PLANNING DESIGN REPORT & INTEGRATED ENVIRONMENTAL ASSESSMENT
CALDWELL LANE
SECTION 14
EMERGENCY STREAMBANK EROSION PROTECTION

Prepared for

Travis County, Texas

by

US Army Corps of Engineers
Fort Worth District

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INTEGRATED EA AND PLANNING DESIGN REPORT

This combined document contains information relevant to both an environmental assessment to satisfy the National Environmental Policy Act (NEPA) and a Planning Design Report used as a planning document by the U.S. Army Corps of Engineers (USACE). A Finding of No Significant Impact (FONSI), if appropriate, will be issued after public review of the environmental assessment.

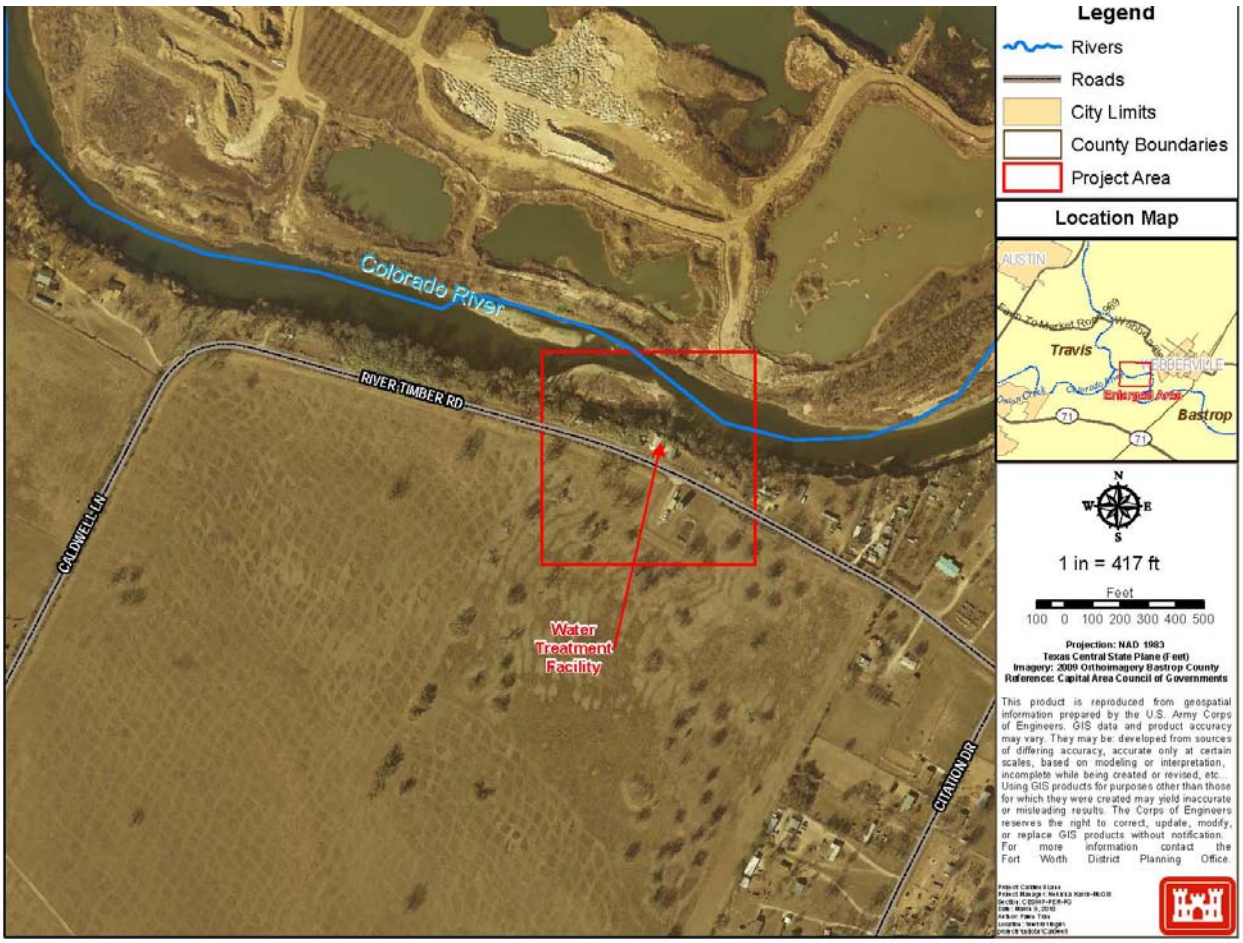
STUDY AUTHORITY

This study is conducted under the authority of the USACE Continuing Authorities Program, Section 14 of the Flood Control Act of 1946, as amended, provides authority for the USACE to provide emergency stream bank protection for public facilities and services.

STUDY AREA

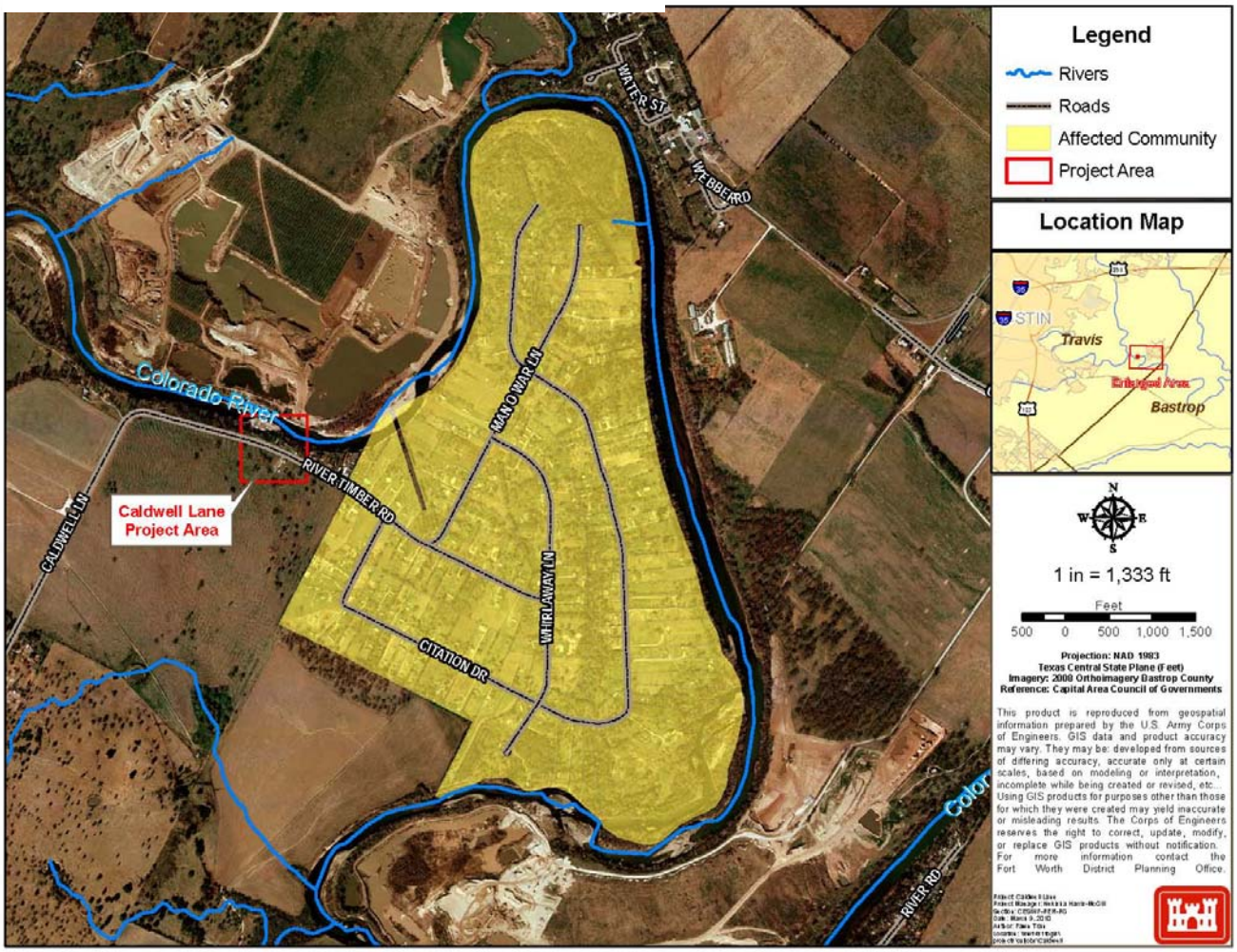
The study area is located north of the town of Garfield in southeastern Travis County, approximately 12 miles southeast of Austin, Texas (See Figure 1). The site is located on the right descending bank of the Colorado River. The Colorado River is very sinuous with a index of approximately 1.9, which describes the ratio of the actual length of the river channel to the length of the river valley. The river bed is composed of sand and gravel, and the channel banks contain higher percentages of silt and clay. Flows in the river are regulated by a reservoir located approximately 21 miles upstream in Austin, Texas regulated by the Lower Colorado River Authority. A large commercial sand and aggregate mining operation is located on the left descending bank across from the project site.

Figure 1- Project Location



At the project site, the top bank of the river is less than 10 feet from the water supply facility owned and operated by the town of Garfield. Less than 50 feet from the eroding stream bank edge is Caldwell Lane, the only access road for a nearby subdivision (See Figure 2).

Figure 2- Project Location and Residental Subdivision



PURPOSE AND NEEDS

The primary purpose of the Caldwell Lane Emergency Streambank Protection project is to assess the need and opportunities, evaluate a range of alternatives, and select a plan from those alternatives, which is technically sound, environmentally acceptable and economically feasible, a supported by the local sponsor, Travis County, and the Federal Government.

The erosion and subsequent slope failure is caused by a continuous undercutting of the bank toe resulting in an insufficient base to support the upper portion of the riverbank. This slope failure is exacerbated when the top of the bank becomes saturated and as the toe is being undercut. The additional weight causes the slope to fail. In addition, rapid draw down of the river particularly after a prolonged period of high-water, further reduces the soil strength due to saturation. The erosion has left a nearly 30 to 40 foot vertical bank void of vegetation over a 1,000-foot reach. The erosion problems demonstrates a need to further investigate the opportunities and alternatives to offer emergency streambank protection and a Federal Interest in this project.

Figure 3 - Eroded stream bank along Colorado River upstream of affected water supply facility.

Figure 4 - Eroded stream bank along Colorado River. Water supply facility is located just beyond trees on left bank.

AFFECTED FACILITY AND INFRASTRUCTURE

At its narrowest point, the top of bank is less than 10 feet from a water supply facility owned and operated by the town of Garfield. Loss of the water supply facility due to erosion would affect 500 residents. Additionally, less than 50 feet from the eroding stream bank edge is Caldwell Lane, the only access for a subdivision of about 100 homes.

Figure 5 - Town of Garfield water supply facility. Note eroded bank is in close proximity to facility's fence.

Figure 6 - Caldwell Lane services a neighborhood of 500 residents and the water supply facility.

HYDRAULIC ANALYSIS

The nearest river gauging station on the Colorado River to the project site is located at Bastrop, Texas (USGS #08159200) approximately 25 river miles downstream from the project site. There are more than 50 years of record at this station beginning in1960. The maximum flow recorded was 17, 900 cfs on 29 October 1960. During a site visit on

March 11, 2008, the gage had a reading of 1550 cfs. The HEC-RAS hydraulic model of the Colorado River at river cross-section 1444-204 indicates a flow ranging from 8 to 10 feet per second for the 10-year through the 100-year flood. Water surface profiles at this cross section were provided to the Geotechnical Section to assist in designing the elevation of the embankment protection materials. Engineering Manual (EM) 1110-2-1601 specifies stone size be calculated at 24 inch D30.

AFFECTED ENVIRONMENT

The river is very shallow along the toe of the bank but the facility could still be threatened from geotechnical failures due to the 30 to 40 foot bank height and steep angle and from trees toppled by wind throw. The facility site is near the end of a fairly straight reach of the river. The next bend is located approximately 700 yards upstream of the facility, and it is unlikely that the site would be threatened by the down-valley migration of the bend in the near future. Conditions could however change resulting in an attack on the toe of the bank. This most likely would be due to changes in the deposition area upstream of the site or flood flows which would change the low flow pattern and cause the river to be directed toward the bank toe at the facility. In addition, changes in a mining operation along the opposite river bank could result in a change of flow direction and renewed erosion at the site.

River bank erosion farther downstream from the water supply facility is much more active. Flows running directly along the toe of the bank are eroding and steepening the toe with tension cracks developing along the top bank. This is allowing overland drainage water to enter and saturate the banks. Geotechnical failure occurs and the material slumps to the toe of the bank. This material could provide some measure of stability but if it is not stabilized by vegetation it would be removed by the next significant flow event. This process would continue until the curvature of the bend becomes too severe and the point of river attack shifts down-valley, resulting in meandering of the river pattern. Also, it is possible that rapid drawdown of river stages due to reservoir operation may contribute to bank instability.

Climate - Winters in Travis County are usually dry and mild with only a few days when the temperature drops below freezing. Summers in Travis County are usually humid, sunny and hot when temperatures reach 100 degrees for several consecutive days. The average annual rainfall in the Travis County area ranges from 31 to 32.5 inches.

Physiography and Geology - Travis County is located astride the Balcones Fault, the boundary between the Edwards Plateau to the west and the Blackland Prairie to the east. The Edwards Plateau is underlain by horizontally bedded, hard to soft dolomitic limestone and marl from shallow, marine Cretaceous sediments. The Edwards limestone is cavernous, forming dolomite and chert honeycombed limestone. Landscapes typically consist of a plateau bordered by scarps with subsurface caverns located in the upper area of the Edwards Aquifer. The plateau uplands are flat to rolling, and some poorly defined stream channels have been found in regions of Karst geology. Soils on the Edwards Plateau are thin, stony, and formed in limestone and marl in long ridges, with deeper soils in stream valleys. Soils are fairly uniform, dark-colored calcareous clays interspersed with some gray, acidic sandy loams.

The Balcones Escarpment was formed around 12 million years ago, when faulting caused uplift of the Edwards Plateau. Chemical and geological processes active on the Edwards Formation caused the fractures in the Balcones Fault Zone. Extensive faulting throughout the Edwards Formation is an important phenomenon in the development of local physiographic features such as springs and the subsurface water resource known as the Edwards Aquifer. Solution, or karst, features, including sinkholes, caves and smaller cavities along bedding planes and fractures are found throughout the Edwards Formation, and springs commonly occur at its base. Karst features were created as calcium carbonate dissolved from the limestone bedrock. Down-cutting by water and faulting has produced dissections within these features and created karst “island habitats” that act as a barrier to the distribution of species adapted to cave conditions, known as troglobites. Troglobites of the Edwards require low light, high humidity, mildly warm, moist and stable conditions that are characteristic of these unique ecosystems. In return, these karst habitats depend on surface plant and animal communities for nutrients and energy. The Edwards Aquifer is unique in that it is home to a diverse assemblage of over forty highly adapted, aquatic and troglobitic species indigenous to karst limestone formations.

Aquifers are generally composed of three segments: 1) the drainage, or catchment area, 2) the recharge zone, and 3) the reservoir zone. Major recharge of the Edwards Aquifer occurs in streambeds underlain with faulted or cavernous limestone and on low-relief plateau uplands underlain by karst limestone. Input to the aquifer comes from rainfall on the porous limestone and thin, rocky soils capping the Edwards Plateau catchment area. Relatively impermeable layers

in the older Glen Rose Formation stop percolation of this water through the Edwards limestone. Where rivers flowing across the plateau have carved deep canyons and exposed the base of the Edwards Limestone, spring fed streams arise and flow south and east over the impermeable older formations to the recharge zone.

As the Edwards Uplift eroded in the late Miocene and Early Pliocene, ancient rivers deposited rich soils from the mountains in the coastal zones of the inland sea, which today constitute the Blackland Prairie and Post Oak Savannah of Central Texas Counties.

The project area exhibits characteristics closer to the Blackland Prairie region encompassing a mixture of deep dark loamy clays and rocky sandy loams with no Karst features.

Air Quality - The Environmental Protection Agency (EPA) uses six "criteria pollutants" as indicators of air quality, and has established for each of them a maximum concentration above which adverse effects on human health may occur. These threshold concentrations are called National Ambient Air Quality Standards (NAAQS). Areas of the country where air pollution levels persistently exceed the NAAQS may be designated as non-attainment areas. Conversely, areas of the country that do not persistently exceed the NAAQS are designated as attainment areas.

The study area is located in Travis County which is currently a full attainment area for all air quality criteria pollutants of the EPA and Texas Commission of Environmental Quality (TCEQ).

Surface Water - The headwaters of the Colorado River begin in eastern Dawson County and flow approximately 600 miles southeasterly across the state of Texas to the Gulf of Mexico near Matagorda, Texas. The total drainage area of the Colorado River Basin in Texas is 39,893 square miles. The river bed is composed of sand and gravel, and the channel banks contain higher percentages of silt and clay.

Ground Water – Travis County is designated as a Priority Ground Water Management Area (PGMA) as stated in chapter 35 of the Texas Water Code and in Chapters 239 and 294 of the Title 30, Texas Administrative Code. The Edwards Aquifer, the Trinity Aquifer, and the Austin Chalk Aquifer are the three major aquifers that lie within the boundaries of Travis County. The Edwards Aquifer is the closest ground water source to the project area.

The Edwards (Balcones Fault Zone, or BFZ) aquifer covers approximately 4,350 square miles in parts of 11 counties. The aquifer forms a narrow belt extending from a ground-water divide in Kinney County through the San Antonio area northeastward to the Leon River in Bell County. A poorly defined ground-water divide near Kyle in Hays County hydrologic ally separates the aquifer into the San Antonio and Austin regions. The name Edwards (BFZ) distinguishes this aquifer from the Edwards-Trinity (Plateau) and the Edwards-Trinity (High Plains) aquifers. Water from the aquifer is primarily used for municipal, irrigation, and recreational purposes; approximately 54 percent is used for municipal supply. The aquifer feeds several well-known recreational springs and underlies some of the most environmentally sensitive areas in the state.

The chemical quality of water in the aquifer is typically fresh, although hard, with dissolved-solids concentrations averaging less than 500 mg/l. The down dip interface between fresh and slightly saline water represents the extent of water containing less than 1,000 mg/l. Within a short distance down gradient of this “bad water line,” the ground water becomes increasingly mineralized.

Due to its highly permeable nature in the fresh-water zone, the Edwards aquifer responds quickly to changes and extremes of stress placed on the system. This is indicated by rapid water-level fluctuations during relatively short periods of time. During times of adequate rainfall and recharge, the Edwards aquifer is able to supply sufficient amounts of water for all demands as well as sustain spring flows at many locations throughout its extent. However, under conditions of below-average rainfall or drought when discharge exceeds recharge, spring flows may be reduced to environmentally detrimental levels.

Terrestrial and Aquatic Resources - Vegetation within the site includes black willow *(Salix nigra),* green ash *(Fraxinus pennsylvanica),* soapberry *(Sapindus drummondii),* cedar elm (*Ulmus crassifolia),* hackberry *(Celtis laevigata),* sycamore *(Platanus occidentalis),* Bois d' arc (*Maclura pomifera),* side oats gramma *(Bouteloua curtipendula),* and ragweed (Ambrosia artemisiifolia). The only aquatic vegetation in the area is algae attached to the

rocks. The study area is highly disturbed, and sparsely vegetated due to heavy erosion during episodes of high water.

There are several large pool and riffle complexes in the vicinity. Aquatic habitat in the area includes large rocks, undercut banks, logs, root wads and sparse canopy of overhanging vegetation.

Birds. Due to the extremely disturbed nature of the riverbank, habitat for terrestrial animals in the project area is extremely limited. Birds that have been observed in the area include barn swallows, American robins, cardinals, common grackles, house sparrows, and mockingbirds.

Reptile. Herpetofauna include aquatic and terrestrial reptile and amphibian species. Common reptiles found in Travis County include the Texas rat snake (*Elaphe obsoleta*), patch-nosed snake (*Salvadora grahamiae*), northern fence lizard (*Sceloperus undulatus*), and ground skink (*Scincella lateralis*).

Fish. Lower Colorado River Authority (LCRA) survey records indicate that 42 species of fish frequent the Colorado River in or around Austin, Texas. Some of the fish found in the river in that area include largemouth and Guadalupe bass, flathead and channel catfish, bluegill, long ear sunfish, common carp, blue sucker, stoneroller, gizzard shad, green striped topminnow, mosquito fish, and three species of darters (logperch, rainbow darter and dusky darter). There were no fish or aquatic invertebrates observed within the immediate project area most likely due to poor habitat caused by heavy erosion.

Threatened and Endangered Species - Within Travis County, eight vertebrate and invertebrate species are currently listed as endangered by the Service. Two bird species, the golden-cheeked warbler (*Dendroica chrysoparia)* and the black-capped vireo (*Vireo atricapillus*); and six cave-dwelling invertebrates, the Tooth Cave ground beetle (*Rhadinepersephone*), Bee Creek Cave harvestman (*Texella reddelli*), Tooth Cave spider (*Neoleptoneta myopica*), Tooth Cave pseudoscorpion (*Tartarocreagris texensis*), Kretschmarr Cave mold beetle (*Texamaurops reddelli*), and the Bone Cave harvestman (*Texella reyesi*) have been placed on the federal endangered species list.

Critical Habitat – Terrestrial and aquatic habitat resources are very fragmented within the study area. There is no critical habitat or Karst features within the study area.

Cultural Resources - There are no identified National Register of Historic Places eligible or listed structures or buildings present within the immediate study area. However, there are three deeply buried archaeological sites, and one surface scatter, previously recorded within 1.5 miles radius of the proposed project location and in a similar environment along the Colorado River. Archeological site 41TV265 was recorded in 1972 on an open terrace adjacent to the Colorado River and exposed approximately 6 to 9 feet beneath the surface with buried hearths, snail shells, and a few chipped artifacts present. Site 41BP74 was recorded originally in 1928 as located on the surface and with a potential depth of 4 to 5 feet beneath the surface of a high terrace adjacent to the Colorado River with snail shells and chipping debris present. Site 41BP307 was recorded in 1986 as a surface scatter of chipping debris on a terrace adjacent to the river.

A site visit by a USACE archaeologist conducted in 1999 noted the potential for buried archeological sites within the bluff face along the fence line of the water intake structure. The bluff is primarily formed of loess deposits with several silty-clayey depositional sequences exposed across the face of the bluff. A possible buried hearth was noted as was two potential buried paleosols (buried surfaces generally attributed to human occupations) exposed in the bluff face. Additionally, numerous flaked edge tools and one preform or blank artifact was noted during the reconnaissance at the base of the bluff in an exposed and eroding bed of chert and gravel nodules. Despite continued erosion since that field visit, any excavation into the bluff to lay it back may have the potential to impact buried sites.

Hazardous Material - No visual indication of possible contamination concerns are present at the proposed site. A review of Travis County records indicates there is no history of past storage, use, release, and disposal of any hazardous substances or petroleum products within the study area.

Executive Order 12898, Environmental Justice – Executive Order 12898 requires the federal government to consider impacts to minority population and low income populations when evaluating alternatives. The problem in the immediate study area is stream bank erosion that is threatening a local water supply facility and Caldwell Lane. There are no minority or low income populations in the immediate vicinity that could be impacted as a result of implementing the proposed action.

Aesthetics - Areas or resources of aesthetic and potential public value were identified from recent aerial photography and photographs. The survey of areas available to the public or designated by a public agency includes those areas or resources that are potentially valued by community residents.

Aesthetic features in the vicinity of the project area are long scenic views scapes of the Colorado River Valley, which include vegetation diversity and landscape variety (e.g. rocky outcroppings, bluffs and ridgelines).

MOST PROBABLE FUTURE WITHOUT A PROJECT

If the stream bank erosion continues along the right descending bank of the Colorado River near Caldwell Lane, the most likely future condition of the area is as follows:

1. Erosion of the stream bank will continue toward the City of Garfield water intake structure.
2. Caldwell Lane will become vulnerable.
3. At some critical juncture, the intake structure will not operate as designed and water supply to the city and industries will be affected.
4. Once the intake structure is unusable, another structure will have to be built.
5. As bank erosion continues, public use of Caldwell Lane will have to be discontinued and this will leave a nearby residential edition isolated because Caldwell Lane is the only entrance access to that development.

PLAN FORMULATION

The goal of this study is to provide emergency streambank protection at Caldwell Lane in the City of Garfield, Texas.

Planning Objectives

Planning objectives reflect an expression of public and professional issues or concerns about the use of water and related land resources resulting from the analysis of existing and future conditions in the study area. These planning objectives were used in guiding the development of alternative plans and their evaluation for the period of analysis.

1. Reduce the risk of erosion overtaking the City of Garfield water intake structure.
2. Reduce risk to welfare of nearby residents by decreasing the risk of Caldwell Lane eroding into the Colorado River and preserving access to the residential subdivision.
3. Avoid or minimize the cost associated with the water supply facility not operating as designed due to the effects of the nearby stream bank erosion.
4. Provide an economically efficient solution
5. Minimize environmental impacts

Planning Constraints

Constraints are restrictions that limit the planning process and they include legal and policy constraints that apply to every Corps study and study-specific constraints that may only apply to this study. In order to provide direction for the plan formulation efforts the following constraints were taken into account:

1. The top of the bank at the project site is extremely vulnerable to erosion therefore due to safety risks no improvements can be done from the top of bank.
2. Impacts to any threatened and endangered should be avoided, minimized, and/or mitigated.

ALTERNATIVE PLANS CONSIDERED

In accordance with the guidelines outlined in ER 1105-2-100, the development and evaluation of alternatives reflected the magnitude and scope of a Section 14 study. A non-structural solution, vegetation and/or slope grading, was considered but discounted based on engineering experience and judgment. The lack of available land to cut back the slope and the inability to establish vegetation eliminated any type of "soft" erosion protection project from further consideration. The alternatives for addressing the imminent threat to the water intake facility and to Caldwell Lane considered typical structural solutions using the following terms:

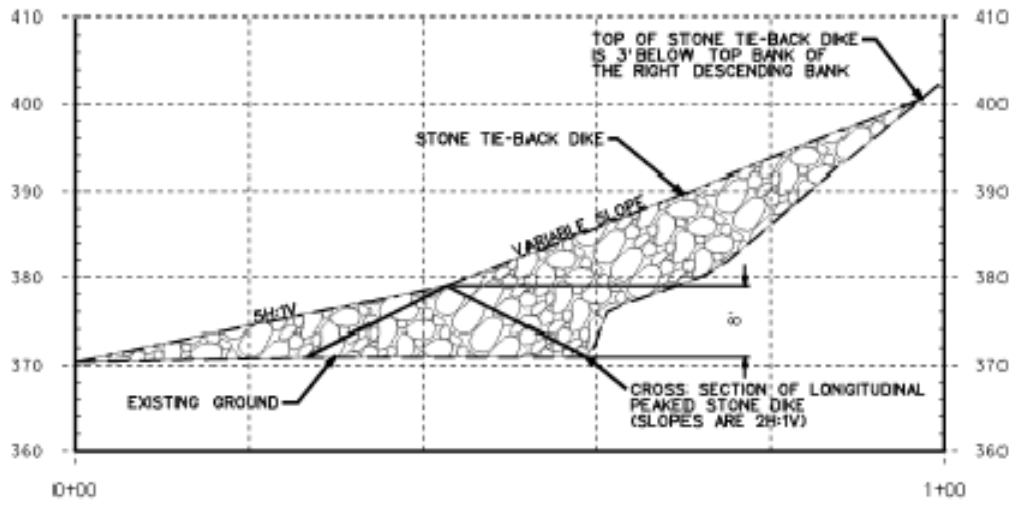
- Identify the erosion problem
- Identify the cause(s) of the erosion problem
- Develop alternatives based on engineering judgment and experience that address the erosion problem threatening the water intake facility and Caldwell Lane
- Based on engineering judgment and experience decide on the alternative that would address the erosion problem in the least costly manner

No Action

If no action is taken, erosion of the stream bank would continue. If the erosion continues, the failure of the Garfield water treatment tank and Caldwell Lane is imminent. If the water treatment structure were to be undermined, the town of Garfield could no longer use this facility to ensure quality water for residents. Caldwell Lane serves as the only access road for a neighborhood of 100 homes, failure of the road would prevent access to the neighborhood for its residents and emergency vehicles. Furthermore, this area could become a public safety hazard because of the highly eroded stream bank. Eventually, this “no action” alternative would lead to relocation of the water intake facility and Caldwell Lane. The resulting relocation would only be temporary as erosion concerns would continue.

Alternative 1 - Longitudinal Peaked Stone Dike and Tie Back

Alternative 1 consists of a longitudinal peaked stone toe dike placed at the toe along 1,200-feet of the right bank of the Colorado River. The upstream reach of the stone toe dike would begin at Station 0+00. The longitudinal stone toe dike would have a triangular cross section with an approximate height of 8 feet, a base width of about 32-feet, and 4H:1V side slopes. The entire 1,200-foot reach of the longitudinal stone toe dike would have stone tie-back dikes extending out perpendicularly from the crest of the longitudinal stone dike to the bank and would be spaced every 100-feet along the longitudinal stone dike. The crest height of the tie-back dikes would match the crest height of the longitudinal stone dike at the juncture of the two and would slope up toward the bank on a slope of 5H:1V. The tie-back dikes would be keyed into the bank 3 feet below the existing ground. This alternative has an estimated cost of $2,552,998 and would require approximately 14,240 cubic yards of fill material into the river channel.

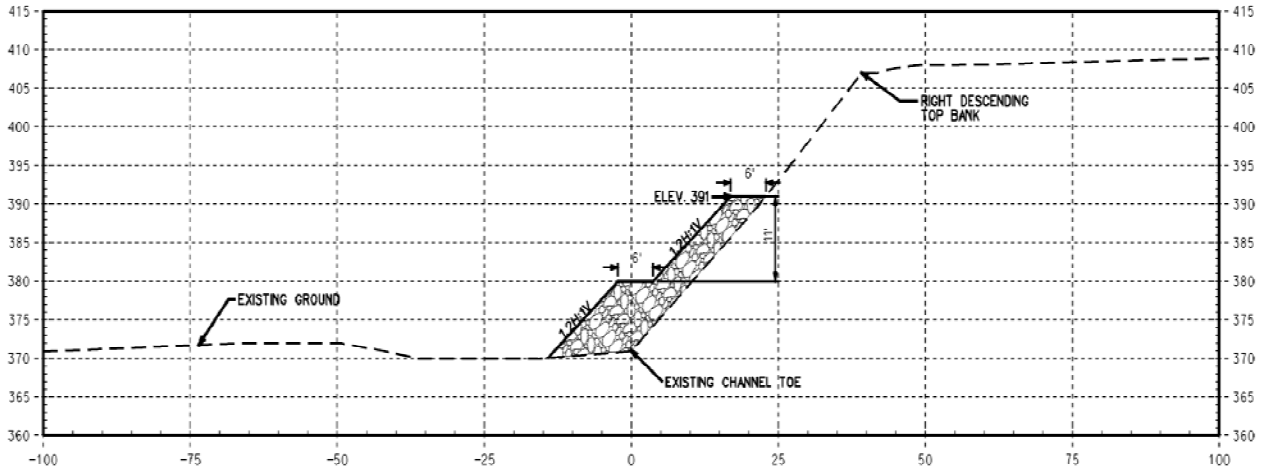


TYPICAL STONE TIE-BACK DIKE PROFILE

NOTE: STONE TIE-BACK DIKE SLOPES 2H:1V ON EITHER SIDE TO NATURAL GROUND ELEVATION.

Alternative 2 – Stone Riprap Toe Protection

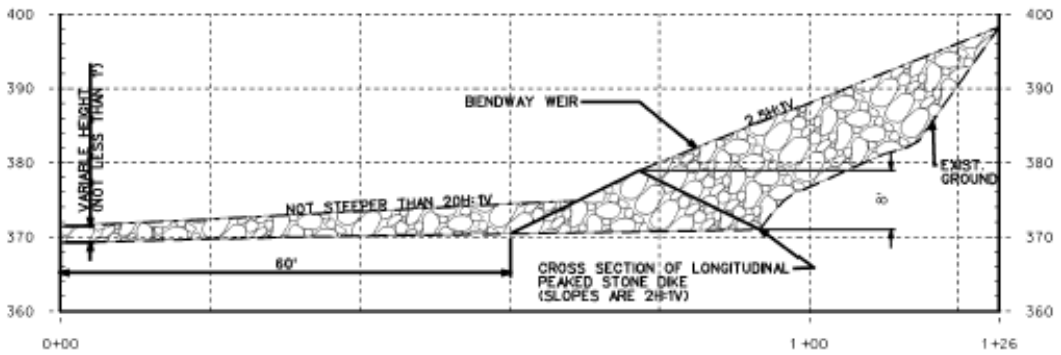
Alternative 2 consists of stone riprap placed at the toe along approximately 1,200-feet of the right bank of the Colorado River. The upstream reach of the riprap would begin at Station 0+00. Riprap would be placed along the toe of the bank and to elevation 391 feet (13 feet below the top of the bank to provide erosion protection to the toe of the bank from river scour. Once the riprap is in place, the exposed embankment would be planted with native vegetation. This alternative has an estimated cost of $1,959,623 and would require approximately 10,422 cubic yards of fill material into the river channel.



TYPICAL RIPRAP TOE PROTECTION SECTION

Alternative 3–Longitudinal Peaked Stone Toe Protection With Bendway Weirs

Alternative 3 consists of bendway weirs constructed of stone in combination with a longitudinal peaked stone toe dike placed at the toe along approximately 1,200 feet of the right bank of the Colorado River. The weirs have a trapezoidal cross-section about 4 feet in height, a 5 foot crest width, 2H:1V side slopes and would slope downward toward the center of the riverbed on a 20H:1V slope. The weirs would be spaced every 100 feet and would extend out toward the centerline of the riverbed 60 feet from the longitudinal stone toe dike. The weirs are angled upstream approximately 10 to 15 degrees from the radius of the bend to direct flow away from the bank toward the center of the riverbed. The bendway weirs would extend up the bank on a 2.5H:1V slope to intersect the existing bank. This alternative has an estimated cost of $2,475,653 and would require approximately 22,061 cubic yards of fill material into the river channel.



TYPICAL BENDWAY WEIR PROFILE

NOTE: BENDWAY WEIRS HAVE A TRAPEZOIDAL CROSS SECTION ABOUT 4-FEET IN HEIGHT, A 5-FOOT CREST WIDTH, AND 2H:1V SIDE SLOPES.

SELECTING THE RECOMMENDED PLAN

A summary of the costs for each alternative is provided in Table 1 below. The recommended alternative was compared to relocation of the threatened facility. As can be seen in Table 1, Alternative 2 is the least costly solution to the erosion problem and is less than the alternative of relocation; therefore according to ER 11052-100, dated 22 April 2000, the least cost alternative plan is assumed to be justified.

Table 1 – Alternative Cost Analysis[1]	Alternative 1 Peak Stone Stone Dike & Tie-back	Alternative 2 (Recommended Plan) Toe Protection with Rock Riprap	Alternative 3 Peak Stone Dike & Bendway Weirs	No Action (Replacement Costs for the intake & Caldwell Lane)
Bank Stabilization	$1,963,844	$1,507,403	$1,904,349	$2,375,000
Planning Engineering and Design	$294,576	$226,110	$285,652	$63,200
Construction Management	$294,576	$226,110	$285,652	$190,000
Total Cost	**$2,552,996**	**$1,959,623**	**$2,475,653**	**$2,628,200**

[1] A contingency amount of 25% was applied.

RECOMMENDED PLAN

Alternative 2 is the most economical solution to the erosion problem. This would protect the bank from further erosion and prevent the loss of the intake structure and Caldwell Lane. As previously mentioned the plan involves placing stone riprap along the toe of the bank and up to approximately 13 feet below the top of the bank, and following the riprap placement with native plantings along the remaining exposed embankment.

ENVIRONMENTAL CONSEQUENCES

No Action Alternative

Under the No Action plan, eventual failure of the bank is likely and Caldwell Lane would be compromised making it unsafe for travel. This road is the only way for a nearby residential development to commute in and out of the community. The Colorado River at the project site would continue to change and move to accommodate the change in flow regimes from increased surface runoff and flows in the watershed. Turbidity issues would continue as bank instability hinders vegetation establishment at the project site. Over time the bends in the river would become more severe and trees adjacent to the channel would continue to succumb to erosive processes eventually falling down into the river. The river would eventually return to a natural state shaped by the increases in flow events and velocities leaving the Caldwell Lane and the water supply facility vulnerable to structural failure making them a public safety hazard.

Recommended Plan (Alternative 2 – Stone Riprap Toe Protection)

Soils. Disturbances to soil would be primarily from excavation of the stream bank sides and the addition of fill and armor material from backhoe activities. Further disturbance to soils would be from construction equipment access as well as site preparation and minor grading for vegetative plantings following construction. Direct and indirect impacts would from sedimentation during rainfall events that occur during construction and before vegetation is established. A Storm Water Pollution Prevention Plan would be implemented using best management practices before construction would commence to minimize the temporary impacts to soils during construction.

Land Use. Land use in the area includes a nearby residential area that can only be accessed by Caldwell Lane, a municipal water facility owned by the City of Garfield, and a sand and gravel mining operation. The proposed alternative for stream bank stabilization would benefit the City of Garfield by allowing the water facility to continue to operate. Proposed stream bank stabilization would also allow Caldwell Lane to remain open for residential access.

Surface Water. Construction activities associated with the proposed alternative would have temporary direct and indirect impacts to water quality by causing an increase in river turbidity. This would directly affect the adjacent waters and have further indirect effects for a short distance downstream until the sediment is diluted. This short-term increase in turbidity would cause a reduction in river dissolved oxygen levels by shading the oxygen-producing phytoplankton. These impacts would occur immediately in the vicinity of the construction activity.

The proposed bank protection would provide long-term beneficial impacts to water quality by eventually eliminating the source of stream bank erosion. Over time vegetation on affected areas would stabilize soils and minimize the movement of soil particles and other debris allowing for improved water quality comparable to pre-erosion conditions. As water quality increases, plant and microorganisms would increase to create a diversified aquatic habitat for fish and wildlife to use.

Ground Water. Stabilizing the bank would allow improved water quality by slowing or eliminating the amount of siltation and debris that sloughs into waters from storm runoff or high swift moving waters. Improving the water quality within the study area would most likely benefit ground water resources given the fact that the aquifer catchment areas usually occur along the riverbed.

Floodplains. Consistent with Executive Order 11988, Floodplain Management, locating the recommended action in the floodplain would be the only practicable alternative. As such, modifications to the river would be designed to minimize potential harm to or within the floodplain. In addition, the recommended project would not increase the base flood elevation to a level that would violate applicable floodplain regulations or ordinances.

Terrestrial and Aquatic Resources. Stream bank preparation would be required during implementation of the proposed alternative. The preparation would involve contouring, and soil removal or relocation. These construction activities would initially eliminate all terrestrial habitat in the riparian zone and adversely impact organisms utilizing this area. Noise and other disturbances associated with construction would also temporarily adversely impact terrestrial species utilizing wildlife habitats adjacent to the project site. Materials used for the construction of the proposed project would provide some habitat for terrestrial animals. Once established, the stone riprap toe protection for this project would provide suitable habitat for small mammals, reptiles, and birds which utilize subterranean sites for shelter.

Aquatic organisms presently utilizing shoreline or near shore habitats adjacent to the project site would be displaced through any construction activity which requires bank removal or contouring. Aquatic habitat provided by shading structures (such as overhanging vegetation), root wads, and undercut banks, would be eliminated by any bank preparation activities. Since the desired outcome of the project would be to alter hydrology and the resultant erosional characteristics of the river, the aquatic species adapted to the present hydrologic regime of the Colorado River at, or near the project site, would be adversely impacted through changes in aquatic habitat. In addition to the water quality improvements previously discussed that would benefit the aquatic resources, the proposed alternatives would provide additional beneficial impacts to fish, aquatic invertebrate, and other aquatic resources in the Colorado River by providing substrate for colonization, feeding, spawning, and refuge.

Threatened and Endangered Species. Due to the fragmented nature of the area and impacts from heavy erosion, it is unlikely that the subject property would support any of the protected wildlife species for other than transitory purposes. Should any protected wildlife species be sited during construction, all activities would stop. U.S. Fish & Wildlife and Texas Parks and Wildlife Department biologists would be contacted to determine if construction activities can continue without adverse affects to protected wildlife species.

Cultural Resources. In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, and it's implementing regulation 36 CFR Part 800, USACE is required to consider the impacts the project may have on cultural resources. While the area has a high potential for intact subsurface deposits, the preferred alternative to place rip rap along the toe of the eroding bank and plant vegetation would have no adverse affect on those resources. Rather, this alternative would serve to protect potentially significant deposits from further erosion.

Consideration of the American Indian Religious Freedom Act with regard to potential interments or burials is necessary during project construction activities. Burials have been reported in similar bluff settings in this geographic region of Texas and the potential is present in this location as well. Should human remains or funerary objects be observed during construction, all activity in vicinity of the find will cease immediately and the USACE Cultural Resources specialist will be called so that appropriate action and consultation can be undertaken without delay.

Hazardous Material. A review of Travis County records indicates there is no history of past storage, use, release, and disposal of any hazardous substances or petroleum products within the study area. If a site is discovered during

construction, activities would be stopped until the hazardous and toxic waste material is properly contained and disposed of.

Air Quality. Impacts to air quality from the recommended alternative would be temporary in nature during construction primarily from the use of heavy equipment such as front-end loaders, back hoes, and dump trucks. Limiting the number of units required for construction activities and routine equipment inspections would be used to minimize emissions from heavy equipment. Using these practices would allow air quality to stay within attainment standards during construction.

Noise. Residents near the proposed Caldwell Lane construction site would experience some disturbance due to the operation of heavy equipment and maintenance vehicles. During construction activities, noise levels would increase. However, these noise disturbances would be temporary and limited to day time working hours. No long-lasting adverse environmental effects are expected to occur.

Socioeconomic and Environmental Justice. The proposed alternative would not separate, or isolate any distinct neighborhoods, ethnic groups, or other specific groups. There are no disproportionate impacts on any minority and/or low-income populations associated with the project. Therefore, the requirements of Executive Order 12898 (Environmental Justice) are satisfied.

Aesthetic Resources. The proposed alternative for bank stabilization within the study area would involve adding vegetation to add roughness to the banks aiding in erosion protection. The addition of vegetation would greatly improve the landscape of the area and add habitat diversity for wildlife allowing nearby residents to enjoy the benefits of improved scenery and opportunities to view wildlife.

Irreversible and Irretrievable Commitments of Resources. The recommended action would not entail any significant irretrievable or irreversible commitments of resources. Construction of a longitudinal peaked stone toe dike would require consumption of petroleum products (just enough to run the construction equipment for a few weeks), and importing materials such as rock, soil, gravel, and vegetation. However, the recommended action would entail long-term commitment and environmental stewardship to ensure the long-term sustainability of restored environmental resources.

Environmental Consequences Comparison of Construction Alternatives

Similar to the construction impacts of the Recommended Plan (Alternative 2 – Riprap Toe Protection); Alternative 1 Longitudinal Peaked Stone Dike and Tie Back and Alternative 3 Longitudinal Peaked Stone Toe Protection with Bendway Weirs would incur temporary impacts. None of the alternatives would result in significant adverse impacts to the environment.

Alternative 3 is anticipated to incur the greatest temporary impacts to surface water quality due to the placement of the greatest amount of fill material into the waters of the U.S. Likewise, Alternative 1 having the second greatest placement of fill material in the waters of the U.S. would have the next greatest temporary water quality impacts.

Noise impacts for the Recommended Plan and Alternatives 1 and 3 would be similar. It is anticipated that longer construction periods for Alternatives 1 and 3 would create longer duration of noise as compared to the Recommended Plan, but would still be considered insignificant.

Impacts for Alternatives 1 and 3 to ground water, land use, floodplains, hazardous material and cultural resources are expected to incur similar impacts as the Recommended Plan. Also, like the recommended plan, it is very likely that Alternatives 1 and 3 would not affect protected wildlife species because of the lack of supporting habitat due to the fragmented nature of the area. Because of rock type and quantity of fill material used in Alternatives 1 and 3, differences in terrestrial and aquatic resources are anticipated to be only slightly different, but very minor, from the use of riprap under the Recommended Plan.

CUMULATIVE IMPACTS

This section addresses the cumulative impacts associated with the implementation of the Recommended Plan and other concurrent/future activities affecting the environment.

Past Activities

Past activities that have occurred in the project area would include the construction of Caldwell Lane, the development of a nearby residential community, the operation of local water intake facilities, recreational biking, walking, jogging, and activities associated with a local sand and gravel mining operation.

Present and Reasonable Foreseeable Future Activities

Present and future activities occurring in the project area would be the continued operation of the water intake facility, low impact recreation such as scenic walking or jogging, vehicular commuting along Caldwell Lane in and out of a nearby residential development, development of the nearby residential community, and continued activities associated with a local sand and gravel mining operation.

Cumulative Impacts With Recommended Plan

The Recommended Plan would not add any significant cumulative impacts to soils, air quality, noise, existing land use (including sand and gravel mining operations and local residential development), aesthetic resources, social economic, environmental justice, potential presence for hazardous materials, existing flood plains, terrestrial/aquatic wildlife, endangered or threatened species, surface or ground water resources.

The recommended alternative, placing riprap at the toe of the bank and followed by native plantings would have minor temporary impacts to resources with-in the project vicinity. Temporary impacts would include short-term increased turbidity, short-term displacement of terrestrial and aquatic organisms with-in and near the project area due to physical disturbances from construction activities, and short-term increase of fugitive dust related to construction activities. These temporary impacts associated with fugitive dust are very minor in comparison to impacts associated with ongoing area sand and gravel mining operations, and is not considered to be a significant contribution of overall fugitive dust to create major cumulative surface water and air quality concerns.

Stabilization of the stream bank to prevent further erosion would protect the integrity and prevent structural failure of the road. After project implementation, soils would stabilize with vegetational succession while water quality would increase due to less turbidity promoting a more productive system for aquatic organisms at the site. Terrestrial organisms in the project vicinity temporarily displaced by construction activity would begin to reoccupy the area. Vehicular use of Caldwell Lane would continue, and the water system would continue to operate in place. The mining operation indirectly adds to the instream sediment transport, but the Recommended Plan would not significantly change the overall sediment load.

REGULATORY REQUIREMENTS

Since this is an emergency stream bank protection project, there would be no other practical alternatives to conducting proposed activities within the flood plain. Nationwide Permit 13 (NWP 13) authorizes bank stabilization activities necessary for erosion prevention. Under the terms and conditions of NWP 13 any project over 500 feet in length requires a written notice to USACE Regulatory Branch requesting this requirement to be waived. This project would be approximately 1,200 feet long and would require an approved waiver in order to use NWP 13. Adverse impacts to aquatic resources from implementing proposed bank protection would be minimal. Therefore the project would qualify for authorization under NWP 13, which does not require an individual alternatives analysis and evaluation pursuant to Section 404(b)(1) guidelines. Further, since the TCEQ has issued 401 water quality certification for NWP 13, the proposed project would be in compliance with Section 401 of the Clean Water Act (CWA.)

Section 402 of the Clean Water Act and Chapter 26 of the Texas Water code require construction activities that disturb areas greater than 1 acre to obtain a National Pollution Discharge Elimination System (NPDES) Construction General

Permit. Bank stabilization construction operations would meet water quality standards set forth by Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code by preparing and following a Storm Water Pollution Plan (SWPPP) approved by the USACE and the Texas Commission of Environmental Quality (TCEQ). This SWPPP would outline measures for the contractor to implement during construction activities to minimize pollution in storm water runoff. A TCEQ Notice of Intent (NOI) would be filed at least 48 hours prior to any ground disturbing activities. As required a copy of this NOI and the prepared SWPPP would be posted on site.

MITIGATION REQUIREMENTS

Final project designs would use measures to avoid and minimize impacts to natural and cultural resources. The following is a list of measures that would be used to mitigate impacts to natural and cultural resources.

- No excessive fill material would be used for stream bank protection.
- Dust control would be used during construction.
- Use of heavy equipment would be limited to only essential equipment required to perform necessary repair tasks and no more than 10 hours per day in order to limit noise and air emissions.
- Heavy equipment would operate on matting and would not remain in the channel for prolonged periods of time.
- Appropriate soil erosion and sediment controls would be used and maintained in effective operating condition during construction, and all exposed soils would be permanently stabilized at the earliest practicable date.
- As much as possible, construction work would be performed during periods of low or no flow.
- Vegetation lost during clearing and grading activities would be replaced with native vegetation on a one to one basis.
- If determined during the cultural resources survey, cultural monitoring would be done during construction.

PUBLIC INVOLVEMENT

A draft of this Integrated Environmental Assessment will be sent to the following resource agencies for review and comment in accordance with coordination requirements as set forth by NEPA: Texas Parks & Wildlife Department; U.S. Fish and Wildlife Department; U.S. Environmental Protection Agency; Texas Historic Commission, and the Texas Commission on Environmental Quality. The EA will undergo a 30 day public comment period. Any comments received during the comment period will be included as an Appendix.

REAL ESTATE CONSIDERATIONS

The area along the toe of the river bank where construction, operation, and maintenance would take place is privately owned therefore interest in real estate would have to be acquired. Total project acreage excluding the land owned by the Garfield Water supply would require an easement of approximately .67 acres. Travis County is considered fully capable of acquiring this minor easement. Appraised market value according to Travis Central Appraisal District records for this acreage is $737.

Construction access would be accomplished by using an entry point currently owned by Travis County. Little Webber Ville Park provides a 1 acre staging and storage area with direct access to the construction site. Appraised market value according to Travis Central Appraisal District records for this acreage is $498. The total LERRDS value is thus estimated at $1,235.

COST ESTIMATE OF RECOMMENDED PLAN

It is not necessary to account for interest during construction in project costs for Section 14 projects. This cost estimate is based on a preliminary design. Table 2 below is a summary of the cost estimate breakdown for the recommended plan.

Table 2 – Recommended Plan Cost Estimate

Task	Cost
Bank Stabilization	$1,507,403
Planning Engineering and Design	$226,110
Construction Management	$226,110
Real Estate Cost	$8,500
Total Estimated Cost	**$1,968,123**

ESTIMATED COST APPORTIONMENT

The total project cost would be cost shared between the non-federal sponsor, Travis County and the Federal Government on a 35% and 65% proportion, respectively. The non-Federal share is estimated to be approximately $688,843 along with annual costs of approximately $10,000 for operations, maintenance, repair, rehabilitation, and replacement. Travis County's 35% apportionment is also comprised of a credit for the value of lands, easements, rights-of-way, relocations, and disposal areas (LERRD) required by the project and provided by the city. The federal share is estimated at approximately $1,279,280.

Table 3 – Cost Apportionment

Total Estimated Project Cost	**$1,968,123**
Travis County	
LERRD	$1,235
Cash Contribution	$667,608
Total Non-Federal Sponsor Share	$688,843
Federal Government	
Total Federal Share	$1,279,280

OPERATION, MAINTENANCE, REPAIR, AND REHABILITATION AND REPLACEMENT (OMRR&R)

Annual OMRR&R costs are estimated at $10,000 for this project would be a 100% percent non-Federal responsibility. The County agrees to regularly inspect the condition of the bridge, abutments, and riprap. In the event of damage occurring to any of the project features, including but not limited to, localized scour and or erosion, displacement of riprap, etc., Travis County would restore the project to its original design as quickly as possible. The Fort Worth District would conduct annual inspections of the project to ensure adequate OMRR&R is being accomplished.

PROJECT IMPLEMENTATION

Once a letter of intent is received from Travis County, efforts would continue on the development of plans and specifications for the recommended plan. When the plans and specifications are sufficiently complete, project approval and a commitment of Federal funds for construction would be requested. Once received, the Project Participation Agreement (PPA) would be executed, followed by advertisement of a construction contract. The Table 4 below displays the major project milestones and their completion date.

Table 4 – Project Implementation

Milestone	Completion Date
Initiate Plans and Specifications	Jan 2011
Receive Project Approval	June 2011
Execute PPA	July 2011
Acquire Real Estate	Jul 2011
Advertise Construction Contract	Aug 2011
Award Contract	Sep 2011

CONCLUSIONS AND RECOMMENDATIONS

The findings of this study indicate that there is a need for stream bank protection along the right descending bank of the Colorado River located north of the town of Garfield, Texas. A failure to do so would result in the imminent failure of the stream bank, the loss of a municipal water facility, and the loss of accessibility to a nearby residential development. The recommended plan would provide stream bank protection against further erosion and save the affected facilities and restore the area to conditions comparable to pre-erosion and pre-flood conditions. This report with integrated environmental assessment (EA) discloses the potential environmental and cultural impacts associated with the proposed emergency stream bank stabilization project along the Colorado River along Caldwell Lane north of Garfield, Texas. The recommended plan would result in minimal temporary adverse impacts to the natural environment. The stabilization would reduce stream bank erosion and subsequently improve local water quality by decreasing the turbidity in the Colorado River that has been caused by sedimentation.It is the finding of this assessment that implementation of the recommended plan, the construction of a stone riprap toe protection, would cause no significant environmental impacts and would not constitute a major Federal action requiring the preparation of an Environmental Impact Statement (EIS).

REPORT PREPARERS

The people who were primarily responsible for conducting the preparation of this Planning Design Report and Integrated Environmental Assessment are listed in Table 5.

Table 5: List of Report Preparers

Name	Discipline/Expertise
William Haferkamp	CAP Program Manager
Kathy Mitchell	Environmental Resource Planner
Nekisha Harris-McGill	Plan Formulation
Syed Haneefuddin	Geotech
Lori Baldi	Civil Design
Michael Velasquez	Hydrology and Hydraulic
Thurman Schweitzer	Real Estate