Pueblo County DFIRM Conversion Project  
Pueblo County, Colorado

Client:  
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Phase 1 of this on-going project is being conducted under the Cooperating Technical Partners (CTP) agreement between the State of Colorado, Colorado Water Conservation Board and the Federal Emergency Management Agency (FEMA) as part of the nationwide Map Modernization program. The purpose of the project is to convert the effective Flood Insurance Rate Maps (FIRMs) for Pueblo County, the City of Pueblo, the Town of Rye and the Town of Boone to a digital format for the general use of all FEMA stakeholders. This project includes the following tasks:

(a) preparing a Scope of Work, and preliminary and final DFIRM (Digital FIRM) panel layouts;
(b) preparing a FEMA standard digital base map based primarily on existing Geographic Information System data provided by Pueblo County and the City of Pueblo, with additional data obtained from alternate sources and digitization of all stream centerlines from recent aerial photography;
(c) conducting **hydraulic analyses** and preparing floodplain/floodway mapping for 23 miles of Fountain Creek, 7 miles of the Arkansas River, and 3 miles of Turkey Creek;
(d) incorporating 42 miles of detailed and limited detailed floodplain/floodway mapping for numerous streams provided by the City of Pueblo;
(e) **hydrologic analysis, hydraulic modeling** and **automated floodplain mapping** for high quality approximate flood hazard zones along 53 miles along three creeks and the Arkansas River;
(f) **hydrologic analysis, hydraulic modeling** and **automated floodplain mapping** for moderate quality approximate flood hazard zones along 580 miles of numerous streams throughout the county;
(g) reviewing 50 miles of detailed floodplains for accuracy and completeness of information, including floodplain redelineation using recently developed, detailed topography and existing flood hazard data on an as-needed basis;
(h) performing a vertical datum shift where necessary on all Base Flood Elevations (BFEs) and flood profiles from the NGVD 1929 vertical datum to the NAVD 1988 vertical datum;
(i) assisting the City of Pueblo and the Arkansas River Conservancy District in the levee **accreditation (PAL)** process;
(j) combining all existing and revised digital data into a **FEMA DFIRM format database** and preparing sample DFIRM panels for review by the FEMA NSP and the affected communities;
(k) applying all pertinent DFIRM standard graphics to the final DFIRMs;
(l) preparing the **Flood Insurance Study (FIS)** for the countywide study including floodway data tables and flood profiles;
(m) coordinating with the CWCB, FEMA’s NSP, and the community during the post-preliminary processing and outreach and coordination phases of the project;
preparing final negatives of the DFIRM panels for delivery to the U.S. Government Printing Office; and
preparation of reports, information and documentation required for the Technical Support Data Notebook (TSDN).

All work completed for this project is being conducted in accordance with the requirements identified in the Map Modernization Guidelines and Specifications for Flood Hazard Mapping Partners [FEMA, April 2003].

Phase 1 Project Status: Entering Provisionally Accredited Levee (PAL) Process

Phase 2 of this project was completed for the Pueblo County DFIRM Conversion Project under a contract with the CWCB. The purpose of this study was to define hydrology and the 100-year floodplain for Turkey Creek over a 3.1-mile reach between Highway 50 and the Pueblo Reservoir, west of Pueblo. This project includes the following tasks:

(a) **field reconnaissance** efforts to identify potential surveying requirements, characterize channel and overbank conditions and roughness coefficients, and to visually evaluate bridges and other hydraulic structures;
(b) **surveying** of all hydraulic structures along the study reach;
(c) development of a HEC-HMS **hydrologic model** for a 124 square mile basin;
(d) development of a HEC-RAS **hydraulic model** through the use of HEC-GeoRAS in conjunction with a DEM-based TIN;
(e) **mapping** of the 1-percent annual chance of occurrence floodplain, and the preparation of the digital floodplain work maps using HEC-GeoRAS and ACE’s *automated floodplain mapping* methods;
(f) development of the graphical flood profiles, tables, and text for incorporation into the Pueblo County Flood Insurance Study (FIS);
(g) preparation of all flood hazard data in **DFIRM** format;
(h) the preparation of all survey, hydrologic, and hydraulic information in a Data Capture Standard (DCS) format for submission to FEMA’s Mapping Information Platform (MIP); and
(i) the preparation of reports, information and all required **documentation** for all hydrologic and hydraulic analyses.
All work completed for this project was conducted in accordance with the requirements identified in the Map Modernization Guidelines and Specifications for Flood Hazard Mapping Partners [FEMA, April 2003].

**Phase 2 Status: Completed on March 10, 2006 and Uploaded to the MIP**

**Phase 3 Status: Completed on November 15, 2007 and Uploaded to the MIP**

This project was completed as Phase 4 of the Pueblo County DFIRM Conversion Project. The purpose of this study was to define Zone A approximate 1-percent annual chance floodplains for 6.6 miles of the

### Project Highlights:
- Field reconnaissance and surveying
- Topographic data
- Hydrologic and hydraulic modeling
- Floodplain mapping
- DFIRM and FIS production
- MIP data entry
- Documentation

*Fountain Creek at Abandoned Railroad Bridge*
North St. Charles River, 1.0 miles of Middle Creek, 2.2 miles of North Creek, 13.9 miles of Greenhorn Creek, and 3.4 miles of the Golf Course Drainage located in Pueblo County. This project included the following tasks:

(a) **field reconnaissance efforts** to characterize channel and overbank conditions and roughness coefficients, and to visually evaluate bridges and other hydraulic structures;

(b) **hydrologic evaluation** using HEC-GeoRAS and a 10-meter DEM to define the approximate 1-percent annual change discharge profile for each study reach;

(c) development of a terrain Digital Elevation Model (DEM) using 2-foot and 4-foot contour **topographic data** provided by the Pueblo County GIS Department;

(d) development of a **hydraulic model** through the use of HEC-GeoRAS in conjunction with a DEM-based TIN;

(e) **mapping** of the Zone A approximate 1-percent annual chance of occurrence floodplain;

(f) preparation of flood hazard data in **DFIRM** format for inclusion in the Pueblo County DFIRM;

(g) the preparation of all survey, terrain, hydrologic, and hydraulic information in a Data Capture Standard (DCS) format for submission to FEMA’s Multi-Hazard Information Portal (MIP); and

(h) the preparation of reports, information and documentation required for the Technical Support Data Notebook (TSDN) for all hydrologic and hydraulic analyses.

All work completed for this project was conducted in accordance with the requirements identified in the Map Modernization Guidelines and Specifications for Flood Hazard Mapping Partners [FEMA, April 2003].

**Phase 4 Status:** Completed on December 15, 2006 and Uploaded to the MIP
Phase 5 of this project is currently being completed in conjunction with the Pueblo County DFIRM Conversion Project under a contract with the Colorado Water Conservation Board. This specific phase of the project will define the 100-year without-levee residual floodplain for a 3-mile long levee and a ¼-mile long floodwall on **Fountain Creek**, a ¾-mile levee on **Wild Horse Creek**, and a 4-mile long concrete-and rock-lined levee on the **Arkansas River**. The floodplains for the 3 levees and the floodwall will be mapped in mostly urbanized areas; by utilizing both 1- and 2-dimensional hydraulic analyses.

These hydraulic studies included the following tasks:

(a) **field reconnaissance efforts** to confirm street flow and channel conditions and roughness coefficients to be used in the models, and to visually evaluate bridges, levees, and other hydraulic structures;
(b) **surveying** of bridge structures to be incorporated into both the 1-D and 2-D hydraulic models;
(c) development of a [1-dimensional HEC-RAS hydraulic model](#) through the use of HEC-GeoRAS in conjunction with a DEM-based TIN;
(d) development of a [2-dimensional FLO-2D hydraulic model](#) through the use of a DTM derived from 2-foot contour data;
(e) **mapping** of the 1-percent annual chance of occurrence floodplains, and the preparation of the digital floodplain work maps using HEC-GeoRAS, FLO-2D, and ACE’s [automated floodplain mapping](#) methods;
(f) development of the graphical flood profiles, tables, and text for incorporation into the Pueblo County Flood Insurance Study (FIS);
(g) preparation of flood hazard data in DFIRM format for inclusion in the Pueblo County DFIRM;
(h) the preparation of all survey, terrain, hydrologic, and hydraulic information in a Data Capture Standard (DCS) format for submission to FEMA’s Mapping Information Platform (MIP); and
(i) the preparation of reports, information and [documentation](#).

All work completed for this project was conducted in accordance with the requirements identified in the Map Modernization Guidelines and Specifications for Flood Hazard Mapping Partners [FEMA, April 2003].

Phase 5 Status: Fountain Creek levee floodplain completed December 2008, Fountain Creek Floodwall, Wild Horse levee, and Arkansas levee analyses 50% complete