

CHAPTER 4 RECOMMENDED PLAN

SIGNIFICANCE OF PROJECT RESTORATION OUTPUTS

The significance of the recommended habitat restoration can be described in a number of ways including technical recognition (importance based on scientific knowledge or judgment of critical resource characteristics) in terms of scarcity, representativeness, status and trends, connectivity, critical habitat, and biodiversity; institutional recognition (importance of environmental resource is acknowledged in laws, adopted plans, and other policy statements of public agencies); or public recognition (segment of general public recognizes the importance of the environmental resource).

From a *technical recognition* perspective, the recommended habitat is significant because it addresses habitat *scarcity and diversity*. Nationally, the loss of aquatic and riparian habitats is widely recognized. Freshwater animal species are disappearing five times faster than terrestrial animals, due (in part) to the widespread physical alteration of rivers (Ricciardi and Rasmussen 1999; NPS 2003). Of 860,000 river miles within the United States, approximately 24 percent have been impacted by channelization, impoundment, or navigation. The USFWS estimates 70-percent of the riparian habitats nationwide have been lost or altered, and 50-percent of all listed threatened or endangered species depend on rivers and streams for their continued existence. In some geographic areas, loss of natural riparian vegetation is as much as 95 percent – indicating that riparian areas are some of the most severely altered landscapes in the country (NRCS 2002). The National Research Council (NRC) has stated that restoration of riparian functions along America’s water bodies should be a national goal (NRC 2002). Urban riparian buffers are the framework for healthy streams and water quality and provide greenways that improve the quality of life for citizens (Okay 2000).

Within the State of Texas, based on analysis of more than 21,000 plant and animal species, the Nature Conservancy’s ranking of biodiversity (2002) within the 50 states and the District of Columbia show four states as having exceptional levels of biodiversity, with Texas ranked 2nd overall, but ranked 1st for diversity of birds and reptiles. Unfortunately, Texas ranks 4th in the number of extinctions, and is ranked 11th overall for species at risk. Following is a listing of Texas rankings (out of 51) for the percentage of species at risk. Those listings in bold type are significant to the recommended ecosystem restoration of the San Antonio River.

- **Bird Diversity at Risk** 6th
- Amphibian Diversity at Risk 7th
- **Freshwater Fish Diversity at Risk** 8th
- Mammal Diversity at Risk 9th
- Reptile Diversity at Risk 9th
- **Vascular Plant Diversity at Risk** 11th

The national and state trend for habitat loss is even more pronounced within Bexar County and the study area. An analysis of tree cover within the San Antonio region reveals tree loss trends in three distinct analysis areas. As might be expected, the most dramatic loss of tree cover occurs within the City of San Antonio. The city has had its heavy tree cover (areas with greater than 50% canopy) decline by nearly 39 percent from 63,522 acres in 1985 to 38,753 acres in 2001. The greater San Antonio Area, including Bexar County and surrounding suburbs saw its heavy tree cover drop from 26 percent to 20 percent; areas with medium density canopy (20-49%) had the most significant percentage change, from 6 percent in 1985 to 3 percent by 2001 – a loss of approximately 43 percent; areas with light tree canopy (less than 20% tree cover) expanded from 69 percent in 1985 to 77 percent in 2001 (American Forests 2002). Further, the introduction of exotic plant and animal species has had a substantial effect on riparian areas, leading to displacement of native species and the subsequent alteration of ecosystem properties (NRC 2002). Problematic non-native woody and herbaceous plant species are found throughout the project area. Local elimination of these species has been recommended by the USFWS (2004). This *trend* in the loss of habitat and species is expected to continue unless proactive restoration measures are taken. Between 2000 and 2020, the Bexar County population is projected to grow up to 49-percent. Of all the attributes of natural land in south Texas, wildlife habitat is the most endangered by human growth pressures.

The species benefiting from the restoration are also significant for a number of reasons. First, the restored aquatic habitat provides the opportunity for native fish populations to return to the San Antonio River within the SACIP. Fish assemblages are strongly influenced by instream habitat, which in turn is strongly influenced by the riparian zone (Paller, et al. 2000). Annual fish surveys conducted by the San Antonio River Authority (SARA) between 1998 and 2003 of the river both within and below the project area show that the percentage of non-native species within the SACIP is consistently 200-300 percent higher (15-57 percent non-native) than below the floodway (2-17 percent non-native). The fish survey conducted for this study by the U.S. Army Corps of Engineers, Engineering and Research Design Center (ERDC) found 25 percent of the total number identified were non-native species. Sixty-four percent of the native species population were species tolerant of degraded habitat. Therefore, 89 percent of the fishes surveyed within the project area are either introduced species or natives that tolerate degraded conditions.

It has been demonstrated that habitat is the limiting factor in the return of native fish to the project area. As water quality in the river has improved through better wastewater treatment, an increase in the number of pollution-intolerant fish species such as stone rollers and longear sunfish in the San Antonio River downstream of the project area has been observed. The resource agencies believe the number of native fish will increase throughout the project area after implementation of the restoration project.

Migratory birds are of great ecological value and contribute immensely to biological diversity. Bexar County provides essential feeding and resting habitat for migratory bird and is in the “central-flyway” for migrating birds. Over 300 species of birds are listed as Nearctic-Neotropical migrants in North America, and over 98% of those have been recorded in Texas. Meaning of the more than 600 species of birds documented in Texas, 54% of them

are neotropical species which depend on Texas to provide habitat for nesting or migration, and many of those are dependent on south central Texas riparian areas specifically (Table 4-1). Neotropical migratory birds have been declining in numbers for several decades. Initially, the focus of conservation for this important group of birds was focused on breeding habitat and wintering grounds; however, recently it has been recognized that the loss, fragmentation, and degradation of stop-over habitat is potentially the greatest threat to the survival and conservation of neotropical birds (Smithsonian Migratory Bird Center). In arid areas of the United States, stop-over sites are restricted to small defined habitats along shelter belts, hedgerows, desert oases and riparian corridors. The riparian corridors of south central Texas provide an opportunity for the birds to replenish fat reserves, provide shelter from predators and water for re-hydration prior to continuing, what is for most neotropicals, a trip of over 1000 miles one-way. During the fall migration, the San Antonio area is located towards the end of the long flight, and therefore, provides the vital link between having enough fat reserves to complete the trip or perish.

Desirable habitat for migratory waterfowl and neotropical migrants is limited in the San Antonio Area. The project area is centrally located between two areas where migratory birds are heavily concentrated, Mitchell Lake and Brackenridge Park. The Mitchell Lake Wildlife Refuge, located approximately 2.5 miles from the southern end of the project area, has had over 300 species of birds recorded and is one of the most heavily birded locations in Bexar County. The other area of heavy use is located just 3 miles from the northern end of the project area is Brackenridge Park. In Brackenridge Park, there is a small remnant of quality riparian habitat along the San Antonio River. This area has also recorded a large number of neotropical migrant species and represents the other heavily birded locations in Bexar County. The San Antonio River Restoration Project, centrally located between these two preferred migratory bird habitats, would increase the amount of highly used, but scarce habitat along a proven migratory bird stop-over corridor.

The Cagle's map turtle is listed as threatened by the state of Texas and listed as a candidate species for Federal listing by USFWS. Cagle's map turtle is endemic only to the Guadalupe and San Antonio watersheds. The recommended habitat restoration would restore lost components of the turtle's habitat. Male Cagle's require riffles and the transitional areas between riffles and pools for feeding while the females primarily feed in the pools. Additionally, Cagle's map turtles require large woody debris for basking and clear shoreline for nesting. The turtle is strictly a riverine species and much of the current threat to the species is loss of riverine habitat due to dam construction along the Guadalupe. There are no major impoundments on the main stem of the San Antonio River making it an uninterrupted system connected to the Gulf of Mexico with few population centers other than at its headwaters in San Antonio. Riffle and pool restoration, rip-rap removal from the banks, and restoration of a woody riparian zone are all measures that would help build habitat that could again support a population of Cagle's map turtles.

The blue suckerfish is listed as endangered by the State of Texas, and there is a historical record it once inhabited the San Antonio River. Blue suckers are adapted to swift currents where they feed on insects in cobbled areas. Lake construction and disconnection from tributaries have reduced reproductive success of the blue sucker fish, which migrates up

Table 4-1
Partial List of Bird Species Occurring in Bexar County Requiring Habitats
Restored by the NER Plan

Common Name	Scientific Name	Habitat Required in Bexar County
House wren	<i>Troglodytes aedon</i>	Riparian woodlands & uplands with dense understory
Swainson's thrush	<i>Catharus ustulatus</i>	Riparian woodlands
Rusty blackbird	<i>Euphagus carolinus</i>	Riparian woodlands
Swainson's warbler	<i>Limnothylypis swainsonii</i>	Riparian woodlands
*Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	Riparian woodlands
Swamp sparrow	<i>Melospiza Georgiana</i>	Riparian woodlands
Song sparrow	<i>Melospiza melodia</i>	Riparian woodlands
Kentucky warbler	<i>Oporornis formosus</i>	Riparian woodlands
Northern parula	<i>Parula Americana</i>	Riparian woodlands
Rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	Riparian woodlands
Scarlet tanager	<i>Piranga olivacea</i>	Riparian woodlands
American Woodcock	<i>Scolopax minor</i>	Riparian woodlands
White-breasted nuthatch	<i>Sitta carolinensis</i>	Riparian woodlands
Barred owl	<i>Strix varia</i>	Riparian woodlands
Winter wren	<i>Troglodytes troglodytes</i>	Riparian woodlands
Red-eyed vireo	<i>Vireo olivaceus</i>	Riparian woodlands
*Snowy plover	<i>Charadrius alexandrinus</i>	Riparian baregrounds
*Olive sparrow	<i>Arremonops rufivirgatus</i>	Riparian and upland woodlands
*Vermillion flycatcher	<i>Pyrocephalus rubinus</i>	Riparian and upland woodlands
*Yellow-billed Cuckoo	<i>Coccyzua americanus</i>	Riparian & upland woodlands
Louisiana waterthrush	<i>Seiurus motacilla</i>	Perennial waterways, edge of flowing streams
Northern waterthrush	<i>Seiurus noveboracensis</i>	Perennial waterways, edge of flowing streams
*American bittern	<i>Botaurus lentiginosus</i>	Perennial waterways
*Peregrine falcon	<i>Falco perginus</i>	Perennial waterways
*White-faced ibis	<i>Plegadis chihi</i>	Perennial waterways
Bank swallow	<i>Riparia riparia</i>	Perennial waterways
*Least grebe	<i>Tachybaptus dominicus</i>	Perennial waterways
Tree swallow	<i>Tachycineata bicolor</i>	Perennial waterways
Violet-green swallow	<i>Tachycineata thalassina</i>	Perennial waterways
Red-winged blackbird	<i>Agelaius phoeniceus</i>	Marshes, perennial waterways, riparian woodlands
*Least bittern	<i>Ixobrychus exilis</i>	Marshes
Groove-billed Ani	<i>Crotophaga sulcirostris</i>	Intermittent streams
Belted Kingfishers	<i>Ceryle alcyon</i>	Intermittent and perennial waterways
Prothonotary warbler	<i>Protonotaria citrea</i>	Intermittent and perennial waterways
*Reddish egret	<i>Egretta rufescens</i>	Creeks

*Species from USFWS List of Migratory Nongame Birds of Management Concern for Region 2.

Source: Kutac and Caran. 1994.

tributaries to spawn. Restoration measures included in the recommended plan are reconnection of old river remnants to the main stem of the river and reconnection to upstream tributaries.

The peregrine falcon, white-faced ibis, and Texas indigo snake also hold an endangered status by the State of Texas. All of these species have a record of occurring in Bexar County; the falcon and snake are solely dependent upon wooded riparian corridors for their habitat, while the white-face ibis requires perennial waterways.

In addition, the Guadalupe bass is a central Texas specialist historically collected in the San Antonio River. Loss of habitat has put this fish in peril to the extent that it potential for listing as a State and/or Federal endangered species. However, prior to pursuing Federal or State listing, the Guadalupe bass was named the State Fish of Texas. This designation gives similar protection as a federal or state endangered listing (personal communication TPWD). The Guadalupe bass is a swift water species inhabiting riffles and runs except during spawning when they need shallow backwater areas for breeding. Once moving from the spawning habitat, the young-of-year join sub-adults in the swifter and deeper waters associated with riffles. During winter young, sub-adults, and adults move to pools with currents. Riffles, pools, and reconnection to backwater habitats are all restoration measures included in the recommended plan for the San Antonio River.

The identified plan makes a significant contribution to a larger watershed conservation and restoration effort being implemented by Bexar County, City of San Antonio (CoSA), and San Antonio River Authority (SARA). The above entities have made commitments to improving habitat across the entire San Antonio River watershed that lay inside Bexar County. The following is a brief listing for some of the recent, current, ongoing, and future projects for the watershed.

- Cibolo Creek, Leon Creek, Salado Creek, Eagleland, and Olmos Creek Studies -- partnership studies with USACE to identify ecosystem restoration opportunities within the San Antonio River watershed.
- On-going community input for restoration of other tributaries of the San Antonio River
- City of San Antonio's Creekways program -- has already spent \$20 million to buy and preserve the riparian zone of the Salado and Leon Creeks.
- City of San Antonio's Proposition 3 (approved) -- provides for funding to purchase lands located in the Edwards Aquifer recharge zone, including creeks. Approximately \$45 million dollars is available for this effort, and thousands of acres have already been purchased.
- Bexar County, SARA, and CoSA spend a great deal for river/creek debris clean-up. CoSA maintains two fulltime crews, and SARA is spending millions to develop water quality models throughout the basin to quantify water quality benefits produced by natural creek systems.

The restored habitat along eight miles of the San Antonio from the identified plan would contribute to and benefit from the goals of the various projects listed above. As part of the

larger watershed plan, the identified restoration project provides significant watershed level outputs that will contribute to sustainability, connectivity, biodiversity, and completeness of the ecosystem.

Significance is also demonstrated by the *institutional recognition* in the importance of restoring environmental resources. The Water Resources Development Act (WRDA) of 1986 established that significant damages to fish and wildlife resources have occurred as a result of USACE water resource projects and authorizes the Corps to "mitigate" for these damages. The SACIP is a prime example of the type of project addressed in the 1986 WRDA. The construction of the SACIP was completed using criteria acceptable at that time. However, under today's heightened awareness for the importance of environmental resources the preservation of habitat would have received equal consideration with the losses to property from flooding during project formulation, and we can expect that the project would have incorporated many mitigation features similar to restoration features proposed in the recommended plan. While the recommended plan is not a mitigation project, it does meet with the spirit of the 1986 WRDA by demonstrating the Corps commitment and ability to restore the riverine functions lost due to the construction of a past flood control project. The restored riverine functions provided by the recommended plan for the San Antonio River can be considered significant by the USACE because the restoration of these functions meet with the spirit of the Water Resources Development Act of 1986, Section 906(b).

The Fish and Wildlife Coordination Act of 1934, as amended, requires all United States departments or agencies to consult with the USFWS when modifications to water bodies are proposed. The Act recognizes the contribution of wildlife resources to the nation. Extensive coordination with the USFWS has been ongoing throughout problem identification, development of restoration objectives, identification of restoration measures, development of HEP models, and habitat evaluations. The USFWS and the Texas Parks and Wildlife Department (TPWD) have dedicated extensive resources developing a set of measures toward the ultimate identification of a plan meeting their objectives for restoration of riverine habitat. The measures identified for restoration when taken as a whole, aquatic and riparian, are considered by the USFWS to have significant environmental outputs as wildlife habitat. The USFWS and TPWD look forward to seeing the project built and plans to point others to the San Antonio Restoration Project as an example of how the two objectives of flood control and habitat restoration can be integrated together. Restoration of the habitat losses caused due to the construction and maintenance of the San Antonio Channel Improvement Project (SACIP) meet with intent and provisions of the Fish and Wildlife Coordination Act by recognizing the vital contribution of wildlife resources to San Antonio, south-central Texas, and the Nation as a project which ensures wildlife resources receive equal consideration with the previously constructed flood damage reduction project. The extreme interest and input placed on the formulation of the restoration plan for the San Antonio River by the USFWS and TPWD demonstrates how significant these agencies believe the outputs will be.

Executive Order 13186 recognizes the significant contribution native species make to the well-being of the Nation's natural environment and directs Federal agencies to take preventive and responsive action to the threat of non-native species invasion and to provide restoration of native species and habitat conditions in ecosystems that have been invaded.

The SACIP has caused degradation of the riverine environment resulting in the loss of an aquatic environment supporting native aquatic species. Linked to the aquatic degradation is the loss of native riparian vegetation species, which in addition to being vital to the aquatic environment, supports native residential and migratory, game and nongame wildlife species. The extent of the degradation is so severe that it is impossible to separate the components of the riverine environment, aquatic versus riparian, to prioritize restoration measures. Virtually no vestige of a natural, complete, native riverine environment remains upon which to add only a few restoration measures and expect significant improvements. The loss of appropriate native riparian vegetation means the necessary components do not exist for the life cycle of the numerous insect species, which are the vital cornerstone of the riverine prey base both for the native aquatic insectivore species and the native riparian-dependent insectivore species. The result has been invasion of the riverine environment with invasive and non-native species. The significance of the habitat outputs from the San Antonio River Restoration project is demonstrated by its compliance with Executive Order 13186. The U.S. Army Corps of Engineers is currently working with the USFWS to develop a Memorandum of Understanding toward the purposes of EO 13186.

The importance of migratory non-game birds to the nation is embodied in numerous laws, executive orders, and partnerships. The Fish and Wildlife Conservation Act demonstrates the Federal commitment to conservation of non-game species. Amendments to the Act adopted in 1988 and 1989 direct the Secretary to undertake activities to research and conserve migratory non-game birds. Executive Order 13112 directs Federal agencies to promote the conservation of migratory bird populations, including restoring and enhancing habitat. Migratory Non-game Birds of Management Concern is a list maintained by the USFWS. The list helps fulfill a primary goal of the USFWS to conserve avian diversity in North America. Additionally, the USFWS' Migratory Bird Plan is a draft strategic plan to strengthen and guide the agency's Migratory Bird Program. The proposed ecosystem restoration would contribute directly to the U.S. Fish and Wildlife Service Migratory Bird Program goals to protect, conserve, and restore migratory bird habitats to ensure long-term sustainability of all migratory bird populations. Rangelwide protection, restoration and enhancement of terrestrial and aquatic habitats and landscapes are crucial to maintain and conserve migratory birds (USFWS 2003).

The Department of Defense has signed an Memorandum of Understanding with Partners in Flight, a cooperative effort involving partnerships among federal, state, and local government agencies, philanthropic foundations, professional organizations, conservation groups, industry, the academic community, and private individuals. A major focus of Partners in Flight is for the conservation of neotropical migrants.

The United States has recognized the critical importance of this shared resource by ratifying international, bilateral conventions for the conservation of migratory birds. These migratory bird conventions impose substantive obligations on the U.S. for the conservation of migratory birds and their habitats, and through the Migratory Bird Treaty Act, the U.S. has implemented these migratory bird conventions with respect to the U.S. The Migratory Bird Treaty Act prohibits the taking, possessing, importing/exporting, selling, and transporting of any listed migratory bird, its parts, nest, or eggs. Included in the protection provided by this

act is all North American diurnal birds of prey, except bald and golden eagles. The North American Waterfowl Management Plan (USFWS 1998), signed by the United States, Canada, and Mexico, lists wetlands, aquatic systems, grasslands, forests, and riparian areas as habitats critical to waterfowl. Between 1986 and 1997 over \$1.5 billion was invested to secure, protect, restore, enhance and manage waterfowl priority landscapes in North America. Thirty-six Important Waterfowl Habitat Areas have been identified by the USFWS, three of which are represented within Texas, and include east Texas, the gulf coast, and the playa lakes region. Central Texas, including the San Antonio area, provides a critical link between the three priority waterfowl habitat areas. The USFWS states that conservation efforts should include national and regional planning for both migratory and endemic waterfowl species. Whistling ducks, specifically mentioned in the North American Waterfowl Management Plan, are resident (nesting) within the project area.

The significance of protecting and restoring declining species and their habitat is established with both national and state laws and funds. The Endangered Species Act of 1973 (ESA), as amended, "provides a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, and to provide a program for the conservation of these species." The Department of the Interior, acting through the USFWS, is responsible for the protection of most threatened and endangered species. The Texas Endangered Species Act, also enacted in 1973 gave TPWD the authority to establish a list of fish and wildlife that are endangered or threatened with statewide extinction. The Non-game and Endangered Species Conservation Fund of Texas enables Texas Parks and Wildlife to contribute to ongoing education, research and management activities for the conservation, restoration, research, and regulation of all non-game species and their habitats. In Texas, Senate Bill 2, 77th Legislature of Texas recognizes the San Antonio River basin as a critical fish and wildlife resource. This bill requires the TPWD, The Texas Water Development Board (TWDB), the Texas Commission on Environmental Quality (TCEQ), and other agencies to establish an interagency instream flow program to determine conditions necessary to support a sound ecological environment. Further, a draft document by the Nature Conservancy identifies the riparian community native to the San Antonio River as a target community for conservation. In this publication, Crosstimbers and Southern Tallgrass Prairie Ecoregion: Communities and System Conservation Elements (2003) an evaluation of the biodiversity within an ecoregion and a blueprint for conservation action is presented.

In addition to the recommended plan significance to scarce habitats, migratory birds, endangered species, and institutional recognition, significant **public recognition and tangible support** are demonstrated in the importance of implementing the recommended plan. In 1998, the San Antonio River Oversight Committee (SAROC) was formed and is comprised of a diverse group of individuals and organizations whose objective is the restoration of the San Antonio River. Their vision is to restore the San Antonio River to a more natural condition, while maintaining the existing flood damage reduction capability. This 22-person citizen-committee has remained dedicated for four years to seeing the restoration of the San Antonio River become a reality establishes the public recognition of the significant habitat to be gained. The SAROC fully endorses the recommended plan. In addition, endorsements of the recommended plan have been received from the San Antonio River Authority, Bexar County Commissioners Court (signed by four commissioners and the county judge), the city

of San Antonio (four city councilmen). The following groups have stated their support for the restoration of the river; the San Antonio River Foundation, the U.S Fish and Wildlife Service, Sierra Club, Edwards Aquifer Authority, Bexar Audubon Society, Audubon Texas, League of Women Voters, Symphony Lane Neighborhood Association, Los Compadres de San Antonio Missions, Bexar Land Trust, The King William Association, Texas Department of Agriculture, Mitchell Lake Wetlands Society, and the San Antonio Conservation Society.

Support is also demonstrated by the commitment of funds to project construction by the city of San Antonio and Bexar County. At this time, \$30 million non-Federal dollars have been committed to the project. Further, over \$2 million has been, or will soon be, expended locally on other ecosystem restoration measures. In addition, the Fort Worth District is working for SARA on two additional ecosystem restoration projects within the Continuing Authorities Program (Eagleland and Olmos Creek). Since 1991, approximately \$33.7 million has been spent to secure, protect, restore, enhance and manage waterfowl priority landscapes in Texas. The community is highly involved in ecosystem restoration.

As a secondary benefit to the restoration project, the recommended plan also provides flood damage reduction benefits. An initial investigation by the San Antonio River Authority concluded 41 residential structures no longer lie within the 100-year flood plain as a result of the restoration project. Damages prevented are estimated at \$3.6 million. Of particular importance is the Symphony Lane neighborhood, located just upstream of S.E. Military Road (between river stations 1880+00 and 1901+00). Of the 24 residential structures currently in the 100-year flood plain, 10 will no longer be within the 100-year flood plain as a result of the project.

Regarding sustainability and the relatively low maintenance costs, the recommended plan achieves both. Once the restoration measures are in place, the natural river morphology and sediment transport will facilitate and maintain the restoration of the aquatic habitat with respect to channel slope, water velocity, and dominant substrate. Ecological succession will take over, particularly in riparian vegetation type A, and an under- and mid-story vegetation structure will develop naturally. The restoration project will require very little routine maintenance. Estimated maintenance costs are expected to be less than one-half of one percent of the total implementation cost.

DESCRIPTION OF RECOMMENDED PLAN

Restoration Features. The recommended plan is comprised of a series of pools (68.9 acres), riffles (18.4 acres), and chutes (9.4 acres), two restored river remnants (1.52 acres), nine embayments (5.13 acres), four tributary mouths (0.71 acres), a wetland (7.46 acres) and riparian vegetation (320.14 acres).

In addition to the direct habitat output produced by the recommended restoration features, the recommended restoration plan also benefits 782 acres of riparian and terrestrial habitats located adjacent to the project footprint. These lands are owned and managed by the National Park Service (NPS). The recommended plan would provide connection for the NPS

lands and the riverine habitat of the San Antonio River. The quality of both would be improved by increasing the amount of contiguous habitat, energy flow, and diversity. The riparian area of the recommended plan would serve as a corridor for wildlife movement between the different types of habitat available on NPS land, and provide habitat components to species that require both upland and riparian habitats for survival.

The restoration features are restored and sustained by a pilot channel, 29-riffle structures, two weirs, modification to the existing San Juan Dam, utility, storm water outfall, road, sidewalk, and parking lot relocations, two bridge modifications, channel invert erosion protection, channel slope and over-bank erosion protection, and planting native riparian vegetation. A detailed map of the recommended plan can be seen in Appendix F; a cross-sectional depiction of what the restoration would look like is provided in Figure 4-1.

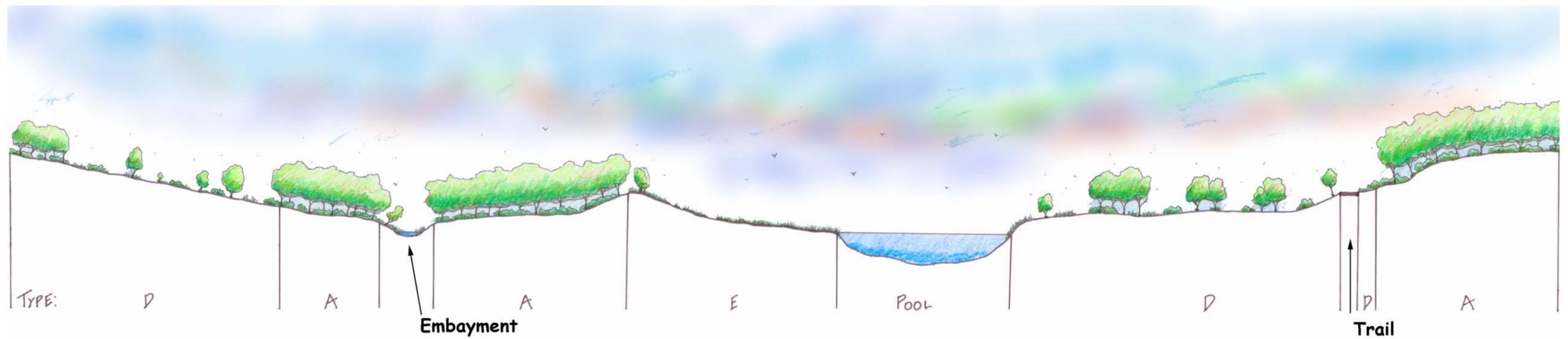
The total restoration project cost is estimated at \$87,965,519 (June 2004 price level). The total annual cost (5-5/8 percent, 50-year period of analysis) is \$6,299,391 (includes interest during construction and annual operation, maintenance, repair, replacement, and rehabilitation). The annual cost per annual habitat unit gained is \$49,800. The annual cost per acre of restoration is \$14,500. The total cost per acre for restoration is \$202,900. Table 4-2 displays a summary of the restoration project costs (an expanded description of project costs is located later in this chapter) and habitat units.

Table 4-2
Summary of Recommended Plan Costs and Habitat Units

	Total Acres	Total Project Cost	Annual Cost	Total AAHU Gained	Annual Cost per AAHU	Annual Cost per Acre
Aquatic	113.40	\$ 53,467,486	\$ 3,786,369	50.56	\$ 74,900	\$ 33,400
Riparian	320.14	\$ 34,498,033	\$ 2,443,023	75.89	\$ 32,200	\$ 7,600
Riverine	433.54	\$ 87,965,519	\$ 6,299,391	126.45	\$ 49,800	\$ 14,500

Pilot / Floodway Channel. The pilot channel, designed in accordance with fluvial geomorphology concepts as described in the Geomorphic and Sediment Transport Technical Memorandum (GSTTM), will require the excavation of about 3,809,827 cubic yards (cy) of material, of which 1,074,574 cy will remain on site as fill, and the remainder to be disposed. In addition, another 6,700 cy of existing concrete channel and dam remnant, as well as ten existing sheet pile walls, will be removed. The excavation quantity includes the existing concrete rubble lining the existing channel bottom and side slopes. The pilot channel is constructed in conjunction with the riffle structures, weirs, modification to San Juan Dam, and the invert slope protection as the complete system in accordance with the GSTTM. The pilot channel is approximately 42,400 feet in total length extending from the Lone Star Blvd Bridge to the downstream limit of the existing floodway channel. The pilot channel in the upper reach from Lone Star Blvd to the confluence with San Pedro Creek ranges between 60 and 140 feet in width, between 3 and 6 feet in depth, and has side slopes of 3H:1V. The pilot

Figure 4-1
Cross-Sectional Depiction of Restoration



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channel in the lower reach from the confluence with San Pedro Creek to the downstream limit of the floodway channel ranges between 88 and 315 feet in width, between 4 and 12 feet in depth, and has side slopes of 3H:1V. The excavation of the pilot channel will require the relocation of utilities, roads, and sidewalks, and the modification to bridges and stormwater outfalls. In addition to the pilot channel, the excavation includes that required to expand the floodway width allowing the placement of additional riparian vegetation.

Although no hazardous waste sites were identified within the project area during this study, further study will be conducted to identify any contaminated or hazardous waste. These studies will ensure that any potentially contaminated or hazardous waste is handled and disposed in a safe and efficient manner. Topsoil may be stockpiled and used as part of the riparian vegetation planting.

Riffle Structures. The riffle structures are an integral part of the pilot channel and the GSTTM. The riffle structures are inverted “T” concrete walls and held in place by anchors. The anchors are 6-inch diameter, drilled holes filled with slurry and reinforcement bar. Rock is placed on both the up- and downstream ends. The dimensions of the riffle structures are described in Table 3-8. Together with the pilot channel, the riffle structures restore the pool, riffle, and chute complexes within the river. A value engineering study may be conducted to determine the most efficient riffle structure configuration and material.

Weirs. The weirs are an integral part of the pilot channel and the GSTTM. They provide the required inflection points for channel stability and efficient sediment transport. In addition, the weir located just upstream of Ashley Road allows water to flow through the restored San Juan river remnant. The second weir, located just downstream of Ashley Road provide a sustainable source of water for the Ashley Road wetland. The weirs are concrete, inverted “T” walls, and anchored to the channel bottom. The upstream weir is about 180-foot wide and has a height of about 6-feet (from the channel bottom). The downstream weir is about 245-foot wide, and has a height of about 6.8-feet (from the channel bottom). Both weirs are anchored using drilled holes filled with slurry and reinforcement.

Modification to San Juan Dam. The modification of the San Juan Dam is an integral part of the pilot channel and the GSTTM. The modification consists of removing the top 4.5-feet of concrete from the existing structure and erosion protection. The remaining top of the structure will be leveled with grout, new erosion protection will be placed. When completed the modified San Juan Dam acts as a riffle structure.

Invert Slope Protection. The invert slope protection is an integral part of the pilot channel and the GSTTM. The invert slope protection is located downstream of Ashley Road. The protection is comprised of 36-inch riprap covering an area of about 19,000 square feet.

Riparian Vegetation. The riparian vegetation includes 53.9 acres of riparian Type A vegetation (250 trees per acre), 90.6 acres of riparian Type C vegetation (70 trees per acre), 120.1 acres of riparian Type D vegetation (30 trees per acre), and 63.25 acres of riparian Type E vegetation (native forbs and grasses) including 7.75 acres of wetland plants. Within Type A, the mid- and understory will be allowed to develop naturally, and no mowing will be

allowed. Within Type C, the midstory and understory vegetation will be predominantly native grasses; however, some areas will be designated as no-mow. The midstory and understory of these no-mow areas will be allowed to develop naturally. As design restrictions for Type C, these no-mow areas must run parallel with the river and have clear compensatory conveyance areas around them. Within Type D, only native grasses will comprise the understory. The areas of Type D will be mowed once per year to control volunteer woody vegetation. Type E vegetation consists of native forbs and grasses. These grasses will be allowed to grow to natural heights; however, mowing will be performed once per year to control volunteer woody vegetation.

The trees planted will be bare-root seedlings. These were chosen to mitigate for the potential loss in flood events as the seedlings are more likely to withstand flood forces immediately upon planting because they would have less resistance than larger trees. As the seedlings grow, their roots will have developed proportionately to the above ground shoot. Allowing an appropriate root-to-shoot ratio to develop in response to the environment, which will also assist in reducing losses to flood events.

The success of the riparian vegetation will depend upon the soil fertility, time of planting, quality and handling of the seedlings, and competition for invasive plant species. The areas to be planted will be cleared, and the topsoil removed and stockpiled. Soil fertility testing will be completed to determine the soil needs for the specific native vegetation to be planted. One or more herbicide treatments will be necessary to remove and control invasive plant species. The area will be tilled or disked, and rolled. A cover crop will be applied as a means of holding the soil and building soil conditions appropriate for tree plantings. Tree planting will occur between November 15 and March 15, preferable between December 15 and January 15. Grass planting can occur anytime, preferable in early. Planting will be completed in the same area over two or more planting seasons to mitigate for extreme climatic conditions affecting survivability in any given planting season. The seedlings must be healthy and the roots not damage or allowed to dry-out prior to planting.

Although no irrigation system is contemplated at this time, synthetic polyacrylate polymers, wetting agents, or mycorrhizae or all three will be added to increase survivability. Biodegradable polyethylene tubes have been demonstrated to significantly increase survivability and growth. If supplemental water were needed during the first summer, it could be provided by vehicle / water tank and sprayed onto the seedlings.

The habitat outputs of the recommended plan are designed for a 90-percent survival rate of the trees. Survival surveys will be performed, but assuming the rate remains at 90-percent or greater, the number of trees is acceptable for the outputs anticipated by the resource agencies. If the survival rate were to fall below the anticipated rate, then an inter-planting would need to occur to bring the seedling count back to an acceptable number. Incorporated in the survival survey should be a survey of the number and species of volunteer tree seedlings. Many of these will be undesirable (Chinaberry, etc.) and therefore will need to be removed, but there may also be some desirable species. If the number of desirable volunteers brings the "live seedling" count up to or past acceptable numbers then an inter-planting would not be necessary. Table 4-3 displays a potential vegetation list as part of the recommended plan.

**Table 4-3
Partial List of Potential Vegetation**

<u>Trees</u>		<u>Shrubs</u>	
<i>Acer negundo</i>	box elder	<i>Rhus aromatica</i>	fragrant sumac
<i>Carya illinoensis</i>	pecan	<i>Rhus microphyla</i>	littleleaf sumac
<i>Celtis laevigata</i>	sugar hackberry	<i>Rubus</i> spp.	dewberry
<i>Cercis canadensis</i>	Texas redbud	<i>Sambucus canadensis</i>	elderberry
<i>Cornus drummondii</i>	roughleaf dogwood	<i>Viburnum rufidulum</i>	rusty blackhaw
<i>Crataegus texana</i>	Texas hawthorn		
<i>Diospyros texana</i>	Texas persimmon	<u>Groundcovers/vines</u>	
<i>Fraxinus americana</i>	white ash	<i>Andropogon setigera</i>	<i>bushy bluestem</i>
<i>Fraxinus pennsylvanica</i>	green ash	<i>Aristida purpurea</i>	purple three awn
<i>Juglans nigra</i>	black walnut	<i>Bothriochloa barbinodis</i>	cane bluestem
<i>Maclura pomifera</i>	Osage orange	<i>Bothriochloa laguroides</i>	silver bluestem
<i>Morus macrophylla</i>	Texas mulberry	<i>Bouteloua curtispindula</i>	sideoats grama
<i>Morus rubra</i>	red mulberry	<i>Bouteloua hirsute</i>	hairy grama
<i>Platanus occidentalis</i>	American sycamore	<i>Bouteloua rigidisetata</i>	Texas grama
<i>Populus deltoides</i>	Eastern cottonwood	<i>Bouteloua tirfida</i>	red grama
<i>Salix nigra</i>	black willow	<i>Buchloe dactyloides</i>	buffalograss
<i>Sapindus saponaria</i>	soapberry	<i>Callirhoe leiocarpa</i>	tall poppymallow
<i>Sideroxylon lanuginosum</i>	gum elastic	<i>Campis radicans</i>	trumpet creeper
<i>Sophora affinis</i>	Eve's necklace	<i>Carex emoryi</i>	emory sedge
<i>Taxodium distichum</i>	bald cypress	<i>Carex tetrastachys</i>	britton sedge
<i>Ulmus americana</i>	American elm	<i>Cassia fasciculata</i>	partridge pea
<i>Ulmus crassifolia</i>	cedar elm	<i>Ceratophyllum demersum</i>	coontail
<u>Shrubs</u>		<i>Chloris cucullata</i>	hooded windmillgrass
<i>Aloysia gratissima</i>	bee brush	<i>Cocculus caroliniana</i>	Carolina snailseed
<i>Cephalanthus occidentalis</i>	buttonbush	<i>Conoclinium coelestinum</i>	blue mistflower
<i>Forestiera augustifolia</i>	arrowleaf forestiera	<i>Conoclinium greggii</i>	palm-leaf mistflower
<i>Forestiera pubescens</i>	elbowbush	<i>Corydalis curvisiligua</i>	scambled eggs
<i>Francula caroliniana</i>	Carolina buckthorn	<i>Cyperus erythorhizos</i>	redroot flatsedge
<i>Ilex decidua</i>	possumhaw	<i>Cyperus ochraceus</i>	pond flatsedge
<i>Lantana urticoides</i>	Texas lantana	<i>Cyperus odoratus</i>	fragrant flatsedge
<i>Malvaviscus arboreus</i>	Turk's cap	<i>Desmanthus illinoensis</i>	bundleflower
<i>Ptelea trifoliata</i>	hop-tree		

Channel Slope and Over-Bank Protection. The channel slope and invert protection are required to stabilize the disturbed ground, and protect the newly planted riparian vegetation from being damaged or destroyed during a flood event. The protection is an erosion control mat made of straw. The straw mat is expected to decompose after 1-2 years. By this time the native vegetative cover should be well established. The blanket will be placed in areas outside of the pilot channel most susceptible to relatively high shear stress, most likely in the bottom of the floodway channel and partially up the floodway channel side slopes. Approximately 925,000 square yards of mat will be used.

Storm Water Outfall Modifications. Storm water outfall modifications are required as part of the excavation of the pilot channel and as part of the excavation of the floodway channel. The modified outfalls will include grated inlet drop structures, and outflow pipes.

The outlet pipe may terminate at either the edge of the pilot channel or with a stone headwall. The exact configuration will take into account the location of the outfall relative to the pilot channel and the multi-purpose recreation trail.

Utility Relocations. Utility relocations are required as part of the excavation of the pilot channel and the floodway channel. The total relocations included 3,315 linear feet (LF) of gas line, 15,370-LF of sewer line (6- to 48-inch of either gravity, force main, or siphon), 5,620-LF of water line (6- to 36-inch lines), and 2,345-LF of electric line. A detailed utility survey will be required to identify the specific location of specific utilities.

Bridge Modifications. Two bridges are required to be modified to provide additional conveyance for the purpose of planting the riparian vegetation. Both the East Southcross and East White bridges will be modified by replacing the existing sloped, concrete slope paving, with an inverted “T” concrete, retaining wall.

Road, Sidewalk, and Parking Lot Relocations. The excavation of the floodway channel for additional conveyance allowing additional riparian vegetation to be planted results in the required relocation of 2,519-feet of Mission Parkway, 14,800-feet of sidewalk, and 14,400 square feet of parking lot. The portion of Mission Parkway between Mission Road and East White Road will be removed and replaced at grade once the excavation of the floodway channel is complete. Several sections of sidewalk will also be removed and replaced as part of the excavation of the floodway (for conveyance). Two parking lots will also be removed and replaced.

Real Estate Acquisition. Land requirements for the recommended plan include 355.0 acres of lands dedicated to the SACIP. Remaining land requirements be acquired in fee include 138.4 acres of land for the project, and 140 acres of disposal area. Within the 138.4 acres, 49.74 acres are within the San Antonio Missions National Historic Park. There are a total of 113 tracts and 42 owners. The total real estate cost of \$4,637,091 is comprised of real estate payments (\$3,300,440), administration (\$900,370) and contingency (\$436,281). The SARA will acquire the privately owned land in fee, and local governmental and public property may be donated to the project. The Fort Worth District, acting on behalf the SARA will coordinate with the NPS on the acquisition of NPS property. The NPS will secure congressional authorization to provide the land for the project, in return for mitigation of impacts to the cultural landscape of the lands provided. A description of the complete real estate requirements and a summary of costs are located in the real estate plan located in Appendix G. The non-Federal sponsor will also be responsible for all utility relocations, storm water outfall relocations, bridge modifications, and road, sidewalk, and parking lot relocations.

Disposal Area. The disposal area is located on Southon Road, approximately six-miles from the downstream project limit, and is currently in private ownership. The area is currently agricultural land with capacity to take all excavated materials generated by the recommended restoration project. This site consists of 240 acres of cleared land, of which 100 acres is within the floodplain of Salado Creek. All excavated material produced shall be mounded up to thirty feet on the portion of the property which is outside the floodplain. The

side slopes will be contoured to ten horizontal to one vertical, and the mound will be re-vegetated with grass and trees after disposal is complete.

Recreation Facilities

Existing Recreation Facilities. As of 1998, the city's parkland totaled 7,575 acres, which was an increase of 27% since 1981, and included 164 park facilities. Acquisition of new park acreage has not kept pace with the rapid growth rate and current population ratios for the city, (excluding facilities owned and operated by other public agencies). The national goal recommended by The National Recreation and Park Association is 10-acres of parkland per 1,000 residents.

In addition to the city owned parkland, an additional 1,325 acres are owned by other public entities, and residents have access to 32 additional facilities. Bexar County and the National Park Service provide 991 acres, and incorporated cities within the county account for 334 acres of park land. Including these acreages with the City of San Antonio's acreage results in a total of 8,786 public park acres and a ratio of 7.88 acres per 1,000 city residents.

The Mission Reach area is characterized by residential, retail/commercial, and light industrial uses. The neighborhoods are ethnically diverse and include historic districts near downtown and newer subdivisions in the outer areas near Loop 410. Retail/commercial development is concentrated along major thoroughfares such as S. W. Military Drive. The terrain is generally flat with wooded areas composed of mesquite and hackberry. Brooks Air Force Base, Stinson Municipal Airfield, Palo Alto College and the National Park Service's San Antonio Missions National Historical Park attract considerable visitors to the area. Additional natural resource assets include the San Antonio River, historically significant sites, Leon and Comanche Creeks, Braunig, Mitchell and Canvasback Lakes and an abundance of flat, undeveloped property in the southern half of the area.

As of 1997, the City owned 956 acres, which equates to seven acres per 1,000 residents. Currently a deficiency of 225 acres exists, using strictly city owned park acreage. When all park acres are included, the ration increases to 14 per 1,000 residents. The San Antonio Missions National Historical Park makes up a large percentage of this acreage, but is not completely accessible during all hours. Assuming no further acquisition, there will be a deficit of 233 acres by 2002 and 239 by 2007. In the Mission Reach vicinity, there is approximately 170 acres of city and national park. Community surveys indicated a need for lighted walking and jogging trails, bicycle paths, swimming pools and playgrounds.

Recommended Recreation Features. The City of San Antonio desires recreation features as part of recommended restoration plan. Recreation features include a multi-use concrete trail, shade shelters, day use facilities, lighting, and directional and interpretative signage. The recommended trail will be incorporated into the current and planned City of San Antonio Mission Trail system, as well as, future planned trails by the National Park Service. From an environmental perspective, recreation features are located to avoid adverse impacts to riparian vegetation, particularly types A and C.

The multi-purpose trail is designed for walking, jogging, and bicycling. On the east side of the river, the recommended trail begins at Roosevelt Park (Lone Star Boulevard) and extends downstream ending near the San Juan Dam. A portion of the Mission Trail system will connect to this segment of the recommended trail at the historic Mission Concepcion. From San Juan Dam, the National Park Service has proposed a trail (outside of the restoration project area) downstream to just south of IH 410 where it would connect to the recommended trail.

Along the west bank of the San Antonio River, the recommended trail begins upstream of Steves Avenue and extends downstream to the confluence with San Pedro Creek. The east and west trail will be connected via two bridges over the river. The first is located at the west trailhead, and the second is located at the confluence. There is no existing, proposed, or recommended trail between the confluence and Mission Road along the west side of the river. From Mission Road, there is an existing trail extending downstream to East White Road. This existing trail will be replaced as part of the restoration project. From East White, a 900-foot segment of the recommended trail will connect the existing (replaced) trail to another segment of existing trail, which is also being replaced as part of the restoration project. This existing (replaced) trail extends downstream to near the San Juan Dam remnant. Two bridges will connect the east- and west side trails within this portion. In addition, a portion of the Mission Trail system from Mission San Jose will connect to the recommended trail. From the San Juan Dam remnant there is no existing, proposed, or recommended trail until just upstream of S.E Military Drive where an existing trail begins. The existing trail will be widened to ten-feet (currently six-feet) from this point to just downstream of Mission Parkway (below Espada Dam). A footbridge is recommended just downstream of Espada Dam / Mission Parkway to connect the proposed NPS trail to the recommended trail. From this point to just below IH-410, portions of the existing trail will be either replaced as part of the restoration project or widened. From this point, a new trail will extend downstream terminating at Mission Espada. In addition, a portion of the Mission Trail system from Mission San Juan and Mission Espada will connect to the recommended trail.

In summary, 3,000-feet of existing trail will be widened, and 38,000-feet of new trail will be constructed (not including the 14,800-feet of the existing trail replaced as part of the restoration plan). All trails will be 10-foot wide, and constructed of either concrete or asphalt depending upon whether the trail is located within the floodway or along the top of bank. There are five footbridges spanning the river. The recommended trail will connect to the proposed Mission Trail System at Mission Concepcion, Mission San Jose, Mission San Juan, Mission Espada, and the proposed trail by the National Park Service.

There are six shade shelters located along the trails. These structures will provide a resting area for trail users and shelter from climatic conditions. The shelters are a wood frame structure on a concrete slab, roofed but open air, and include benches, water fountain, trash receptacles, and signage. They are located: 1) near the confluence of San Pedro Creek and the San Antonio River (west side); 2) about 3,200 linear feet (lf) downstream of the first on the east side of the river; 3) 4,200 lf downstream of the second on the east side; 4) 7,800 lf downstream of the third; 5) 6,500 lf downstream from the fourth (at Espada Dam) on the

west side; and 6) 6,500 lf downstream of the fifth on the west side of the river. A map delineating the tentative location of the shade shelters in located in Appendix F.

Day use facilities will be located at various locations, and are comprised of 78 picnic tables (on pads), eight water fountains, 34 benches, 30 trash receptacles, and 70 directional and interpretative signs, located throughout the project area. Lastly, portions of the trail will have lighting between Roosevelt Park and Mission County Park a distance of approximately 19,500-feet. A light fixture will be placed approximately every 100-feet. The lights are pole mounted with a 0.5 foot-candle rating (industry standard). Figure 4-2 and Appendix F displays the location of the existing and proposed trails.

The recreational features are compatible with the recommended restoration project, and would serve the surrounding neighborhoods and region by providing non-consumptive recreational opportunities and eventual links to proposed trails. The recreational features would not detract from the goals of the recommended restoration plan. The formulation of the recreational features is based on the guidance defined in Policy Guidance Letter No. 59, Recreation Development at Ecosystem Restoration Projects. The formulation of recreational features was conducted within the following framework:

- are totally ancillary, i.e. project was not formulated solely for recreation;
- would take advantage of the project’s recreation potential;
- are not vendible; and
- would not exist without the project.

Economic justification is based on an evaluation of competing facilities, existing and expected future use with and without the recommended plan, and unfulfilled demand. According to the Texas Parks and Wildlife Department (TPWD), Land and Water Resources Conservation and Recreation Plan, which identifies population, usage, and demand trends within the study area, the demand for recreation facilities, such as trails, is steadily increasing. TPWD also states that San Antonio ranks below average for all outdoor activities. Applying the appropriate participation rates to the population of potential users, the access would be used to capacity from the time it becomes available to the public through the period of analysis.

Current standards indicate this type of trail will accommodate 57,662 visitors per year per mile of trail for the pedestrian trail. For 55,800-foot pedestrian trail, the total capacity usage would be 609,000 visitor days per year calculated as follows - (55,800 linear feet / 5,280 linear feet per mile) times 57,000 visitors per year per mile equals 602,000 visitors per year. Point values are assigned based on selective criteria applicable to the proposed trail. The criteria and assigned points are as follows:

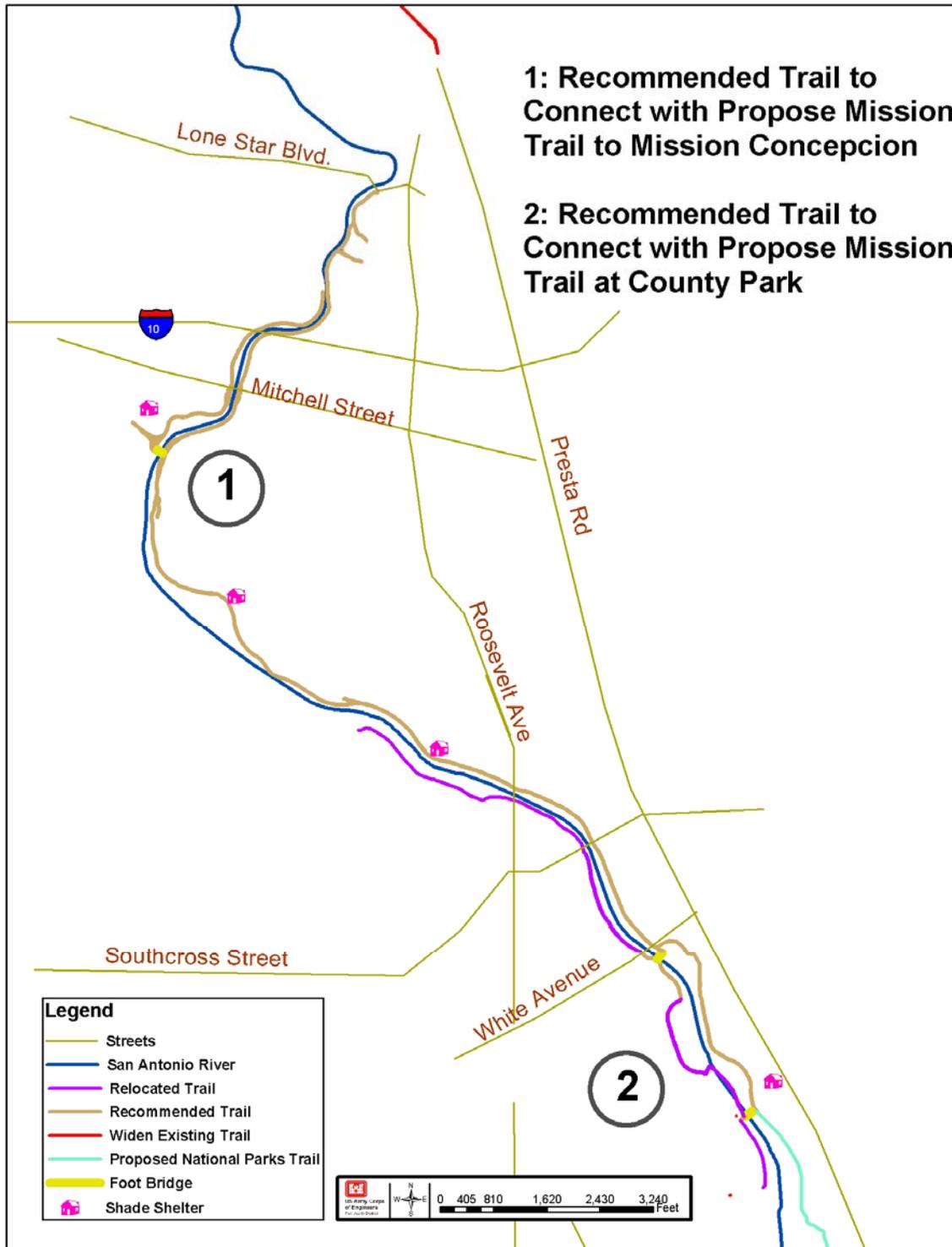
- Several general activities: 20 points
 - One or two within 1-hour travel time: 8 points
 - Adequate facilities to conduct without deterioration of resource: 7 points
 - Good access to site; good roads within site: 12 points
 - Above average aesthetic quality: 10 points
- 57 points

For fiscal year 2004, 57 points equate to a unit day value of \$6.38. The annual benefit for the trails and day use facilities is estimated to be \$3,841,000. Table 4-4 displays unit costs for recreation features, total and annual costs, total benefits, and benefit-cost ratio. Costs were annualized using an interest rate of 5 5/8-percent, over a 50-year period of analysis. The resultant benefit cost ratio is 8.8 making the recreational features economically justified.

Table 4-4
Summary of Recreation Costs
(June 2004 price level)

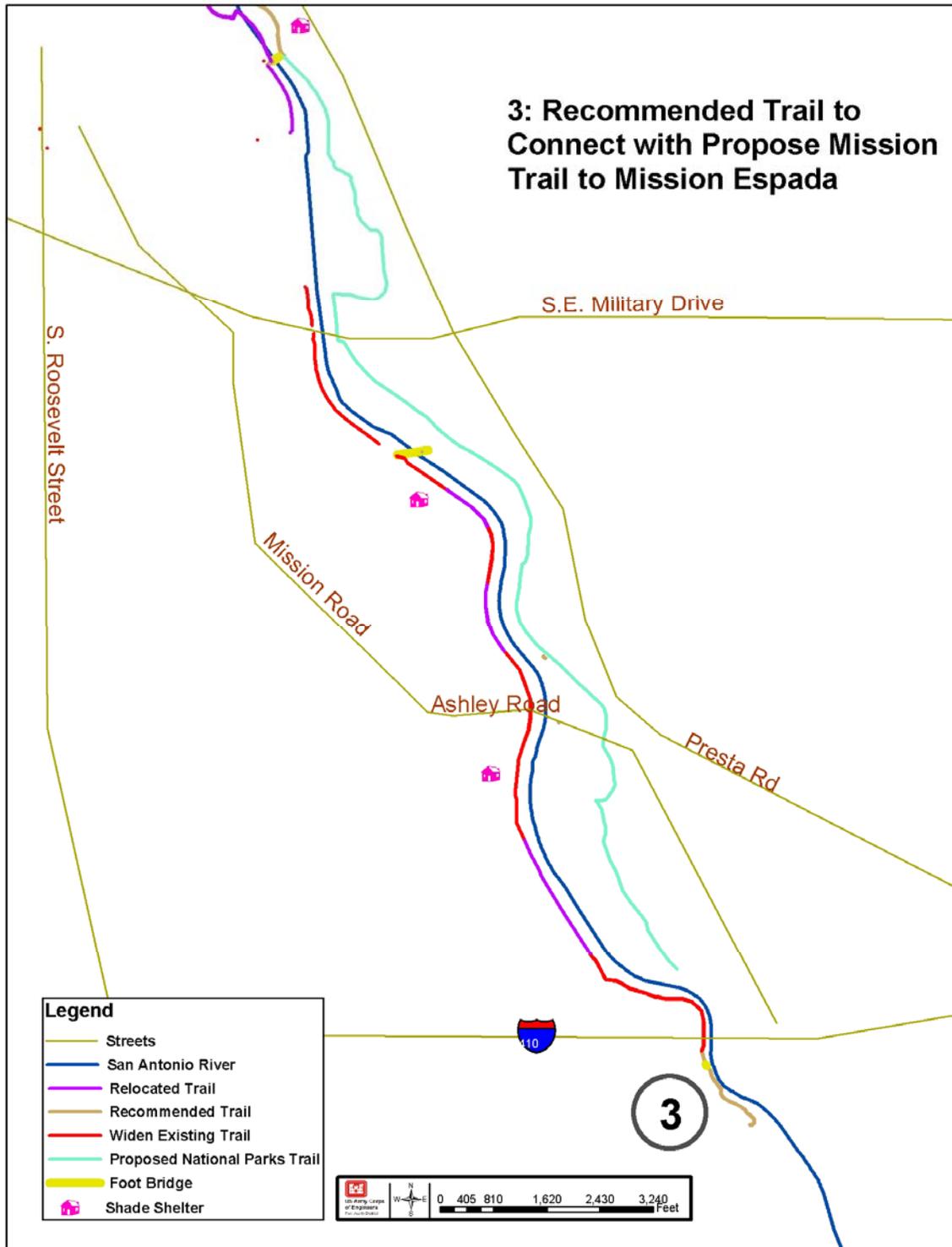
<u>Recreation Item</u>	<u>Unit</u>	<u>Quantity</u>	<u>Total Cost</u>
Trail	LF	55,800	\$ 1,705,738
Foot Bridges	EA	5	\$ 934,610
Shade Shelter	EA	6	\$ 737,526
Directional/Interpretive Signs	EA	70	\$ 61,278
Benches	EA	34	\$ 56,477
Water Fountains	EA	8	\$ 31,574
Picnic Tables (w/ pads)	EA	78	\$ 332,465
Trash Receptacles	EA	30	\$ 39,866
Lighting	LS	1	\$ 1,192,251
Subtotal Recreation Features			\$ 5,091,786
Plans and Specifications (8%)			\$ 407,327
Supervision and Administration (8%)			\$ 407,327
Total Recreation			\$ 5,906,440
Total Recreation Cost First Cost			\$ 5,906,440
Interest During Construction			\$ 1,085,341
Total Investment Cost			\$ 6,991,781
Interest (5 5/8-percent)			\$ 393,358
Amortization (50-yr period of analysis)			\$ 27,248
Subtotal Annual Cost			\$ 420,606
Annual Maintenance			\$ 17,500
Total Annual Cost			\$ 438,106
Annual Benefit			\$ 3,841,000
Benefit-Cost Ratio			8.8

**Figure 4-2
Recommended Recreation Plan**



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**Figure 4-2
Recommended Recreation Plan**



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Recreation features are cost-shared equally between the Government and the customer, and must be located entirely on project lands.

Impact of Recreation Features on Restoration Project. The recommended recreation plan will not adversely impact the recommended restoration plan. It is only when the ecosystem has value to humans that it will be cared for and sustainability is really achievable.

The specific goal of the restoration was to restore quality habitat for wildlife and fish species; the broad goal of the recreation was to add additional quality to the habitat by providing opportunities for the human population to value the restored ecosystem. For the restoration goal to be truly successful, the recreation goal must also succeed. To facilitate achieving both, recreation was developed after the restoration measures were established and the recommended (NER) plan was identified. Trails were designed to avoid passing directly through the best vegetation types (A and C). Not allowing trails to bisect Type A or Type C vegetation allows use of the trail while not impacting the more sensitive species that may choose to hide, nest, or forage within the denser vegetation types. Additionally, trails were not allowed to replace vegetational areas directly adjacent to any aquatic areas. Nighttime use of the trail should be limited to the northern end of the project area, as trail lighting will not be provided along the southern end. Again, because the trail avoids the denser vegetation areas, lighting should not have a significant impact on the value of the habitat for wildlife. Trails, rest stations, pavillions, and other components of the recreation plan are located to allow human observation, study, interaction, and appreciation, but not interference with the functioning ecosystem.

Impact of Recommended Plan on Existing Flood Damage Reduction Project (SACIP). The recommended plan will not adversely impact the existing flood damage reduction project (SACIP). The recommended plan would provide some flood damage reduction benefits. An initial investigation by the San Antonio River Authority concluded 41 residential structures no longer lie within the 100-year flood plain as a result of the restoration project. Damages prevented are estimated at \$3.6 million. Of particular importance is the Symphony Lane neighborhood, located just upstream of S.E. Military Road (between river stations 1880+00 and 1901+00). Of the 24 residential structures currently in the 100-year flood plain, 10 will no longer be within the 100-year flood plain as a result of the project.

ENVIRONMENTAL ASSESSMENT

This section of the document provides compliance with Section 102 of the National Environmental Policy Act of 1969 (NEPA), as implemented by the regulations promulgated by the President's Council on Environmental Quality (CEQ) [40 Code of Regulations (CFR) Parts 1500-1508]. This Environmental Assessment (EA) provides sufficient evidence and analysis for determining whether to prepare a Notice of Intent (NOI) for an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) (40 CFR 1508.9). The principal objectives of NEPA are to ensure the careful consideration of environmental aspects of proposed actions in Federal decision-making processes. Additionally, NEPA ensures that environmental information is made available to the public before decisions are

made and actions taken. Implementation of the proposed ecosystem restoration could result in either beneficial or adverse impacts as described in the following sections.

Legal protection is afforded through a number of Federal, state, and local laws, regulations, ordinances, and executive orders. Table 4-5 provides a listing of the primary Federal statutes and declarations taken into account for analysis of the recommended plan.

**Table 4-5
Federal Statutes and Declarations Considered in Analysis**

Resource	Statutes
Water	<ul style="list-style-type: none"> ▪ <i>Federal Water Pollution Control Act</i> of 1972 (PL 92-500) and Amendments ▪ <i>Clean Water Act</i> of 1977 (PL 95-217) ▪ <i>Water Quality Act</i> of 1987 (PL 100-4) ▪ <i>Safe Drinking Water Act</i> of 1972 (PL 95-523) and Amendments
Wetlands and Floodplains	<ul style="list-style-type: none"> ▪ Section 401 and 404 of the <i>Federal Water Pollution Control Act</i> of 1972 (PL 92-500) ▪ Floodplain Management – 1977 (Executive Order [E.O.]. 11988) ▪ <i>North American Wetlands Conservation Act</i> of 1989 (PL 101-233)
Biological	<ul style="list-style-type: none"> ▪ <i>Migratory Bird Treaty Act</i> of 1918 ▪ <i>Fish and Wildlife Coordination Act</i> of 1958 (PL 85-654) ▪ <i>Endangered Species Act</i> of 1973 (PL 93-205) and Amendments ▪ <i>Fish and Wildlife Conservation Act</i> of 1980 (PL 96-366) ▪ <i>Lacey Act Amendments</i> of 1981 (PL 97-79)
Air	<ul style="list-style-type: none"> ▪ <i>Clean Air Act</i> of 1970 (PL 95-95), as amended in 1977 and 1990 (PL 91-604)
Noise	<ul style="list-style-type: none"> ▪ <i>Noise Control Act</i> of 1972 (PL 92-574) and Amendments of 1978 (PL 95-609)
Cultural	<ul style="list-style-type: none"> ▪ <i>National Historic Preservation Act</i> of 1966 (16 USC 470 et seq.) (PL 89-665) and Amendments ▪ Protection and Enhancement of the Cultural Environment - 1971 (E.O. 11593) ▪ Indian Sacred Sites – 1996 (E.O. 13007) ▪ <i>Archaeological and Historic Preservation Act</i> of 1974 ▪ <i>American Indian Religious Freedom Act</i> of 1978 (PL 95-341) ▪ <i>Antiquities Act</i> of 1906 ▪ <i>Archaeological Resources Protection Act</i> of 1979 (PL 96-95) ▪ <i>Native American Graves Protection and Repatriation Act</i> of 1990 (PL 101-601)
Hazardous and Toxic Materials	<ul style="list-style-type: none"> ▪ <i>Resource Conservation and Recovery Act</i> of 1976 (PL 94-5800), as Amended ▪ <i>Comprehensive Environmental Response, Compensation, and Liability Act</i> of 1980 (42 USC 9601) (PL 96-510) ▪ <i>Toxic Substances Control Act</i> (PL 94-496) ▪ <i>Federal Insecticide, Fungicide, and Rodenticide Control Act</i> (40 CFR 162-180) ▪ <i>Emergency Planning and Community Right-to-Know Act</i> (40 CFR 300-399)
Environmental Justice	<ul style="list-style-type: none"> ▪ Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations (E.O. 12898) ▪ Protection of Children from Environmental Health Risks and Safety Risks (E.O. 13045)

Alternatives. The alternatives considered to accomplish ecosystem restoration within the Mission Reach of the SACIP have been discussed, in detail, in Chapter 3 of this document. The alternatives considered were:

- No Action;
- DC0 – Replace existing non-native grasses with native grasses;
- DC1 – Excavate within the existing SACIP right of way to implement habitat restoration *without using* geomorphic and sediment transport design guidelines;
- DC2 – Excavate within the existing SACIP right of way implement habitat restoration *using* geomorphic and sediment transport design guidelines;
- DC3A and DC3B – Two variations of a design condition that would implement habitat restoration measures within and outside of the existing SACIP right of way utilizing geomorphic and sediment transport design guidelines.

These alternatives have been assessed through application of the USACE planning process as required by Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook. ER 1105-2-100 provides the overall direction by which USACE Civil Works projects are formulated, evaluated, and selected for implementation.

The evaluation process has culminated in the identification of DC3B as the National Ecosystem Restoration (NER) plan and is the recommended plan. This section is dedicated to providing a fair assessment of the environmental impacts associated with implementation of DC3B as the recommended plan.

No Action Alternative. Under the No Action Alternative, ecosystem restoration to the Mission Reach of the SACIP would not occur. This reach of the river would remain in its existing condition, and no riparian vegetation would be planted within the floodway. The aquatic habitat would remain in its degraded condition and would not improve. There would always be a complete lack of a riparian habitat throughout this 8-mile reach. The resources lost to fish, wildlife, and human populations by the construction of the SACIP would remain absent for all present and future generations.

Recommended Plan. Implementation of ecosystem restoration measures through construction of DC3B would consist of the following actions:

- Acquire approximately 128 acres of land adjacent to the existing floodway in order to provide improved ecosystem restoration opportunities (go outside existing SACIP right-of-way).
- Acquire land to be used as a disposal site for clean fill (140 acres to be impacted).
- Remove and dispose of approximately 2,735,300 cubic yards of clean fill (concrete riprap and excavated soil).
- Relocate 26,650 linear feet of utility lines (water, sewer, electric, gas).
- Relocate approximately 2,500 linear feet of Mission Road.
- Modify East Southcross and East White Street bridge abutments from sloped to vertical.

- Construct approximately 42,500-feet of pilot channel with pool/riffle/chute habitats using principles of geomorphic and sediment transport design guidelines.
- Remove approximately 308.84 acres of non-native Bermuda grass.
- Plant approximately 320 acres of riparian vegetation (trees, shrubs, grasses, forbs) utilizing only native plant species.
- Restore 5 tributary mouths (0.71 acres total).
- Connect main channel of the river with 2 old river bendways (1.52 acres total).
- Create 1 wetland (7.75 acres) and 9 embayments (5.13 acres total).
- Construct recreation facilities consisting of approximately 55,800 linear feet of multi-purpose trail including four footbridges over the river, five covered seating areas, day use facilities (picnic tables, water fountains, trash receptacles), lighting, and signage.

Ecosystem restoration measures that would be implemented by the recommended plan are compared with existing conditions in Table 4-6.

**Table 4-6
Existing Condition vs. the Recommended Plan**

Characteristics	Existing Condition	Design Condition 3B
Channel:		
Acres of Pool	39.37	68.89
Acres of Riffle	1.26	18.42
Acres of Chute	19.34	9.43
Acres of Scour Pool	1.25	1.55
Acres of Chute below pool	0.37	0.00
Riparian Vegetation:		
Acres of Type A	0.00	53.94
Acres of Type C	0.00	90.58
Acres of Type D	0.00	120.15
Acres of Type E	0.00	55.48
Bermuda grass	308.84	0.00
Special Aquatic Features:		
Acres of Embayments	0	5.13
Acres of Tributary Mouths	0	0.71
Acres of Wetlands	0	7.75
Acres of Restored Remnants	0	1.52
Type A=250 trees per acre	Type C=70 trees per acre	
Type D=30 trees per acre	Type E=Native grasses	

The recommended plan will produce approximately 2.7 million cubic yards (cy) of clean excavated material that will require off-site disposal. Many properties were identified as potential off-site disposal areas; six properties were considered functional sites. These included:

- 7985 SW White Road – former gravel pit with 200,000 cy capacity;
- 8980 SW White Road – former gravel pit with 500,000 cy capacity;
- 12515 Fischer Road – former gravel pit with 200,000 cy capacity;
- 5050 Old Pearsall Road – future park consisting of undeveloped land and former landfill with 50,000 cy fill requirement;
- McAllister Park near the intersection of Starcrest and Jones Maltsberger – old borrow areas with 325,000 cy capacity;
- 11269, 11716 and 11410 Southton Road – agricultural land with capacity to take all excavated materials generated by the proposed ecosystem restoration.

The Southton Road site was selected because it is closest to the proposed project area, and can fulfill 100% of the disposal needs. A full discussion documenting the selection of the Southton Road site is included as Appendix C.8. The Southton Road Site, located at 11269, 11716 and 11410 Southton Road, is currently in private ownership. This site consists of 240 acres of cleared land, of which 100 acres is within the floodplain of Salado Creek. All excavated material produced by this project is proposed to be mounded over thirty feet on the portion of the property which is outside the floodplain. The side slopes will be contoured to 10:1 and the mound will be re-vegetated with grass and trees after disposal is complete.

Environmental Effects of the Recommended Plan. The following section describes the probable consequences of the recommended plan to environmental resources.

Land Use. The recommended plan will impact approximately 49.4 acres of land within the San Antonio Missions National Historic Park. There is potential for adverse impacts to the cultural landscape (scenic and historical association) from the recommended plan resulting from excavation of the existing floodway for restoration purposes in the vicinity of the labores. Detailed investigations will be completed prior to project construction to determine the extent and magnitude of the adverse impacts, and identify appropriate mitigation measures. There would be an insignificant impact to the remaining land use as a result of the recommended plan. Ecosystem restoration along the Mission Reach is consistent with current land uses and enhances existing public use areas and the general quality of life for local residents.

There would be an insignificant impact to land use of the disposal site. The 240-acre site is currently in agricultural use (hay production/livestock grazing). If excavated material were placed on the site, it would be converted either to wildlife habitat and/or public use (recreational). Placement of 20-30 feet of spoil on the site would prevent it from being considered for any future commercial or residential development.

Aesthetics and Visual Resources. Implementation of the recommended plan will result in substantial beneficial changes to aesthetics and visual resources along the Mission Reach

of the San Antonio River. The floodway, currently devoid of native riparian vegetation, will be reconstructed to allow native vegetation to grow in close proximity to the water. Although vegetation Types C, D, and E within the riparian area will require occasional maintenance (for flood protection purposes), the view shed of the river will emulate a natural setting.

Geology and Topography. There would be no impact to the geology of the region, and an insignificant impact to topography from implementation of the recommended plan in the vicinity of the floodway. Implementation of the proposed project would involve recontouring the localized area within the SACIP, however, the changes would be consistent with the existing and adjacent land form.

There would be an insignificant impact to topography to the disposal site resulting from implementation of the recommended plan. The 140 acres proposed for placement of excavated materials currently has about a 20-foot rise in elevation; from 530 to 550 feet above mean sea level (msl). The total area to receive fill is approximately 0.219 square miles. Approximately 2,737,000 cubic yards of excavated material would be mounded from 20-30 feet high (compacted for stability) and would be contoured to blend into the surrounding area. The site would then be revegetated with native plant species. The placement of spoil on this site would result in a change to the topography of a small geographic area.

Soils. The recommended plan will involve standard construction activities, which would disturb approximately 483 acres of soils within the Mission Reach. The river channel within the project area would be reconfigured to improve the pool/riffle/chute configuration. The riprap armoring would be removed from the river during this process, exposing native soils. Most of the stormwater outfalls would be reconfigured to a more natural configuration through removal of existing concrete headwalls and linings. The banks and side slopes of the floodway would be cleared of the non-native Bermuda grass, and graded prior to planting with native trees, shrubs, and grasses. Construction of the recommended plan would involve excavation of approximately 3,812,000 cubic yards of soil and rock. Twenty-eight percent of the excavated material (1,075,000 cubic yards) would be reused. Approximately 2,737,000 cubic yards of material would be placed at the proposed disposal site.

Topsoil at both the proposed project area and disposal site would be removed and stockpiled for use as planting substrate. Approximately 140 acres at the proposed disposal site would be disturbed. Soils present in the vicinity of the proposed project area are listed in Table 4-7. Soils associated with the disposal site are listed in Table 4-8. Erosion potential for each soil impacted would be determined prior to construction, and appropriate erosion control designs would be incorporated into the construction plans.

Short-term impacts would include runoff and erosion during site construction due to removal of vegetation, exposure of soil, and increased susceptibility to wind and water erosion. However, these effects would be minimized by the use of appropriate Best Management Practices (BMPs) for controlling runoff, erosion, and sedimentation. In accordance with the

Table 4-7
Soils Located near the Proposed Project Area

Map Symbol	Mapping Unit	Description
Fr	Frio clay loam, 0 to 2 percent slopes, occasionally flooded	The Frio series consists of very deep soils that formed in loamy and clayey calcareous alluvium. These flood plain soils have slopes ranging from 0 to 2 percent. Soils are well drained, with slow runoff, and moderately slow permeability. Most areas have ground water within a depth of 20 feet.
LvB	Lewisville silty clay, 1 to 3 percent slopes	The Lewisville series consists of very deep soils that formed in ancient loamy and calcareous sediments. Soils are well drained, runoff is slow to medium, and permeability is moderate. Original vegetation was mid and tall grasses, with a few widely separated elm, hackberry, and mesquite trees.
PaC	Patrick soils, 3 to 5 percent slopes, rarely flooded	The Patrick series consists of moderately deep soils that formed in clayey over gravelly sediments. These soils are on nearly level to strongly sloping ancient terraces of uplands. They are well drained, with medium runoff, and moderate permeability.
VcA and VcB	Venus clay loam, 0 to 1 percent slopes Venus clay loam, 1 to 3 percent slopes	The Venus series consists of very deep soils that formed in loamy calcareous alluvial sediments. These are nearly level to moderately sloping soils mainly on stream terrace and valley fill positions. They are well drained, with slow to medium runoff, and moderate permeability. Original vegetation was tall and mid grass and widely spaced live oak and other hardwoods.

Clean Water Act, a Storm Water Pollutions Prevention Plan would be prepared prior to the start of construction.

In the long-term, soils along the Mission Reach and at the disposal site would be stabilized through the presence of native riparian vegetation. Additionally, soils would improve in richness over time, due to the large contribution of organic matter from establishment of native trees, shrubs, vines, and forbs. However, due to the long length of time required for natural processes to build soils, there would be an overall insignificant impact to soils over the 50-year period of analysis.

Prime Farmlands. As required by Section 1541(b) of the Farmland Protection Policy Act (FPPA) of 1980 and 1995, 7 U.S.C. 4202(b), federal and state agencies, as well as projects funded with federal funds, are required to (a) use the criteria to identify and take into account the adverse effects of their programs on the preservation of farmland, (b) consider alternative actions, as appropriate, that could lessen adverse effects, and (c) ensure that their programs, to the extent practicable, are compatible with state and units of local government and private programs and policies to protect farmland. A list of prime farmland soils for Bexar County

Table 4-8
Soils Located near the Disposal Site

Map Symbol	Mapping Unit	Description
KaC	Karnes loam, 3 to 5 percent slopes	The Karnes series consists of deep soils that formed in limy sediments. These soils are on nearly level to sloping stream terraces, alluvial fans and foot slopes in valleys. The soil is well drained, with slow to medium runoff, and moderately rapid permeability. Range consists of little bluestem, sideoats grama, indiagrass, and scattered live oak trees.
PaB	Patrick soils, 1 to 3 percent slopes	The Patrick series consists of moderately deep soils that formed in clayey over gravelly sediments. These soils are on nearly level to strongly sloping ancient terraces of uplands. They are well drained, with medium runoff, and moderate permeability. Native vegetation includes buffalograss, threeawn, Texas wintergrass, sideoats grama, and mesquite trees.
SaB	San Antonio Clay loam, 1-3 percent slopes	The San Antonio series consists of deep soils formed in ancient alluvial sediments. These soils are on nearly level to gently sloping uplands and stream terraces. The soil is well drained, with slow runoff, and slow permeability. Native vegetation includes little bluestem, fourflower trichloris, sideoats grama, buffalograss, mesquite, and sensitive briar.
VcB	Venus clay loam 1 to 3 percent slopes	The Venus series consists of very deep soils that formed in loamy calcareous alluvial sediments. These are nearly level to moderately sloping soils mainly on stream terrace and valley fill positions. They are well drained, with slow to medium runoff, and moderate permeability. Original vegetation was tall and mid grass and widely spaced live oak and other hardwoods.
WbB	Webb fine sandy loam, 1 to 3 percent slopes	The Webb series consists of very deep soils that formed in loamy residuum from sandstone. These nearly level to gently sloping soils are on uplands, and are well drained. Runoff is slow to medium. Permeability is moderately slow. Under climax conditions, the dominant native grasses are twoflower and fourflower trichloris, tanglehead, plains bristlegrass, pink pappusgrass, buffalograss, and Arizona cottontop. About 5 percent perennial forbs and 5 percent shrubs also occur.

was obtained from the Natural Resources Conservation Service (USDA 2004). Prime farmland soils in the vicinity of the proposed ecosystem restoration include Loire clay loam [Frio] (Fr), Lewisville silty clay (LvB), Sunev clay loam [Venus] (VcA and VcB).

Approximately 5.0 acres of Frio clay loam (Fr) [currently in cultivation] would be impacted at the proposed project site by implementation of the recommended plan. The remaining 478 acres are not agricultural lands, and therefore, are not considered prime farmland. Since the loss of cultivated prime farmland soil is a small percentage of the proposed project and is a small percentage of actively cultivated lands in the region the overall impact to prime farmland soils would be insignificant.

No impact to prime farmland soil would result from placement of excavated material at the disposal site. The Venus (VcB) soil present on the tract is not in agricultural production, and it falls outside of the footprint proposed for placement of material.

Surface Water and Groundwater. Surface waters that could be impacted if the recommended plan is implemented include the San Antonio River, within the proposed project area, and Salado Creek, adjacent to the proposed disposal site. Both are jurisdictional waters of the U.S. and subject to protection under Sections 401 and 404 of the Clean Water Act. No direct impacts would occur within the jurisdictional area of Salado Creek, as excavated materials would be placed only on adjacent uplands. Although a USACE permit would not be issued for the proposed ecosystem restoration (USACE cannot permit its own actions), all activities carried out to implement the recommended plan have been reviewed by the USACE (Fort Worth District Regulatory Branch), and would be done in accordance with Nationwide Permit (NWP) 27, Stream and Wetland Restoration Activities. Activities authorized under NWP 27 include “the removal of accumulated sediments; the installation, removal, and maintenance of small water control structures, dikes, and berms; the installation of current deflectors; the enhancement, restoration, or creation of riffle and pool stream structure; the placement of in-stream habitat structures; modifications of the stream bed and/or banks to restore or create stream meanders; the backfilling of artificial channels and drainage ditches; the removal of existing drainage structures; the construction of small nesting islands; the construction of open water areas; the construction of oyster habitat over un-vegetated bottom in tidal waters; activities needed to reestablish vegetation, including plowing or disking for seed bed preparation and the planting of appropriate wetland species; mechanized land clearing to remove non-native invasive, exotic or nuisance vegetation; and other related activities.”

In Texas, all activities carried out in compliance with the terms and conditions of NWP 27 are also considered to be in compliance with Section 401 of the Clean Water Act and do not require separate permitting for Water Quality Certification from TCEQ.

Short-term impacts to waters of the U.S. would be insignificant and would include temporary loss of water surface area (water diverted from channel during active construction), and elevated sediment loading during storm events. These impacts would not exist at the conclusion of construction activities.

There would be numerous long-term beneficial impacts to surface waters if the recommended plan is implemented, such as:

- Increase in surface water area
- Temperature control (influence of vegetation)
- Improved water chemistry
- Increase in organic allochthonous materials

No impacts on the groundwater supply in the project area are anticipated from proposed construction activities because of the great depth to groundwater. No groundwater would be used during or after construction.

Water Rights. Water in the rivers, streams, underflow, creeks, tides, lakes and every bay and arm of the Texas portion of the Gulf of Mexico is considered state water. Its use may be acquired through appropriation via the permitting process established in Chapter 11 of the Texas Water Code and Title 30 of the Texas Administrative Code. In order to divert, use, store or transfer state water, a permit must be obtained from the TCEQ. TCEQ may issue permits for permanent use, or may issue more restrictive permits such as, seasonal permits, term permits, temporary permits, emergency permits, or bed and banks permits. TCEQ usually grants new water rights only where normal flows and levels are sufficient to meet demand.

A number of permanent and temporary Water Use Permits currently exist authorizing use of state water from the San Antonio River to maintain flows through old river remnants or acequias, and for other purposes. If the recommended plan is constructed, water could potentially be removed from the river to irrigate riparian plantings. Water would be purchased from the San Antonio Water System (SAWS), and transported to the project area via the San Antonio River (pumped to an upstream location through existing infrastructure, then taken from the river at the project site).

The use of the San Antonio River as a mechanism for conveyance of water (bed and bank) to the proposed construction site for purposes of irrigation would require a temporary permit from the TCEQ, but would be an efficient means to transport water to the site, and would have no impact on existing surface water or groundwater.

Water Quality. Water quality in segment 1911 of the San Antonio River currently meets all state standards for aquatic life use. The only water quality concern listed for this segment in the 2004 Draft 303(d) list for Texas is nutrient enrichment, which implementation of the recommended plan would improve.

Storm water, important to surface water quality, has the potential to introduce sediments and other contaminants (petroleum products, chemicals, etc.) into lakes, rivers, and streams. Generally, higher densities of development (i.e. urban areas) require greater degrees of storm water management due to higher proportions of impervious surfaces, and rapid runoff that occurs following a storm.

The proposed ecosystem restoration would diminish the negative water quality impact of storm water flows through reestablishment of native riparian vegetation, and construction of tributary mouths, wetlands, and embayments. Plantings in the riparian zone and backwater areas would act as effective vegetative filters, reducing amounts of sediments and other contaminants that would otherwise flow directly into the river, and would improve water quality over existing conditions. The long-term water quality impact of constructing the recommended plan would be beneficial.

During the construction period, the potential for degradation of water quality exists through sedimentation while soils are exposed. These impacts would be short-term and insignificant. Adherence to proper storm water management engineering practices, applicable regulations, codes, and permit requirements would reduce storm water runoff-related impacts. Erosion and sedimentation controls would be required and would be in place during construction to reduce and control siltation or erosion impacts. The use of BMPs such as silt fencing and sediment traps, the application of water sprays, and the prompt revegetation of disturbed areas would reduce potential impacts. Implementation of sediment and erosion controls during construction activities would maintain water runoff quality at levels comparable to existing conditions.

Every construction project poses a potential contamination risk from petroleum or chemical spills. Through the use of BMPs such as proper storage, handling, and emergency preparedness, the risk of such contamination would be substantially diminished. A Spill Prevention Plan prepared specifically for this proposed project would be prepared and followed during construction of the recommended plan.

Overall, implementation of the proposed project would have insignificant short-term impacts to water quality, but would provide long-term beneficial impacts.

Floodplains. Flood potential is evaluated by the Federal Emergency Management Agency (FEMA), which determines the floodplain for 100 and 500-year flood events. Federal, state, and local regulations often limit floodplain development to passive uses such as recreational and preservation activities in order to reduce the risks to human health and safety.

Executive Order (E.O.) 11988, “Floodplain Management”, was enacted May 24, 1977, in order to set guidelines to avoid the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. Flood Insurance Rate Maps (FIRM) for Bexar County, Texas (Community Panel Numbers 48029C0627 E and 48029C0629E) was analyzed to establish the locations of the 100-year and 500-year flood zones within the proposed project area.

The SACIP is a floodway that defines most of the 100-year floodplain (it was designed to hold the 100-year event) within the Mission Reach. Construction of the recommended plan would reshape the 100-year floodplain, and would increase the flood capacity in some locations. An initial investigation by the San Antonio River Authority concluded 41

residential structures would no longer lie within the 100-year flood plain if the restoration project were implemented. Damages that would be prevented are estimated at \$3.6 million. Of particular importance is the Symphony Lane neighborhood, located just upstream of S.E. Military Road (between river stations 1880+00 and 1901+00). Of the 24 residential structures currently in the 100-year flood plain, 10 would no longer be within the 100-year flood plain as a result of the project. No new structures would be placed within the 100-year floodplain. There would be a beneficial, but imperceptible impact to the 500-year floodplain resulting from implementation of the recommended plan.

The proposed disposal site would be located on 140 acres of upland adjacent to Salado Creek. The use of this site would have no impact on floodplains within the area, as it is located outside both the 100- and 500-year floodplains.

Biological Resources. If the proposed recommended plan were constructed, there would be effects to vegetation, terrestrial and aquatic habitats, and fish and wildlife populations. There would be direct impacts to approximately 483 acres of aquatic and terrestrial environments at the proposed ecosystem restoration site, and approximately 140 acres at the proposed disposal site. Adjacent properties, habitats, and wildlife populations would be affected by indirect impacts of the proposed project.

Vegetation. Existing vegetation within the SACIP consists of non-native Bermuda grass. Native riparian vegetation was removed when the SACIP was constructed during the 1960s and 1970s. Native vegetation was removed and not allowed to reestablish in favor of non-native Bermuda grass, which provides low hydraulic resistance to flowing water. Some existing woodland vegetation would be removed outside of the current SACIP right-of-way if the recommended plan is constructed. Vegetational assessments and habitat suitability assessments (Appendix J) of the adjacent woodlands were performed by the Lady Bird Johnson Wildflower Center (2002) and the USFWS, respectively. Existing woodlands were classified into five types, providing varying habitat values as listed in Table 4-9.

Table 4-9
Existing Woodland Habitat Types

Woodland Type	Acreage Impacted	Habitat Suitability Index
Late successional woodland	0.024	0.96
Legume woodland	46.955	0.37
Mid successional woodland	0.913	0.48
Park woodland	10.653	0.34
Woodland	26.838	0.37

Descriptions of the existing woodland classifications are provided in Chapter 3 of this document. If the recommended plan were constructed, a total of 85.38 acres of existing woodland would be removed. However, most of these woodlands are low in overall habitat suitability. The acreages and habitat suitability of wooded areas that would be planted if the proposed project were constructed are listed in Table 4-10.

Table 4-10
Acres and Mature Condition Habitat Suitability of Proposed Project

<u>Woodland Type</u>	<u>Acres Planned</u>	<u>Habitat Suitability at Maturity</u>
Type A: 250 trees/acre	53.94	0.91
Type C: 70 tree/acre	90.59	0.72
Type D: 38 trees/acre	120.14	0.70

Clearly, by constructing the recommended plan, woodland habitats would increase in both geographic area (265 acres) and quality. The remaining 55 vegetated acres would be planted with native grasses (Type E). Descriptions of the proposed vegetation types are provided in Chapter 3 of this document.

Except for the woodlands that would be removed, existing parks and large blocks of native vegetation adjacent to the proposed project would be protected from any damage due to construction activities. The appropriate use of BMPs such as erosion control practices and tree protection devices at construction sites would protect existing parks and large blocks of vegetation/habitat adjacent to the construction areas. Construction of the recommended plan would provide connectivity of these upland sites with riparian forest and stream habitats, as was its historical condition.

River margins, embayments, wetlands, restored remnants, and tributary mouths would provide backwater areas that would be planted with, or allowed to develop with hydrophilic (water loving) vegetation. These areas would provide highly productive environments for many species of fish, reptiles, amphibians, birds, and small mammals.

There would be substantial beneficial effects from the planting of approximately 320 acres of native riparian vegetation, and the development of hydrophilic vegetation in wet areas. Vegetation would improve aquatic habitats through effective stormwater management and water quality improvements (filter out sediments and chemical constituents). Additionally, it would provide forage, cover, and organic inputs (energy) to the riverine ecosystem, providing resources for fish and wildlife that have been absent from this 8-mile reach for the past 30-40 years.

Fish and Wildlife. There would be substantial long-term beneficial effects to fish and wildlife populations from implementation of the recommended ecosystem restoration plan through geographic expansion and improved quality of their respective habitats. By restoring the river to a more natural condition native fish populations would have the opportunity to repopulate areas that have not been favorable for their existence or survival. By providing appropriate habitat for native fishes, they can once again compete with non-native species for resources. Water quality improvements (that would result from the planting of riparian and hydrophilic vegetation) would improve habitat conditions for intolerant native species, and should restore balance to the native tolerant/native intolerant species balance.

The restoration of riparian habitat would provide additional wildlife habitat (food, shelter, and reproductive resources) for small mammals, amphibians, reptiles, birds, and

invertebrates. Implementation of the recommended plan would connect the riverine system to adjacent park and woodland areas and reduce existing habitat fragmentation. The proposed project area located in the U.S. central flyway for migratory waterfowl and neotropical bird species, would increase the amount of scarce riparian habitat and water resources along a critical migratory bird stop-over corridor. The ability of these species to find adequate resources along their migration route impacts their populations throughout the remainder of the U.S. and Canada.

Lighting is proposed for portions of the multipurpose trail in the upper portion of the project area, where it is more densely populated. Lighting in these areas will have an insignificant impact to local wildlife species, by discouraging use of the area for nesting sites, however, other species (e.g. bats, toads) will utilize the light resource as a forage area. Lighting is not planned for large wooded areas in the southern portion of the proposed project area.

Where construction or disposal is proposed, there would be an increased level of human disturbance, such as noise, vehicular traffic, and construction equipment. There would be temporary localized displacement affecting existing fish and wildlife populations. Mortality of fish or wildlife individuals is possible during the construction phase, but would be rare, as most species would avoid the areas of disturbance.

Threatened and Endangered Species. There would be no adverse impact to any federal- or state-listed endangered, threatened, or other species of concern, or their habitats. However, construction of the proposed action would create habitat, which could one day be utilized by the federal candidate for listing, and state-listed threatened Cagle's map turtle (*Graptemys caglei*). Riffle and pool restoration, rip-rap removal from the banks, and restoration of a woody riparian zone are all measures that would help build habitat that could again support a population of Cagle's map turtles.

Cultural Resources. Cultural resources are defined by the National Historic Preservation Act (NHPA) as prehistoric and historic sites, structures, districts, or any other physical evidence of human activity considered important to a culture, a subculture, or a community for scientific, traditional, religious, or any other reason. Depending on the condition and historic use, such resources may provide insight into living conditions in previous civilizations and/or may retain cultural and religious significance to modern groups.

Several federal laws and regulations govern protection of cultural resources, including the NHPA of 1966, the Archaeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990.

The consultation process proscribed in Section 106 of the NHPA and its implementing regulations, 36 CFR Part 800, requires an assessment of the potential impact of an undertaking on historic properties that are within the proposed project's Area of Potential Effect (APE), which is defined as the geographic area(s) "within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." In accordance with EO 12372, *Intergovernmental Review of Federal*

Programs, determinations regarding the potential effects of an undertaking on historic properties are presented to the state historic preservation office (SHPO). The APE for this undertaking would include the recommended ecosystem restoration site, the proposed disposal site, and all adjacent or nearby areas containing cultural resources, including the San Antonio Missions National Historic Park.

A survey was carried out in 1974 on properties within and adjacent to the current project area (Scurlock et al. 1976). This investigation utilized cursory surveys of the study area (driving along roads and making note of possible historic resources, informal interviews with residents, and limited subsurface testing to identify these resources. The Center for Archaeological Research at the University of Texas at San Antonio compiled a report of known cultural resources within the Mission Reach (Fox, et al. 2002). Working from this list, and from data available from the Texas Historical Commission's Texas Archaeological Sites Database online, a list of known sites that may be impacted by the recommended plan has been compiled for the current study. This is not an exhaustive list of the resources located along the river, and other resources are likely to exist. Extensive cultural resource surveys and evaluation of known sites will be conducted prior to restoration, excavation, and planting activities along the river. If during this additional testing, significant cultural resources are found within the boundaries of the San Antonio Missions National Historic Park, interagency consultation will be needed and the conclusions may prohibit the use of that portion of land for the recommended plan. By following the protocols outlined in Section 106 of the NHPA and through consultation with the SHPO, adverse impacts to cultural resources will be avoided, or if unable to be avoided, properly mitigated for, in coordination with the SHPO.

The recommended plan will impact 49.4 -acres of land within San Antonio Missions National Historic Park, including portions of undisturbed labores. Adverse impacts to cultural resources (including buried resources and the cultural landscape) will be avoided if at all possible. In accordance with 36 CFR Part 800.6(b), in the event adverse impacts cannot be avoided, the impacts will be appropriately mitigated. Potential mitigation measures may include, but not limited to, acquisition of similar lands or the restoration of cultural features within or adjacent to the current San Antonio Missions National Historic Park boundary. The extent of the impact and the mitigation plan will be finalized during the preconstruction engineering and design phase in coordination with the National Park Service, SHPO, and the Advisory Council on Historic Preservation. In the event the preferred mitigation plan is the acquisition of land, a revised real estate plan and environmental assessment may be required along with further Section 106 compliance for the land being acquired. Pursuant to Section 7(a) of Public Law 93-291 (16 U.S.C. Section 469c(a)), the costs of mitigation and data recovery activities associated with historic preservation shall be borne entirely by the Government and shall not be included in total project modification costs, up to the statutory limit of one percent of the total amount the Government is authorized to expend for the Project Modification.

Air Quality. In accordance with federal Clean Air Act (CAA) requirements, the air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. The measurements of these "criteria pollutants" in ambient air are expressed in

units of parts per million (ppm) or in units of micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). The U.S. Environmental Protection Agency (EPA) established numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS) [both primary and secondary NAAQS], for pollutants that have been determined to impact human health and the environment. NAAQS are currently established for six criteria air pollutants including: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter [PM_{10}]) and particulate matter equal to or less than 2.5 microns in diameter ($\text{PM}_{2.5}$), and lead (Pb). The State of Texas has adopted the NAAQS and has titled them the Texas Ambient Air Quality Standards (TAAQS). Table 4-10 presents the primary and secondary NAAQS and TAAQS that apply to the air quality in Texas.

Table 4-11
National and Texas Ambient Air Quality Standards

Pollutant	Standard Value		Standard Type
Carbon Monoxide (CO)			
8-hour Average	9.5 ppm	(10 mg/m^3) ¹	Primary
1-hour Average	35 ppm	(40 mg/m^3) ¹	Primary
Nitrogen Dioxide (NO_2)			
Annual Arithmetic Mean	0.053 ppm	(100 $\mu\text{g}/\text{m}^3$) ¹	Primary & Secondary
Ozone (O_3)			
1-hour Average	0.12 ppm	(235 $\mu\text{g}/\text{m}^3$) ¹	Primary & Secondary
8-hour Average	0.08 ppm	(157 $\mu\text{g}/\text{m}^3$) ¹	Primary & Secondary
Lead (Pb)			
Quarterly Average		1.5 $\mu\text{g}/\text{m}^3$	Primary & Secondary
Particulate < 10 micrometers (PM_{10})			
Annual Arithmetic Mean		50 $\mu\text{g}/\text{m}^3$	Primary & Secondary
24-hour Average		150 $\mu\text{g}/\text{m}^3$	Primary & Secondary
Particulate < 2.5 micrometers ($\text{PM}_{2.5}$)			
Annual Arithmetic Mean		15 $\mu\text{g}/\text{m}^3$	Primary & Secondary
24-hour Average		65 $\mu\text{g}/\text{m}^3$	Primary & Secondary
Sulfur Dioxide (SO_2)			
Annual Arithmetic Mean	0.03 ppm	(80 $\mu\text{g}/\text{m}^3$) ¹	Primary
24-hour Average	0.14 ppm	(365 $\mu\text{g}/\text{m}^3$) ¹	Primary
3-hour Average	0.5 ppm	(1,300 $\mu\text{g}/\text{m}^3$) ¹	Secondary

Notes:

¹ Parenthetical value is an approximately equivalent concentration.

ppm – parts per million mg/m^3 – milligrams per cubic meter $\mu\text{g}/\text{m}^3$ – micrograms per cubic meter

The project area is located within the Metropolitan San Antonio Intrastate Air Quality Control Region (MSAIAQCR) (40 CFR 81.40). Ambient air quality for the MSAIAQCR is in attainment for all criteria pollutants except 8-hour O_3 . However, it is listed on the nonattainment list for 8-hour ozone as an Early Action Compact (EAC), which establishes voluntary air pollution control strategies designed to ensure that the area attains and

maintains compliance with the new 8-hour O₃ standard. Participation in an EAC indicates that the region is considered *near-nonattainment* (and should be treated as an attainment area). Through participation in the EAC, the MSAIAQCR can avoid a possible non-attainment designation, so long as the region complies with the rules and milestones defined in their air quality plan. Under this condition, the general conformity rule, created to ensure that federal projects do not cause or aggravate an existing violation in air quality standards, does not apply, and no detailed conformity analysis is required for the proposed project.

There would be a short-term insignificant impact to air quality from implementation of the recommended plan. Construction of the proposed project would generate total suspended particles (TSP) and PM₁₀ emissions as fugitive dust from ground disturbing activities (e.g., grading, demolition, soil piles, etc.) in addition to the emissions of all criteria pollutants from the combustion of fuels in construction equipment. Fugitive dust emissions would be greatest during the initial site preparation activities and would vary from day-to-day depending on the construction phase, level of activity, and prevailing weather conditions. The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area of land being worked and the level of construction activity. Emissions would be temporary in nature. The use of BMPs during construction (e.g. application of water for dust control) would minimize these emissions.

Hazardous and Toxic Materials. Specific environmental statutes and regulations govern hazardous material and hazardous waste management activities. For the purpose of this analysis, the terms *hazardous waste*, *hazardous materials*, and *toxic substances* include those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), or the Toxic Substances Control Act (TSCA). In general, they include substances that, because of their quantity, concentration, or physical, chemical, or toxic characteristics, may present substantial danger to public health or welfare or to the environment when released.

Potential hazardous material sites in close proximity to the Mission Reach were identified in Chapter 3 of this document (Table 3-2). In order to fully identify and assess recognized environmental conditions at each of the properties, a site walk would be conducted; interviews would be undertaken with property owners or facility operators; and aerial photographs, Sanborn Insurance Maps, and Municipal records would be reviewed in accordance with ASTM Standard E 1527-00. With proper handling, storage, and /or disposal of hazardous and/or regulated materials there would be no substantial adverse impacts to onsite workers or neighboring flora and fauna.

A search of environmental records revealed two areas of potential environmental concern within a ½-mile radius of the proposed disposal site, however, further investigation indicated that neither would affect the site. Numerous oil wells and several water wells were identified on or near the site. The oil wells have been plugged; an associated tank battery has been removed, and no fill is proposed for that location. Two of the water wells are still functional; a third is not. These wells would need to be plugged in accordance with state regulations. Three pole-mounted transformers located on the property would need to be removed and

properly disposed. With proper handling, storage, and /or disposal of hazardous and/or regulated materials there would be no substantial adverse impacts to onsite workers, neighboring flora and fauna, and no risk to public health and safety.

To minimize potential impacts from hazardous and regulated materials during construction, all fuels, waste oils, and solvents would be collected and stored in tanks or drums within a secondary containment system that consists of an impervious floor and bermed sidewalls capable of containing the volume of the largest container stored therein.

The refueling of machinery would be completed following accepted guidelines, and all vehicles would have drip pans, when not in use, to contain minor spills and drips. Although it would be unlikely for a major spill to occur, any spill of five gallons or more would be contained immediately within an earthen dike, and the application of an absorbent (e.g., granular, pillow, sock, etc.) would be used to absorb and contain the spill. Any major spill of a hazardous or regulated substance would be reported immediately to SARA and USACE environmental personnel who would notify appropriate Federal and State agencies.

Additionally, all construction personnel would be briefed as to the correct procedures for preventing and responding to a spill. All waste oil and solvents would be recycled if practicable. All non-recyclable hazardous and regulated wastes would be collected, characterized, labeled, stored, transported, and disposed of in accordance with all Federal, State, and local regulations, including proper waste manifesting procedures. A Spill Prevention Plan would be in place prior to the start of construction, and all personnel shall be briefed on the implementation and responsibilities of this plan. Adoption and full implementation of the construction measures described above will reduce adverse hazardous/regulated substances impacts to insignificant levels.

Noise. Noise is described as unwanted sound, which is measured and perceived by its characteristic amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of changes in the pressure of a sound wave. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Sound is represented on a logarithmic scale in decibel (dB) units. The threshold of human hearing is approximately 0 dB, and the threshold of pain is around 120 dB.

Frequency of measured sound is adjusted to correspond to the frequency sensitivity of the human ear if measuring community response to noise. Sound levels that have been adjusted are referred to as A-weighted sound levels and are represented as dBA units. Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL).

DNL is the community noise metric recommended by the EPA and has been adopted by most federal agencies (Federal Interagency Committee on Noise 1992). A DNL of 65 dB is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities that do cause noise. Areas exposed to

DNL above 65 dB are generally not considered suitable. A DNL of 55 dB was identified by EPA as a level below which there is effectively no adverse impact (USEPA 1972).

The primary noise sensitive receptors near the project area are residential neighborhoods, isolated residences such as farms and ranches, churches, and public use areas (golf courses and parks, including the San Antonio Missions National Historic Park). Article III, Section 21-52 of the City of San Antonio Noise Ordinances states that the operation of any tools or equipment used in construction, excavation, drilling, demolition, alteration or repair work: Other than during the daytime on week days (Monday through Saturday 6:00 a.m. to 11:00 p.m.); or at anytime such that the sound level at or across a real property boundary exceeds 80dBA, will be considered “noise nuisances,” and are unlawful.

For on-site construction workers, the permissible exposure limits (PEL) and requirements for noise control are an 8-hour time-weighted average exposure level (TWA) of 90 dBA with a 5-dB exchange rate between allowable duration and noise level. Engineering or administrative controls are required to be implemented above this level, and hearing protection devices (HPDs) must be issued and worn when exposures exceed the PEL. Regulations require hearing conservation programs (HCPs) for overexposed workers. The Occupational Health and Safety Administration’s Construction Regulation 1926.101 mandates the use of hearing protection above the PEL and requires insert devices to be fitted or determined individually by “competent persons” (Suter 2002). Table 4-12 provides a summary of noise exposure levels experienced by heavy equipment operators.

Table 4-12
Average Daily Noise Exposure Levels (8-hour TWA)
of Heavy Equipment Operators and Associated Laborers in dBA

Operator or Task	Mean TWA	SD	Range
Heavy-duty bulldozer	9	5	91-107
Vibrating road roller	97	4	91-104
Light-duty bulldozer	96	2	93-101
Asphalt road roller	95	4	85-103
Wheel loader	94	4	87-100
Asphalt spreader	91	3	87-97
Light-duty grader	89	1	88-91
Power shovel	88	3	80-93
Laborers	90	6	78-107
Crawler crane - .35 ton Noninsulated cab	97	2	93-101
Crawler crane - 35 ton Noninsulated cab	94	3	90-98
Insulated cab	84	3	80-89
Rubber tired crane - 35 ton Noninsulated cab	84	5	78-90
Insulated cab	74	9	59-87
Rubber tired crane - 35 ton Insulated cab	81	4	77-87
Truck-mounted crane	79	2	76-83
Tower crane	74	2	70-76

Heavy equipment such as backhoes, front-end loaders, and cement and dump trucks would cause short-term, localized, insignificant increases in noise levels. These short-term increases are not expected to substantially affect adjacent noise sensitive receptors or wildlife areas. Construction activities would increase noise levels temporarily at locations immediately adjacent to the project area, but would be attenuated by distance, topography, and vegetation. Noise levels created by construction equipment would vary greatly depending on factors such as the type of equipment, the specific model, the operation being performed, and the condition of the equipment. The equivalent sound level of the construction activity also depends on the fraction of time that the equipment is operated over the time period of the construction. Construction would occur only during daylight hours, thus reducing the DNLs and the chances of causing annoyances. The use of BMPs such as keeping equipment in good operating condition, proper training, and providing appropriate health and safety equipment will minimize the potential noise impacts associated with the proposed action.

Recreation. There would be beneficial, but insignificant, effects to recreation within the city and region resulting from implementation of the recommended plan. All 483 acres of the proposed ecosystem restoration project would be accessible for public use. Approximately 56,800 linear feet of multipurpose trails, five covered seating areas, and other day use facilities (benches, picnic tables, water fountains, trash receptacles, etc) would be constructed as part of the proposed project. These facilities, in addition to improvements to vegetative cover and the river channel, would improve aesthetics and increase outdoor recreational opportunities (i.e. hiking, biking, bird watching). Conversion of the disposal site from agricultural to wildlife habitat may provide additional recreational opportunities for wildlife viewing within the region.

Public Utilities. There would be insignificant short-term impacts to public utilities attributed to implementation of the recommended plan. Construction of the proposed project would require the relocation of 26,650 linear feet (\approx 5.0 miles) of utility lines, including 3,315 linear feet of gas line, 15,370 linear feet of sewer line, 5,620 linear feet of water line, and 2,345 linear feet of overhead electrical line. Public utility relocations would take place intermittently (not all at once), and would parallel planned construction phasing. If the relocations are properly executed, there would be no interruption of services to end users. No public utilities would be impacted by activities planned for the proposed disposal site.

Traffic. Short-term, insignificant impacts to traffic volumes would be expected during construction activities. Local roads are well designed and are capable of handling a large volume of vehicles. However, during construction, traffic congestion could occur, particularly during the morning and evening rush hour as construction vehicles enter and exit the project area, or transport construction debris to a disposal site. Road closures or restricted access may occur along Mission Parkway between Mission Road and White Avenue while Mission Parkway is rerouted. Since this is not a major thoroughfare, impacts to local traffic would be minor. Construction involving E. Southcross and E. White Avenue bridges, to modify the abutments (underneath), would result in partial or full closure of the bridges for up to 4 months each. Either partial or full closure of these bridges would be an inconvenience to local travelers, however, alternate routes across the river are locally available. Traffic patterns and density would be temporarily impacted at both the bridge

modification and alternate route sites. A traffic control plan would be prepared by the construction contractor and submitted for approval to federal and local officials prior to the start of any construction activities. This would make detailed construction traffic, road closure, and/or detour information available to the public prior to the initiation of construction.

Socio-Economics. The labor force that would be utilized for the ecosystem restoration construction would be provided by local and/or regional contractors. There would likely be no increases in the population of the project area resulting from implementation of the recommended plan. Materials and other project expenditures would be obtained through merchants in the local community giving direct economic benefits.

No structures (either residential or industrial) are located in the proposed project right-of-way; therefore, no displacement would result. Providing ecosystem restoration along the Mission Reach would not be expected to increase burdens on local social resources; however, it may result in higher numbers of individuals visiting the local area for recreational purposes. Short- and long-term impacts to socioeconomics would be beneficial, but insignificant.

Environmental Justice/ Protection of Children from Health and Safety Risks. E.O. 12898 “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations”, dated February 11, 1994, requires all federal agencies to identify and address disproportionately high and adverse effect of its programs, policies, and activities on minority and low-income populations. The 2000 demographic profile for Bexar County indicates that Hispanic or Latino populations make up the majority of the population (54.3 percent), white [not Hispanic] (14.6 percent), black or African American (7.2 percent), American Indian or Alaska native (0.8 percent), Asian (1.6 percent), Pacific islander (0.1 percent), and some other or a combination of races (21.4 percent). The median household income, median family income, and per capita income all fall below national levels. The percentages of families and individuals below the poverty level (12.7 and 15.9 percent, respectively) are higher than national averages (9.2 and 12.4 percent respectively).

Even though minorities account for a large portion of the local population (particularly groups claiming Hispanic/Latino and African American origin), and the low-income population is above the national average, construction of the proposed project would not have a disproportionately high or adverse affect on these populations. Implementation of ecosystem restoration measures to the Mission Reach is expected to have a beneficial effect on all populations regardless of race, origin, or income level. This conclusion is based on the fact that no substantial adverse environmental effects have been identified for any resource area or population (minority, low-income, children, or otherwise) analyzed in this EA. In fact, many beneficial impacts associated with the proposed project have been identified. Therefore, the proposed project would be consistent with E.O. 12898.

E.O. 13045 “Protection of Children from Environmental Health Risks” dated April 21, 1997 requires federal agencies to identify and address the potential to generate disproportionately high environmental health and safety risks to children. This E.O. was prompted by the

recognition that children, still undergoing physiological growth and development, are more sensitive to adverse environmental health and safety risks than adults. Since the project area is located near residential areas where children may be present, E.O. 13045 is considered in this EA.

Short-term insignificant impacts on the protection of children would be expected. Numerous types of construction equipment such as backhoes, bulldozers, graders, and dump trucks, and other large construction equipment would be used throughout the duration of construction of the proposed project. Because construction sites and equipment can be enticing to children, construction activity could create an increased safety risk. The risk to children would be greatest in construction areas near densely populated residential neighborhoods – primarily in the upper half of the proposed project area. Because of the relatively low population surrounding the lower half of the proposed project area, the risk to children would be lessened. During construction, safety measures would be followed to protect the health and safety of residents as well as construction workers. Barriers and “No Trespassing” signs would be placed around construction sites to deter children from playing in these areas, and construction vehicles and equipment would be secured when not in use. Since the construction area would be flagged or otherwise fenced, issues regarding Protection of Children are not anticipated.

Cumulative Impacts. The assessment of cumulative impacts is addressed in NEPA by its reference to interrelations of all components of the natural environment. The CEQ defined cumulative impact as the incremental impact of multiple present and future actions with individually minor but collectively substantial effects. Cumulative impacts can be concisely defined as the total effect of multiple land uses and developments, including their interrelationships, on the environment (Bain *et al.* 1986)

As mentioned in Chapter 1, there are a number of ongoing USACE projects or investigations within the vicinity of San Antonio, Texas. These include:

- Eagleland Habitat Restoration (approximately 15 acres)
- Olmos Creek Aquatic Restoration (approximately 100 acres)
- San Antonio River, Federal Emergency Management Agency, Limited Map Maintenance Program (floodplain mapping)
- Cibolo Creek Interim Feasibility Study (Ecosystem Restoration)
- Salado Creek Interim Feasibility Study (Ecosystem Restoration)
- Leon Creek Interim Feasibility Study (Ecosystem Restoration)
- Lower San Antonio River Basin Interim Feasibility Study
- Alamo Heights Reconnaissance Study, and Woodlawn, Reconnaissance Study

The type of projects that are either underway, or which might be undertaken as a direct result of one of these studies, include flood damage reduction, ecosystem restoration, water quality, or water supply. These projects, if implemented, would have environmental impacts of all varieties. Unavoidable adverse affects to natural or human environments would be conditional on the application of effective mitigation practices so as to avoid, minimize, and compensate for those impacts. However, many future projects would be designed for, or

would otherwise incorporate ecosystem restoration measures, which would have few short-term adverse impacts, but many long-term beneficial ones. The extent of impacts associated with many of these ongoing studies is not yet known.

The National Park Service, with 826 acres adjacent to the proposed project area, has a mission to preserve the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. Current and future project interests of the San Antonio Missions National Historic Park are outlined in their Strategic Plan for Fiscal Years 2001-2005. Projects identified as important to the park primarily include investigation, preservation, and restoration of park resources. Planned activities include:

- Condition assessments and maintenance or restoration of structures;
- Condition assessments of archeological sites;
- Cultural landscape design, construction, and maintenance;
- Investigations for water quality improvements;
- Update species database;
- Develop ecosystem monitoring plan consistent with agency standards
- Construct multipurpose trail (walkway/maintenance route) along the San Juan Acequia (east of river) from Loop 410 to the old Hot Wells Hotel;

There are numerous U.S. military facilities in the vicinity of San Antonio, TX. Each is independently responsible for work, training, housing, and amenities for thousands of U.S. military personnel within the region. Past, present, and future initiatives such as Base Realignment and Closure, Transformation, and Privatization affect the physical facilities required for on-going installation activities. Military actions do not usually affect the general population, as they are carried out within the boundaries of an existing federal facility. Noise generation from training activities and traffic may be the most common impact to neighboring businesses and residents. Economic benefits to communities from having major military installations are substantial and beneficial. Actions involving construction and training could have adverse impacts to natural and cultural resources within the limits of the military installation. All such facilities are required by law to prepare and follow natural and cultural resource management plans, perform environmental impact analyses in compliance with the NEPA, and coordinate with state and federal agencies (i.e. USFWS, State Historic Preservation Officer (SHPO), TPWD, TCEQ) regarding impacts of proposed actions prior to initiation of any such action. Through proper mitigation practices, military actions should result in insignificant impacts to natural, cultural and human environment. Any proposed action involving substantial impacts would involve participation from all levels of government and the public.

Local governments within the watershed have a desire to independently pursue other restoration opportunities. The extent of any project which might be implemented is unknown at this time, however, any ecosystem restoration activities, if properly studied, designed, and constructed, would result in long-term beneficial impacts to the natural environment. Current efforts include:

- Restoration of other tributaries of the San Antonio River;
- Purchase and preserve portions of the riparian zones of Salado and Leon Creeks;
- Ongoing program to purchase lands located in the Edwards Aquifer recharge zone, including creeks—thousands of acres already purchased;
- Ongoing river/creek debris clean-up;
- Develop water quality models throughout the basin to quantify water quality benefits produced by natural creek systems.

The SARA, City of San Antonio, Bexar County, and the greater metropolitan area are to be commended for taking active roles in the pursuit of good environmental stewardship. Their contributions to regional and national air quality (as the architects of the Early Action Compact program), water quality, and ecosystem restoration issues are a model for other metropolitan areas throughout the country.

San Antonio, ranked 9th largest city in the U.S. by the U.S. Census Bureau in 2002, is now the fastest-growing city in Texas, with approximately 1,214,725 residents as of July 1, 2003. Urban development is responsible for the loss of many natural and cultural resources. Ironically, public demand is also responsible for recent trends in preservation and restoration of these same resources. Natural resources are protected to some extent from rampant urban development through provisions in the Clean Water Act, Clean Air Act, Endangered Species Act, etc. However, because urban development within the state of Texas does not undergo a stringent level of environmental impact analysis, most impacts to natural and cultural resources cannot be quantified.

Direct and indirect impacts to natural and cultural resources would occur as a result of human activities (both governmental and private) within the metropolitan area of San Antonio. Modern awareness pertaining to the importance of these resources influence some development practices, such as pollution prevention, however, many other development practices are determined by cost rather than ecosystem health. The cumulative impacts from unchecked urban development would be considered substantial and adverse. Federal actions, which must undergo rigorous environmental impact analysis could have adverse impacts to natural and cultural resources, but those impacts would be mitigated, to the extent practicable.

Conclusion. A summary of anticipated impacts is provided in Figure 4-3 on the following page. Implementation of the proposed ecosystem restoration would have both short-term adverse effects to some individual resources, but long-term beneficial effects to ecosystem health. The proposed project would benefit fish, wildlife, and human populations. Substantial beneficial impacts would occur to aquatic and riparian habitats. However, because the purpose of the proposed project is to reestablish conditions that once existed in this location, a Notice of Intent (NOI) to prepare an Environmental Impact Statement is not warranted, and a draft Finding of No Significant Impact (FONSI) has been prepared for this proposed action.

	Proposed Restoration	Disposal Site		Proposed Restoration	Disposal Site
Land use	●	●		●	●
Aesthetics	●	●		●	●
Topography	●	●		●	●
Soils/Prime Farmlands	●	●		●	●
Groundwater	○	○		●	○
Surface Water	●	○		●	○
Water Quality	●	●		●	●
Floodplains	●	○		●	○
Vegetation	●	●		○	○
Wildlife	●	●		○	○
Threatened/Endangered Species	○	○		●	●
			Cultural Resources	●	●
			Air Quality	●	●
			Hazardous/Toxic Material Sites	●	●
			Noise	●	●
			Recreation	●	○
			Public Utilities	●	○
			Traffic	●	●
			Socio-Economics	●	○
			Environmental Justice	○	○
			Protection of Children	○	○
			Cumulative Effects	●	●

Legend:

○ No Effect	● Insignificant Effect	■ Long-Term Effect
● Beneficial Effect	● Significant Effect	▨ Short-Term Effect

Figure 4-3. Proposed Project Impact Matrix

San Antonio Channel Improvement Project General Reevaluation Report

Date: July 2004

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PROJECT IMPLEMENTATION

Project implementation is comprised of two phases. They are preconstruction engineering and design, and construction. Each is briefly described in the following sections.

Pre-construction Engineering and Design (PED) Phase. During the preconstruction engineering and design (PED) phase, a number of activities will take place including the completion of a detailed design report, plans and specifications, execution of the Project Cooperation Agreement, real estate acquisition, and contract award activity. Each of the PED activities is briefly described below.

Detailed Design Report. The Detailed Design Report (DDR) includes completing project feature final design. As part of the DDR, remaining ground surveys, utility surveys, drilling and testing for subsurface (geotechnical) conditions, drilling and testing for potential site-specific contaminants will be completed. The final pilot channel alignment, and riffle structure and erosion protection locations, will be verified based on the final hydraulic analyses. Design parameters for all project features will be defined for development of the plans and specifications. All cultural resource investigations and mitigation requirements will be finalized prior to the final project design. The DDR will be completed within one year of the initiation of PED.

Plans and Specifications. Plans and specifications (P&S) are the development of project construction drawings, project construction specifications, estimation of final quantities, and the government cost estimate. These documents (with the exception of the government cost estimate) are made available to contractors interested in bidding on the construction of the proposed project. It is anticipated that up to four sets of P&S will be developed for the pilot channel, special aquatic features, and riparian vegetation. All cultural resource investigations and mitigation requirements will be finalized prior to the final project design.

Project Cooperation Agreement and Items of Non-Federal Responsibility. The Project Cooperation Agreement (PCA) is a contract between the Federal Government and the non-Federal partner describing the rights and responsibilities of each party during project implementation, including cost sharing. Appendix L is a copy of a draft model PCA agreement. The PCA will be executed during the plans and specifications phase of project implementation.

Prior to commencement of construction, local interests must agree to meet the requirements for non-Federal responsibilities, as summarized below and in future legal documents. The final non-Federal responsibilities will be detailed in the Project Cooperation Agreement.

- Provide 35 percent of the separable project costs allocated to environmental restoration and 50 percent of the separable project costs allocated to recreation.
- Provide, during construction, funds required to cover the non-Federal share of design costs.

- Provide all lands, easements, and rights-of-way, including suitable borrow and dredged or excavated material disposal areas, and perform or assure the performance of all relocations determined by the Government to be necessary for the construction, operation, and maintenance of the project.
- Provide or pay to the Government the cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, that may be required at any dredged or excavated material disposal areas required for the construction, operation, and maintenance of the project.
- Provide, during construction, any additional costs as necessary to make its total contribution equal to 35 percent of the separable project costs allocated to environmental restoration and 50 percent of the separable project costs allocated to recreation.
- For so long as the project remains authorized, operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, including mitigation features, at no cost to the Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and any specific directions prescribed by the Government in the Operation, Maintenance, Replacement, Repair, and Major Rehabilitation manual.
- Give the Government a right to enter, at reasonable times and in a reasonable manner, upon land which the local sponsor owns or controls for access to the project for the purpose of inspection, and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.
- Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element.
- Hold and save the Government free from all damages arising for the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the Government or the Government's contractors.
- Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project to the extent and in such detail as will properly reflect total project costs.
- Perform, or cause to be performed, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response,

- Compensation, and Liability Act (CERCLA), 42 USC 9601-9675, that may exist in, on, or under lands, easements or rights-of-way necessary for the construction, operation, and maintenance of the project; except that the non-Federal sponsor shall not perform such investigations on lands, easements, or rights-of-way that the Government determines to be subject to the navigation servitude without prior specific written direction by the Government.
- Assume complete financial responsibility for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Government determines necessary for the construction, operation, or maintenance of the project.
 - To the maximum extent practicable, operate, maintain, repair, replace, and rehabilitate the project and otherwise perform its obligations in a manner that will not cause liability to arise under CERCLA.
 - Prevent obstructions of, or encroachments on, the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the ecosystem restoration purpose, hinder its operation and maintenance, or interfere with its proper function, such as any new development (*including recreation facilities or features*) on project lands or the addition of facilities that would degrade the *ecosystem restoration benefits* of the project.
 - Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public law 91-646, as amended by title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR part 24, in acquiring lands, easements, and rights-of-way, and performing relocations for construction, operation, and maintenance of the project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.
 - Comply with all applicable Federal and State laws and regulations, including Section 601 of the Civil Rights Act of 1964, Public Law 88-352, and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."
 - Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project, in accordance with cost sharing provisions of the project cooperation agreement;
 - Not use Federal funds to meet the non-Federal sponsor's share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is authorized.

- Provide and maintain necessary access roads, parking areas, and other public use facilities, open and available to all on equal terms.
- Obtain all necessary water rights for the operation of the project.

Real Estate Acquisition. The Non-Federal partner is responsible for acquiring all privately, as well as local government or public, owned lands, easements, rights-of-way, relocations, and disposal areas (LERRD's) required for project construction, operation, and maintenance. The Fort Worth District acting on behalf of the SARA will facilitate the acquisition of National Park Service lands. Following the execution of the Project Cooperation Agreement, the non-Federal sponsor will be provided a right-of-way map delineating the real estate to be acquired. The non-Federal sponsor will coordinate the real estate acquisition with the Fort Worth District, and provide a right-of-entry prior to any construction contract advertisement. All lands, including cultural mitigation lands if necessary, must be acquired prior to the advertisement and award of any construction contract. The cultural mitigation lands must be acquired prior to the NPS lands being conveyed to the project.

Contract Advertisement and Award. Once the PCA is executed, a set of plans and specifications completed, and right of entry has been provided to the Fort Worth District, a construction contract will be solicited and advertised. Prior to awarding the contract, the non-Federal partner must provide any applicable cash contribution. The contract will be awarded to the lowest responsive bidder and construction may be initiated within 30-45 days from the bid opening.

Project Management Plan. The Project Management Plan (PMP) defines the scope, work breakdown structure, schedule and budget required to complete PED, and includes additional documentation on value management, quality control, communication, change control, and other management topics. The PMP must be developed, negotiated, and agreed upon by all parties prior to the start of the PED phase.

Project Construction. After award of a construction contract, the Government will manage the project construction. Up to eight construction contracts may be awarded (not including contracts potentially awarded by the local sponsor for relocations). Inherent with this contract, a warranty period for the actual construction items and the plantings will be specified. Construction of the pilot channel, riffle structures, and appurtenant features is estimated to take 36 months to complete. The planting of the riparian vegetation will begin in those areas where the pilot channel is complete. The planting will occur over at least two planting seasons within the same planting area. There will be a two-year contract period beyond each specific planting period to ensure the vegetation is alive and thriving. This activity will include removing invasive species, watering (if needed), and replacement of vegetation (to ensure a minimum survival rate). During construction, an archeologist will monitor the excavation, and should any previously undiscovered significant cultural resources be identified, mitigation procedures would take place prior to further excavation. The total implementation time is estimated at 67 months. A Project Management Plan for the construction phase will be developed during the PED phase.

Monitoring and Adaptive Management. In an effort to ensure the success of the recommended plan, the restoration measures implemented will be periodically surveyed to provide feedback on the response of the ecosystem and its resources to the management measures taken. By connecting the ecosystem response to the restoration as well as the management measures, potential beneficial adaptations and adjustments to the project or management plan can be identified to ensure continued success of the project. This is especially true of the plantings that will have to be frequently monitored from their initial planting until reasonable stabilization is achieved. To accomplish this goal, periodic monitoring of the restoration measures will be conducted over a three-year period beginning after the completion of the construction of project features and the initial reforestation plantings.

Operation, Maintenance, Repair, Replacement, and Rehabilitation. The Non-Federal sponsor is responsible for operation, maintenance, repair, replacement, and rehabilitation of the completed project. The Fort Worth District will provide an operations and maintenance manual after project (or portion thereof) construction is complete, and prior to turning the project over to the non-Federal for OMRR&R. OMRR&R of the restoration project is comprised of the structural integrity of the riffle structures, and the recreation facilities. There will be routine OMRR&R, and OMRR&R required following a flood event. A detailed Operations and Maintenance manual will be provided prior to the project delivery to the customer. Table 4-13 summarized the OMRR&R annual costs.

Pilot Channel, River Remnants, Embayments, and Tributary Mouths. Routine maintenance will include the periodic inspection, the repair of localized erosion, removal of excess sediment and debris, and the replacement of dislodged riprap. The riffles and other hard structures within the river will help maintain the recommended river alignment during flood events.

Riparian Vegetation. Beyond the contractor requirement, and the monitoring and adaptive management period, there is no need for any routine maintenance for the riparian vegetation. The selected mowing within the restoration area is required to maintain the flood damage reduction capability of the project, not for restoration. Accordingly, mowing costs are part of the flood damage reduction project. However, mowing costs should be significantly reduced with the restoration project in place because the majority of the area is within a no-mow zone.

It is anticipated some loss of vegetation may occur, particularly during the first years 3-5 years of the project in the event of a significant flood event. This potential loss of habitat output was mitigated using seedlings for the trees plantings. Seedlings are more likely to withstand flood forces while the root system becomes firmly established. Further, it is not expected that all of the trees planted will survive to maturity (this was taken into account in the habitat evaluations). An increase in debris is expected to accumulate during and after significant flood events. This accumulation will increase as the vegetation matures. The removal of this debris was accounted for in the OMRR&R cost estimate.

Table 4-13
Annual OMRR&R Costs

Activity	Annual OMRR&R Costs
<i>Routine Maintenance:</i>	
Restoration:	
Pilot Channel	\$ 25,000
Riffle Structures	\$ 10,000
Riparian Vegetation	<u>\$ 0</u>
Subtotal Restoration	\$ 35,000
Recreation	\$ 17,500
Subtotal Routine Maintenance	\$ 52,500
<i>Post-Flood Maintenance:</i>	
Inspection / Debris Removal / Erosion and Riprap Repair / Riffle Structure Replacement / Recreation	<u>\$ 75,000</u>
Total Annual Maintenance Cost	\$ 127,500

Riffle Structures. Routine maintenance will include the periodic inspection of the structures, the repair of localized erosion, removal of excess sediment behind the structure, and the replacement of dislodged riprap.

Recreation Facilities. Routine maintenance of the trail and the footbridges will require a periodic inspection, repairing minor cracks and scaling, and clearing of debris. Comfort stations will require period cleaning and trash removal. It is expected that picnic tables, benches, water fountains, and signage will require nominal repair and replacement.

Project Implementation Schedule. The project may be implemented in four phases. They are:

- San Juan Diversion to Espada Dam
- Lonestar (upstream project limit) to San Pedro Creek
- San Pedro Creek to San Juan Diversion
- Espada Dam to downstream project limit

Table 4-14 displays the draft implementation schedule. The final schedule will be coordinated and approved by the local sponsor, and included in the final PED Project Management Plan.

Table 4- 14
Project Implementation Schedule

	San Juan Diversion To Espada Dam	Lonestar to San Pedro Cr	San Pedro Cr to Espada Dam	Espada Dam to Project End
Initiate PED	October 2004	October 2004	October 2004	October 2004
Execute PCA	December 2004	December 2004	December 2004	December 2004
Complete Initial DDR	September 2005	September 2005	September 2005	September 2005
Acquire Real Estate	March 2006	November 2006	May 2007	October 2007
Advertise Contract	May 2006	January 2007	July 2007	December 2007
Award Contract	August 2006	April 2007	October 2007	March 2008
Complete Pilot Channel	April 2007	May 2008	April 2009	August 2009
Complete Planting	March 2008	March 2009	March 2010	March 2010
Complete Monitoring	March 2010	March 2011	March 2012	March 2012
Project Closeout	September 2010	September 2010	September 2010	September 2010

Total Project Cost. The total project cost is comprised of all expenditures for lands, easements, rights-of-way, relocations, and disposal areas, pre-construction engineering and design, and construction, including contingencies. The complete MCACES cost estimate is located in Appendix C.8. Table 4-15 displays a summary of the total project costs by the U.S. Corps of Engineers Code of Accounts.

Table 4-15
Total Project Cost Summary

<u>Code of Account</u>	<u>Total Cost</u>
02 – Relocations	\$ 6,224,599
04 – Dams	\$ 226,129
06 – Fish and Wildlife	\$ 2,774,249
09 – Channels and Canals	\$ 62,609,904
14 – Recreation Facilities	\$ 5,091,786
TOTAL CONSTRUCTION	\$ 76,926,667
01 – Lands and Damages	\$ 4,637,091
18 – Cultural Resources Mitigation	\$ 500,000
30 – Planning, Engineering, and Design	\$ 6,154,100
31 – Supervision and Administration	\$ 6,154,100
TOTAL PROJECT COST	\$ 94,371,958

The 02–Relocations includes all utilities (gas, sewer, water, electric), storm water outfalls, modification to the East Southcross and East White bridges, relocation to Mission Parkway, and relocation of existing sidewalks, parking lots, and fences. These costs were apportioned to both the pilot channel and the vegetation. The 04–Dam account includes the modification to the existing San Juan Dam (riffle structure). The 06–Fish and Wildlife account is the

riparian vegetation planning including site preparation, planting, and irrigation. The 09–Channels and Canals includes the excavation of the pilot channel and floodway, riffles structures, erosion protection, and appurtenant items. These costs were apportioned to both the pilot channel and the vegetation. The 14–Recreation includes the multi-purpose trail, footbridges, shade shelters, day use facilities, lighting, and appurtenant features.

Table 4-16 displays a summary of total project cost by project purpose. Table 4-17 displays a summary of total annuals costs.

Table 4-16
Summary of Restoration Total Project Cost

<u>Item</u>	<u>Pilot Channel</u>	<u>Special Aquatic Features</u>	<u>Riparian Vegetation</u>	<u>Total Restoration Project Cost</u>
Relocations	\$ 1,838,119	\$ 0	\$ 4,386,480	\$ 6,224,599
Dams	\$ 226,129	\$ 0	\$ 0	\$ 226,129
Fish and Wildlife	\$ 0	\$ 0	\$ 2,774,249	\$ 2,774,249
Channel and Canals	<u>\$ 41,650,825</u>	<u>\$ 1,013,488</u>	<u>\$ 19,945,591</u>	<u>\$ 62,609,904</u>
TOTAL CONSTRUCTION	\$ 43,715,073	\$ 1,013,488	\$ 27,106,320	\$ 71,834,881
Lands and Damages	\$ 1,618,504	\$ 0	\$ 3,018,587	\$ 4,637,091
Planning, Engineering, and Design	\$ 3,479,116	\$ 81,079	\$ 2,186,562	\$ 5,746,757
Supervision and Administration	<u>\$ 3,479,116</u>	<u>\$ 81,079</u>	<u>\$ 2,186,562</u>	<u>\$ 5,746,757</u>
TOTAL RESTORATION	\$ 52,291,809	\$ 1,175,646	\$ 34,498,033	\$ 87,965,519

Totals may not sum due to rounding; does not include cultural mitigation (\$500,000).

Table 4-17
Annual Restoration and Recreation Project Costs

	<u>Restoration</u>	<u>Recreation</u>	<u>Total</u>
Total Project First Cost ⁽¹⁾	\$ 87,965,519	\$ 5,906,440	\$ 93,871,958
Investment Cost:			
Annual Interest Rate (%)	5-5/8	5-5/8	5-5/8
Period of Analysis (yrs)	50	50	50
Implementation Period	67	67	67
Compound Interest Factor	78.50	78.50	78.50
Capital Recovery Factor	0.060157	0.060157	0.060157
Interest During Construction	<u>\$ 14,921,598</u>	<u>\$ 1,001,910</u>	<u>\$ 15,923,508</u>
Total Investment Cost	\$ 102,887,117	\$ 6,908,350	\$ 109,795,466
Annual Cost:			
Interest	\$ 5,788,429	\$ 388,664	\$ 6,177,093
Amortization	\$ 400,961	\$ 26,923	\$ 427,884
Annual OMRR&R	<u>\$ 110,000</u>	<u>\$ 17,500</u>	<u>\$ 127,500</u>
Total Annual Cost	\$ 6,299,391	\$ 433,086	\$ 6,732,477

⁽¹⁾ Does not include \$500,000 for cultural mitigation; totals may not sum due to rounding

Cost Sharing. The restoration project features are cost shared on a 65-percent Federal and 35-percent non-Federal proportion. The non-Federal share includes the value of all lands, easement, rights-of-way, relocations, and disposal areas (LERRD's) provided for the recommended plan. In the event the value of the LERRD's is less than 35-percent of the total project cost, a cash contribution is required to make the non-Federal share at least 35-percent. Recreation project features are shared equally between the Federal Government and the non-Federal sponsor. The non-Federal share is provided in cash. The non-Federal cash contribution is required prior to the fiscal year in which it will be expended. Table 4-18 displays a summary of the project cost sharing cost sharing.

Table 4-18
Project Cost-Sharing

	<u>Restoration</u>	<u>Recreation</u>	<u>Cultural Mitigation</u>	<u>Total Project Cost</u>
Total Cost	\$ 87,965,519	\$ 5,906,440	\$ 500,000	\$ 94,371,958
Federal Share	\$ 57,177,587	\$ 2,953,220	\$ 500,000	\$ 60,630,807
Non-Federal Share:				
Lands	\$ 4,637,091	\$ 0	\$ 0	\$ 4,637,091
Relocations	\$ 7,220,535	\$ 0	\$ 0	\$ 7,220,535
Cash	\$ 18,930,305	\$ 2,953,220	\$ 0	\$ 21,883,525
Total Non-Federal	\$ 30,787,931	\$2,953,220	\$ 0	\$ 33,741,151

Financial Plan and Capability Assessment

Total financial obligation of the non-Federal sponsor during project implementation is estimated at \$33,741,151. The annual non-Federal obligation for operation, maintenance, repair, rehabilitation, and replacement is estimated at \$127,500 (both at June 2004 price levels). Table 4-19 displays their financial obligation by fiscal year (starting October 1, 2005).

Table 4-19
Estimated Schedule of Federal and Non-Federal Expenditures

	<u>Non-Federal</u>			<u>Total Non-Federal</u>	<u>Total Federal</u>
	<u>Cash</u>	<u>Acquisition</u>	<u>Relocations</u>		
FY 2005	\$ 0	\$ 670,000	\$ 150,000	\$ 820,000	\$ 2,500,000
FY 2006	\$ 0	\$ 1,855,000	\$ 150,000	\$ 2,005,000	\$ 2,750,000
FY 2007	\$ 0	\$ 1,855,000	\$ 2,150,000	\$ 4,005,000	\$ 15,500,000
FY 2008	\$ 13,000,000	\$ 257,091	\$ 2,050,000	\$ 15,307,091	\$ 19,500,000
FY 2009	\$ 8,558,000	\$ 0	\$ 2,720,535	\$ 11,278,535	\$ 19,500,000
FY 2010	\$ 185,000	\$ 0	\$ 0	\$ 185,000	\$ 500,000
FY 2011	\$ 92,500	\$ 0	\$ 0	\$ 92,500	\$ 250,000
FY 2012	\$ 48,025	\$ 0	\$ 0	\$ 48,025	\$ 130,807
TOTAL	\$ 21,883,525	\$ 4,637,091	\$ 7,220,535	\$ 33,741,151	\$ 60,630,807

Statement of Financial Capability. The statement of financial capability is based on information provided by the San Antonio River Authority (SARA), and is a description of its capability to meet its financial obligations for the recommended plan.

SARA serves as local sponsor with the USACE for the project. As the local sponsor, SARA coordinates project activities among the local funding partners; the City of San Antonio and Bexar County, and between the local funding partners and the USACE. SARA prepares budgets and cash flow requirements for each of the funding partners over the duration of the project, and is responsible for securing the appropriation authorizations and appropriations from the local funding partners to support the implementation of the project. SARA also administers all necessary financial transactions involving the local funds on the project and maintains all financial records on the project.

The local match requirement for the project is supported by the City of San Antonio and Bexar County. Funding for the project is projected through September 2010. Under this project schedule and the projected 35% match requirement on the environmental restoration components and 50% match requirement on the recreation components, the local match requirement of \$33,741,151 will be funded by both the City of San Antonio and Bexar County. Both entities have developed cash flow strategies to fund the project through 2010. Each entity appropriates funds annually to support the implementation of the project.

Financing Plan. SARA manages the cash flow requirements for the City of San Antonio and Bexar County projected over the life of the project according to uses and percentages approved by the funding partners.

The source of funding for Bexar County is an ad valorem flood tax collected from property owners in Bexar County. Bexar County has agreed to set the tax rate at a level sufficient to meet the financing requirements of the project. SARA, through an Interlocal Agreement with Bexar County, issues and manages the debt financing for the project. According to the terms of the Interlocal Agreement, each fiscal year SARA informs Bexar County of its debt funding requirements for the upcoming fiscal year to ensure that the flood tax rate is set at a level sufficient to meet the annual debt requirements to support the county's commitment to fund the project. The county is contractually obligated to the SARA to meet these debt service requirements. SARA is required to secure authorizations from the county to proceed with design and construction at which time the county commits the appropriations to support the authorization requested. Funding authorizations and appropriations, especially for construction, may be secured in phases over the life of the project. SARA will issue debt incrementally over the life of the project as needed to fund the county's approved appropriations for the project.

The City of San Antonio has identified several funding sources to meet its requirements for the project. Funding for the project is anticipated in the City's Six Year Capital Improvement Program and will be supported by general obligation bonds, revenue bonds, special revenue funds, and other funds managed by the city. As with the county, SARA will request authorizations to proceed with design and construction of the project at which time the city will appropriate the required funds. Funding authorizations and appropriations,

especially for construction, may be secured in phases over the life of the project. SARA will invoice the City of San Antonio for actual expenses to be paid from the city's funding.

Assessment of Financial Capability. Based on the above review of the financial capabilities and financing plan, it is reasonable to expect that ample resources available to satisfy the non-Federal financial obligation of the recommended plan.

FULLY FUNDED COST ESTIMATE

The fully funded cost estimate is intended to provide an indication of total project costs when inflation is taken into account. Inflation rates are based on rates developed as part of the Corps budgeting process. The total fully funded cost estimate is \$96,155,018; \$61,765,673 Federal and \$34,389,345 non-Federal. Table 4-20 displays a summary of the fully funded cost estimate.

Table 4-20
Fully Funded Cost Estimate

	Non-Federal		Federal	
	Total Cost June 2004 Price Level	Fully Funded Cost Estimate	Total Cost June 2004 Price Level	Fully Funded Cost Estimate
FY 2005	\$ 820,000	\$ 830,660	\$ 2,500,000	\$ 2,532,500
FY 2006	\$ 2,005,000	\$ 2,035,075	\$ 2,750,000	\$ 2,791,250
FY 2007	\$ 4,005,000	\$ 4,073,085	\$ 15,500,000	\$ 15,763,500
FY 2008	\$ 15,307,091	\$ 15,613,233	\$ 19,500,000	\$ 19,890,000
FY 2009	\$ 11,278,535	\$ 11,504,106	\$ 19,500,000	\$ 19,890,000
FY 2010	\$ 185,000	\$ 188,700	\$ 500,000	\$ 510,000
FY 2011	\$ 92,500	\$ 95,501	\$ 250,000	\$ 255,000
FY 2012	\$ 48,025	\$ 48,985	\$ 130,807	\$ 133,423
TOTAL	\$ 33,741,151	\$ 34,389,345	\$ 60,630,807	\$ 61,765,673

VIEWS OF THE LOCAL SPONSOR

The San Antonio River Authority, on behalf of the city of San Antonio and Bexar County, are identified as the local sponsor. The San Antonio River Authority, the city of San Antonio and Bexar County all support the recommended plan, and intend to participate in its implementation. A letter of intent stating their support, and their intention to participate in project implementation will be included in the final report.

VIEWS OF THE RESOURCE AGENCIES

Both the United States Fish and Wildlife Service and the Texas Parks and Wildlife Department are very supportive of the recommended plan. The recommended plan fulfills a number of their missions and objectives. Letters from these agencies announcing their support for the recommended plan are expected once the public review period is complete.

VIEWS OF THE NATIONAL PARK SERVICE

The National Park Service (NPS) is responsible for managing the San Antonio Missions National Historic Park. NPS lands required for the recommended plan define the cultural landscape around the four historic missions within the park. The NPS is supportive of the recommended plan provided no significant historic or cultural resources are adversely impacted, and impacts to the cultural landscape are satisfactorily mitigated.

PUBLIC INVOLVEMENT

Public involvement of the San Antonio River within the Mission Reach began during the development of the conceptual design for the ecosystem restoration outlines in the San Antonio Channel Improvement Project Concept Design – Design Guidelines (July 2001). Numerous public workshops were conducted to solicit public input. Since that time, the San Antonio River Oversight Committee has conducted many public meeting keeping local citizens informed of the study progress and continuing to solicit input. Numerous letters have been received from local environmental and conservation groups supporting the study efforts (located in Appendix O – Correspondences). A public meeting will be conducted during review of the draft report to solicit the Once the public review process is completed, a number of letters supporting the recommended plan are expected to be received in the Fort Worth District, and will be included in the Appendix.

CONCLUSIONS

The following conclusions are based on the study findings conducted in connection with this feasibility level report:

- The recommended plan is a multi-objective project consisting of ecosystem restoration features and recreation amenities.
- A significant need for implementation of ecosystem restoration measures and construction of recreation facilities to meet the identified needs of these project purposes.
- The recommended plan consists of series of pools (68.9 acres), riffles (18.4 acres), and chutes (9.4 acres), two restored river remnants (0.66 acres), nine embayments (3.9 acres), four tributary mouths (1.02 acres), a wetland (7.46 acres) and riparian vegetation (320 acres). The annual habitat gain is 126 habitat units; total habitat units over the 583-acre restoration area totals 180.52 habitat units. The restoration features are restored and sustained by a pilot channel, 29-riffle structures, two weirs, modification to the existing San Juan Dam, utility, storm water outfall, road, sidewalk, and parking lot relocations, two bridge modifications, channel invert erosion protection, channel slope and over-bank erosion protection, planting native riparian vegetation.
- The total restoration project cost is estimated at \$87,965,519. The total annual restoration cost is \$6,299,391. The annual cost per annual habitat unit gained is \$49,800. The annual cost per acres of restoration is \$14,500. The total cost per acre of restoration is \$202,000. The total recreation cost is \$5,906,400.
- The San Antonio River Authority is identified as the local sponsor for implementation of the recommended plan. Federal and non-Federal cost apportionments for the recommended restoration plan are estimated at \$57,177,587 and \$30,787,931 respectively. Federal and non-Federal cost apportionments for the recommended recreation plan are estimated at \$2,506,178 each.
- The recommended plan will cause no long-term adverse environmental impacts within the study area. Adverse impacts to cultural resources, either buried or in the cultural landscape will be identified and appropriate mitigation will be completed prior to project construction. A draft Finding of No Significant Impact (FONSI) has been prepared and is included herein. Distribution of this report, including the draft FONSI, was made to the public for review and comment in August 2004. Further cultural testing is necessary to determine whether there are any significant adverse impacts to cultural resources.
- The recommended plan is supported by the San Antonio River Authority, the city of San Antonio, Bexar County, the U.S. Fish and Wildlife Service, the Texas Parks and Wildlife Department, and the San Antonio River Oversight Committee.

The decision to invest in the San Antonio River restoration investment decision should not be based on comparisons with other opportunities, but rather whether it provides the desired output at a reasonable cost. Notwithstanding the fiscal constraints that make this kind of comparison necessary, below is a summary of why an investment of this restoration project is warranted.

The recommended plan -

- Fulfills Corps restoration mission
- Is in accordance with the Corps Civil Works Strategic Plan
- Is in accordance with the Corps Environmental Operating Principles
- Is in compliance with Corps restoration policy
- Is technically sound
- Is sustainable through the application of geomorphologic principles for sediment transport, hydraulic modeling, incorporating native vegetation species - survivability, and synergistic effects
- Has low maintenance costs
- Restores significant resources
- Restores habitat for native species, threatened and endangered species, and neotropical migratory bird species
- Complements other state and federal restoration programs and projects
- Restores biological and environmental resources that existed prior to the SACIP
- Demonstrates flood damage reduction and ecosystem function and restoration can co-exist
- Is an opportunity to demonstrate progressive commitment to the principles of environmental restoration by the Corps of Engineers
- Recommended plan provides connection to adjacent habitat and remaining watershed
- Captures the synergy between riparian and aquatic habitats
- Restores the river to a more natural configuration and function resulting in the greatest improvement in sinuosity, slope gradient, velocity and sediment transport
- Reasonably maximizes aquatic habitat; complete restoration to pre-SACIP conditions not practical from a financial perspective
- Provides greatest diversity in aquatic habitats, restores scarce habitats, particularly river remnants
- The total first cost of restoring two river remnants is less than one-half of one percent of the estimated total project first cost
- Is supported by the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department; has widespread local support
- Is an opportunity to protect and preserve habitat in an area where further loss of environmental resources is likely
- Customer has demonstrated commitment to ecosystem restoration by implementing millions of dollars to other projects.
- Customer is prepared to implement the San Antonio River project immediately having secured all required funding for implementation
- Provides flood damage reduction benefits

RECOMMENDATION

I propose the ecosystem restoration and recreation features identified as the recommended plan in the San Antonio Channel Improvement Project, General Reevaluation Report proceed with implementation in accordance with the cost sharing provisions set forth in this report.

This recommendation is made with the provision that prior to project implementation, the non-Federal sponsor shall enter into a binding agreement with the Secretary of the Army to perform the items of local cooperation, as specified in this document.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent to the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

John R. Minahan
Colonel, Corps of Engineers
District Engineer

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