

Fort Worth Central City Preliminary Design



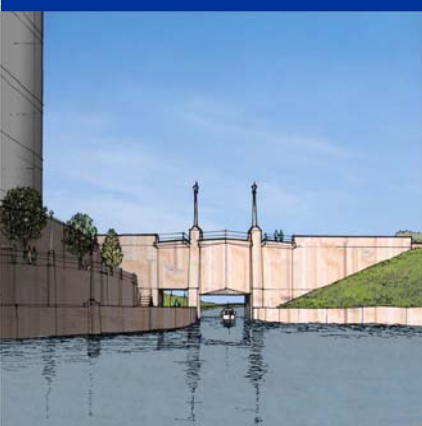
Hydrology and Hydraulics



Draft Environmental Impact Statement

Appendix A

May 2005



Images courtesy of CDM, Gideon Toal, and Bing Thom Architects



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- Attachment A Storage Calculations for Riverbend*
- Attachment B Interior Drainage Analysis*
- Attachment C Sediment Scour and Stream Stability Analysis*

Digital Data Submitted on CD

- Hydrologic Models
- Hydraulic Models
- Inroads Model of the Riverbend Mitigation Site

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Section 1

Introduction

1.1 Project Description

The Fort Worth Central City (FWCC) Project consists of a bypass channel, levee system and associated improvements to divert flood flows around a segment of the existing Trinity River adjacent to downtown Fort Worth. The proposed bypass channel is approximately 8,400 feet long and approximately 300 feet wide between the top of levees. The bypass channel would be approximately 30 feet below existing grade. Design level of protection of the project is SPF plus four feet. The essential components of the project are shown in Figures 1-1 through 1-3.

Water levels in the bypass channel would be controlled by a dam with crest gates. The dam is proposed on the West Fork of the Trinity River just east of the Samuels Avenue bridge and would be designed to maintain normal water level of approximately 525 feet above sea level in the bypass channel and interior area. Flood isolation gates would be incorporated into the levee system to protect the interior area, otherwise known as Trinity Uptown. The gates are located upstream at the confluence of the bypass channel and the Clear Fork (Clear Fork Gate), at the midpoint of the bypass channel and the West Fork confluence (Trinity Point Gate), and downstream at the confluence of the bypass channel and the West Fork (TRWD Gate).

Construction of the bypass channel, dam and isolation gates would create an approximately two-mile segment of the existing West Fork Trinity River as a controlled, quiescent watercourse. A water feature or urban lake, approximately 2900 feet long, is proposed for the interior area (Trinity Uptown). The water feature would extend from the bypass channel southeast to the existing West Fork and Clear Fork confluence of the Trinity River.

Six bridges are proposed for the project, including four vehicular bridges and two pedestrian bridges. Vehicular bridges are proposed over the bypass channel at North Main Street, over the bypass channel and Fort Worth and Western Railroad (FW&W Railroad) at Henderson Street and White Settlement Road, and on the White Settlement Road extension over the urban lake. Two pedestrian bridges are also proposed, across the bypass channel downstream of Henderson Street, and across the West Fork, approximately 500 feet upstream of the existing FW&W Railroad Bridge.

The project also includes proposed modifications to University Drive, which would effectively raise the roadway approximately 10 feet from existing grade and out of the 100 year floodplain. The proposed modifications begin north of the existing bridge over the West Fork extending to Jacksboro Highway (State Highway 199).

Without mitigation, the project would result in a loss of floodplain or valley storage due to the fact that the bypass channel is shorter and contains less volume than the existing river channel. To mitigate for this potential loss of storage, valley storage mitigation sites are included in the preliminary design. A wide range of valley storage mitigation alternatives were considered. Valley storage mitigation sites would be provided in three areas, along the West Fork of the Trinity River upstream of the project area, in the vicinity of the Samuels Avenue Dam, and slightly downstream of the dam in proximity to Riverside Park. Construction of the bypass channel and associated valley storage sites would not increase downstream water surface elevations or downstream flows.

1.2 Purpose and Scope

This appendix to the Draft Environmental Impact Statement summarizes the existing hydrologic, hydraulic, and associated regulatory conditions within the project area (Section 1). This document also outlines the development of the hydrologic and hydraulic models and associated hydrologic and hydraulic analyses for the FWCC Project (Sections 2 and 3). Operational and maintenance consideration are detailed in Section 4. Summary and conclusions are presented in Section 5 and references in Section 6.

These analyses were completed by CDM on behalf of the Tarrant Regional Water District (TRWD) in collaboration with the U.S. Army Corps of Engineers (USACE), and the City of Fort Worth. The objective of the analyses is to demonstrate a viable configuration of the Project that maintains flood protection with regard to the relevant design criteria (discussed in Section 1.3), while being consistent with other project objectives, including environmental enhancement, recreation, and urban revitalization. The hydraulic analyses include modeling a bypass channel to divert flood flows from the West Fork and Clear Fork of the Trinity River near downtown Fort Worth, and include four structures to control water flow (one dam and three isolation gates).

1.3 Regulatory Considerations

In the mid-1980's, USACE prepared a regional programmatic Environmental Impact Statement (EIS) to establish a floodplain development permitting strategy for the Upper Trinity River and its tributaries. USACE issued a Record of Decision in April 1988 specifying criteria the USACE would use to evaluate Section 404 permit applications in the Upper Trinity River Corridor. As a result, the cities and counties in the Upper Trinity River Corridor formed the Trinity River Steering Committee, facilitated by the North Central Texas Council of Governments. The Steering Committee developed and is responsible for implementing the Corridor Development Certificate (CDC) process to meet the 1988 Record of Decision.

The CDC program and accompanying CDC Manual affirm local government authority for local floodplain management while establishing a set of common permit criteria and procedures for development within the Upper Trinity River Corridor. The Trinity River Steering Committee, consisting of local elected official from jurisdictions

in the Upper Trinity River Corridor, approved the first edition of the CDC manual May 23, 1991. Within the next two years, the participating communities (Arlington, Carrollton, Coppell, Dallas, Farmers Branch, Fort Worth, Grand Prairie, Irving, Lewisville) officially amended their floodplain ordinances to adopt the CDC common permitting criteria and process. In the CDC process, the CDC model (a HEC-RAS model developed and maintained by USACE) is considered the baseline design model for proposed development projects in the Upper Trinity River Corridor.

1.4 Existing Conditions

The Upper Trinity River has been considerably urbanized over the past century as a part of the Dallas /Fort Worth (DFW) metropolitan area, otherwise known as the Metroplex. In 2000, the population of the ten county Metroplex was just over five million and covered a land area of over 7,200 square miles (NCTCOG 2003). The 2030 projected population for the region indicates an increase of an additional four million people.

The waterways of the Upper Trinity River basin are currently and will continue to be heavily influenced by urban hydrology. Waterways are further influenced by discharges from surrounding man-made reservoirs. The combined effects of urban development and flood control activities within the basin have permanently altered the natural-state hydroperiod and hydraulic regime.

The Central City study area shown on Figure 1-1, encompasses the confluence of the Clear Fork and West Fork of the Trinity River within the developed metropolitan area of Fort Worth. Several flood control projects dating back to the 1920's were constructed within the study area and the area is currently an active Federal floodway operated and maintained by the Tarrant Regional Water District. Water supply and flood control reservoirs exist upstream on both the Clear Fork (Benbrook Lake) and the West Fork (Lake Worth and Eagle Mountain Lake).

The study area is part of the Upper Trinity River system, which is covered by two major floodplain management policies, the 1988 Record-of-Decision associated with the USACE's Upper Trinity River Feasibility Study and the resulting CDC Program. The CDC hydrologic and hydraulic models, as the foundation to the CDC Program, are used for analysis of proposed floodplain development projects within the Upper Trinity River Corridor.

The baseline condition hydraulic model used for this study is the current CDC model which was developed and is maintained by the USACE. The CDC model was originally developed using the backwater program HEC-2 Water Surface Profiles. The model was subsequently converted to HEC-RAS River Analysis System version 3.0, but has most recently been used in version 3.1.2. The West Fork Trinity River CDC model limits are the confluence of the West Fork and the Elm Fork in Dallas County on the downstream side and the confluence to Lake Worth Dam on the upstream side, a distance of 58.08 miles.

The original CDC West Fork hydraulic models were developed by extensive use of digitized 2-foot contour interval topography. The topographic data was developed from February/March 1991 aerial photography. The majority of the cross-section data were supplied by the surveying contractor and generated from the topographic data, with cross sections locations developed by the USACE. Additional cross sections were developed from the topographic files and included in the models as necessary. Other information used in the development of the CDC models originated from bridge plans, bridge surveys, field reconnaissance, and levee surveys. Channel data originated from 1975 field surveys. Aerial photographs and field reconnaissance were used to determine roughness coefficients.

The Federal Emergency Management Agency (FEMA) maintains maps of local floodplains as a part of its administration of the National Flood Insurance Program. For the Central City Project area, Figure 1-4 illustrates the existing 100-yr and 500-yr floodplains as defined by FEMA.

1.5 Relevant Design Criteria

Several hydrologic and hydraulic criteria are applicable to proposed projects within the Upper Trinity River floodplain and include criteria associated with USACE regulations and the regional CDC Program.

In consultation with the USACE, it was determined that if the hydrologic and hydraulic analysis of the Central City Project met the standard criteria set forth by the regional CDC guidelines, then all regulatory criteria would be met. The specifics of the CDC criteria are:

- No increase in 100-year and SPF water surface elevations outside the project limits;
- No increase in 100-year flood or effective increases in SPF water surface elevations within the project limits unless appropriate flood protection is provided;
- No decrease in valley storage for 100-year flows; and
- No more than five percent decrease in valley storage for SPF flows.

In addition to the CDC criteria, the design will be subject to the following hydraulic performance requirements:

- No increase in the SPF water surface elevation as this is the Record of Decision Criteria for the Upper Trinity planning area and base USACE criteria for construction within a Federal flood control project;
- Discharges will not be increased downstream of the project limits;
- Increases in the base flood elevation (BFE) will be mitigated with appropriate flood protection measures;

- Velocities will not be increased above erosive levels outside the project limits;
- Manageable flow velocities will be maintained throughout the range of return periods such that infrastructure, earthen structures, habitats, and the like will not be damaged; and
- Levee freeboard above the SPF water surface elevation will be provided consistent with the existing level of protection. USACE preference is for “SPF plus four feet,” which will be provided for all new levees.

