BIOLOGICAL ASSESSMENT

FOR NATIVE FISH PASSAGE AT

PUBLIC SERVICE COMPANY OF NEW MEXICO

DIVERSION DAM, SAN JUAN COUNTY, N.M.

Prepared By:
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for:
San Juan River Recovery and Implementation Program

May 2001

EXECUTIVE SUMMARY

This biological assessment was prepared to evaluate anticipated affects on Federally listed threatened and endangered species and their habitats resulting from the construction of fish passage facilities at the Public Service Company of New Mexico Diversion Dam, San Juan County, New Mexico. The project is located about 1 mile west of Fruitland, New Mexico (see Figure 1). The facilities would consist of a fish passage structure to allow native fish to move upstream of the diversion dam. The facility would also include selective passage components which would allow the structure to prevent movement of non-native species upstream of the diversion dam.

The fish passage project is included in the San Juan River Basin Recovery Implementation Program's (SJRIP) Long Range Plan. The goal of the SJRIP is to protect and recover native Colorado pikeminnow and razorback sucker populations in the San Juan Basin while water development proceeds in compliance with all applicable Federal and State laws, including fulfillment of Federal trust responsibilities to the Southern Ute Indian Tribe, Ute Mountain Ute Tribe, Jicarilla Apache Nation, and the Navajo Nation.

Informal consultation with the U.S. Fish and Wildlife Service and subsequent evaluations resulted in the identification of four (4) Federally endangered and two (2) threatened species that may occur within the project area.

Table 1. -Federally Listed Species

Species (Common Name)	Status	Anticipated Affects
Bald eagle	Threatened	No affect
Razorback sucker	Endangered	May affect, not likely to adversely affect (Beneficial)
Colorado pikeminnow	Endangered	May affect, not likely to adversely affect (Beneficial)
Southwestern willow flycatcher	Endangered	No affect
Mancos milkvetch	Threatened	No affect
Mesa Verde Cactus	Endangered	No affect

The project would result in no additional water depletions. Water needed to operate the fish passage structure would be non-consumptive and would be immediately returned to the river.

The proposed project is projected to have no affect on bald eagle, southwestern willow flycatcher, Mesa Verde Cactus, and Mancos milkvetch. The proposed project is expected to be beneficial to the Colorado pikeminnow and razorback sucker. Incidental take of Colorado pikeminnow and razorback sucker may occur during construction, operation and maintenance of the fish passage facility; however, the overall population response is projected to be positive.

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1.0 INTRODUCTION

1.1 General Project Description

The San Juan River Basin Recovery Implementation Program (SJRIP) is proposing to construct, operate and maintain a fish passage structure at the PNM Diversion Dam. A need has been identified to allow native fish to move upstream past the PNM Diversion Dam while preventing non-native fish movement. Establishing fish passage at PNM would allow access to upstream habitats and potentially increase the range and distribution for razorback sucker and Colorado pikeminnow.

1.2 Public Service Company of New Mexico Diversion Dam

The Public Service Company of New Mexico (PNM) Diversion Dam was constructed in 1971. The diversion structure is located on the San Juan River about 12 miles downstream of Farmington, New Mexico and near the town of Fruitland, New Mexico at River Mile 166.6. Diversion facilities include a concrete weir, a series of screened intake structures, an intake channel, a settling channel, and a pump house. The facility provides up to about 1 million gallons per hour (16,667 gpm) of water to PNM for cooling operations at the San Juan Generating Station (SJGS). The average annual diversion totals about 24,200 acre-feet per year.

1.3 Recovery Program

Federal and State agencies, water users and environmental interests have been cooperating in the SJRIP. The SJRIP, established in 1991, is comprised of a partnership between the Jicarilla Apache Nation, Navajo Nation, Southern Ute Indian Tribe, Ute Mountain Ute Tribe, State of Colorado, State of New Mexico, U.S. Bureau of Indian Affairs, U.S. Bureau of Land Management, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, and water development interests.

The goal of the Recovery Program is twofold:

1) To conserve populations of Colorado pikeminnow (formerly known as Colorado squawfish) and razorback sucker in the basin, consistent with the recovery goals established under the Endangered Species Act, 16 U.S.C. 1531 et seq., and

2) To proceed with water development in the basin in compliance with Federal and state laws, interstate compacts, Supreme Court decrees, and Federal trust responsibilities to the Southern Utes, Ute Mountain Utes, Jicarillas, and Navajos.

Program elements include the following:

1) Protection of genetic integrity, management and augmentation of populations,

2) Protection, management, and augmentation of habitat involving identifying important reaches of the San Juan River for different life stages of the endangered fish,

3) Water quality protection and enhancement,

4) Determining interactions between native and non-native fish species, and

5) Monitoring and data management to evaluate status and trends of endangered fish species, as well as other native and non-native species and to define the overall success of the Recovery Program.

A seven-year research program was completed in 1997 and flow recommendations for the reoperation of Navajo Reservoir were approved in 1999.

As part of the SJRIP, a rock fish passage structure is being constructed at the Hogback Diversions which will restore native fish passage at the Hogback Diversion and Cudei Diversion Dam is being replaced by a siphon from the Hogback canal to the Cudei canal. The removal of the Cudei diversion dam and the construction of fish passage at the Hogback diversion will restore native fish access to habitats above these two structures. In addition, the PNM weir has been identified as an impediment to fish passage and the Arizona Public Service Company weir is being assessed for its impact on fish passage.

1.4 Agency Coordination and Consultation

A list of Federally threatened or endangered species was requested from the U. S. Fish and Wildlife Service (Service) on July 10, 2000. The Service (USFWS 2000b) responded on August 2, 2000, with a list of species for San Juan County, New Mexico. It was determined that six species may occur in the project area.

Species evaluated in detail included bald eagle (*Haliaeetus leucocephalus*), southwestern willow flycatcher (*Empidonax traillii extimus*), Colorado pikeminnow (*Ptychocheilus lucius*), razorback sucker (*Xyrauchen texanus*), Mancos milkvetch (*Astagalus humillimus*), and Mesa Verde cactus (*Sclerocactus mesae-verdae*).

2.0 PROJECT DESCRIPTION

2.1 Project Design

The proposed project was designed based on the behavior of the endangered fish, their swimming abilities, dam operations and maintenance needs, and the need to limit impacts to diversions.

The fish passage alternatives being considered would construct the passage on the north bank of the San Juan River on property owned by PNM or on the south bank of the San Juan River on property leased to PNM from the Navajo Nation. Fish passage alternatives include both concrete and rock passage structures. The fish passage entrance on either side of the river would be located downstream of the dam's apron and the existing wing wall, about 20 to 30 feet below the

white water being created at the apron toe (Figure 2 and Figure 3). Natural lighting would be used to light the fish passage. If a concrete structure is constructed, experimental grouted rock may be installed on the floor of the passageway to provide diversity in flow velocities, including pockets of low velocities to serve as resting areas. Maximum average velocities in the steeper sections of the ladder would reach 3 fps (Tetra-Tech 2000).

North Bank Fish Passage Alternative

The fish passage on the north bank (Figure 2) would be constructed using a concrete channel and the ladder alignment would run from the fish passage entrance at the downstream end of the diversion around the northwest wing wall and under the PNM intake channel. The existing PNM intake channel elevation is set too high for the passageway to cross over the intake channel. Crossing through the diversion would create a significant obstruction inside the channel and hinder diversion operations and maintenance (Tetra-Tech 2000). Estimated flows for the fish ladder are between 26 cfs and 95 cfs depending on river flow (Table 1). Attraction flow needs are estimated at 50 cfs.

Two baffle types have been proposed; the chevron baffle and the Redlands style baffle. Figure 3 illustrates the two types of baffle designs.

Table 1. - Fish Ladder Hydraulic Parameters

River Flows (cfs)	500	950	4000	7000	10000	15300	19500
Estimated Average Flow in Ladder (cfs)	26	28	43	54	57**	95	***
Depth (ft)*	5.2-3.6	5.3-3.9	6.2-6.2	7.4-8.0	7.7-7.9**	11.3-12.0	***
Velocity	1.7-2.4	1.8-2.4	2.3	3.2-3.0	1.7-3.7**	2.8-2.6	***

*depth and velocity are downstream to upstream,**limit flows entering the ladder with the forebay gates,***ladder becomes inundated.

South Bank Fish Passage Alternative

The fish passage on the south bank (Figure 3) would be constructed using rock and boulder material to create a riffle and pool sequence. The boulder drops would create the baffle sections between each pool. A typical boulder baffle would include several large boulders, about 4 feet in diameter, placed in the center of the channel section with about 12 inch spacing in between. Smaller boulders would be placed to the sides of the larger center boulders. Upstream of each boulder baffle would be a pool between 2 and 4 feet deep. Pools would be placed with about 0.25 feet drop in between. Maximum velocities would be 2.7 to 2.9 fps. About 100 cfs would be needed to operate the passage.

Texas Crossing

A "Texas Crossing"(~2 ft concrete apron) would be constructed across a low-lying area of the river bank on the south side of the river just upstream of the PNM diversion. PNM leases this property from the Navajo Nation and maintains a road to perform dam maintenance activities. This bank reportedly overtops when flows in the main river channel reach approximately 7000 cfs. With operation of Navajo Dam to meet SJRIP flow recommendations, flows will exceed 10,000 cfs for 5 days at this location in at least 20% of the years, with durations of 20 days possible. Flows will exceed 8,000 cfs for 10 days in at least 1/3 of the years, with durations as high as 40 days. Since these flows will overflow the low-lying south bank, non-native fish could move upstream of the diversion dam during these events.

2.2 Construction

PNM would participate in the design process to ensure the facility does not conflict with the operations and maintenance of the diversion dam and intake system. Temporary construction easements and permits would also be acquired from affected landowners prior to construction. Following construction, all disturbed areas would be restored, as near as possible, to natural conditions.

Access to the project area would be via U.S. Highway 550. Construction staging and material storage would be within the fenced PNM property. Cofferdams would be used to direct the river around the work areas during construction. Reclamation would request Clean Water Act, Section 404 approval from the U.S. Army Corps of Engineers. The contractor or Reclamation would request water quality certification under Section 401. If discharging water from dewatering is needed, the contractor would obtain a Section 402 permit. Construction would be scheduled during low water conditions in the fall and winter of 2001 or 2002.

2.3 Operations, Maintenance and Replacement Measures

The Service or contractor would operate the fish passage structure from April through October each year. The Service would monitor native and endangered fish use of the ladder. Non-native fish would be removed, while native fish would be returned alive to the river upstream of the diversion dam via a return pipe.

Between 26 and 100 cfs of San Juan River flow would be needed to operate the fish passage structure. The fish passage would not be operational if flows in the San Juan River drop below 500 cfs.

3.0 FEDERALLY LISTED SPECIES

The U.S. Fish and Wildlife Service identified, in a memorandum dated August 2, 2000 (see attachment), nine (9) Federally listed threatened or endangered species and one candidate species that could potentially occur within the project area. Six species were evaluated in detail. The other four were not evaluated in any great detail because of the lack of suitable habitat. Evaluated species are listed in Table 1 of the Executive Summary. The known distribution and status of these species in the project area are discussed below.

Inventories were conducted by Reclamation biologists in July-November 2000. Inventories included visual surveys for bald eagle and southwestern willow flycatcher habitat. Literature research and personal communications were used to evaluate effects on the San Juan River endangered fishes. Survey data collected during the preparation of a biological assessment for the Jicarilla Water Subcontract were also used in this assessment (USBR 2000).

3.1 Razorback Sucker

The razorback sucker (*Xyrauchen texanus*) was listed as endangered by the Service on October 23, 1991 (U.S. Fish and Wildlife Service 1991). Critical habitat was designated on March 21, 1994 (U.S. Fish and Wildlife Service 1999).

Life History:

The razorback sucker is an endemic species unique to the Colorado River Basin. Razorback suckers were historically abundant and widely distributed within warmwater reaches throughout the Colorado River Basin including the San Juan River Basin. The species can be identified by its large, fleshy, subterminal mouth and is the only sucker with an abrupt sharp-edged dorsal keel behind its head. Adults often exceed 3 kg (6 pounds) in weight and 600 mm (2 feet) in length.

Males are smaller and slimmer than females but have larger fins and a more exaggerated predorsal keel. In late winter to spring, both sexes exhibit breeding colors of dark brown to black dorsally and yellow ventrally with a lateral band that can be orange, reddish, or violet. Riverine spawning is linked to the ascending limb of the hydrograph, generally during May or June in the Upper Colorado River Basin (Minckley et al 1991). Spawning appears to be ritual.

Habitat Preference/Details:

Razorback suckers occupy a variety of habitats during their lives. In general, razorback suckers prefer calmer, flat water reaches over higher velocity white water or canyon reaches (Minckley et al. 1991). Adults occupy shoreline and main channel habitats including slow runs, shallow to deep pools, backwaters, eddies, and other slow velocity habitats associated with sand substrates (Tyus and Karp, 1990; Osmundson and Kaeding 1991). During spawning, preference appears to

consist of gravel and cobble substrates clear of fine materials. All documented spawning in rivers occur in broad, flat water areas (Minckley et al. 1991). Young fish remain along shorelines in embayments and tributaries, and then disperse into channels or larger backwaters. Juveniles appear to drift downstream into these habitat types (Minckley 1991). Tyus and Karp (1990) and Osmundson and Kaeding (1991) describe these habitat preferences in greater detail.

Distribution and Abundance:

Historically, razorback suckers were found in the mainstem Colorado River and major tributaries in Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, California, and Mexico (Minckley 1983). Population declines can be attributed to constructions of dams and reservoirs, introduction of non-native fishes, and dewatering of the Colorado River system (U.S. Fish and Wildlife Service 1999).

The historic distribution and abundance of razorback suckers for the San Juan River is not well known. It is speculated that razorbacks probably used the mainstem San Juan River from its confluence with the Colorado upstream to the Colorado/New Mexico state line (Koster 1960). In the Upper Colorado River Basin, razorback sucker populations are the largest in the Green River and lower Yampa River. In the Colorado River, most razorbacks are found in the Grand Valley near Grand Junction, Colorado (U.S. Fish and Wildlife Service 1999). In 1991 and 1992, 28 adults were collected from isolated ponds adjacent to the Colorado River near DeBeque, Colorado (Burdick 1992).

Distribution of razorback suckers in the San Juan River, including introduced fish, is currently from the San Juan arm of Lake Powell to the vicinity of the Hogback (River Mile 158.6). The Hogback (a local rock formation between Shiprock and Waterflow, New Mexico) is about 8 river miles downstream of the PNM Diversion. Wild razorbacks have not been collected from the San Juan River in Colorado or New Mexico during recent sampling programs (Ryden 2000).

Between 1994 and 2000, the Service stocked 6,147 razorback suckers in the San Juan River near the Hogback, New Mexico. The Recovery Program plans to continue stocking razorbacks below PNM in the future. In August 1999, unmarked razorback suckers being reared in a grow out pond on the Navajo Indian Irrigation Project (NIIP) upstream of the PNM Diversion, escaped during flash flood events. Three unmarked razorbacks were collected during October 2000 surveys at river mile 169.0 above the PNM Diversion, which were believed to be fish that escaped from the NIIP pond (Ryden 2000). No other razorbacks have been collected above the PNM Diversion.

Critical habitat was designated for the razorback sucker by the Service on March 21, 1994. The lower San Juan River was designated as critical habitat in San Juan County, New Mexico and San Juan County, Utah. The designation reads as follows:

> New Mexico, San Juan County, and Utah, San Juan County. The San Juan River and its 100-year floodplain from the Hogback Diversion in T.29N., R.16W., section 9 (New Mexico Meridian) to the full pool elevation at the mouth of Neskahai Canyon on the San Juan arm of Lake Powell in T.41S., R.11E., section 26 (Salt Lake Meridian).

Impact from the Proposed Project:

The proposed project will have a beneficial affect on the distribution and abundance of razorback suckers. The SJRIP identified five diversion structures on the San Juan River as impediments to endangered fish movement. Three of these have been set as high priority for construction of fish passage or removal. The Cudei Diversion (RM 145) is scheduled for removal in 2002, and a fish passage was recently constructed at the Hogback diversion (RM 158)(Figure 5). The two structures were evaluated in an earlier environmental assessment prepared for the Bureau of Indian Affairs (BIA 2000). The PNM Diversion, the subject of this BA, was identified for selective fish passage to allow upstream movement of native fish, but limit migration of non-native predators. The Arizona Public Service Diversion at RM 164 is being evaluated for passage construction. The Fruitland diversion at RM 178.5 is not presently a barrier. However, depending on how it is reconstructed, it may become one. The need for passage past this site is also under evaluation. Cudei, Hogback and Fruitland diversions are all owned by the Navajo Nation and the passage work has been completed under the direction of the Bureau of Indian Affairs..

Because of continued stocking and recovery goals, there is a potential for incidental take to occur as a result of the fish facilities. Incidental take could occur as follows: 1) during project construction, 2) endangered fish may be incidentally taken at the fish passage in the fish trap, 3) endangered fish may become trapped on the intake grate of the inlet or pump intake screens of the existing PNM Facility, and 4) after being released from the fish trap, endangered fishes in exhausted condition may move back downstream over the dam. Because the proposed project will not require additional depletions from the San Juan River and is designed to restore endangered fish passage and control non-native species, the PNM Fish Passage Facilities may affect, but is not likely to adversely affect, the razorback sucker. Project affects would be beneficial to the recovery of the razorback sucker; however incidental take may occur.

3.2 Colorado Pikeminnow

The Colorado Pikeminnow (*Ptychocheilus lucius*) was listed as endangered by the Service on March 11, 1967 (U.S. Fish and Wildlife Service 1967). Critical habitat was designated on March 21, 1994 (U.S. Fish and Wildlife Service 1994).

Life History:

The Colorado pikeminnow (formerly known as the Colorado squawfish) is an endemic species unique to the Colorado River Basin. It is the largest cyprinid fish native to North America. It is a streamlined riverine fish that can reach lengths of 1.8 m and weights of 45 kg (Minckley 1973). The Colorado pikeminnow is a long-lived (50 + yrs.), large, elongated fish with large nearly horizontal mouth and long, slender pharyngeal teeth adapted for grasping and holding prey (Minckley 1973, Osmundson et al 1997).

Once Colorado pikeminnow reach a size of 3 or 4 inches, their diet consists almost exclusively of other fishes. Males become sexually mature earlier and at a smaller size than females. Most fish mature by age 7 and 500 mm (20 inches) in length (Vanicek and Kramer 1969).

Spawning is linked to the descending limb of a natural hydrograph as waters reach or exceed 20^{O} C (U.S. Fish and Wildlife Service 1999). Spawning generally occurs between late June and late August.

Habitat Preference/Details:

Spawning sites are comprised of clean-cobble substrate with deep interstitial voids (U.S. Fish and Wildlife Service 1999). Colorado pikeminnow are believed to migrate to pool/riffle areas near the spawning sites. The fish appear to use deep pools, eddies, or mixing zones as resting areas near the spawning sites (Holden 1999). Warm water temperature, discharge, and photoperiod are possible spawning and/or spawning migration cues (Holden 1999).

In the Colorado and Green Rivers, young of year Colorado pikeminnow are found most frequently in backwaters. These waters appear to be important nursery habitat until pikeminnow reach approximately 100 mm total length (Holden 1999). However, there are very few backwaters in the San Juan River, so young of year pikeminnow utilize other low velocity habitat types.

Adult Colorado pikeminnow have been collected from all habitat types but most frequently areas including runs, eddies, backwaters, and pooled canyon mouths. During spring (pre-runoff and runoff), adults tend to use backwaters, flooded mouths of washes, and other low-velocity habitats that are warmer than main channel habitats. As warm waters and flows recede, pikeminnow use eddies, runs and other habitats associated with the main channel. During the fall and winter, pikeminnow use lower-velocity shoreline habitats (Holden 1999).

Distribution and Abundance:

Historically, Colorado pikeminnow were distributed throughout warm water reaches of the Colorado River Basin from Wyoming to Mexico. By the 1970's, the fish was extirpated from the

lower basin below Glen Canyon Dam and from portions of the upper basin. Colorado pikeminnow are currently restricted to the Upper Colorado River Basin and inhabit warmwater reaches in the Colorado, Green, San Juan Rivers, and their associated tributaries. Population declines can be attributed to construction of dams and reservoirs, introduction of non-native fishes, dewatering of the Colorado River system and the loss of natural hydrology (U.S. Fish and Wildlife Service 1999).

In the San Juan River, Colorado pikeminnow are found in low numbers. In 1998, 49 adult Colorado pikeminnow were stocked in the San Juan River above the PNM Diversion Dam. These fish were fitted with radio-transmitters to monitor movements. Fish have been documented as moving downstream past the PNM Diversion Dam. The most recent Colorado pikeminnow collection was at river mile 138.9 about 27 miles downstream of the PNM Diversion Dam (Ryden 2000).

Critical habitat was designated for the Colorado pikeminnow by the Service on March 21, 1994 (U.S. Fish and Wildlife Service 1994). The six designated areas encompass 1) Yampa River, 2) Green River, 3) White River, 4) Gunnison River, 5) Colorado River and 6) San Juan River (USFWS 1994).

The project area is within the critical habitat designation for San Juan County, New Mexico, and reads as follows:

> New Mexico, San Juan County, and Utah, San Juan County. The San Juan River and its 100-year floodplain from the State Route 371 Bridge in T.29N., R.13W., section 17 (New Mexico Meridian) to Neskahai Canyon in the San Juan arm of Lake Powell in T.41S., R.11E., section 26 (Salt Lake Meridian) up to the full pool elevation.

Habitat evaluations conducted by the Recovery Program have identified gravel- bar habitats that are likely suitable for Colorado pikeminnow above the PNM Diversion Dam. It is believed that, if passage is restored at PNM, Colorado pikeminnow will uses these sites.

Impact from the Proposed Project:

It is anticipated that the proposed project will have a positive affect on the distribution and abundance of Colorado pikeminnow. The SJRIP identified three diversion structures on the San Juan River including the PNM structure as total barriers to endangered fish movement. The other two barriers to fish movement are the Hogback and Cudei Diversion dams (both owned by the Navajo Nation) (Figure 5). The two structures were evaluated in an earlier environmental assessment prepared for the Bureau of Indian Affairs (BIA 2000). The Arizona Public Service Diversion, about one mile downstream of the PNM Diversion, is considered to be a temporary impediment to fish movement (Ryden 2000), depending upon how it is operated. At river mile

178.5, also a Navajo Nation diversion, the Fruitland Diversion could also be a total barrier to fish movement when rebuilt.

The State of Utah has been stocking larval and juvenile Colorado pikeminnow in the lower San Juan River since 1996. The Recovery Program also stocked 49 adult Colorado pikeminnow upstream of the PNM Diversion Dam in 1998; however, none of these fish are believed to still be upstream of the structure. The Recovery Program believes there is suitable spawning habitat in the San Juan River as far upstream as the confluence with the Animas River, and that if fish passage is restored, Colorado pikeminnow will use the river above the PNM Diversion (Ryden 2000). Construction of the fish passage facility would also allow Colorado pikeminnow that move downstream past the PNM Diversion Dam to move back upstream of the dam.

As populations of endangered fish increase in the river and the range expands above the PNM Diversion Dam as a result of installation of the fish passage and other actions of the SJRIP, a potential for incidental take at this facility may develop. Incidental take could occur as follows: 1) during project construction, 2) endangered fish may be incidentally taken at the fish passage in the fish trap, 3) endangered fish may become trapped on the intake grate of the inlet channel or pump intake screen of the existing PNM facilities, and 4) after being released from the fish trap, endangered fishes in exhausted condition may back downstream over the dam. Because the proposed project will not require additional depletions from the San Juan River, and is designed to restore endangered fish passage and control non-native species, the PNM Fish Passage Facilities is projected to may affect, but is not likely to adversely affect, the Colorado pikeminnow. Project affects would be beneficial to the recovery of the Colorado pikeminnow; however, incidental take may occur.

3.3 Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was listed as endangered in 43 of the 48 contiguous states on February 14, 1978. On August 11, 1995, the species was reclassified threatened by the Service (U.S. Fish and Wildlife Service 1995b).

Life History:

The bald eagle is distinctive because of its white head, white tail plumage, dark brown to charcoal black wing and body plumage, and massive yellow bill. The bald eagle ranges from 30-43 inches (75-108 cm) in height and has a wing span between 7-8 feet. Males often appear darker than females. Females are larger than males. Immature bald eagles (6 months to 2 years old) have a dusky head and tail plumage (Peterson 1990; U.S. Bureau of Reclamation 1994).

Feeding habitats are eclectic, reflecting the opportunistic behavior of large raptors. Prey include fishes, ground dwelling scuirids, waterfowl, ungulate carrion and lagomorphs (U.S. Bureau of Reclamation 1994).

Age of first breeding is commonly assumed to be coincident with acquisition of definitive adult plumage. Breeding commonly occurs between 6 and 7 years old. Nest building and repair occur every year. Both male and females build stick nests that are used over many years. Nests can be as large as 3 m (10 ft.) high and 2.1 m (7 ft.) wide. Alternate nests may be present in the breeding area, but pairs usually use one nest until it either falls from the tree or the tree is felled (U.S. Bureau of Reclamation 1994).

Egg laying normally occurs in early February to mid-April depending on elevation. Average clutch size is two eggs. Incubation averages 31 to 35 days. Eggs hatch in mid-March to mid-May and the nesting period lasts 11 to 14 weeks. Both genders incubate, brood and feed young but the female performs most of the tasks. Fledglings are dependent on adults for 6 to 10 weeks and adults will feed juveniles other than their own (U.S. Bureau of Reclamation 1994).

Habitat Preference/Detail:

Bald eagles occupy riparian or lacustrine habitats almost exclusively during the breeding season, but occasionally exploit upland areas for food and roost sites, especially during the winter. Nests sites are mostly commonly distributed around the periphery of lakes and reservoirs larger than 80 acres in size. Nesting also occurs linearly along forested corridors of major rivers, usually within 1 mile of shore; however, cases have been reported of birds nesting as far as 9.3 miles from water while exploiting locally abundant prey such as prairie dogs (U.S. Bureau of Reclamation 1994).

Distribution and Abundance:

The bald eagle is the only species of *Haliaeetus* occurring in and restricted to North America. Historic bald eagle distribution included every state (except Hawaii) and Canadian province, and portions of northern and eastern Mexico (Brown 1976). Populations became depressed in the 1960's from affects of the pesticide DDT.

The bald eagle was reported in New Mexico by early recorders. When the Southwestern Bald Eagle Recovery Plan was developed, no bald eagle nests were known to exist in New Mexico. Bald eagles currently winter in small numbers in northwestern New Mexico and along the San Juan River (USBR 2000). Wintering bald eagles arrive in mid-November and leave by late March or early April. Wintering bald eagles are seen concentrating at reservoirs and along streams and rivers.

Impacts from the Project:

As indicated in the Jicarilla Subwater Contract Biological Assessment (USBR 2000), bald eagle use of the area around the SJGS is expected to be light. The San Juan River near the diversion dam may provide fishing habitat; however, riparian vegetation at the diversion structure is not likely to provide adequate perches for foraging, shade or roosting. Individual trees along the San Juan River could provide nest or roosting locations; however, no nesting has been recorded.

Construction activities during the winter season may result in birds avoiding the area during construction; however, the project is not expected to affect wintering bald eagle habitat. No concentrations are known within 1 mile of the project area; therefore, the project is not expected to affect bald eagles.

3.4 Southwestern Willow Flycatcher

The southwestern willow flycatcher (*Empidonax traillii extimus*) was listed by the Service as endangered on February 27, 1995 (U.S. Fish and Wildlife Service 1995). Critical habitat was designated on July 22, 1997 (U.S. Fish and Wildlife Service 1997).

Life History:

The southwestern willow flycatcher is a small riparian obligate nontropical migrant, approximately 15 cm (5.75 inches) long. It has a greyish green back and wings, whitish throat, light grey-olive breast, and pale yellowish belly. Two wingbars are visible; the eye ring is faint or absent. The upper mandible is dark; the lower is light. The southwestern willow flycatcher is an insectivore and feeds in dense riparian vegetation (U.S. Fish and Wildlife Service 1995).

The southwestern willow flycatcher normally nests in late May or early June and fledge young in early to mid-July. Birds typically arrive onsite in May, build nests in late May to June, lay eggs and incubate in June and July, and fledge in late June to early August (Sogge et al. 1997). The presence and status is often confused by the presence of migrating individuals of the northern subspecies passing through southwestern willow flycatcher breeding habitat. The nest is a compact cup of fiber, bark and grass, typically rimmed with feathers and lined with layers of grass or other fine, silky material. Material is often seen dangling from the bottom of the nest (U.S. Fish and Wildlife Service 1995).

Habitat Preference/Detail:

The southwestern willow flycatcher occurs in riparian habitats along water bodies, wetlands and streams, where dense growths of willows (*Salix sp.*), *Baccharis*, arrowweed (*Plucea sp.*), buttonbush (*Cephalanthus sp.*), tamarisk (*Tamarix sp.*), Russian olive (*Eleagnus sp.*), or other plants are present. Scattered overstory of cottonwood (*Populus sp.*) are often also present. Flycatchers use these riparian communities for both nesting and foraging (U.S. Fish and Wildlife Service 1995). Nesting habitat is described in greater detail in Sogge et al. (1997).

Distribution and Abundance:

The breeding range of the southwestern willow flycatcher includes southern California, Arizona, New Mexico, southwestern Colorado, extreme southern portions of Nevada and Utah, and Western Texas. The southwestern willow flycatcher is currently known to breed in only about 75 sites in riparian habitats in the southwest. The known breeding population is estimated between 300 and 500 pairs (Sogge et al. 1997).

Population declines are believed to be primarily due to habitat loss and modification; however, black-headed cow bird parasitism is also believed to be a significant contribution.

In 1997 and 1998, willow flycatcher surveys were conducted within selected San Juan River riparian areas from Navajo Dam to the confluence of Lake Powell. These presence/absence surveys identified numerous singing male willow flycatchers, including 12 to 14 in 1997 and 21 in 1998 within the New Mexico portion of the San Juan River. These willow flycatchers were identified during the first and second survey periods and, therefore, could not be identified to subspecies level. Most significantly, in 1998, four to five fledged southwestern willow flycatchers were confirmed during the third survey period. Breeding southwestern willow flycatchers and their nests were found several miles downstream of Shiprock, New Mexico near the Malpais Arroyo on the Navajo Nation (Ecosphere 1999). No surveys were conducted near the PNM Diversion Dam in 1997 or 1998. Additional surveys were conducted on the San Juan River in 1999 using Service protocols that include the PNM Diversion Dam. No flycatchers were observed near the property. Overall, the area was determined to have poor to marginal nesting habitat (Ecosphere 2000).

Impact from the Project:

Riparian habitat along the San Juan River near the PNM Diversion Dam is considered to be poor to marginal using the habitat characteristics described in Sogge et al. (1990). The riparian vegetative community is primarily Russian olive-tamarisk with several scattered willows and cottonwood trees.

Several patches (>50 ft.) of Russian olive-tamarisk occur along both sides of the river upstream and downstream of the Diversion Dam. These patches may provide some limited habitat for the southwestern willow flycatcher. These areas will not be modified by construction activities on the north bank of the river. About 1.5 acres of Russian olive, tamarisk, and willows would need to be removed to construct the ladder on the south bank. Appropriate wetlands mitigation would be developed to replace impacted wetlands.

Because the project would be constructed in the fall and winter, outside of the nesting season for the southwestern willow flycatcher, and surveys conducted by Ecosphere did not locate southwestern willow flycatchers , the proposed project is not projected to affect southwestern willow flycatchers.

3.5 Mesa Verde Cactus

The Mesa Verde cactus (*Sclerocactus mesae-verdae*) was listed as threatened on October 30, 1979 by the Service (USFWS 1984).

Life History:

The Mesa Verde cactus usually consists of single globose stems, although clusters of as many as 15 stems, 1.5 to 3 inches tall and with equal diameter may sometimes be found. The cactus has radial spines, cream colored flowers about 0.75 inches in size, and green fruit which turns brown with age (USFWS 1984).

Habitat Preference/Detail:

Mesa Verde cactus is generally restricted to the Fruitland and Mancos shale formations, which are easily erodible and form badlands with sparse vegetation. The cactus is found most frequently on hill tops, benches, and slopes, but rarely on level ground at elevations between 5,232 feet and 6,450 feet.

Distribution and Abundance:

The Mesa Verde cactus has been found in five populations on the eastern edge of the Navajoan Desert in Montezuma, County, Colorado and San Juan County, New Mexico. Total number of plant numbers are estimated between 5,000 and 10,000. One population occurs east of the Hogback and north of Waterflow, New Mexico on Bureau of Land Management and State of New Mexico properties (USBR 2000).

A population of Mesa Verde cactus also occurs under the PNM transmission line. No Mesa Verde cactus have been found within the project area along the San Juan River. Collection and

habitat destruction are believed the primary causes for reduced Mesa Verde cactus distribution and abundance (USBR 2000).

Impacts of the Proposed Project:

The proposed project is not projected to affect the known population of Mesa Verde Cactus. The know population is a considerable distance from the project area. PNM monitors this population on a regular basis and schedules maintenance activities to avoid contact with the plant.

3.6 Mancos Milkvetch

The Mancos milkvetch was listed as an endangered species by the Service on June 27, 1985 (USFWS 1989).

Life History:

The Mancos milkvetch is a small, tufted perennial that forms clumps up to 12 inches in diameter. The top is a dense aggregation of persistent, spiny leafed stalks. The leaves can be up to 1.6 inches in size with 7 to 11 oval leaflets. Flowers are lavender to purple in color with a conspicuous lighter-colored spot in the throat of the coralla tube. Egg shaped fruit with four to nine seeds are common (USFWS 1989).

Habitat Preference/Detail:

Mancos milkvetch is known only from remote semiarid sandstone rimrock ledges and mesa tops of northwestern New Mexico and southwestern Colorado. Because the plant is associated with highly localized sandstone outcrops in the Four Corners area, it is likely that its current and historic ranges are similar. The plant is restricted to small, poorly-defined, tan colored units of the Point Lookout sandstone, which is part of the larger Mesa Verde stratigraphic series that is the edge of a retreating Mesozoic seacoast. The high specificity of the Mancos milkvetch to this substrate indicates the presence of some element in the rock is required by the plant for normal growth. The plant is generally found on large, nearly flat sheets of sandstone, clustered along the margins of bowl-like depressions in the bedrock. It can also be found in cracks or fissures in the sandstone or at the base of gentle slickrock inclines. The substrate is characterized by exfoliation, which may be an important distribution factor (USFWS 1989, USBR 2000).

Distribution and Abundance:

The Mancos milkvetch is known to occur in northwest New Mexico and southwestern Colorado in scattered populations between Towaoc, Colorado and the Chaco River in New Mexico. The plant is primarily found on the Navajo Nation and Ute Mountain Ute Reservations. The remaining known populations occur on New Mexico State Trust or Bureau of Land Management lands. Thirteen populations are currently known with an average density of 233 plants per acre (USFWS 1989).

Impacts of the Proposed Project:

PNM has conducted surveys on their properties for Mancos milkvetch. No known Mancos milkvetch populations have been recorded. The closest known population occurs near the Hogback, New Mexico. The proposed project is projected to have no affect on Mancos milkvetch.

3.7 Species not evaluated in detail

Federally listed or candidate species that would not be affected by the construction of the fish passage facility were not evaluated in detail. These species included black-footed ferret (*Mustela nigripes*), Mexican spotted owl (Strix *occidentalis lucida)*, Knowlton's cactus (*Pediocactus knowltonii*), and Mountain Plover (*Charadrius montanus*). Mountain Plover is a Federal candidate species.

Habitat requirements for all four species were lacking at the project site and would not be affected by the proposed project; therefore, they were eliminated from further examination.

4.0 CONCLUSIONS

No new depletions would occur from the proposed project. The proposed project would be beneficial to razorback sucker and Colorado pikeminnow by restoring fish passage to reconnect critical habitat upstream of the diversion dam and removing non-native fish which compete with or are predators of the endangered fish. Restoring fish passage at Hogback and Cudei Dams would also be beneficial to razorback sucker and Colorado pikeminnow. Incidental take may occur during construction; however, is unlikely because it is believed that no razorback sucker or Colorado pikeminnow currently use the San Juan River above the Hogback. If fish passage is successfully restored at PNM, Hogback and Cudei, there is potential for incidental take to occur as follows: 1) endangered fish may be incidentally taken at the fish passage in the fish trap, 2) endangered fish may become trapped on the intake grate of the inlet channel or pump intake screems of the existing PNM Facility, and/or 3) after being released from the fish trap, endangered fishes in exhausted condition may move back downstream over the dam. The

potential benefits of restored selective fish passage are projected to far outweigh the potential potential population affects from incidental take.

The proposed project is projected to have no affect on bald eagle, southwestern willow flycatcher, Mesa Verde cactus, and Mancos milkvetch.

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6.0 FIGURES

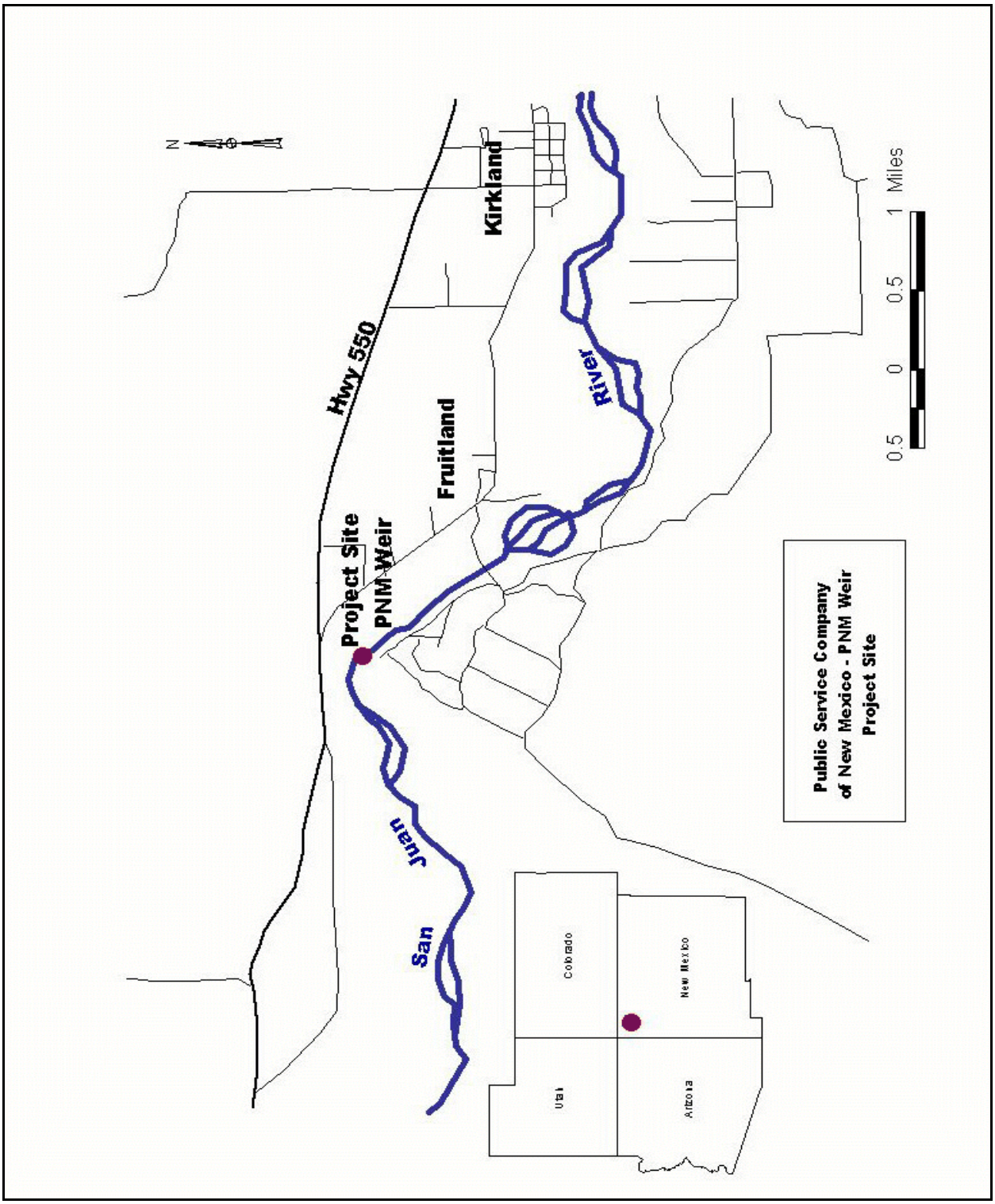


Figure 1. - Project Locator Map

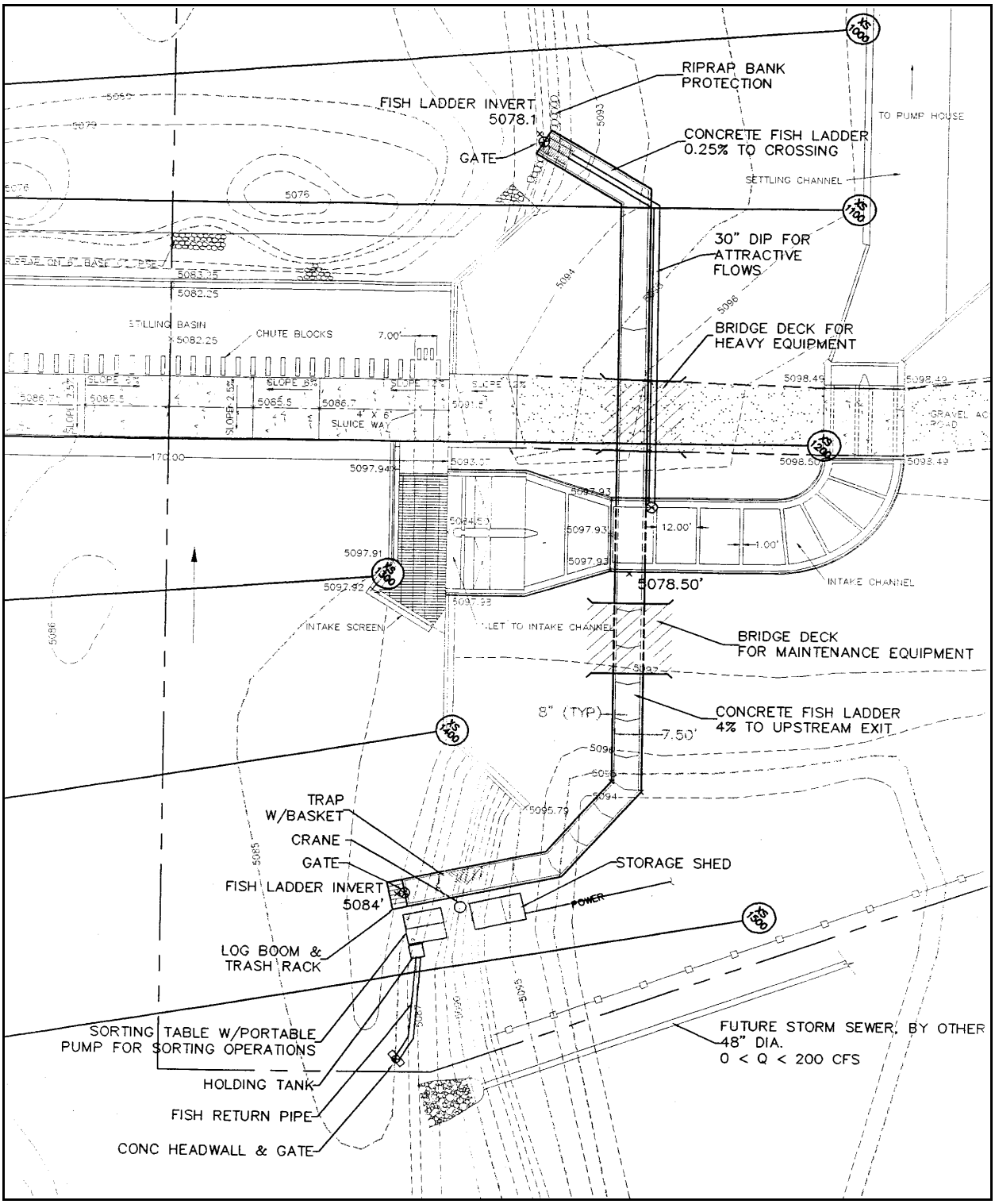


Figure 2. - North Bank Fish Passage Alternative

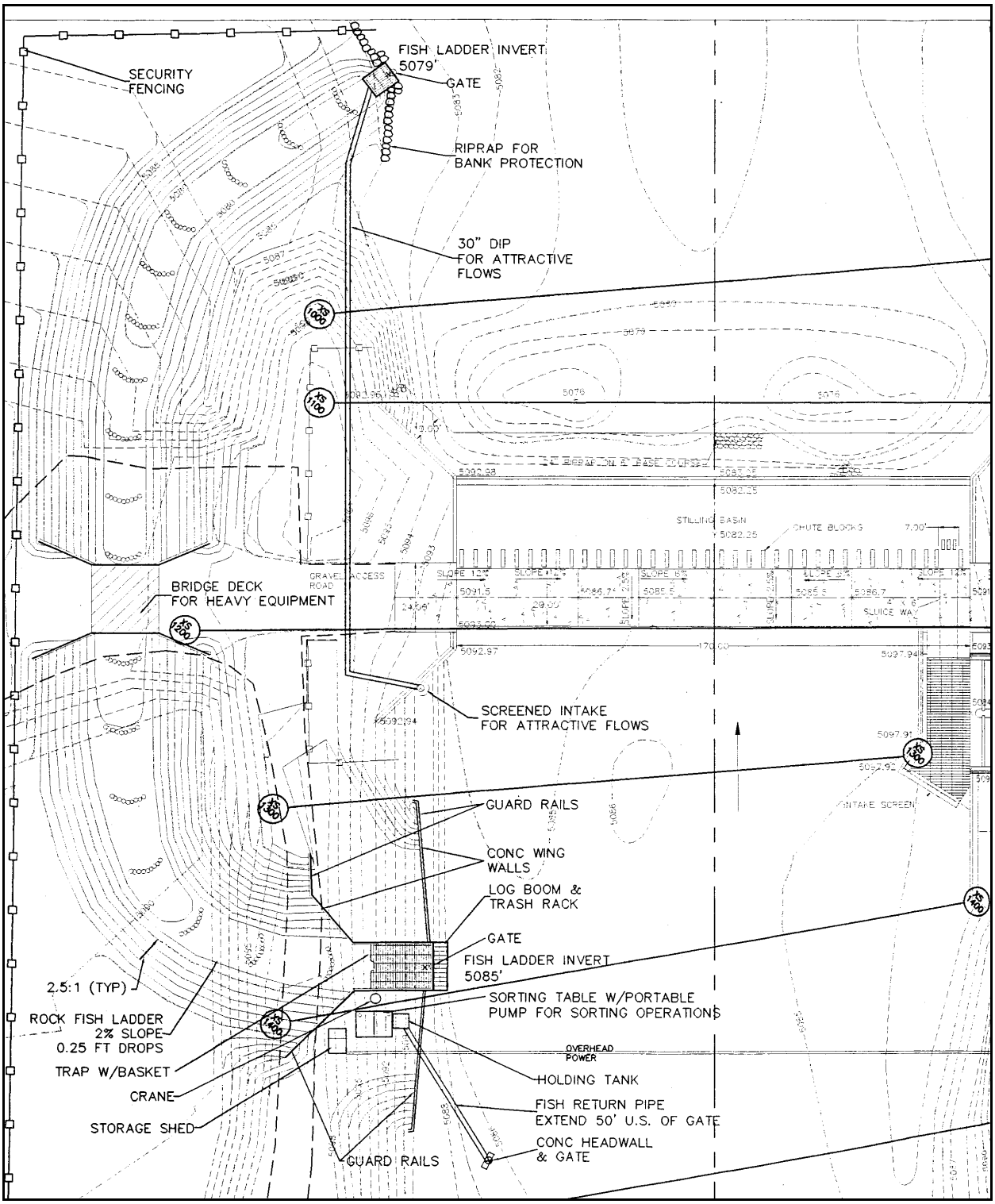
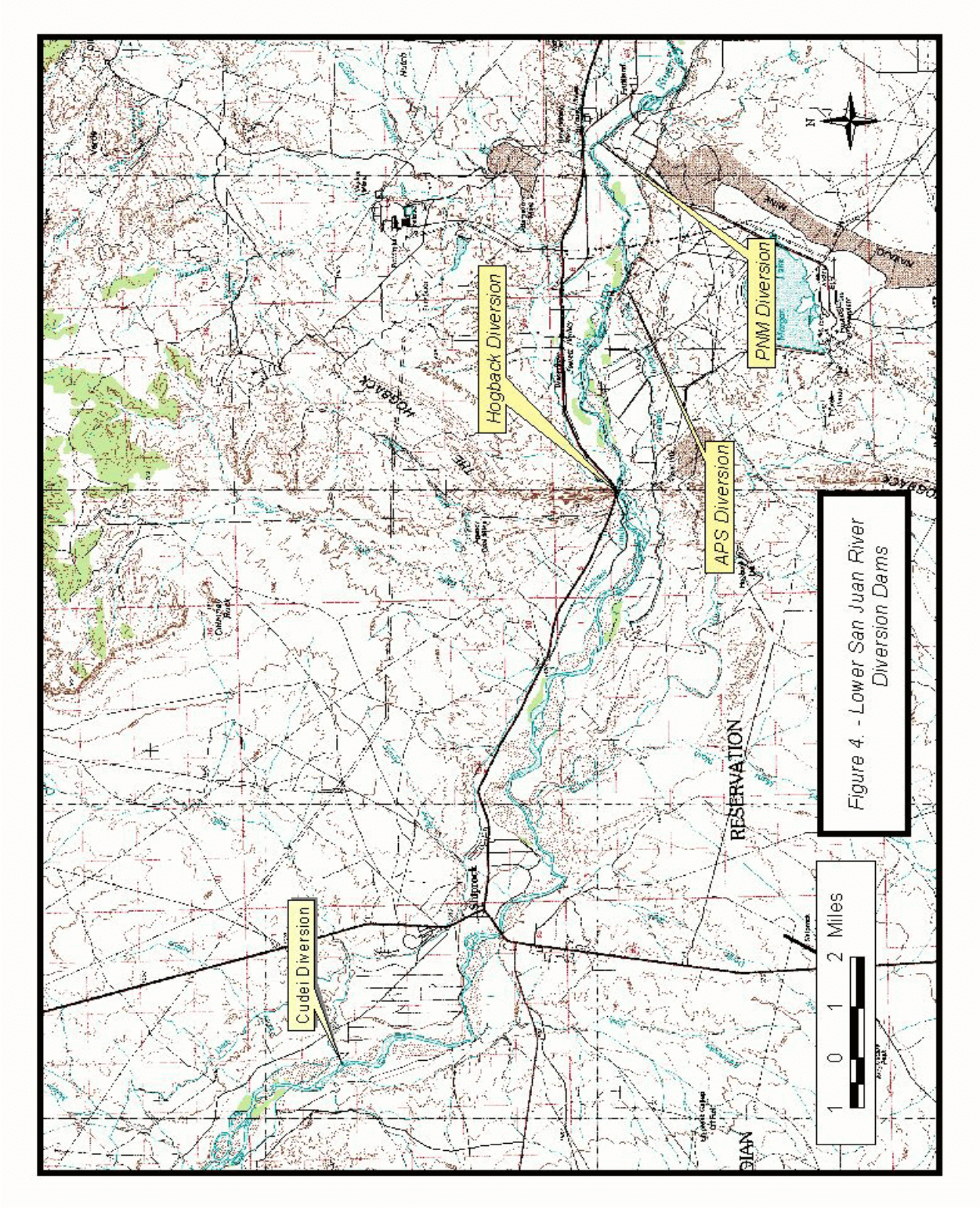


Figure 3. - South Bank Fish Passage Alternative


Cudei Diversion
Hogback Diversion
APS Diversion
PNM Diversion
RESERVATION
1 0 1 2 Miles
Figure 4. - Lower San Juan River Diversion Dams

ATTACHMENTS