

**DRAFT
ENVIRONMENTAL ASSESSMENT
COWSKIN CREEK LOCAL FLOOD PROTECTION PROJECT
WICHITA, KANSAS**

SECTION 1.0 PURPOSE, NEED, AND SCOPE

The U.S. Army Corps of Engineers, Tulsa District, and the City of Wichita are conducting a feasibility study of Cowskin Creek under the authority of Section 205 of the Flood Control Act of 1948, (Public Law 80-858), as amended. The feasibility study began in April 2001 and is scheduled for completion in April 2004. The City of Wichita, as the local sponsor would be responsible for acquisition of the lands, easements, rights-of-way, relocations, and disposal areas that would be required for the project. Acquisitions must be completed before construction can begin. The sponsor must provide at least 35% of the total project cost, with a maximum of up to 50%. The maximum Federal share would be 65%.

A number of prior studies have addressed the flooding problems in the Cowskin Creek basin. A Flood Insurance Study (FIS) was completed in 1986 for the City of Wichita and for Sedgwick County. The purpose of the study was to investigate flood hazards in the area. The information was used to help the City implement a flood insurance program and to assist planners in floodplain management and development.

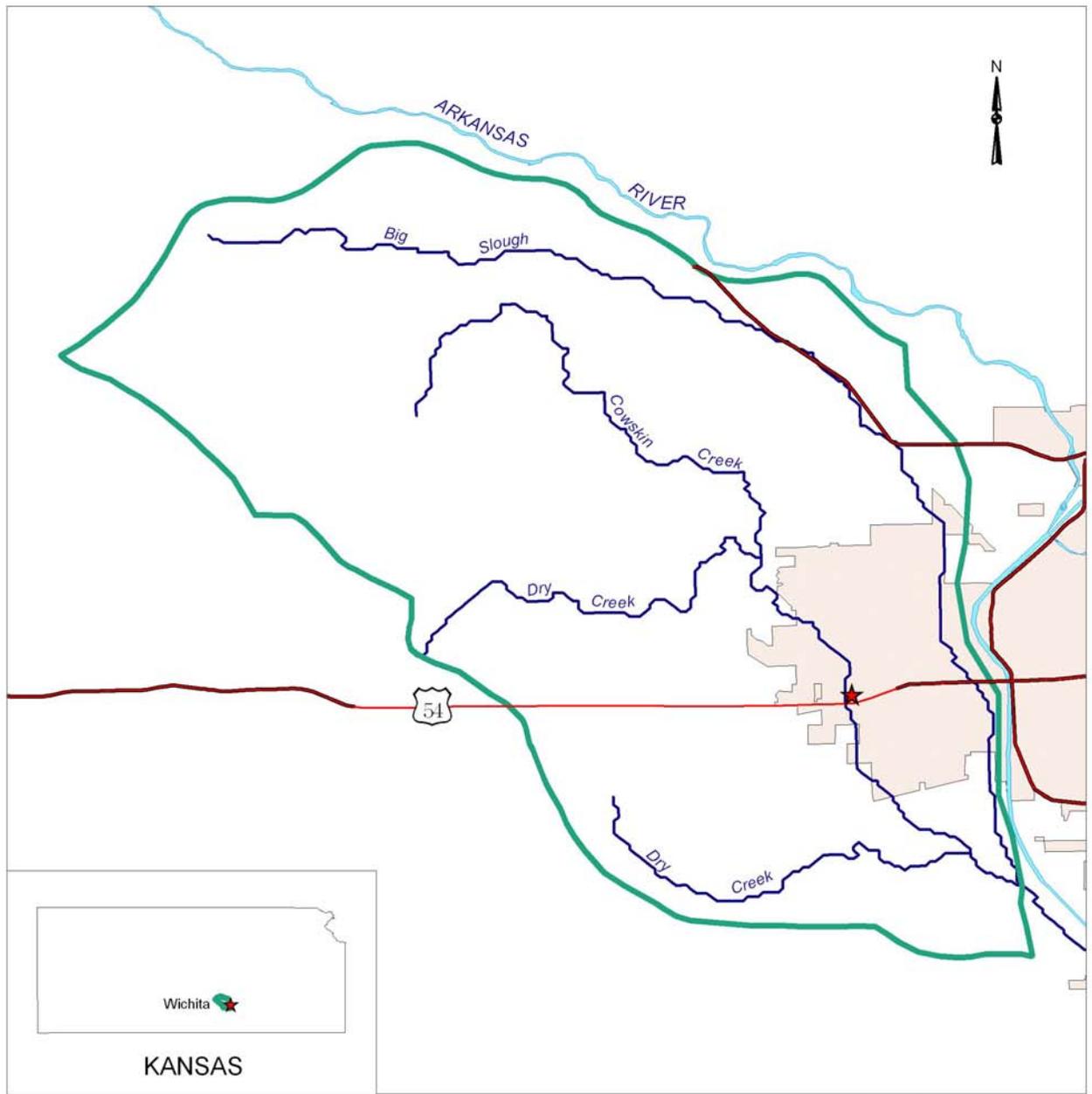
The City of Wichita initiated a restudy of the Cowskin Creek basin in 1994. The purpose of the restudy was to update the floodplain mapping to reflect changed conditions since the original FIS analysis. The study limits were extended based on the City's increased area. A revised map of the City was prepared and submitted to the Federal Emergency Management Agency who accepted the revision in June 1997. City administrators have since used the approved map for floodplain management.

The Cowskin Creek watershed covers an area of approximately 122 square miles (Figure 1.0). The study area extends upstream from Kansas Highway 42 to just southwest of the City of Colwich. Several tributaries to Cowskin Creek were also studied. These included Dry Creek from the Cowskin confluence to 167th Street West, Calfskin Creek from the Cowskin Creek confluence to Kellogg, the North Fork of Calfskin Creek from the Calfskin Creek confluence to just downstream of Central Avenue, the Middle Fork of Calfskin Creek from the North Fork Calfskin confluence to 135th Street West, and Westlink Tributary from the Cowskin Creek confluence to 21st Street North. The drainage basin is approximately 20% developed and is roughly bounded on the west by 311th Street West, on the north by 77th Street North, on the east by 71st Street West, and on the south by Kansas Highway 42. The land is primarily agricultural with small corridors of residential and commercial development.

During the past several years, severe home and street flooding has occurred at several locations adjacent to channels within the Cowskin Creek drainage basin (Photo 1.0). Most recently, rainstorms occurring on Halloween 1998 and September 27th, 1999 caused significant flood damage to several homes and commercial structures. In February 2000, administrators from the City of Wichita and the County of Sedgwick retained Black and Veatch Corporation to evaluate the drainage basin and recommend improvements to address the flooding problems along the channels. Black and Veatch used detailed topographic survey information produced by M. J. Harden Associates, Inc. These base maps were developed from aerial photographs taken in February 1994 and were provided at a scale of 1:2400 with 2-foot contour intervals. In addition to contours, the maps showed existing physical features, residential homes, and roadways.

The Corps of Engineers' Hydrologic Modeling System, HEC-HMS, computer program was used to estimate the stormwater runoff from each drainage area, and to route the flows downstream. The Corps of Engineers' River Analysis System, HEC-RAS, computer program was used to model the hydraulics of the channel and to estimate the existing and proposed water surface elevations.

Eight alternatives were considered by the Corps to alleviate flooding in the Cowskin Creek watershed. These alternatives consist of a series of natural channel improvements, detention, and diversion. The recommended



Source: ArcView StreetMap, ESRI, 2000

KEY TO FEATURES

- Cowskin Creek SubBasin
- ★ Lower Project Limit
- Wichita



Figure 1.0 Vicinity Map, Cowskin Creek Local Flood Protection Project, Wichita, Kansas



Photo 1.0 Flooding from Cowskin Creek.

alternative includes excavation and construction of a large cross-section channel between Kellogg and Maple streets that would serve as a floodway during high-flow conditions. The floodway channel would be situated east of the existing channel. The existing channel would not be disturbed and would serve as a low flow channel. A No Action alternative was also considered.

The National Environmental Policy Act (NEPA) of 1969 (Public Law 91-190) requires all Federal agencies to address the environmental impacts of any major Federal action on the natural and human environment. Guidance for complying with the NEPA is contained in Title 40 of the Code of Federal Regulations (CFR), Parts 1500 through 1508, and in Engineering Regulation (ER) 200-2-2, *Procedures for Implementing NEPA*. The primary intent of NEPA is to ensure that environmental information is made available to public officials and citizens regarding major actions taken by Federal agencies. This environmental assessment was developed to assure that construction of the proposed project complies with the intent of NEPA.

SECTION 2.0 ALTERNATIVES

2.1 No Action Alternative

The Council on Environmental Quality (CEQ) regulations implementing the provisions of the National Environmental Policy Act of 1969 (NEPA) require Federal agencies to consider a "no action" alternative. These regulations define the "no action" alternative as the continuation of existing conditions and their effects on the environment, without implementation of, or in lieu of, a proposed action. This alternative represents the existing condition and serves as the baseline against which to compare the effects of the other alternatives. Under existing

conditions, expected average annual damages from flooding along Cowskin Creek are expected to be \$276,600. It is likely that the "no action" alternative would result in damages equal to or in excess of this estimated annual cost. This alternative would retain the existing condition and would not result in any project-related environmental impacts or losses of fish and wildlife habitat.

2.2 Action Alternatives

The Corps of Engineers considered several structural plans during the preliminary screening of alternatives. Requirements for the selected plan included technical soundness, economic feasibility, and environmental acceptance. The selected plan should provide the greatest amount of protection for an area, and the benefits received from flood protection must be greater than the costs to construct and maintain the project. The selected alternative should also achieve the City's planning objectives and adequately address social, environmental, and economic impacts. The alternatives considered included channel modification, detention, diversion, and levee construction. Only a channel modification plan was determined to be economically feasible and justified a Federal interest.

Five channel modification plans were studied which included the selected plan. The selected plan was designed with a 300-foot bench and had a favorable benefit/cost ratio of 1.96. The other four channel modification plans had lower benefit/cost ratios of 1.83, 1.68, 0.05, and 0.46 and were dropped from further study.

Two detention sites were evaluated and dropped from further study because of unfavorable benefit/cost ratios. They did not meet the economic feasibility requirements for Federal interest.

Another alternative for flood reduction within the Cowskin Creek basin is through the construction of a diversion channel from Cowskin Creek to the Arkansas River. This alternative had a benefit/cost ratio of only 0.18 and was dropped from further study.

A levee plan was screened out early in the formulation process. This alternative would actually increase the average annual flood damages in the Cowskin Creek basin. Although it would provide some flood relief along portions of the Middle and North Forks of Calfskin Creek, these benefits would be overshadowed by the larger flood damages caused by the levee along Dry Creek and Cowskin Creek.

2.2.1 Alternative 1. Kellogg to Maple Channel Modification.

Alternative 1 consists of a channel modification project using three different bench widths between Kellogg Drive and Maple Street. Each would be essentially the same plan except for the bench width. The three included minimum bench widths of 100, 200, and 300 feet. The 100-foot bench plan would have a B/C ratio of 1.68, the 200-foot bench plan would have a B/C ratio of 1.83, and the 300-foot bench plan would have a B/C ratio of 1.96. Alternative 1 with a 300-foot minimum bench width is the selected plan and is discussed in SECTION 3.0, PROPOSED ACTION.

2.2.2 Alternative 2. Maize to Central Channel Modification.

Alternative two would modify the channel of Cowskin Creek from Central Avenue downstream to Maize Road. Channel modification would involve excavation along the sides of the channel to provide additional flow area and flood conveyance. This portion of Cowskin Creek has a large degree of development. The residential and commercial developments along the channel between Maize Road and Central Avenue limit the area available for excavation. Much of the excavated area would require steep slopes with structural bank stabilization as opposed to bioengineering measures. The channel invert would require re-grading to establish a uniform bed slope. The completed project would form a riparian corridor consisting of native vegetation, without the need for frequent maintenance.

Hydraulic analysis of this alternative indicates there would be a significant reduction in flood levels. Flood elevation reductions during the occurrence of the 100-year flood event were used to compute average annual flood damages with this alternative in place. The implementation costs, including construction costs and allowances for utility relocations, right-of-way, inspection, survey, and contingencies amortized over the 50-year life of the project

results in an average annual cost of \$374,100. The expected annual benefit upon implementation of this alternative is approximately \$17,800 for a benefit/cost ratio of 0.05. This alternative would not meet the economic feasibility requirements of a Federal project.

2.2.3 Alternative 3. Kellogg to Maple and Maize to Central Channel Modification.

Alternative three consists of the combination of alternative 1 plus alternative 2. It would modify the channel between Kellogg Drive upstream to Maple Street, which is the proposed plan, and Maize Road upstream to Central Avenue. The combined implementation costs, including construction costs and allowances for utility relocation, right-of-way, inspection, survey, and contingencies for this alternative amortized over the 50-year life of the project results in an average annual cost of \$637,100. The expected annual benefit upon implementation of this alternative is approximately \$294,900. The combination of these two alternatives provides for more widespread improvements along Cowskin Creek. However, because the benefit/cost ratio of alternative 2 is only 0.05, the combined benefit/cost ratio of alternative 1 and alternative 2 is 0.46 which is below the economic feasibility requirement for a Federal project.

2.2.4 Alternative 4. Dry Creek Detention Basin.

Alternative four would be an upstream detention structure designed to minimize the overflow from Dry Creek into the North Fork of Calfskin Creek. This alternative would provide a detention structure within the Dry Creek basin. The runoff from the Dry Creek basin overflows into the North Fork of Calfskin Creek basin during major flood events. This alternative would provide a detention structure with sufficient storage capacity to prevent such basin overflows from occurring within the 500-year frequency. This is an off-channel detention basin that will draw water from Dry Creek upstream of the diversion points. It is roughly bounded by 151st Street West on the east, 167th Street West on the west, 21st Street North on the north, and 13th Street North on the south. The excavated site would cover a land area of approximately 270 acres and have a maximum storage capacity of approximately 4,000 acre-feet.

The structure would function as an off-channel detention basin that would collect and detain flood flows in the Dry Creek basin, upstream of the historical basin overflows into the North Fork of Calfskin Creek. Construction of the detention site would require excavation to achieve the required storage capacity, an embankment structure of compacted earthen fill material, and both principal and emergency spillway structures. The primary outlet structure for this detention site, a double 12' x 5' RCB (reinforced concrete box), was designed to reduce the peak runoff for the 5-year and 100-year frequency storms. An emergency spillway 50 feet in width and 3.0 feet in height would need to be constructed. The emergency spillway could be either a grass-lined channel or a concrete-lined channel. This alternative would provide reductions in flood levels below the structure and throughout many portions of the Cowskin Creek basin. It would prevent the historical overflow from Dry Creek into the North Fork of Calfskin Creek.

The implementation costs, including construction costs and allowances for utility relocations, right-of-way, inspection, survey, and contingencies for this alternative amortized over the 50-year life of the project results in an average annual cost of \$1,115,300. The expected annual benefit upon implementation of the alternative is approximately \$124,500 for a benefit/cost ratio of 0.11. This alternative would not meet the economic feasibility requirements of a Federal project.

2.2.5 Alternative 5. Cowskin Creek Diversion South of the City of Maize.

Alternative five would provide for flood reduction within the Cowskin Creek basin through the construction of a diversion channel from Cowskin Creek to the Arkansas River. A diversion channel beginning at Cowskin Creek, downstream of 37th Street North and southwest of the City of Maize, would convey major flood events out of Cowskin Creek and discharge into the Arkansas River approximately six miles to the east. Minor flood events (less than 2-year events) would remain in the Cowskin Creek channel.

The diversion channel would consist of a rectangular-shaped concrete channel approximately 10 feet deep and ranging in width between 150 and 230 feet. The channel alignment would cross seven existing roadways and

one railroad. The channel alignment also crosses five existing stream channels, and construction measures would be necessary at each crossing to maintain existing flow pattern.

The implementation costs, including construction costs and allowances for utility relocations, right-of-way, inspection, survey, and contingencies for this alternative amortized over the 50-year life of the project results in an average annual cost of \$1,650,500. The expected annual benefit upon implementation of the alternative is approximately \$304,600 for a benefit/cost ratio of 0.18. This alternative would not meet the economic feasibility requirements of a Federal project.

2.2.6 Alternative 6. Dry Creek Levee.

Alternative six considered the construction of a Dry Creek Levee on the east and south sides of Dry Creek to prevent the overflow of floodwater from Dry Creek into the North Fork of Calfskin Creek. The runoff from the Dry Creek basin overflows into the North Fork of Calfskin Creek basin during major flood events. Restoration of the basin divide could be accomplished by the construction of a levee along the right bank of Dry Creek. This option would also involve the raising of some County roadway embankments to function as levees. The levee would be constructed from earthen embankment material to an elevation sufficient to confine Dry Creek runoff to the Dry Creek basin for flood events up to the 500-year recurrence interval. The levee would restore the basin divide and re-establish the flow patterns that were utilized in developing the regulatory floodplain mapping.

This alternative would provide flood relief for North Fork of Calfskin, Middle Fork of Calfskin, and Calfskin Creeks. However, it greatly increases water surface elevations in Dry Creek and Cowskin Creek. Based on peak discharges contained in the hydraulic analysis of this alternative, the Dry Creek Levee would increase peak flow rates along Dry Creek, and would raise peak flow rates along Cowskin Creek, downstream of the Dry Creek confluence. Thus the benefits of the levee are overshadowed by the larger flood damages caused by the levee along Dry Creek and Cowskin Creek.

The implementation costs, including construction costs and allowances for utility relocations, right-of-way, inspection, survey, and contingencies for this alternative amortized over the 50-year life of the project results in an average annual cost of \$65,300. There would be no annual benefit realized from this alternative. This alternative would actually increase the average annual flood damages in the Cowskin Creek basin by an estimated \$485,000. This alternative would not meet the economic feasibility requirements of a Federal project.

2.2.7 Alternative 7. Dry Creek Detention Site "B".

Alternative seven would be an upstream detention structure similar to alternative four designed to minimize the effect of overflow from Dry Creek into the North Fork of Calfskin Creek. This alternative would provide a detention structure within the North Fork of Calfskin Creek basin. The selection of this site was based on finding as large an area of land as possible within the North Fork Calfskin drainage basin that could be used to construct a detention basin without displacing homes or other structures. Detention Site B is roughly bounded by 135th Street West on the east, 151st Street West on the west, 13th Street North on the north, and Central Avenue on the south. The excavated site would cover approximately 200 acres and have a maximum storage capacity of approximately 832 acre-feet.

This detention site would be constructed to capture the flow from two separate streams. Each of these streams has been found to carry overflow from Dry Creek during high-frequency storms. The detention basin would have two primary outlet structures, one for each exiting stream. Each primary outlet structure would consist of a quadruple 11' x 6' RCB, along with an overflow weir 75 feet in length and 2 feet in height. These two outlet structures would be designed to reduce the peak runoff for the 5-year and 100-year frequency storms. An emergency spillway 600 feet in width and 6.1 feet in height would be constructed to sufficiently pass 40 percent of the Probable Maximum Precipitation (PMP). The emergency spillway would be either a grass-lined channel or a concrete-lined channel. If the channel is grass-lined it would approximately 3550 feet in length with a height of 6.4 feet. The dam would be constructed of compacted fill.

The implementation costs, including construction costs and allowances for utility relocations, right-of-way, inspection, survey, and contingencies for this alternative amortized over the 50-year life of the project results in an

average annual cost of \$841,500. The expected annual benefit upon implementation of the alternative is approximately \$124,500 for a benefit/cost ratio of 0.15. This alternative would not meet the economic feasibility requirements of a Federal project.

SECTION 3.0 PROPOSED ACTION

Alternative one with a minimum 300-foot bench width is the selected plan. It would consist of an overflow channel cut from the east bank of Cowskin Creek between Kellogg Drive and Maple Street (Figure 3.0). The bench layout would vary in width from the channel to accommodate channel bends while maintaining a minimum bench width of 300 feet. It would increase the conveyance capacity of the floodplain and generally decrease flood elevations for a given storm event. The overflow bench would have a one vertical to three horizontal bank slope. The existing hydraulic conditions and availability of space within this reach would allow construction of a channel that could be stabilized by vegetation.

The existing streambed would be retained as a low-flow channel under this alternative. The excavated bench would be located along the east bank of Cowskin Creek and would be planted with a mixture of native and erosion resistant vegetation. During heavy rainfall events, the low flow channel would overflow into the excavated channel. Existing vegetation within the limits of the new channel would be removed during construction. The majority of the excavated area would be through agricultural land (Photo 3.0). Due to relatively low velocities of flow throughout this channel reach, the stream bank slopes would not require stabilization with geotechnical structural material.

The proposed plan would have potential environmental impacts, both adverse and beneficial. Construction would have temporary adverse impacts to the biological resources along portions of the excavated area by removing and disturbing vegetation and habitat and by displacing local fauna. It may require modifying the low water crossing near Station 478+95, which could alter existing aquatic habitat in the channel just upstream. Construction would also temporarily impact water quality but should, in the long term, improve water quality by controlling storm water runoff. The acquisition of private land for this alternative would also have socioeconomic impacts. Land that is available for agriculture or that could possibly be used for future development would be removed from production and/or development.

It would reduce flood levels within the improvement area. It is expected that flood levels both upstream and downstream of the improvement area will remain unchanged.

This plan was selected because it would provide increased flood protection along Cowskin Creek between Kellogg Drive and Maple Street. It would have a favorable benefit/cost ratio of 1.96, which meets the requirement of a Federal interest. The hydraulic performance of the system would be improved with construction of this alternative. The City has several bridge removal and/or replacement projects in various stages of planning and design within the Cowskin Creek drainage basin and expects to complete the projects regardless of any Federal plan. These are: 1) Removal of the railroad bridge over Cowskin Creek south of Kellogg; 2) Replacement of the Kellogg bridge and eastbound and westbound frontage roads over Cowskin Creek; 3) Replacement of 119th Street West bridge over Calfskin Creek; 4) Replacement of the Maple Street bridge over the North Fork of Calfskin Creek; and 5) Replacement of three bridges on 13th Street North over Dry Creek. The proposed plan, together with the bridge replacements, is expected to reduce annual flood-related damages by over 244 million dollars with a 75% probability that this figure would be exceeded by another 180 million dollars. It also would provide more favorable hydrological conditions for the bridge projects being completed by the City of Wichita. The local sponsor supports this plan.

The modified channel would be grass-lined with three horizontal on one vertical side slopes. The bottom elevation of the new channel would vary from about elevation 1308 feet NGVD at the upper end of the project to about elevation 1302 feet NGVD at the lower end. It would follow the existing creek channel but the width of the excavated channel would vary from a minimum of 300 feet to about 400 feet near the confluence of Calfskin Creek. The width of the area required for the side slope would vary dependent upon the elevation of the existing ground along the channel alignment. The U.S. Fish and Wildlife Service and the Kansas Department of Wildlife and Parks