimination System] permit containing a numeric criterion selected or calculated pursuant to Paragraph 2, Paragraph 3 or Paragraph 4 of Subsection F of this section, the department shall petition the commission to adopt such criterion into these standards.

**G. Radioactivity**: The radioactivity of surface waters of the state shall be maintained at the lowest practical level and shall in no case exceed the criteria set forth in the New Mexico Radiation Protection Regulations, 20.3.1 and 20.3.4 NMAC.

**H. Pathogens**: Surface waters of the state shall be free of pathogens from other than natural sources in sufficient quantity to impair public health or the designated, existing or attainable uses of a surface water of the state.

**I. Temperature**: Maximum temperatures for each classified water of the state have been specified in 20.6.4.101 through 20.6.4.899 NMAC. However, the introduction of heat by other than natural causes shall not increase the temperature, as measured from above the point of introduction, by more than 2.7°C (5°F) in a stream, or more than 1.7°C (3°F) in a lake or reservoir. In no case will the introduction of heat be permitted when the maximum temperature specified for the reach would thereby be exceeded. These temperature criteria shall not apply to impoundments constructed offstream for the purpose of heat disposal. High water temperatures caused by\ unusually high ambient air temperatures are not violations of these standards.

**J. Turbidity**: Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water. Turbidity shall not exceed 10 NTU [nephalometric turbidity units] over background turbidity when the background turbidity is 50 NTU or less, or increase more than 20 percent when the background turbidity is more than 50 NTU. Background turbidity shall be measured at a point immediately upstream of the turbidity-causing activity. However, limited-duration activities necessary to accommodate dredging, construction or other similar activities and that cause the criterion to be exceeded may be

authorized provided all practicable turbidity control techniques have been applied and all appropriate permits and approvals have been obtained.

**K. Total Dissolved Solids (TDS):** TDS attributable to other than natural causes shall not damage or impair the normal growth, function or reproduction of animal, plant or aquatic life. TDS shall be measured by either the "calculation method" (sum of constituents) or the filterable residue method. Approved test procedures for these determinations are set forth in 20.6.4.14 NMAC.

**L. Dissolved Gases**: Surface waters of the state shall be free of nitrogen and other dissolved gases at levels above 110 percent saturation when this supersaturation is attributable to municipal, industrial or other discharges.

# APPENDIX C

# ACRONYMS

# ACRONYMS

| | |
|---|---|
| ARMS | Archaeological Records Management Section |
| BMPs | Best Management Practices |
| BiOp | Biological Opinion |
| CFR | Code of Federal Regulations |
| CWA | Clean Water Act |
| DO | Dissolved Oxygen |
| EA | Environmental Assessment |
| ESA | Endangered Species Act |
| FR | Federal Register |
| HPD | New Mexico Historic Preservation Division |
| ITA | Indian Trust Assets |
| LWD | Large Woody Debris |
| MBTA | Migratory Bird Treaty Act |
| MRG | Middle Rio Grande |
| MRGCD | Middle Rio Grande Conservancy District |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMAC | New Mexico Administrative Code |
| NMDGF | New Mexico Department of Game & Fish |
| NMISC | New Mexico Interstate Stream Commission |
| NPDES | National Pollutant Discharge Elimination System |
| NRHP | National Register of Historic Places |
| NTU | Nephelometric Turbidity Unit |
| NWR | National Wildlife Refuge |
| OSE | Office of the State Engineer |
| OSHA | Occupational Safety and Health Administration |
| PCPI | Per Capita Personal Income |
| RGVSP | Rio Grande Valley State Park |
| RPA | Reasonable and Prudent Alternatives |
| SDC | South Diversion Channel |
| SSED | Suspended Sediments |
| TCP | Traditional Cultural Property |
| TDS | Total Dissolved Solids |
| UNM | University of New Mexico |
| USACE | U.S. Army Corps of Engineers |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |