CHAPTER 5.0
CUMULATIVE EFFECTS

CHAPTER 5 – CUMULATIVE EFFECTS

The CEQ has defined cumulative effects as "*the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.*" Cumulative effects can result from individually minor, but collectively significant, actions occurring over a period of time (40 CFR 1508.7). The CEQ guidance further indicates that it is not practical to analyze cumulative effects for other than those truly meaningful environmental effects. This guidance has been followed in the preparation of this analysis.

While assessing the potential for cumulative effects for the alternatives being considered, the interdisciplinary team considered all past, present and reasonably foreseeable actions and/or projects within the study area that could contribute to meaningful cumulative effects. Past actions by others in the basin have significantly altered the characteristics of the lower Colorado River. In particular, the river has been dammed and controlled to the point that it was converted from a free-flowing river that was periodically subject to flood events to a mostly controlled system. The timing and duration of flows and flood events in the river has changed dramatically. It is impossible to assess the cumulative impact of past projects on the lower Colorado River basin since data for conditions prior to many of the significant projects do not exist. Consequently, the past actions within the study area that have been identified are being considered as the existing conditions within the basin. Additionally, because present and reasonably forseeable actions by others within the lower Colorado River basin will occur within the study area, they are considered to be part of the No Action Alternative. Past, present, and reasonably foreseeable actions by others above O.H. Ivie or outside the lower Colorado River basin, and therefore outside of the study area but are connected to the lower Colorado River basin, will be considered in the cumulative impact analysis beyond those actions described under the No Action and Proposed Action alternatives. The criteria being used to select actions identified as "reasonably foreseeable" for the purpose of the cumulative assessment are as follows: (a) a congressional mandated study or project authorized by and specifically included in a Water Resources Development Act bill within the last 20 years and where there is a readily available report that documents environmental consequences, or; (b) a current and recently initiated state or federal study, or; (c) a specific individual contemplated, proposed or permitted private action requiring an EA or EIS in order for the action or actions to be authorized and where there is a readily available report that documents environmental consequences of the action or actions(s) or, (d) an

existing or updated regional water plan or reservoir operating plan specifically related to the project area, or; (e) a project report specifically published by the LCRA or Bay City Port Authority.

Public scoping was utilized to ascertain the major issues of concern to the general public and other agencies. Issues discerned from the public meetings held at the initiation of this PEIS process, as well as, those issues which have been made known through other public forums were considered. Flood damage reduction and ecosystem restoration projects typical of past USACE activities have the potential to impact an array of natural resources, induce downstream floodplain impacts and cause general land use changes within the newly protected areas. Continued reclamation of floodplain lands for residential and industrial uses also have the potential to cause other cumulative effects. In recent years, a number of new authorities and administrative procedures have been implemented, including administrative priorities promoting nonstructural flood damage projects. There has also been guidance issued promoting environmental quality measures, such as restoration of important ecosystem components.

An interdisciplinary team has addressed the cumulative effects of the series of alternatives being considered. Cumulative effects will be addressed by resource. The resource categories include; land use, socioeconomics; hydraulics and hydrology; floodplains; vegetation and soils; wildlife resources; freshwater resources; wetlands; marine resources including EFH; water and sediment quality; threatened and endangered species; air quality; cultural resources; recreation and open space; hazardous, toxic, and radioactive waste; and environmental justice.

5.1 Past Actions

5.1.1 USACE Projects in the Study Area

Past actions by the USACE in the study area are shown on Figure 5-1.

Flood Reduction Projects

Flood Protection at Matagorda. This project consisted of the enlargement of existing levees constructed in 1962 to protect the town of Matagorda, Texas from floods on the Colorado River and from hurricane surges from the Gulf of Mexico. The improvement consisted of 6.8 miles of earthen levees encircling the town and alterations to eleven drainage structures.

Boggy Creek Flood Protection Project. The Boggy Creek Flood Protection Project was completed in 1992 and provides local flood protection and recreation within the COA (USACE, 1995). The project consists of 1.1 miles of grass-lined channel and 1.7 miles of paved channel.

Figure 5-1 Past Actions - USACE Projects

Date: October 2004

This Page Intentionally Left Blank

Fifty-four acres of land was acquired to mitigate habitat losses and to provide for ecosystem restoration. The recreational component of the project consists of 1.0 mile of nature trail.

Hords Creek Lake. Hords Creek Lake, in Coleman County, Texas, is a flood control project that was the first USACE project in the Fort Worth District to be put into operation within Texas. The lake was completed in 1948 and also provides the water supply for Coleman, Texas (USACE, 1995). The lake covers 510 surface acres and has a normal storage capacity of 8,640 acre-ft.

Navigation Projects

Matagorda Ship Channel. The Matagorda Ship Channel (MSC) was authorized by the River and Harbor Act of 1958 and construction was completed in 1966. The channel was dredged to a depth of 38 ft and a width of 200 ft. The channel extends from the Gulf of Mexico through a man-made cut through the Matagorda Peninsula and across Matagorda and Lavaca bays to Point Comfort, Texas. The MSC project also includes an additional channel from the main channel to Port Lavaca. This channel was constructed to a depth of 12 ft and a width of 125 ft and includes a turning basin at Port Lavaca.

Channel to Red Bluff. The Channel to Red Bluff, which was authorized March 2, 1945, was constructed in 1962. The channel extends 20.2 miles from the MSC in Calhoun County, Texas across Lavaca Bay up the Lavaca River to a point near a red clay bluff known as “Red Bluff” in Jackson County, Texas. The channel has an authorized depth of 6 ft and a width of 100 ft.

Gulf Intracoastal Waterway. The GIWW extends from the Sabine River southward to Brownsville, a distance of 423 miles (USACE, 1995). The first segment of the GIWW on the Texas coast was completed across West Galveston Bay in 1895. The final segment from Corpus Christi to Port Isabel, Texas was completed in 1949. The majority of the GIWW is currently maintained to a depth of 12 ft and a width of 125 ft.

Mouth of the Colorado River. The authorized project consists of a jettied entrance channel, 15 ft deep by 200 ft wide, in the Gulf of Mexico; a navigation channel, 12 ft deep by 100 ft wide, from the Gulf shore to the GIWW; a harbor and turning basin, 12 ft deep by 350 ft wide by 1,450 ft long, adjacent to the north side of the GIWW at Matagorda; a 3.1-mile diversion channel, 250 ft wide and varying in depth from 20 to 23 ft, to divert the Colorado River flows into Matagorda Bay; a diversion dam across the existing discharge channel near the junction of the Colorado River and

GIWW; closure of Parker's Cut; and a public use area with recreational facilities on land adjacent to the navigation channel.

The studies for the navigation features of the project were completed and approved for construction in 1978 during Phase I. Navigation features included a jettied entrance and navigation channels, recreation facilities, and the harbor and turning basin. River diversion features followed in Phase II and were approved in 1981. Diversion features included the 3.1-mile diversion channel, diversion dam, relocation of the navigation channel, closure of Parker's Cut and placement of oyster clutch for reef development.

The purpose of this project is to enhance the commercial fisheries productivity of Matagorda Bay while providing reductions in navigational hazards and maintenance dredging as well as incidental flood damage reduction.

Colorado River Channel. This channel begins at the GIWW and extends upstream approximately 15.5 miles terminating in a turning basin in the vicinity of Bay City, Texas. The channel is approximately 9 ft deep and 100 ft wide. The turning basin is 9 ft deep, 400 ft wide and 500 ft long.

Sediment Training Structure for Colorado River Channel. A rock sediment training structure was constructed that directs sand transported by the littoral drift to an impoundment basin and prevents it from settling in the federally maintained Mouth of the Colorado River navigation channel. This serves to reduce the shoaling rate and provides for safer navigation. Additionally, it offers protection to a portion of the western shoreline of the channel that experiences significant erosion at the northern end of the west jetty.

Colorado River Locks. The Colorado River Locks are located near Matagorda, Texas, at the intersection of the Colorado River and the GIWW in Matagorda County. The purposes of the locks are to improve navigational safety by controlling traffic flow and currents at the intersection of the GIWW and the river, to reduce flood flows from the rivers into the GIWW and to reduce sand and silt deposition into the GIWW. The locks also serve to raise the navigation traffic from the GIWW to the level of the river during flood stages for crossing the river, then lowering the traffic to the level of the GIWW after crossing.

Channel to Palacios. This channel extends from the GIWW to Palacios, Texas, a distance of 17 miles. The channel is 12 ft deep and 125 ft wide with two turning basins protected by breakwaters.

Other USACE Projects

Bank Stabilization at Smithville Water Treatment Plant. This project was an Emergency Stream Bank Protection Project on the Colorado River located adjacent to and designed to protect the City of Smithville Water Treatment Plant. The project consists of dumped rock riprap along the toe of the bank, approximately 5 ft in height, with 2 Horizontal (H):1.5 Vertical (V) slope and extending 40 ft up the riverbank. At this point, concrete cellular blocks were placed on crushed rock backfill. The cellular blocks rise between 32 and 35 ft on a 2H:1V side slope. The top of the cellular blocks was anchored with rock. From this point, the area was backfilled and graded on a 1H:6V slope until it met the existing bank. The total length of the project was approximately 160 ft. The project was completed in 2001.

Permitted Projects. There are numerous undocumented projects that have been implemented within the study area in the last 20 to 30 years, which may have resulted in adverse impacts to the environment. Environmental impacts resulting from these projects may never be quantified. However, sources of information do exist regarding impacts to natural resources that are located within jurisdictional areas around water bodies. Under the direction of Congress of the United States, using the authorities stated in Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the CWA, the Regulatory Branch of the USACE regulates all work or structures in, or affecting the course, condition or capacity of navigable waters of the United States and the discharge of dredged and fill material into all waters of the United States including wetlands. Consequently, applicants are required to submit information to the USACE for approval of construction projects that are conducted within areas subject to the USACE's jurisdiction under Section 10 and Section 404.

Regulatory documents indicate that over the period from 1999 through 2004 there were a total of 1,217 regulatory actions within the study area. Out of the 1,217 actions during this time period, none of the projects resulted in significant adverse impacts to wetlands as the majority of the impacts were mitigated. Over this five-year period, the records show that approximately 42.7 acres of wetlands were authorized for filling. A total of approximately 40 acres of wetland mitigation was implemented to offset those impacts. It should be noted that even though a USACE permit has been issued, the project may or may not have been constructed.

5.1.2 Projects of Others in the Study Area

Past projects by others in the study area are shown in Figure 5-2.

Multi-purpose Reservoirs.

Lake Buchanan. Lake Buchanan, whose primary purpose is hydroelectric power generation and water supply, was completed in 1937. The lake covers 22,335 acres at it conservation pool level and is located in Llano and Burnet counties. Lake Buchanan has a volume of 875,566 acre-ft when full and is 30.65 miles long. The dam has a total discharge capacity of 355,000 cfs. Lake Buchanan is operated by the LCRA.

Inks Lakes. Inks Lake is located in Llano County and occupies an area of 837 acres. This lake was completed in 1938 and its primary purpose is hydroelectric power generation. Inks Lake is 3.2 miles long and 3,000 ft wide with a conservation pool volume of 15,063 acre-ft. The total discharge capacity of the dam is 3,200 cfs. Inks Lake is operated by the LCRA.

Lake Lyndon B. Johnson. Lake LBJ was completed in 1950 and is used primarily for hydroelectric power generation. When full, the lake has a conservation pool volume of 134,353 acre-ft. Lake LBJ, located in Llano and Burnet counties, is approximately 21 miles long and 10,800 ft wide and covers 6,534 acres. The total discharge capacity is 328,600 cfs. Lake LBJ is operated by the LCRA.

Lake Marble Falls. The primary purpose of Lake Marble Falls is water supply and hydroelectric power generation. The lake was completed in 1951, covers 611 acres and is located in Burnet County. Lake Marble Falls is 5.75 miles long and 1,080 ft wide with a capacity of 6,420 acre-ft when at its conservation pool level. The total discharge capacity at the dam is 112,200 cfs. Lake Marble Falls is operated by the LCRA.

Lake Travis. Lake Travis, constructed by the Bureau of Reclamation, is the only reservoir on the Colorado River specifically designed for flood control. Located in Burnet and Travis counties, the lake was completed in 1941 and has a capacity of 1,131,650 acre-ft when at its conservation pool level. Lake Travis covers 18,622 acres and has a total discharge capacity of 121,080 cfs. Lake Travis is operated by the LCRA.

Lake Austin. Located in Travis County, Lake Austin was completed in 1940 and occupies approximately 1,600 acres. The lake is approximately 20 miles long, 1,300 ft wide, and has a capacity of 21,725 acre-ft at its conservation pool elevation. The primary purpose of Lake Austin is water supply and hydroelectric power generation. The dam has a total discharge capacity of 110,000 cfs. Lake Austin is operated by the LCRA.

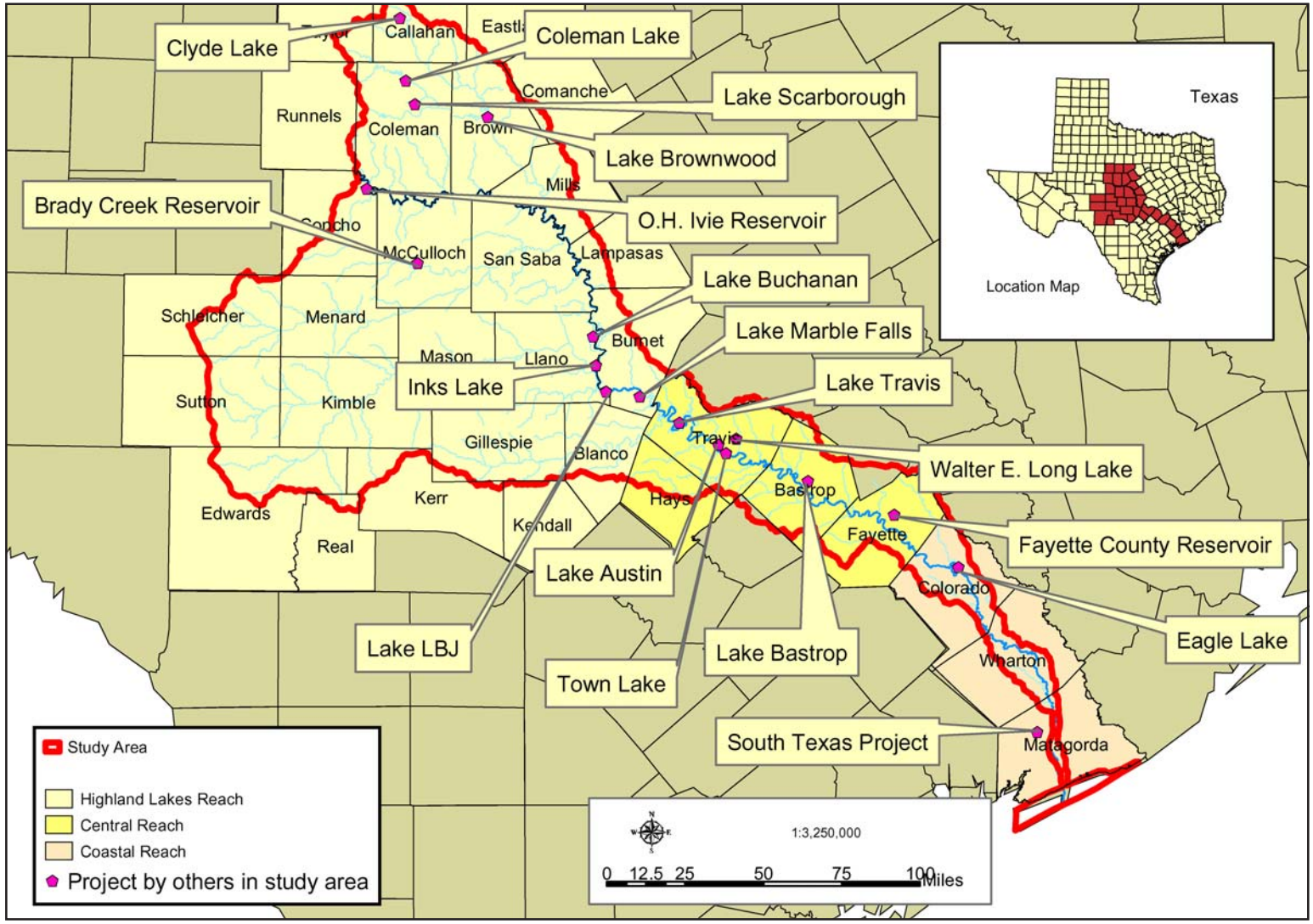


Figure 5-2 Projects by Others in the Study Area

Date: October 2004

This Page Intentionally Left Blank

Town Lake. Located within the COA, Town Lake was completed in 1960. The lake covers approximately 525 acres at its conservation pool elevation and has a maximum depth of 18 ft. Town Lake is owned and operated by the COA.

Lake Bastrop. Lake Bastrop, in Bastrop County, Texas, was impounded in 1964 on Spicer Creek. The lake is owned and is operated by the LCRA. The lake has a conservation surface area of 906 acres and serves as a source of cooling water for LCRA's Sim Gideon Steam Power Plant located adjacent to the lake. Water is discharged into Spicer Creek downstream of the lake.

O.H. Ivie Reservoir. The O. H. Ivie Reservoir, once called Stacy Reservoir, is located in Concho, Coleman, and Runnels counties. In 1938 the USACE expressed a desire for a reservoir site near the confluence of the Concho and Colorado rivers. An agreement was finally reached in 1985, when the Texas Water Commission granted permission to impound 554,000 acre-ft of water on the Colorado River at Stacy, sixteen miles below the confluence. The project was delayed by negotiations to preserve the threatened Concho water snake, and to relocate several local family cemeteries. The lake waters are used for domestic and municipal water supply for a number of West Texas cities and towns. The conservation surface area of the lake is 20,000 surface acres. The reservoir and its two-mile rolled earth fill dam were dedicated in 1990 and are owned and operated by the Colorado River Municipal Water District. The lake drains an area of 3,300 square miles and has a pool elevation of 1,551 ft.

Brady Creek Reservoir. Brady Creek Reservoir is owned and operated by the City of Brady, McCulloch County, Texas, as a municipal and industrial water supply. The reservoir was completed in 1963 and has a conservation surface area that varies from 2,020 acres at the service spillway crest elevation to 4,464 acres at the emergency spillway crest. The drainage area upstream from the reservoir is 508 square miles.

Clyde Lake. Clyde Lake is located in Callahan County, Texas. Damming the north fork of Pecan Bayou approximately six miles south of Clyde, Texas formed the lake. Clyde Lake has a conservation pool elevation of 5,748 acre-ft.

Lake Brownwood. Lake Brownwood is located on Pecan Bayou and Jim Ned Creek in Brown County, Texas. The lake is owned and operated by the Brown County Water Control and Irrigation District No. 1 and covers 7,300 acres at its conservation pool elevation.

Coleman Lake. Coleman Lake, formerly Coleman Reservoir, is on Jim Ned Creek in Coleman County, Texas and has a conservation surface area of 2,000 acres. The lake was completed

in 1966 and is owned and operated by the City of Coleman as the municipal water supply. The drainage area above the dam is 292 square miles.

Eagle Lake. Eagle Lake, off-channel from the Colorado River in eastern Colorado County, Texas, is owned by the Lakeside Irrigation District (LCRA). The project was completed in 1900 and has a conservation surface area of 1,200 acres. Water is pumped from the Colorado River, stored in the lake and used for agricultural irrigation.

Fayette County Reservoir. The Fayette County Reservoir is owned and operated by the LCRA and is a cooling reservoir for the Fayette Power Project in Fayette County, Texas. The reservoir covers 2,400 acres at its conservation pool elevation and was completed in 1978. Water is pumped into the reservoir from the Colorado River, used for cooling and returned to the river.

Lake Scarborough. Lake Scarborough, a man-made lake on Indian Creek in north central Coleman County, serves as a source of municipal water. The lake is owned by the City of Coleman and has a conservation surface area of 2,000 acre-ft.

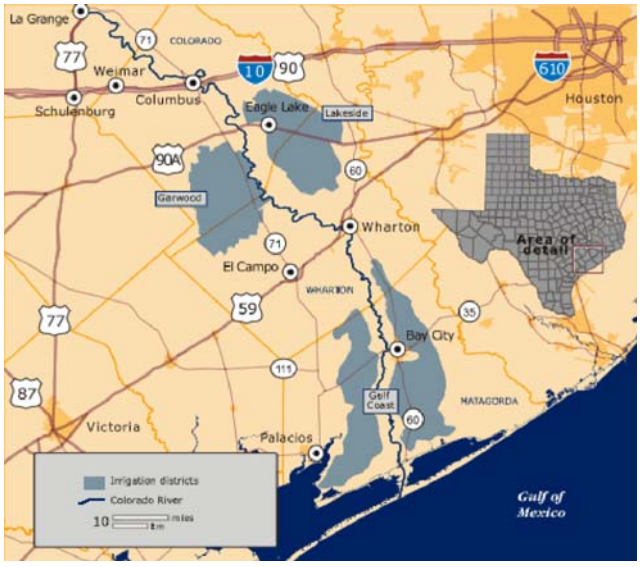
Walter E. Long Lake. Walter E. Long Lake (Decker Lake) was formed by damming Decker Creek and was completed in 1967 in Travis County, Texas. The lake is owned and operated by the COA as a cooling lake for the Decker Creek Power Station. This lake is a pass-through lake.

Diversion Projects

South Texas Project. The South Texas Project Electric Generating Station, located near Bay City, Matagorda County, Texas, includes a 7,000-acre cooling reservoir. Water is pumped into the reservoir from the Colorado River, used for cooling, and returned to the river.

Irrigation Districts. LCRA currently operates nine pumping stations with approximately 1,100 miles of irrigation canals in Colorado, Wharton and Matagorda counties and supply water to agricultural operations in those counties. LCRA's system is organized into three service areas: Gulf Coast, Lakeside, and Garwood (Figure 5-3). LCRA acquired Gulf Coast, Lakeside, and Garwood between 1960 and 1998.

City of Pflugerville Water Project. The City of Pflugerville currently has a water supply reservoir on the Brazos River basin with a water intake on the Colorado River basin to supply water to the reservoir. The project has a capacity of 18,000 acre-ft/year, however, the City of Pflugerville currently has contracted for only 12,000 acre-ft/year from the LCRA that will provide sufficient supply to serve them to 2025. All water pumped from the river is stored water that is released by the LCRA from upstream. No run-of-the-river water is diverted.



Source: http://www.lcra.org/about/irrigation_dist.html

Figure 5-3 LCRA Irrigation System Service Area Date: October 2004

This Page Intentionally Left Blank

LCRA Projects

LCRA Water Management Plan. In 1988, Judge J. F. Clawson of the 264th Judicial District of Bell County, Texas, signed the Final Judgement and Decree relating to LCRA's and COA's respective water rights. This settlement was the product of a long series of negotiations among LCRA, the COA, and the TWC, predecessor agency of the Texas Natural Resource Conservation Commission (TNRCC), now TCEQ. The Final Judgement and Decree required LCRA to submit a reservoir operations plan describing how LCRA would determine the amount of firm and interruptible waters and how LCRA would manage the waters in the Highland Lakes and the Colorado River. Under the Final Judgement and Decree, LCRA was granted the right to use 1,500,000 acre-ft annually from the Highland Lakes. As part of this settlement LCRA was required to determine the Combined Firm Yield of both Buchanan and Travis reservoirs. An interim level of Combined Firm Yield of 500,000 acre-ft was established by the TNRCC with an understanding the LCRA would establish the basis for the Combined Firm Yield calculation and submit it to the TNRCC. The amount of water above the firm yield is considered interruptible water and may be sold only on an interruptible basis subject to annual availability and certain rules and conditions required by the TNRCC. LCRA, in 1989, implemented their Water Management Plan. The purpose of the plan was to define LCRA's water management activities.

LCRA Matagorda Bay Nature Park. The LCRA purchased a 1,600-acre tract on Matagorda Peninsula in Matagorda County, Texas in May 2001 with the goal of creating a nature park of state and national significance and preserving over 1,200 acres of coastal wetlands. East Matagorda Bay, the Gulf of Mexico, and the mouth of the former channel of the Colorado River bound the 1,600-acre tract. The majority of the tract is covered by saline to brackish wetlands and has approximately three miles of beach and dune line. Proposed development will be minimal to protect and showcase the existing natural resources. Planned facilities and infrastructure improvements include two fishing piers and a small boat dock on the river channel, a paved road for public access to the beach, and a Natural Science Learning Center. The majority of the property is open to the public and amenities would focus on the recreational and educational opportunities along the Texas Gulf Coast, including hiking, kayaking, birding, and fishing.

5.2 Reasonably Foreseeable Future USACE Actions in the Study Area

All reasonably forseeable future USACE actions in the study area are shown in Figure 5-4.

Flood Damage Reduction

Flood damage reduction and emergency stream bank protection projects that are close to being implemented and have or will have NEPA compliance completed before the PEIS is finished would not be considered as part of the Proposed Action. For this reason, the PEIS is considering these projects that are part of the No Action Alternative as reasonably foreseeable projects and not part of the Proposed Action.

Pecan Bayou. The purpose of this ongoing feasibility study is to investigate water resource problems, needs and opportunities within the Pecan Bayou watershed, particularly the reduction of flood damages within the City of Brownwood. The feasibility study expands on the preliminary analyses conducted during the reconnaissance study by collecting additional data and completing detailed engineering and technical analyses. The intent is to better define the flood problem, evaluate a wide range of alternatives for flood damage reduction, and select from those alternatives which are technically and economically feasible, environmentally acceptable, and supported by the City of Brownwood and the Federal Government one alternative designated as the recommended plan.

Boggy Creek. Boggy Creek Section 14 is an emergency stream bank protection project that would provide protection to the support structures for the State Highway 183 Bridge over Boggy Creek in Austin, Texas. The project would consist of armoring both sides and the bottom of Boggy Creek for a short distance upstream and downstream of the bridge pilings.

Navigation Projects

Gulf Intracoastal Waterway (GIWW)

Matagorda Bay Reroute. The existing reach of the GIWW across Matagorda Bay has experienced high shoaling rates, groundings, dangerous crosscurrents, and one-way traffic associated delays. The interim feasibility study evaluated several alternatives and an alternate alignment for this reach was tentatively identified. The results of the study are contained in the feasibility report and environmental assessment that was published in June 2002.

GIWW Modification Study on the Colorado River Locks. The feasibility study will focus on developing alternative solutions that will reduce economic losses from time delays through the

Figure 5-4 Reasonably Forseeable Future USACE Projects Date: October 2004

This Page Intentionally Left Blank

locks, reduce damages to lock facilities and to tows, and to reduce hazardous conditions associated with turbulent currents in the GIWW at the intersection with the Bypass Channel.

Alternatives include moving the locks away from the river, widening the lock facility, replacing the locks with floodgates, removing the locks, and moving the entrance of the Bypass Channel further east.

Mouth of the Colorado. A number of issues have arisen at the Mouth of the Colorado River since construction was completed in 1995. 1) High tidal currents at the intersection of the GIWW and the Navigation Channel are difficult for commercial traffic to navigate. Transportation is slowed and safety is a concern. 2) The closure of Parker's Cut has increased the recreational traffic that passes through the Colorado River Locks. Over 20,000 small crafts passed through the locks last year as compared to approximately 8,000 in 1995. Safety rules are not always followed, putting the recreational boaters, passengers, and commercial operators at risk. 3) Maintenance dredging at the Mouth of the Colorado River Navigation Channel has been required at higher frequencies and higher volumes than originally estimated. The scope of the Re-evaluation Study includes preliminary screening of eleven measures to identify alternatives to carry into more detailed plan formulation. Preliminary screening alternatives will include:

- No Action Plan
- Elevation of landward side of weir
- Closure of outer half of weir
- Protection of the west shoreline of the entrance channel
- Extension of the west jetty
- Optimize position of the deposition basin
- Over-dredge as needed
- Replacement of east jetty
- Open Southwest Cut
- Construct a groin field along the Gulf shoreline east of the entrance and east jetty
- Non-structural measure to be determined

Matagorda Ship Channel Section 216 Reevaluation Study. Section 216 projects involve the investigation of modifications to existing projects or the operation of those projects. In the case of the MSC, the study will investigate possible widening and deepening of the channel, modification to the existing jetties, and various other alterations to the current configuration. The reconnaissance phase of the MSC study indicates that there is a Federal interest in continuing the study of the

navigation problems at MSC into the feasibility phase. If Federal interest is determined, a Feasibility Report will be forwarded to Congress with a recommendation for authorization.

Jetty restoration and flanging to slow the current and interdict erosional events could greatly enhance the operation of the channel. It is recommended that further study of improvements at the MSC be approved and authorized. The recommendation of the reconnaissance evaluation of MSC is that the Galveston District proceed with a cost-shared feasibility study with the Calhoun County Navigation District as the cost-sharing sponsor. The preliminary cost estimate to perform the feasibility study is $3 million and the duration is estimated at 48 months.

5.3 Reasonably Foreseeable Actions of Others in Study Area

Flood Damage Reduction

City of Austin. The COA proposes numerous projects within the study area in addition to those projects co-sponsored with the USACE. The projects currently proposed or underway are presented in Table 5-1. These projects include:

- Structural and non-structural water quality features such as storm water inlet retrofits, litter control retrofits, water quality remediation, rehabilitation of existing detention ponds, and new local/regional detention ponds in various watersheds.
- Structural and non-structural erosion control features in various watersheds including buyouts.
- Structural and non-structural flood reduction features such as storm drain upgrades, levee and floodwalls, gabion lining, channel improvements, rail and road bridge replacements, Waller Creek Tunnel, and buyouts.

Ecosystem Restoration Projects

Austin-Bastrop River Corridor Partnership. The Austin-Bastrop River Corridor Partnership is an informal partnership of nonprofit organizations, governmental agencies, and local citizens concerned with the future of the Colorado River corridor from Austin to Bastrop, Texas. Their stated mission is to support sustainable development and a healthy riparian ecosystem along the corridor. While this organization has no specific projects planned, their stated goals are:

- To raise community awareness about issues affecting the future of the river corridor over the next twenty years of rapid development;

Table 5-1

Projects Proposed by City of Austin Within the Study Area

Project Name	Watershed	Project Description	Status
Barton Springs Zone Water Quality Remediation-Lower Barton Creek	Barton Creek	Design and construction of facilities to capture and treat runoff from existing development near Barton Springs Pool.	Scheduled for 2005
Blunn Creek @ Saint Edwards Water Quality	Blunn Creek	Develop an integrated solution to address erosion, flood, and water quality problems	Scope of services for consultant being prepared.
Blunn Creek Water Quality Project	Blunn Creek	Evaluation and implementation of traditional and innovative water quality retrofits	Survey and preliminary drainage study conducted in area of Stacy Park near Travis Heights Elementary school.
US 183 Channel Erosion Stabilization	Boggy Creek	Stabilization of channel outside TxDOT right-of-way	Scheduled for 2005
Boggy Creek Oak Springs Water Quality	Boggy Creek	Retrofit a water quality pond into existing flood detention facility	Proposal from consultant was reviewed and request made for changes. Consultant currently revising proposal
Boggy Creek Watershed Water Quality Project	Boggy Creek	Evaluation and Implementation of traditional and innovative water quality retrofits	Staff are evaluating potential project sites. No consultant assistance required at this time
Boggy Creek @ NW Ave	Boggy Creek	Erosion Control Buyouts: The house foundation is within 2 feet of a 10-foot vertical streambank. A voluntary buy out is anticipated and funding is presently available. Level D estimate: $150,000	On Feb 5, 2003 Real Estate agent met with property owners to discuss voluntary buyout offer from the COA and address any questions and/or concerns.
Bull Creek Saint Edwards Area IN	Bull Creek	Bridge upgrades, buyouts, and regional detention that could include water quality treatment.	Scope of services for consultant being prepared.
Thornberry Road Culvert Upgrade	Carson Creek	Culvert enlargement and road pavement replacement	In design
Bouldin Creek Integrated WQ	East Bouldin Creek	A study to identify and provide conceptual designs of water quality retrofit projects	Buyout of a potential retrofit site on Evergeen Avenue is being pursued.
East Bouldin "S" Bend	East Bouldin Creek	This project will stabilize approximately 150 feet of streambank erosion	On hold pending resolution of the grant application
Fort Branch of Boggy Creek Improvements	Fort Branch	Channel, gabion, and culvert improvements	Ph. 1 Berkman to Briarcliff comp. 1/92, Phase 2, 3 & 4 in design

*Table 5-1 continued on next page.

Table 5-1, continued

Projects Proposed by City of Austin Within the Study Area

Project Name	Watershed	Project Description	Status
Fort Branch of Boggy Creek Improvements	Fort Branch	Complete needed improvements to eliminate flooding problems.	Phase I Complete 12/91. Continue design and right-of-way acquisition for remaining 3 phases.
Betty Cook Dr. Pond Rehab. (Little Walnut Creek)	Little Walnut Creek	Removal of sediment buildup in pond to expand capacity of pond for water quality benefits; repair of dam and installation of new outlet structure.	Replacement of sewer line is now part of the Austin Clean Water Partners Project. Dredging and regarding of the pond will be done in conjunction with line replacement.
Little Walnut Crk LID Water	Little Walnut Creek	(LID) techniques would treat stormwater runoff from the adjacent neighborhood areas to improve water quality.	Preliminary engineering design work is being performed in-house.
Erosion and Drainage Improvements	Little Walnut Creek	Three locations Auburndale, Lakeside and Bridgewater	Solutions under study
Los Indios Trail/Pond Upgrade	Rattan Creek	Los Indios Trail/Pond Upgrade	Study underway
Rosedale Storm Drain Improvements	Shoal Creek	Preliminary Engineering Study to develop strategies for mitigating localized flooding	Preliminary Engineering proceeding. Survey crews are fininshing up field data collection.
Ridgelea Storm Drain Improvements	Shoal Creek	Preliminary Engineering Study to develop strategies for mitigating localized flooding	Preliminary Engineering proceeding. Survey crews are fininshing up field data collection.
Tanglwood Forest Pond Retrofit	Slaughter Creek	The pond system will be evaluated to identify appropriate modifications to the pond embankment, outlet works and emergency spillway and construction phase to implement appropriate modifications to the pond system.	Final design is anticipated to begin by March 2003. Bidding and construction cannot begin until additional funding is provided.
1803 Victoria Drive Erosion Stabilization	Tannehill Branch	Structural project that includes channel stabilization and possible detention pond on the Morris Williams golf course. Also includes buyout of one home.	Design for structural features will be completed in late 2004 with construction starting in 2005. Buyout of home is pending.
Tannehill Branch of Boggy Creek	Tannehill Branch	Complete needed improvements.	Ongoing design and right-of-way acquisition.

*Table 5-1 continued on next page.

Table 5-1, continued

Projects Proposed by City of Austin Within the Study Area

Project Name	Watershed	Project Description	Status
Tannehill Branch of Boggy Creek	Tannehill Branch	Channel excavation and gabion lining improvements	Ongoing design, right-of-way acquisition.
Erosion Control Program-Engineering	Various	Project allows the design and permitting of erosion control construction projects.	Projects under design on Little Walnut Creek, Fort and Tannehill Branch and other creeks.
BSZ Water Quality Remediation	Various	This project will identify high priority retrofit opportunities in the Barton Springs Zone	Work to date has included hiring experts to provide input on the sampling program, evaluation of data, and possible sources of high PAHs in Barton Creek and elsewhere.
Lake Austin Restoration	Various	This project includes necessary studies and activities to restore the ecosystems of Lake Austin including aquatic plant control.	Proceeding with Lewisville Environmental Aquatic Research Facility for plantings
Misc. Drainage Improvements	Various	Misc. Drainage Improvements	Drainage improvements city-wide
Dell Water Quality Ponds	Various	Dell Water Quality Ponds	Dell representative has indicated that they have authorized a contractor to begin working on the punch list items related to vegetation management. The other items will be worked on when the vegetation work is completed.
Water Quality Retrofits	Waller Creek	Water quality retrofits to reduce pollutant loads into Waller Creek and Town Lake	Scheduled for 2005
Waller Creek Tunnel	Waller Creek	Waller Creek Tunnel	Funding options being decided
Waller Creek/Hyde Park Drainage	Waller Creek	Channel improvements, detention ponds, and bridge replacements	On-going master plan to identify solutions. Plan complete.
Walnut Creek Reg Ponds	Walnut Creek	Study was performed to determine the feasibility of on-line detention to control in-stream erosion	RSMP and ECP are combining efforts to design and construct 2 of the 4 proposed ponds.
Pond G	Walnut Creek	The goal of the proposed regional facility is to reduce fully developed stormwater flows and to provide for erosion control.	Currently in the process of acquiring fee simple and drainage easements.

*Table 5-1 continued on next page.

Table 5-1, continued

Projects Proposed by City of Austin Within the Study Area

Project Name	Watershed	Project Description	Status
Walnut Creek Other Land Options	Walnut Creek	Walnut Creek Other Land Options	RSMP and ECP are combining efforts to design and construct 2 of the 4 proposed ponds.
Pond G Walnut Creek-Feasibility	Walnut Creek	Proposed regional facility to reduce fully developed stormwater flows to the peak flow rates existing in 1988 and to provide for erosion control.	Currently in the process of acquiring fee simple and drainage easements.
Duval/Dorsett Channel Improvements	Walnut Creek	Channel improvements. This project also includes the replacement of the existing railroad structure.	Project under Study
Wells Branch Regional Stormwater Facility - Scofield Farms	Walnut Creek	Design and construct regional detention facility	Consultant authorized to prepare final engineering report on August 30.
West Bouldin @ S. 6th	West Bouldin Creek	Erosion Control Buyouts	On Feb 5, 2003 Real Estate agent met with property owners to discuss voluntary buyout offer from the COA and address any questions and/or concerns.
Pleasant Valley Road Mitigation and Wet Pond	Williamson Creek	Design and construction of wet pond to reduce pollution loads to the St. Elmo tributary to Williamson Creek	Scheduled for 2005
Lundelius/McDaniel Tract Water Quality Retrofit Project	Williamson Creek	Water quality retrofit in BSZ zone	Scheduled for 2005
Sunset Valley Detention	Williamson Creek	Sunset Valley Detention	Study
Williamson Creek/Creek Bend Phase 2	Williamson Creek	Home voluntary Buy-outs	Project is currently on schedule.

*Source: COA

- To promote economic and recreational use of the river corridor that supports long-term ecological health and social equity;
- To promote actions that conserve and maintain a healthy riparian system along the Austin-Bastrop Colorado River Corridor; and
- To assist with restoration of riparian habitats along the river corridor.

Water Supply Projects

Senate Bill 1. After years of unsuccessful attempts to adopt statewide planning, the 77th Legislature passed Senate Bill 1 (SB 1) in recognition of Texas' limited water supplies, vulnerability to drought and rapid population growth. The state's population is expected to increase from 19 million to more than 39 million people by 2050.

With passage of SB 1, the Legislature put in place a "bottom up" water planning process designed to ensure that the water needs of all Texans are met as Texas enters the 21st century. SB 1 allows individuals representing 11 interest groups to serve as members of Regional Water Planning Groups (RWPG) to prepare regional water plans for their respective areas. A total of 16 RWPG's were created. These plans map out how to conserve water supplies, meet future water supply needs and respond to future droughts in the planning areas. The study area for this PEIS falls within the Region K RWPG. The TWDB compiled regional water plans developed by the RWPG.

The TWDB, in their report "Water for Texas - 2002", identifies anticipated water needs by county through the year 2050 for all of the river basins in Texas. Within the lower Colorado River basin, only Travis County was identified as having unmet water needs in 2050. The report further identifies recommended major and minor reservoirs in the regional water plans to meet the anticipated water needs. Major reservoirs were defined as those having capacities greater than 5,000 acre-ft of storage capacity. Conversely, the minor reservoirs are those with capacities less than 5,000 acre-ft. No major reservoirs were identified for the lower Colorado River basin. Four minor reservoirs were identified for the lower Colorado River basin. These are the Llano Off-Channel Reservoir, Goldthwaite On-Channel Dam, Goldthwaite Off-Channel Dam, and the Mills County Reservoir.

LCRA/San Antonio Water System (SAWS) Project. The purpose of the LCRA/SAWS Water Project is to help satisfy long-term water needs in both the lower Colorado River basin and the San Antonio area while exhibiting good stewardship of the environment. The project anticipates increasing the available water supply in the lower Colorado River basin by up to 330,000 acre-

ft. San Antonio benefits by securing a 50-year water supply while protecting the Edwards Aquifer through managed use. SAWS would have the option to extend the water contract for up to 30 more years. The sources of water for the Project include development of surface water via off-channel reservoirs (150,000 acre-ft), conjunctive use of groundwater for agriculture (62,000 acre-ft) and agricultural conservation (118,000 acre ft). Currently, it is anticipated that the off-channel reservoirs and associated facilities would be located in Colorado, Wharton, and/or Matagorda counties.

The project is currently entering a 6-year study phase to determine whether a project can be designed that would meet the water needs without adverse impacts to the lower Colorado River basin or the Matagorda Bay estuarine system. The studies will include a variety of environmental, engineering, and water supply analyses.

LCRA Water Management Plan. LCRA has prepared proposed revisions to their Water Management Plan (WMP) that was last updated in 1997. The current plan projected the ten-year future firm demands (year 2005) at about 230,000 acre-ft annually. Based on the Senate Bill 1 analyses, the new ten-year projected firm demands (year 2010) are about 285,000 acre-ft per year - an increase of 55,000 acre-ft per year. The primary reason for this increase is additional water needs to meet population and economic growth in the Austin area, including domestic water use around the Highland Lakes. With this large projected increase in firm water demand, the WMP must be adjusted to give a compensating reduction in the interruptible supplies available since firm needs take priority. This reduction will be achieved by revising the annual interruptible water supply curtailment policy adopted in the WMP. There is no change in the previous (1997) forecast 83,700 acres for first crop rice irrigation. This projection is based on the highest acreage planted over the past ten years. The proposed revisions are currently under review.

City of Pflugerville Water Project. The City of Pflugerville currently has a water supply reservoir on the Brazos River basin with a water intake on the Colorado River basin to supply water to the reservoir. At some point in the future, the City of Pflugerville will increase the amount of water pumped from 12,000 acre-ft/year to 18,000 acre-ft/year.

Transportation Projects

Texas Department of Transportation. Texas Department of Transportation (TxDOT) has proposed several road and bridge projects within the study area. These projects are described in Table 5-2.

Table 5-2

Projects Proposed by TxDOT Within the Study Area

Project Name/ID	Project Description	County	TxDOT District	Waterway Crossed
Loop 1/US 183	Expand capacity of Loop1/US 183	Travis	Austin	Colorado River, Barton Creek
I-35 Central Texas Cooridor	Widen and upgrade roadway	Williamson, Travis, Hays	Austin	Colorado River and various tributaries
SH 45 North/TTA 2002(252)	Construct turnpile facility with intermittent frontage roads	Travis	Austin	Various tributaries to Colorado River
SH 130	Construct toll road bypass around Austin	Travis	Austin	Colorado River and various tributaries
W. North Loop Bridge Replacement/BR 2002(226)	Replace bridge on W. North Loop	Travis	Austin	Hancock Branch
FM 969/C 1186-1-54	Extend 5-lane section on FM 969 from US 183 to FM 3177	Travis	Austin	Elm Creek Decker Creek
CR 272/BR 2002(467)	Replace bridge and approaches on CR 272	Burnet	Austin	San Gabriel River
CR 219/BR 2002(590)	Replace bridge and approaches on CR 219	Burnet	Austin	Mill Creek
Watts Lane/BR 2002(382)	Replace bridge and approaches on Watts Lane	Bastrop	Austin	Cedar Creek
Zapalac Rd./BR 2002(383)	Replace bridge and approaches on Zapalac Rd.	Bastrop	Austin	Bartons Creek
Kovar Rd./BR 2002(384)	Replace bridge and approaches on Kovar Rd.	Bastrop	Austin	Bartons Creek
CR 147/BR 2002(789)	Replace bridge and approaches on CR 147	Bastrop	Austin	Walnut Creek
CR 427/BR 96(272)	Replace bridge and approaches on CR 427	Mills	Brownwood	Blowout Creek
FM 102 Roadway Widening	Widen roadway from FM 3013 to FM 1161	Wharton	Yoakum	Caney Creek
FM 2031	Replace existing swing bridge with a fixed bridge structure	Matagorda County	Yoakum	Gulf Intracoastal Waterway
CR 455/BR 2001(651)	Replace bridge and approaches on CR 455	Colorado	Yoakum	Miller Creek
FM 1693/BR 2004(33)	Replace bridge and approaches on FM 1693	Colorado	Yoakum	Mustang Creek
FM 521 Bridge Replacement	Replace bridge and approaches on FM 521	Matagorda County	Yoakum	Colorado River

*Source: TxDOT Web Page Dated 4/15/2004

Trans Texas Corridor. The Trans Texas Corridor is a proposed 4000-mile network of transportation corridors throughout Texas. Each proposed corridor would be approximately 1,200 feet wide and would consist of separate highway lanes for passenger vehicles and trucks, high-speed passenger rail, high-speed freight rail, commuter rail and a dedicated utility zone.

Four corridors have been identified as priority segments. Three of those corridors, as proposed, would cross the project area (Figure 5-5). One of the corridors would generally follow the existing U.S. Highway 59 route, a second would follow the existing IH-10 route and the third would follow the existing IH-35 corridor. Currently, two of the identified priority segments, TTC-35 and I-69/TTC, are actively in the environmental process. The anticipated date for Federal approval of the I-69/TTC EIS is Spring 2007 and the anticipated date for Federal approval of the TTC-35 is mid 2006.

Other Projects

FEMA Mapping Initiative. Currently, FEMA is re-mapping floodplains in five counties: Travis, Hays, Bastrop, Fayette, and Wharton. Preliminary maps are scheduled for distribution in Hays, Bastrop and Wharton counties in 2004 while preliminary maps are scheduled for distribution in Travis and Fayette counties in 2005. The benefit to these counties will be availability of GIS file for use by floodplain administrators, availability of study in a digital format, and a reduction in the time and cost for map updates.

Ecosystem Restoration Projects

USACE is participating in two studies outside of the study area that could have potential cumulative effects.

Kickapoo Creek Aquatic Ecosystem Restoration Project. The Kickapoo Creek Section 206 Aquatic Ecosystem Restoration Project would restore aquatic instream flow to Kickapoo Creek a tributary to the Colorado River in the upper Colorado River basin by implementing best management practices to control invasive hydrophytic vegetation such as mesquite. After brush is controlled, native vegetation would be restored. Alternatives include aerial herbicide treatments, hand treatments, mechanical removal, and combinations of measures. The non-Federal sponsor is the Upper Colorado River Authority.

O.C. Fisher Aquatic Ecosystem Restoration Project. The O.C. Fisher Section 1135 Aquatic Ecosystem Restoration Project would restore instream flow to the Concho River which flows into

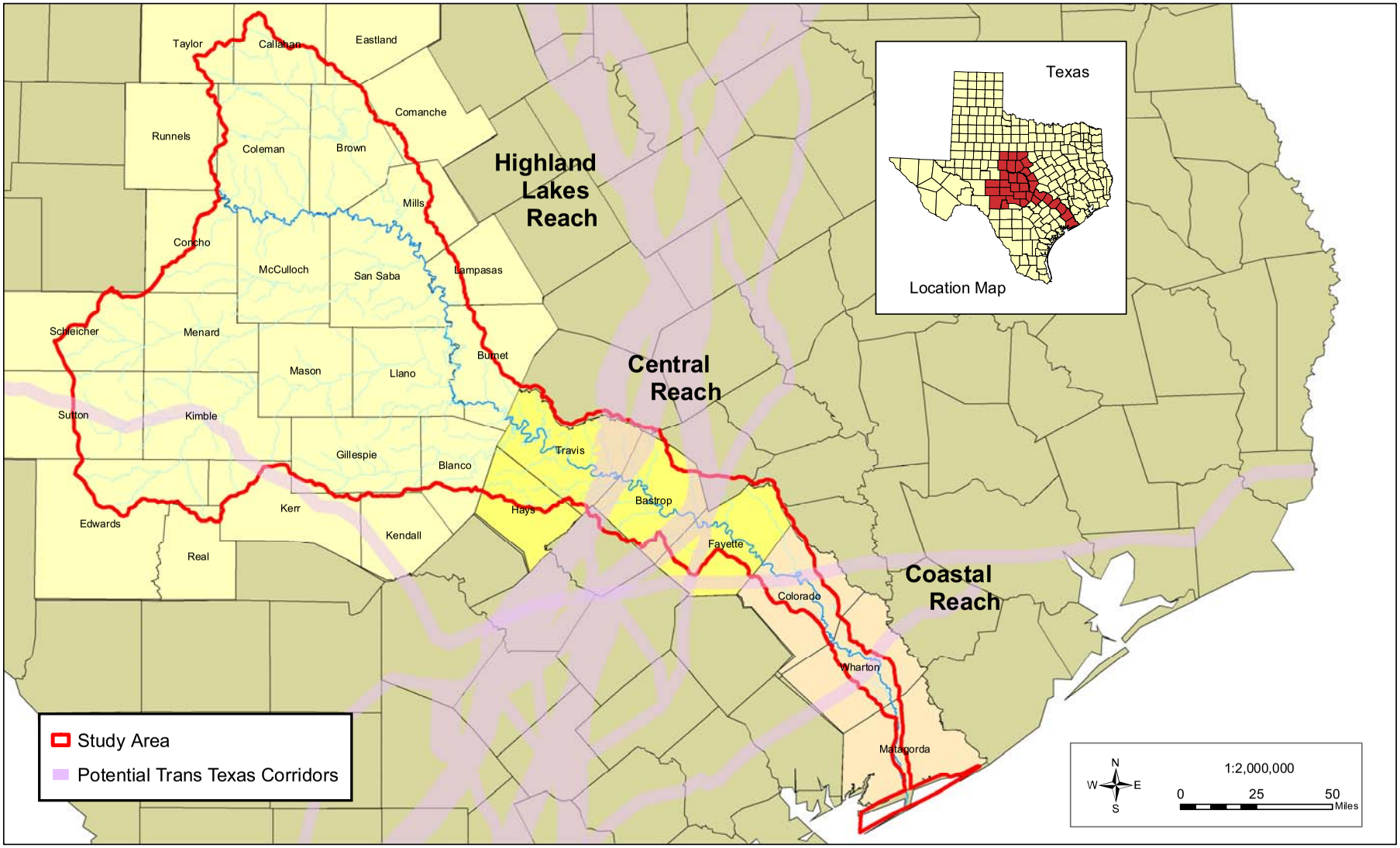


Figure 5-5: Potential Trans Texas Corridors.

Date: March 2005

This Page Intentionally Left Blank

O.C. Fisher Lake by controlling around 15,000 acres of hydrophytic vegetation within the basin of the lake. After brush is controlled, native vegetation would be restored. Alternatives include aerial herbicide treatments, hand treatments, mechanical removal, and combinations of measures. This project is located in the upper Colorado River basin. The City of San Angelo is the non-Federal sponsor.

5.4 Cumulative Effects by Resource

The cumulative effects addressed here are for the flood damage reduction and ecosystem restoration program as a whole. Cumulative effects are assessed for the past, present, and reasonably foreseeable future projects conducted by others within the basin. There is consensus among the interdisciplinary team that cumulative effects to land use, hydraulics and hydrology, flood plains, socioeconomics, vegetational areas and soils, wildlife and aquatic resources, wetlands, marine resources, air quality, water and sediment quality, threatened and endangered species, cultural resources, recreation and open space, HTRW, and environmental justice would occur either from the Proposed Action or No Action alternatives evaluated (Table 5-3). Discussions of potential cumulative effects of the various plans for the basin are presented by resource in the paragraphs that follow.

5.4.1 Land Use

The reasonably foreseeable actions by others would continue to impact existing land uses as has been described for the No Action Alternative. Proposed transportation projects would affect land uses throughout the basin while impacts from land development and associated infrastructure development would be focused in the Austin metropolitan area. Four proposed minor reservoirs in the upper reaches of the study area would cumulatively affect land uses in that region by changing existing land uses to that of lacustrine habitat and shoreline.

Cumulatively, structural measures implemented under the Proposed Action would convert existing private lands to public lands used for flood control. Some of these structural measures would also convert existing private and public lands to open space and parklands. Structural measures would also increase the amount of land available for development by removing land from the floodplain that is currently subject to flooding. Conversely, some structural measures have the potential to bring new lands into the 100-year floodplain. Land use changes associated with the structural measures, combined with the land use changes from the reasonably foreseeable actions of others, would be considerable and beneficial to the general public. However, the cumulative effects

would not be significant since the land use changes under the proposed action, combined with those proposed by others are generally consistent with adopted land use plans in the basin.

Non-structural and ecosystem restoration measures would alter land uses and likely would not follow existing land use plans if the area is designated as commercial or residential development. However, these changes, when considered with the changes resulting from projects by others, would not result in a significant adverse effect on land use because most cities have goals of reducing the amount of development in the floodplain and desire public ownership of the areas adjacent to creeks and streams.

5.4.2 Socioeconomics

Continued land development, transportation and water supply projects associated with reasonably foreseeable projects by others would cumulatively bring additional jobs and population growth in the basin. This would be particularly true in the Austin metropolitan area. Increased development and job growth would cumulatively increase demand for housing, especially affordable housing in the basin, increase demand for water and cause increased traffic regionally. These actions would be cumulatively significant as they substantially alter the distribution and location of the ROI population.

Structural program measures would cumulatively reduce flood damages and flood insurance costs in the lower Colorado River basin. Cumulatively, structural measures would reduce the local tax base in the basin by taking land out of private ownership. Multipurpose reservoirs and detention basins would have the largest cumulative effect; however, the net reduction in floodplain elevations would open new lands for development, increasing land values and cumulatively increasing the tax base in portions of the basin. When considered in conjunction with the reasonably foreseeable projects by others, the structural measures would not meet the significance criteria for socioeconomics.

Non-structural measures such as buyouts and zoning will cumulatively alter the tax base in portions of the basin. Other non-structural measures would have cumulative beneficial effects of reducing flood damages and bringing money into the local communities. Ecosystem restoration measures would have a slight adverse cumulative impact on socioeconomics if lands were taken out of the local tax base; however, they would bring money into the community during construction.

Table 5-3
Summary of Cumulative Impacts by Resource

Resource	Reach	Structural Measures					Non-structural Measures	Ecosystem Restoration	No Action
		Reservoirs	Dry Detention Basins	Levees & Floodwalls	Diversions & Tunnels	Channel Improvements			
Land Use	All Reaches	▼▲	▼▲	▼▲	▼▲	▼▲	▲	▼▲	▲
Socioeconomics	All Reaches	▲	▲	▲	▲	▲	◁▷	◁▷	▲▲
Hydraulics & Hydrology	Highland Lakes	▲	▲	▲	▲	▲	◁▷	◁▷	▼
	Central	▲	▲	▼▲	▼▲	▼▲	◁▷	◁▷	▼
	Coastal	▲	▲	▼▲	▼▲	▼▲	◁▷	◁▷	▼
Floodplains	Highland Lakes	▲▲	▲▲	▲▲	▲▲	▲▲	▲	◁▷	▼▲
	Central	▲▲	▲▲	▲▲	▲▲	▲▲	▲	◁▷	▼▲
	Coastal	▲▲	▲▲	▲▲	▲▲	▲▲	▲	◁▷	▼▲
Vegetational Areas & Soils	Highland Lakes	▼▼	▼▼	▼	▼	▼	▲	▲▲	▼▲
	Central	▼▲	▼▲	▼	▼	▼	▲	▲▲	▼▲
	Coastal	▼▲	▼▲	▼	▼	▼	▲	▲▲	▼▲
Wildlife Resources	Highland Lakes	▼▼	▼▼	▼	▼	▼	▲	▲▲	▼
	Central	▼▲	▼▲	▼	▼	▼	▲	▲▲	▼
	Coastal	▼▲	▼▲	▼	▼	▼	▲	▲▲	▼▲
Freshwater Resources	Highland Lakes	▼▼	▼▼	▼	▼	▼	◁▷	▲▲	▼▼
	Central	▼	▼▼	▼	▼	▼	◁▷	▲▲	▼▼
	Coastal	▼	▼▼	▼	▼	▼	◁▷	▲▲	▼▼
Wetlands	Highland Lakes	▼▼	▼▲	▼	▼	▼	◁▷	▲▲	▼▲
	Central	▼	▼▲	▼	▼	▼	◁▷	▲▲	▼▲
	Coastal	▼	▼▲	▼	▼	▼	◁▷	▲▲	▼▲
Marine Resources Including EFH	Coastal	▼▼	▼▼	▼	▼	▼	◁▷	▲	▼▲
Water and Sediment Quality	Highland Lakes	▲	▲▲	▼	▼	▼	▲	▲	▼▲
	Central	▲	▲	▼	▼	▼	▲	▲	▼▲
	Coastal	▲	▲	▼	▼	▼	▲	▲	▼▲
Threatened and Endangered Species	Highland Lakes	▼▼	▼ ▲▲	▼▲	▼▲	▼▲	◁▷	▲	▼
	Central	◁▷	◁▷	▼▲	▼▲	▼▲	◁▷	▲	▼
	Coastal	◁▷	◁▷	▼▲	▼▲	▼▲	◁▷	▲▲	▼▲
Air Quality	All Reaches	◁▷	◁▷	◁▷	◁▷	◁▷	◁▷	◁▷	▼
Cultural Resources	All Reaches	◁▷	◁▷	◁▷	◁▷	◁▷	◁▷	◁▷	▼▼
Recreation and Open Space	All Reaches	▲	▲	▲	▲	▲	▲	▲	▲
Hazardous, Toxic, and Radioactive Waste	All Reaches	◁▷	◁▷	◁▷	◁▷	◁▷	◁▷	◁▷	▼
Environmental Justice	All Reaches	▲	▲	▲	▲	▲	▼	◁▷	◁▷

◁▷ No Cumulative Impact

▲ Slight Beneficial Cumulative Impact
▼ Slight Adverse Cumulative Impact
▼▲ Both Slight Beneficial and Adverse Cumulative Impacts
▲▲ Significant Beneficial Cumulative Impact
▼▼ Significant Adverse Cumulative Impact

Note: Reservoirs include changes in gate operations at Lake Travis

This Page Intentionally Left Blank

5.4.3 Hydraulics and Hydrology

Proposed projects by others would alter the hydraulics and hydrology of the basin. Proposed flood control and water supply projects will reduce peak flows and increase the period of those peak flows. The COA enforces strict storm water ordinances which minimize the impacts of development, but continued development in the outlying Austin suburban area will increase stormwater runoff into the Colorado River. Proposed water supply reservoirs and revisions to the LCRA's Water Management Plan would cumulatively reduce the total volume of water reaching the lower basin. Navigation projects proposed by USACE could alter tidal flows and currents in and around the mouth of the Colorado and intersection of the Colorado River and GIWW. The LCRA/SAWS project would remove some freshwater from the basin and transfer that water to the San Antonio area, however minimal instream flows within the lower Colorado River would be maintained.

The implementation of all program components would cumulatively alter the hydraulics and hydrology in the basin by reducing flood heights and altering the duration of flows. Channelization and confinement of the Colorado River and its tributaries would block floodwaters from entering the San Bernard River basin. Structural measures in Wharton would increase peak flows downstream of the project; however, the LCRA/SAWS Project would have a beneficial cumulative effect of reducing that rise in peak flows if the diversion was upstream of Wharton as it would take flood flows from the Colorado River and capture them in off channel detention reservoirs. However, this decrease would probably not be sufficient to mitigate the total increase in peaks flows. Structural measures such as detention basins, and multi-purpose reservoirs would cumulatively retain more water in the upper basin for a longer period and result in more constant flows with attenuated peaks downstream of Lake Travis. Cumulatively, changes in gate operations at existing reservoirs, including Lake Travis, and projects proposed by others, including increased impermeable areas in the basin, would increase water surface elevations below Lake Travis through Travis and Bastrop counties.

Increased mining activities by others along with ecosystem restoration projects, dry detention basins and buyouts would cumulatively increase water storage during flood events. However, the volume of flood storage would not be large enough to be cumulatively significant.

5.4.4 Floodplains

Reasonably foreseeable flood reduction projects and proposed reservoirs by others will cumulatively reduce the floodplain area in many of the tributaries within the basin, especially on Shoal, Walnut, Williamson, and Onion creeks. Implementation of the structural measures would cumula-

tively reduce the overall floodplain levels throughout the basin. Changes in gate operations at reservoirs, including Lake Travis, would reduce floodplain levels upstream of the dam but would increase floodplain elevations immediately downstream of the dam. Changes in gate operations at Lake Travis will increase the floodplain elevations of the Colorado River through lower Travis and Bastrop counties.

Implementation of the structural measures, when evaluated with the reasonably foreseeable actions by others, would not cumulatively increase water surface elevations or result in a substantial increase in flooding or erosion in the basin. Consequently, no significant cumulative adverse effect is anticipated. Significant cumulative benefits would be realized from the structural measures in combination with all of the projects of others through the cumulative reduction of floodplains in the basin. Likewise, ecosystem restoration measures would have no cumulative adverse effect on floodplains. Non-structural measures would have cumulative beneficial effects on floodplains in the basin because houses would be removed from the floodplains.

5.4.5 Vegetation Areas and Soils

Reasonably foreseeable projects proposed by others, such as transportation, flood control, water supply reservoirs and residential and commercial development, would cumulatively reduce vegetated areas and impact soils within the basin. Woody vegetation and grasslands in upland habitats would experience the greatest cumulative reduction in area. These impacts would be cumulatively significant and adverse since little, if any, mitigation would likely be provided for the impacts. Reasonably foreseeable future USACE actions would include appropriate mitigation for impacts to vegetation and would not result in significant cumulative effects.

All of the structural measures would also impact vegetation and soils. Cumulatively, projects such as the dry detention basins, detention basins and multipurpose reservoirs would significantly impact existing vegetation communities by altering the plant species composition or eliminating vegetation within hundreds or thousands of acres of the basin. When considered with the reasonably foreseeable projects by others, the reservoir and detention basin measures would result in significant cumulative effects to vegetation and soils. Specific mitigation plans would be developed for each reservoir and basin project that would offset that project's impacts. Due to the size of the reservoir projects, it may not be possible to bring some of these projects below the significance threshold for impacts to vegetation and soils.

Structural measures such as levees, floodwalls, diversion channels, tunnels, and channel improvements would have slightly adverse cumulative effects to vegetation and soils. Project-specific mitigation plans would reduce these impacts to a level below the significance threshold.

Non-structural measures would result in slightly beneficial effects to vegetation through the revegetation and stabilization of currently eroding areas. Ecosystem restoration measures would provide significant beneficial cumulative effects, as there is the potential to restore large acres of riparian vegetation.

5.4.6 Wildlife Resources

Reasonably foreseeable projects proposed by others would cumulatively reduce the available wildlife habitat in the basin. Remaining wildlife habitats would be further fragmented by projects such as transportation and land development. The impacts resulting from the reasonably foreseeable projects by others would be cumulatively adverse and significant since a large portion of the impacts would likely not be mitigated. Impacts to wildlife resources resulting from the proposed structural measures, together with the reasonably foreseeable projects of others, would cumulatively remove existing wildlife habitat and could result in cumulative fragmentation of the remaining habitats. This would be particularly true for dry detention basins and multipurpose reservoirs which will directly alter or remove hundreds to thousands of acres of wildlife habitat. Mitigation would be planned and implemented with each project. For the structural measures other than reservoirs and dry detention basins, the mitigation would bring the level of cumulative effects below the stated significance threshold. However, cumulatively reservoir and detention basin projects could have significant cumulative effects even with mitigation.

Non-structural measures would result in a slight beneficial cumulative impact to wildlife by converting currently developed lands to open space.

Ecosystem restoration activities would result in a net increase of wildlife habitats through the creation of new habitat and the restoration of previously existing habitat. These increases would be cumulatively significant in the basin if the projects were large scale. If the projects were small in scale, then there would still be cumulative beneficial effects, however, they would not be significant.

5.4.7 Freshwater Resources

Proposed flood control and water supply reservoir projects by others would cumulatively alter the flow characteristics of the Colorado River and its tributaries by reducing peak flow heights and increasing the duration of the peak flows. The water supply projects along with LCRA/SAWS Project and LCRA's proposed Water Management Plan revisions would cumulatively reduce the quantity of water in the lower Colorado River reaching Matagorda Bay. These changes, in turn, would alter the characteristics of the aquatic resource communities present in the basin. Species that thrive in more constant and consistent flow patterns would benefit while species that require more pronounced seasonal fluctuations would be adversely impacted. Not all of these impacts would be mitigated and the resulting cumulative effects could be significant.

Proposed multipurpose reservoirs would cumulatively reduce peak flow heights and increase the duration of the peak flows. Reservoirs, in combination with water supply projects proposed by others, would cumulatively reduce the amount of water moving through the basin, however minimum instream flows would be maintained. Reservoirs would potentially convert miles of riverine habitat to deep water lacustrine habitat. Dry detention basins would periodically flood river segments and would alter downstream aquatic habitat by altering the magnitude and duration of peak flow events.

Mitigation plans would be developed for each reservoir and basin project during the project planning. While the mitigation would offset impacts there is the potential that mitigation may not reduce impacts to less-than-significant levels.

The remaining structural measures would cumulatively result in slightly adverse impacts to aquatic resources by altering existing flow patterns and sedimentation rates. As with reservoir and basin projects, mitigation plans would be developed and implemented for each project.

Buyouts, along with the projects of others, would have a slight cumulative beneficial effect on tributaries by increasing water quality caused by decreasing the amount of impervious cover and non-point source pollution from runoff, fertilizers on lawns, and large debris and trash associated with houses. Cumulative beneficial effects on the Colorado River would be smaller due to dilution. Other non-structural measures would have no effect on aquatic resources, as they would not direct impacts on aquatic resources. Ecosystem restoration measures could potentially result in significant restoration of aquatic habitats if large-scale restoration projects are implemented .

5.4.8 Wetlands

There would be a net loss of wetlands and wetland functions associated with the reasonably foreseeable projects by others. Wetland impacts subject to permitting requirements under Section 404 of the Clean Water Act would be mitigated while losses of isolated, non-regulated wetlands would not be mitigated. Mitigation would be provided for the reasonably foreseeable future USACE actions that impact wetlands and wetland functions.

Wetland losses resulting from reservoirs could be cumulatively significant as existing wetlands over large areas would be flooded. Project-specific mitigation plans would be developed to offset those impacts however, given the size of the impacted area, it may not be possible to reduce the impacts to a less-than-significant level. Furthermore, reservoirs in combination with the LCRA/SAWS project and the LCRA Management Plan will reduce the amount of water in the lower Colorado River basin which would cumulatively impact wetlands that rely on freshwater flows. Furthermore, the cumulative reduction in freshwater flows could cause the conversion of some coastal freshwater marshes to more saline marsh types.

Dry detention basins and detention basins would have both slight beneficial and adverse cumulative effects to wetlands in all reaches of the basin by removing wetlands downstream and creating wetlands upstream of the dam. The remaining structural measures would have slightly adverse cumulative effects on wetlands by impacting small amounts of wetlands. The impacts would be temporary because all wetland loss would be mitigated.

Non-structural measures would have no effect on wetlands since they would be located in developed areas where wetlands should not be present. Ecosystem restoration measures would potentially have significant beneficial cumulative effects. This would be particularly true in the coastal reach where proposed projects by others combined with potential ecosystem restoration projects as part of this proposed action could result in a cumulative increase of 100 or more acres of wetland and riparian habitats.

5.4.9 Marine Resources Including Essential Fish Habitat

Proposed flood control and water use projects by others, including water supply reservoirs would cumulatively alter the quantity, timing and duration of flows in the Colorado River and freshwater discharges into Matagorda Bay. Increases in development in the Austin metropolitan area would move floodwaters to the river faster and increase the level of pollutants entering the river and potentially being transported to Matagorda Bay. Increases in development in the Austin

metropolitan area would result in a cumulative increase in stormwater runoff. However, water quality requirements and safeguards maintained by the COA and the LCRA should prevent the impacts from being significantly adverse to marine resources and essential fish habitat. Reasonably foreseeable future USACE actions identified in the upper portions of the study area would have no cumulative effect on marine resources and essential fish habitat. All adverse impacts to EFH and associated living marine resources that would result from USACE actions will be avoided and minimized to the greatest practicable extent. All unavoidable impacts will be mitigated in consultation with NMFS.

Structural measures such as multipurpose reservoirs, dry detention basins, and detention basins, combined with the reasonably foreseeable actions of others such as the LCRA/SAWS project and the LCRA Management Plan, would cumulatively reduce the quantity, and affect the timing and duration of freshwater flows into the Matagorda Bay system. Structural measures located in Wharton and Matagorda counties, including levees and floodwalls, would also cumulatively alter the timing and duration of flows in the Colorado River and freshwater discharges into Matagorda Bay. Channelization and confinement of the Colorado River and its tributaries would block lower Colorado River basin floodwaters from entering adjacent basins and moving to adjacent estuaries. The change in the flow characteristics of the river, combined with an increase in impermeable surfaces from residential, commercial and industrial development in the basin, could cumulatively alter the sediment transport characteristics in the river. Cumulatively, marine resources and essential fish habitat would be impacted through the changes in freshwater flows and sedimentation rates. Each of the structural measures would also include mitigation to offset anticipated impacts. With appropriate mitigation, most of the structural measures would not result in cumulatively significant impacts. However, there is the potential that the construction of reservoirs, and detention basins and dry detention basins, with mitigation, in combination with water supply projects proposed by others would still result in cumulatively significant impacts to marine resources.

Non-structural measures would have no cumulative effect on marine resources, including essential fish habitat since there are no direct impacts to marine resources.

Ecosystem restoration measures generally would have no effect on freshwater flows reaching estuarine and marine systems. However, ecosystem restoration measures, especially those projects proposed in Matagorda County involving the restoration and/or creation of wetlands, (e.g. Mad Island Marsh project) would have a beneficial cumulative effect by increasing the amount of wetland habitat present in the bay system and trapping sediments and pollutants before they reach the

estuary and near-shore environment. However, the quantity of wetland habitat created as a result of ecosystem restoration actions would likely not be cumulatively significant.

5.4.10 Water and Sediment Quality

The identified reasonably foreseeable projects by others are greater than one acre in size, and would require the implementation of Storm Water Pollution Prevention Plans (SWPPP) for stormwater quality protection. Therefore these projects would not result in cumulatively significant impacts to water and sediment quality because they would not exceed the significance threshold identified for water and sediment quality. Many of the projects identified for the COA involve implementation of water quality improvements for stormwater runoff. The transportation projects identified for both the COA and TxDOT would be designed to include water quality control features to capture and filter stormwater before it enters waterways. While all of the projects would result in increase turbidity during construction, implementation of required SWPPPs would minimize those impacts.

Cumulatively, structural measures such as floodwalls, levees, tunnels, channel improvements and diversion channels would increase the amount of impermeable areas within the basin and confine stream flows increasing the pollutant loads entering the Colorado River, having a slight adverse impact to water quality. Reservoirs, detention basins and ecosystem restoration measures retain sediments and pollutants and will therefore cumulatively improve water and sediment quality in the upper reaches of the basin. Overall, the proposed structural measures would not result in a significant cumulative impact to water and sediment quality.

Non-structural and ecosystem restoration measures would have a slight beneficial cumulative impact on water and sediment quality by removing structures and some potential pollutant-causing activities from the basin.

5.4.11 Threatened and Endangered Species

A total of 25 Federally listed or candidate species have the potential to occur in counties that border the Colorado River study area. Another 15 species or subspecies listed as threatened or endangered by the State of Texas are also considered to have the potential to occur in the counties that border the Colorado River in the study area.

The reasonably foreseeable actions of others that have been identified would all be subject to compliance with the Endangered Species Act (ESA) and would be coordinated with the USFWS

during the planning process. Any of the projects proposed by TxDOT, LCRA or projects proposed through the TWDB would also be coordinated through the TPWD during the planning process. Projects proposed by the COA, other cities or counties, and private developments would not be required to protect state-listed species. The proposed water supply and local flood control projects would have the highest potential for significant cumulative effects. The potential for cumulative adverse impacts to a threatened and endangered species would exist for many of the projects proposed by others but would be reduced through the required coordination processes. It is assumed that any project that is coordinated with the USFWS and/or TPWD would include mitigation for any resulting impacts to threatened and endangered species. Projects that do not require coordination with the TPWD would result in cumulative effects to state-listed species.

Reasonably foreseeable future USACE projects would be coordinated with both the USFWS and the TPWD and would include mitigation for identified impacts. Therefore, the future USACE projects would not result in significant cumulative effects to threatened and endangered species.

Coordination with the USFWS and the TPWD would occur during project planning for the proposed structural measures. This process would minimize the potential for adverse impacts. The potential for cumulative effects was evaluated by species and is as follows:

Cumulative effects to the Concho water snake would potentially result from projects that occur above Lake Buchanan. Structural measures that result in continuous flows and reduced sediment loads would have a cumulative positive effect to the Concho water snake while adverse cumulative effects would result from structural measures, such as reservoirs that permanently impound channel flows. Non-structural and ecosystem restoration measures would have no cumulative impact to the Concho water snake.

The bald eagle would cumulatively benefit from improvements to water quality and increases in mature forested areas that may result from both structural and non-structural measures and ecosystem restoration actions, respectively.

Cumulative detrimental or adverse effects to the black-capped vireo and the golden-cheeked warbler could result from the construction dry detention basins, detention basins, and multipurpose reservoirs. The construction of levees, floodwalls, relief and diversion channels, tunnels and channel improvements would not result in cumulative effects to these species. These structural measures would be confined to the floodplain of the Colorado River and major tributaries where the warblers and vireos are not likely to be found. The black-capped vireo and the golden-cheeked

warbler would both benefit cumulatively from buyout and ecosystem restoration measures that result in increases to their respective habitat types.

Impacts to wetlands would be avoided to the maximum extent possible and unavoidable impacts would be mitigated to insure no net loss of wetlands. Consequently, the various structural measures would not cumulatively impact the whooping crane. Beneficial cumulative effects to the whooping crane would be realized with buyout and ecosystem restoration measures that increase the area of wetlands present in the basin.

Construction of dry detention basins and multipurpose reservoirs would most likely occur upstream of the Highland Lakes and outside the recharge contributing zone for the Edwards Aquifer. Therefore, these projects would have no cumulative effects to aquatic salamanders. The construction of levees, floodwalls, relief and diversion channels, tunnels, detention basins, and channel improvements would occur in the floodplain of the Colorado River and/or major tributaries where the potential for impacts to aquifers is minimal. Therefore, no cumulative impact to the aquatic salamanders is anticipated from these measures. Buyout and ecosystem restoration measures that restore vegetation communities would cumulatively benefit the aquatic salamanders that inhabit Barton Springs and cave invertebrates that occur in karst within the Edwards and associated formations by reducing pollution loading and sedimentation into their respective habitats. No cumulative effects are anticipated to the peregrine falcon, zone-tailed hawk, swallow-tailed kite, white-tailed hawk, wood stork, Attwater's greater prairie chicken, and sooty tern from the structural measures as none of the structural measures would remove or substantially disturb their nesting, breeding or feeding habitat. Beneficial cumulative effects would result for these species from buyouts and other ecosystem restoration measures by reducing pollutant loads and increasing their foraging habitat.

Large-scale elimination or disturbance to coastal marsh, tidal flats, or degradation to water quality, from either a single project or cumulatively from smaller projects, are not expected from the implementation of the structural measures. Consequently, adverse cumulative effects to the least tern, piping plover, reddish egret, white-faced ibis, whooping crane, and brown pelican would not occur. Beneficial cumulative effects would be realized from buyout and ecosystem restoration measures for all these species in the form of reduced pollutant loads, reduced sedimentation, and expansion of native vegetation.

The structural measures would not alter the current flows within the state-listed blue sucker's habitat. Consequently, the structural measures would have no cumulative effect on the state-listed

blue sucker. Non-structural and ecosystem restoration measures would enhance water quality through the reduction of turbidity, sedimentation, and pollutant loads. However, these reductions would not be enough to cumulatively benefit the species. Cumulative effects to the Houston toad, Texas horned lizard, timber rattlesnake, American alligator, the smooth green snake, Texas scarlet snake, and the Texas tortoise are not expected from implementation of the proposed action. The Houston toad is an inhabitant of sandy uplands outside the floodplain and therefore should not be impacted from any of the project measures. Potential cumulative effects to the other species would be reduced through coordination with the USFWS and TPWD during the planning and construction of those measures. Non-structural and ecosystem restoration measures would result in cumulative beneficial impacts to these species through increased habitat and reduction in turbidity, sedimentation and pollutant loading.

Cumulative effects to the Navasota ladies'-tresses would not occur, as this species is not found in the type habitats where the structural and non-structural measure or the ecosystem restoration measures would occur.

Cumulative effects to the five species of sea turtle and the West Indian manatee are not likely, as these species do not occur in the areas where the structural measures would be located. However, potential flood control projects that alter freshwater inflows could result in indirect effects on sea turtles by affecting various estuarine dependent fish species that serve as their prey items. For the same reasons, non-structural and ecosystem restoration measures would not cumulatively impact these species.

Of the structural measures considered, reservoirs and dry detention basins would potentially result in significant adverse cumulative effects to the Concho water snake, the black-capped vireo, and the golden-cheeked warbler by flooding existing occupied habitat.

Although some of these projects may be able to reduce project-specific impacts through mitigation, it may not be possible to reduce the cumulative effects to a less-than-significant level. The remaining structural measures would result in either slight beneficial and adverse cumulative effects to protected species. Project-specific impacts would be mitigated and these structural impacts would not result in significant cumulative effects.

The non-structural measures would have no cumulative effect while ecosystem restoration measures could have significantly beneficial effects through wetland and riparian habitat enhancement, preservation and creation.

5.4.12 Air Quality

Continued residential and commercial development associated with the reasonably foreseeable action of others, particularly transportation projects, would result in a significant cumulative impact to air quality in the Austin metropolitan area. Continued development growth and associated road construction would bring additional vehicles into an area that is already on the edge of noncompliance. These actions would likely cause or contribute to a violation of state or federal ambient air quality standards in the COA. The actions outside the Austin metropolitan area would not cumulatively impact air quality. When considering the study area as a whole and considering construction impacts to air quality are generally localized there would not be significant cumulative effects to air quality.

The proposed structural measures would result in temporary, localized increases in emissions associated with construction equipment. These temporary and localized impacts would be cumulative to the emission environment of the Austin area and could contribute to a noncompliance situation. However, within the entire study area, the impacts associated with the proposed structural measures would not be cumulatively significant.

Temporary and minor increases in emissions from construction equipment would be associated with non-structural and ecosystem restoration measures. Therefore, these impacts would not be cumulatively significant within the study area.

5.4.13 Cultural Resources

Known historic and archaeological sites are present near identified reasonably foreseeable projects proposed by others, and many of these sites could be impacted during construction activities. Significant cumulative effects to cultural resources from projects with federal, state or city sponsorship are unlikely given regulatory requirements currently in place. This is also true for agencies created by the state such as river authorities. The highest potential for significant cumulative effects to cultural and archaeological resources lies with the continued private development on private lands. Continued private development in the basin could result in significant cumulative effects to cultural resources due to the lack of regulatory protection.

Cumulative effects to cultural resources from construction activities associated with all program measures are limited as a result of Federal actions. All future structural and non-structural measures would be subject to Section 106 compliance as federally mandated in the NHPA and outlined in this document. Full Section 106 compliance would be completed prior to any ground

disturbing activity, which will mitigate for any adverse effects to cultural resources resulting from those activities. As a result, no additional, significant cumulative adverse impacts are anticipated from any of the program's future structural, ecosystem restoration or non-structural measures.

Development of private lands that are removed from the floodplain and do not utilize federal funding or permitting have the potential to impact cultural resources, as they are not subject to either NEPA or Section 106 regulations. The development of these and other private lands in the basin could have a cumulative adverse impact to cultural resources. However, given the limited area that would be opened for development by any of the structural measures compared to the entirety of the study area, the cumulative effects that would result would not be significant.

5.4.14 Recreation and Open Spaces

Cumulatively there would be a net increase in recreation and open spaces resulting from structural measures such as reservoirs and detention basins, and non-structural measures such as buyouts. Ecosystem restoration measures would provide additional open space and recreational opportunities. Additionally, many projects proposed by others (e.g. USACE, LCRA) include recreation components and will cumulatively benefit recreation opportunities within the basin. Therefore, no significant cumulative effects are anticipated from the structural and non-structural measures or the ecosystem restoration opportunities.

5.4.15 Hazardous, Toxic, and Radioactive Waste

The reasonably foreseeable actions by others that have been identified have the potential to cumulatively affect HTRW through the disturbance of existing, undocumented sites during construction activities. Federal and state agencies and city governments sponsor the majority of the actions identified. These sponsors are either required or routinely evaluate project sites for the presence of HTRW prior to proceeding with a project. Therefore, no significant cumulative effects would be likely.

The program has the potential to cumulatively affect HTRW through the disturbance of existing, undocumented sites during construction activities. However, USACE would evaluate each project site for the presence of HTRW and would not proceed with any properties with HTRW. Consequently, no significant cumulative effects would result from any of the potential alternatives.

5.4.16 Environmental Justice

Cumulatively, considering the known reasonably foreseeable project by others, the implementation of program measures would have a net benefit to minority communities and those in poverty. The acquisition of lands for structural and non-structural measures as well as ecosystem restoration measures would be monitored to ensure that no specific segment of the population within the project area was disproportionately affected. Therefore no significant cumulative effects to environmental justice are anticipated.

This Page Intentionally Left Blank