



Interior Drainage Hydrologic and Hydraulic Analysis for El Paso, TX

International Dam to Riverside Weir

Background

- IBWC has performed rehabilitation work on the Rio Grande levee to provide adequate freeboard for 100-year flows
 - FEMA levee certification requires a drainage analysis for the interior side of the City of El Paso
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Limits of Interior Drainage Study



Interior Drainage Analysis Overview

1. Data Collection
2. Hydrologic Analysis
3. Hydraulic Analysis
4. Flood Depths
5. Impact Results



Data Collection

- **Rio Grande Rehabilitation As-built Plans**
- **Storm Sewer As-built Construction Plans**
 - TxDOT
 - El Paso Water
 - City of El Paso
 - IBWC
 - US General Services Administration
- **Regulatory H&H Models**
- **Geospatial Data**
- **Previous Drainage Studies**



City of
El Paso

Ciudad
Juarez

Central Region

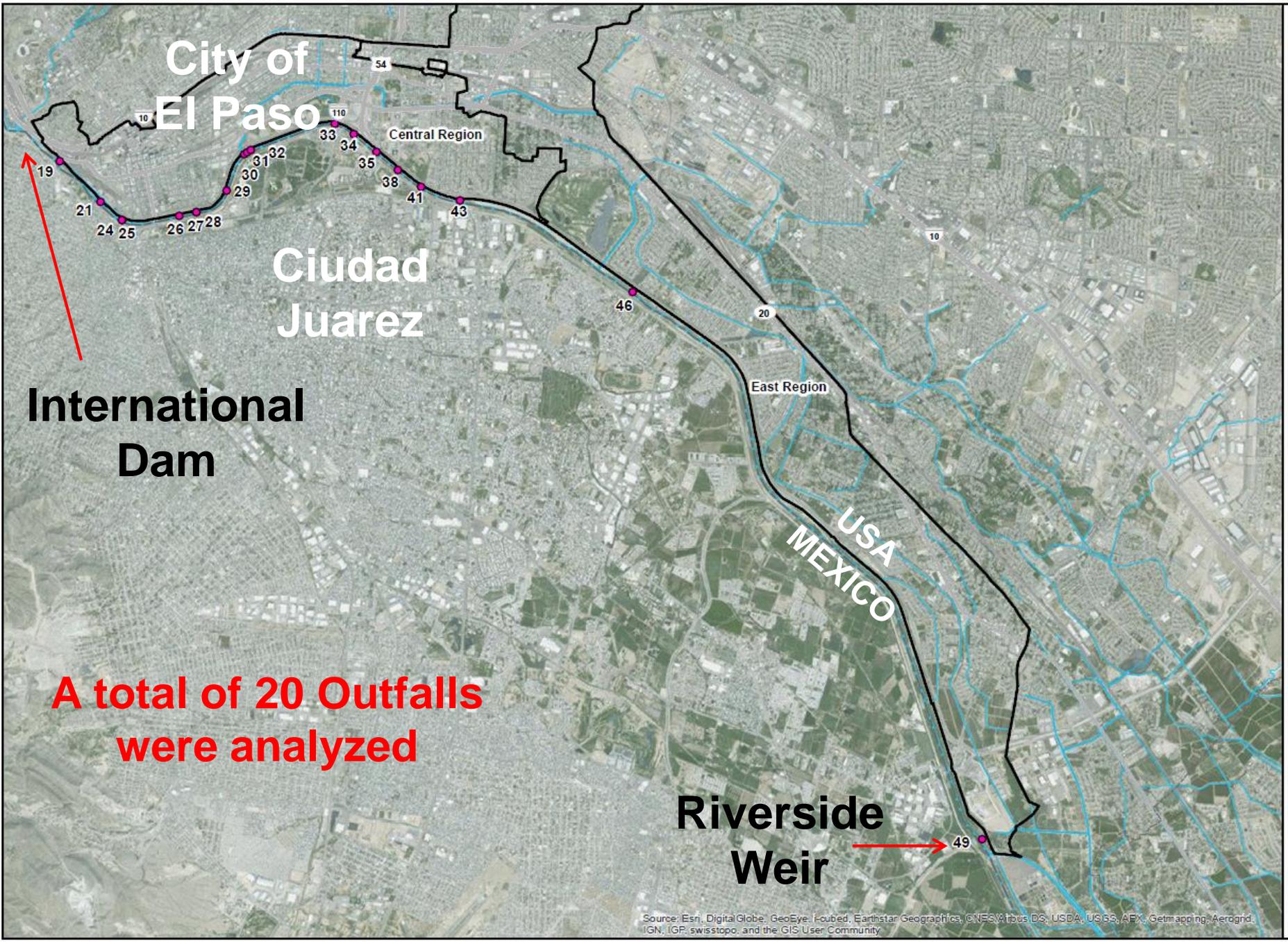
East Region

USA
MEXICO

Riverside
Weir

International
Dam

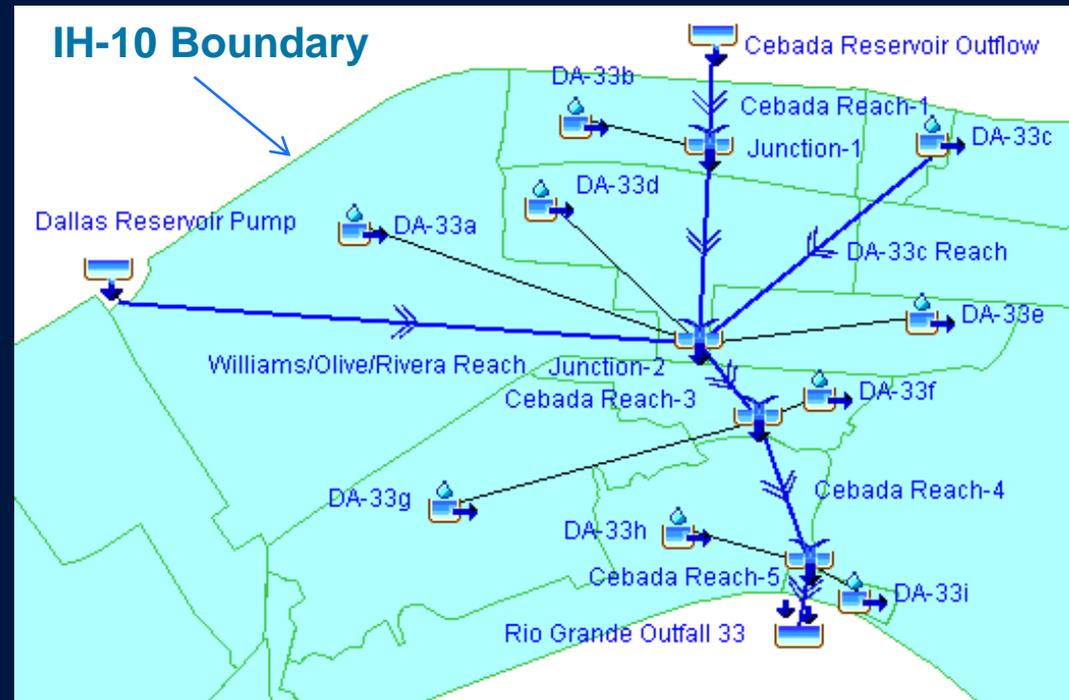
A total of 20 Outfalls
were analyzed



Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

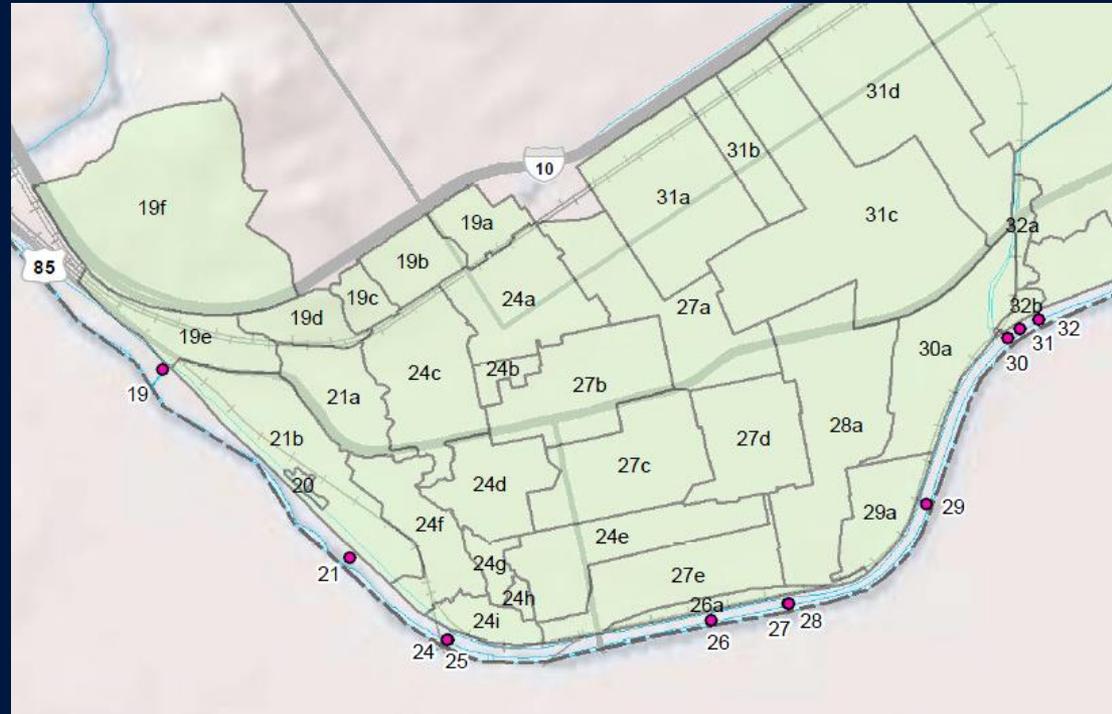
Hydrologic Analysis

- Rainfall Runoff & Routing
 - 100-year, 24-hour storm discharges
 - Drainage Area Delineation
 - Runoff Curve Number
 - Time of Concentration
 - Precipitation



Drainage Areas Delineation

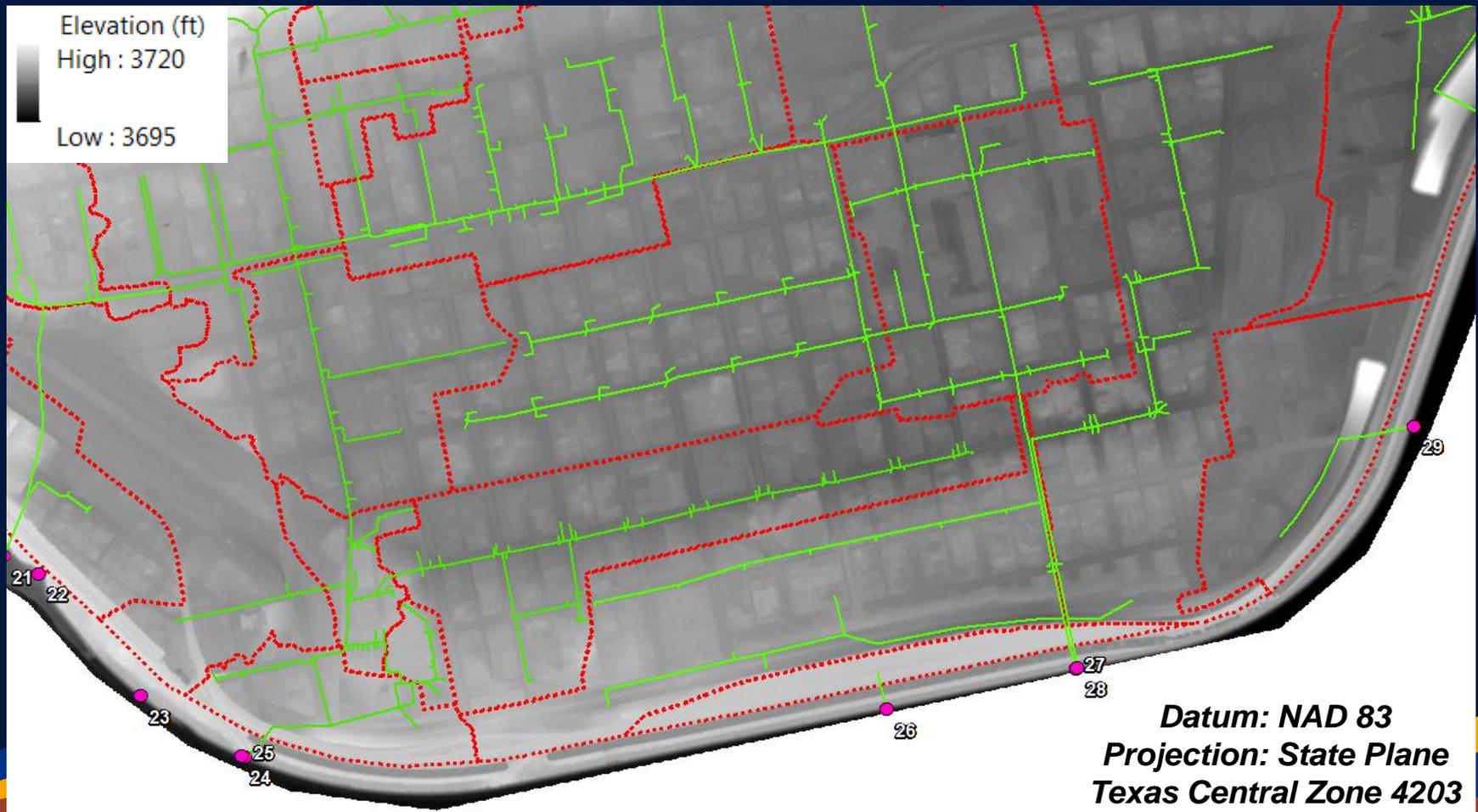
- 2008 Stormwater Masterplan
- Topography
- City Blocks
- Storm Sewer Systems
- Rio Grande Outfalls



Topography

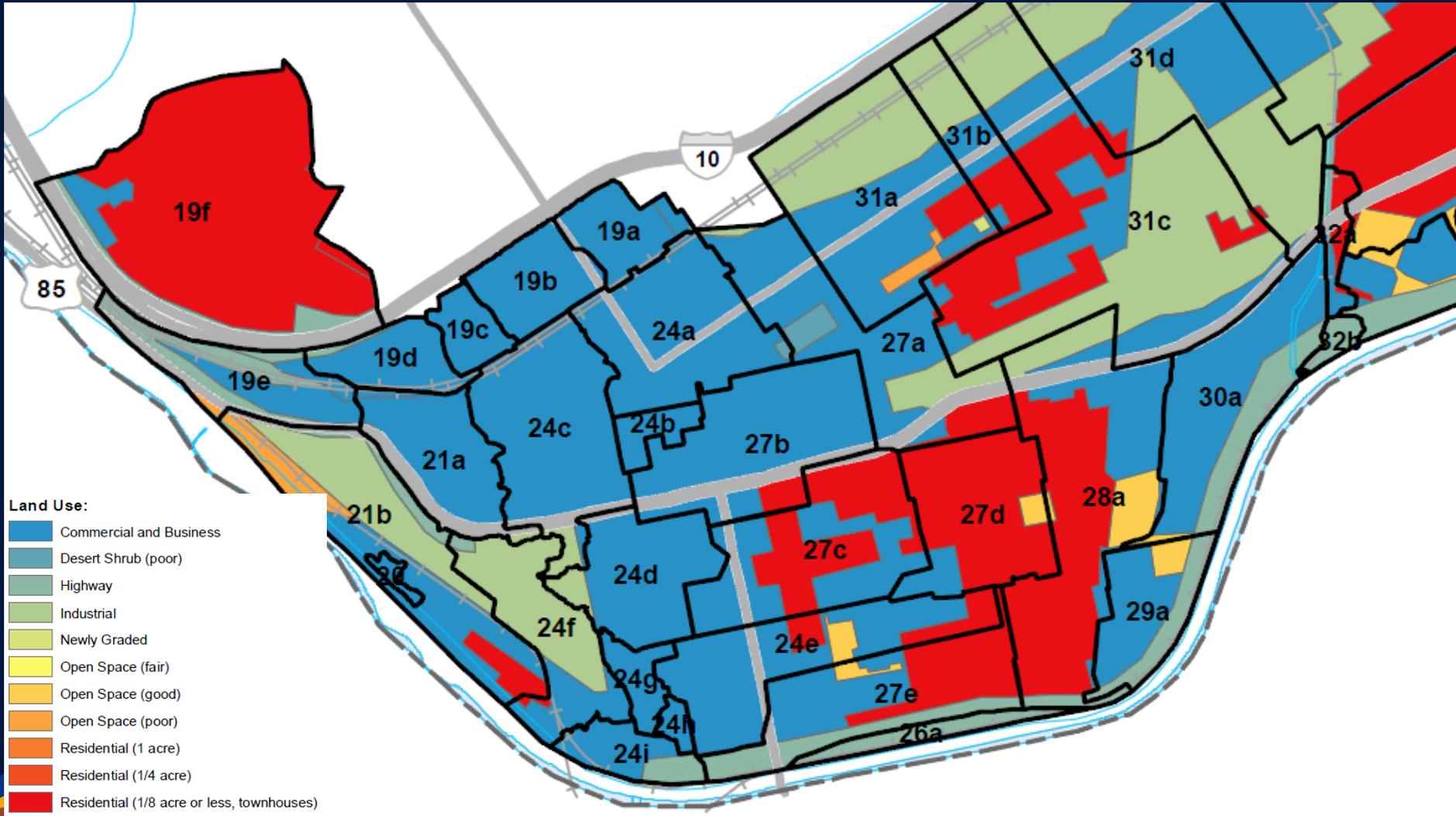
City of El Paso 2009 LiDAR

LiDAR – Remote sensing technology that measures distance by illuminating a target with a laser and analyzing the reflected light



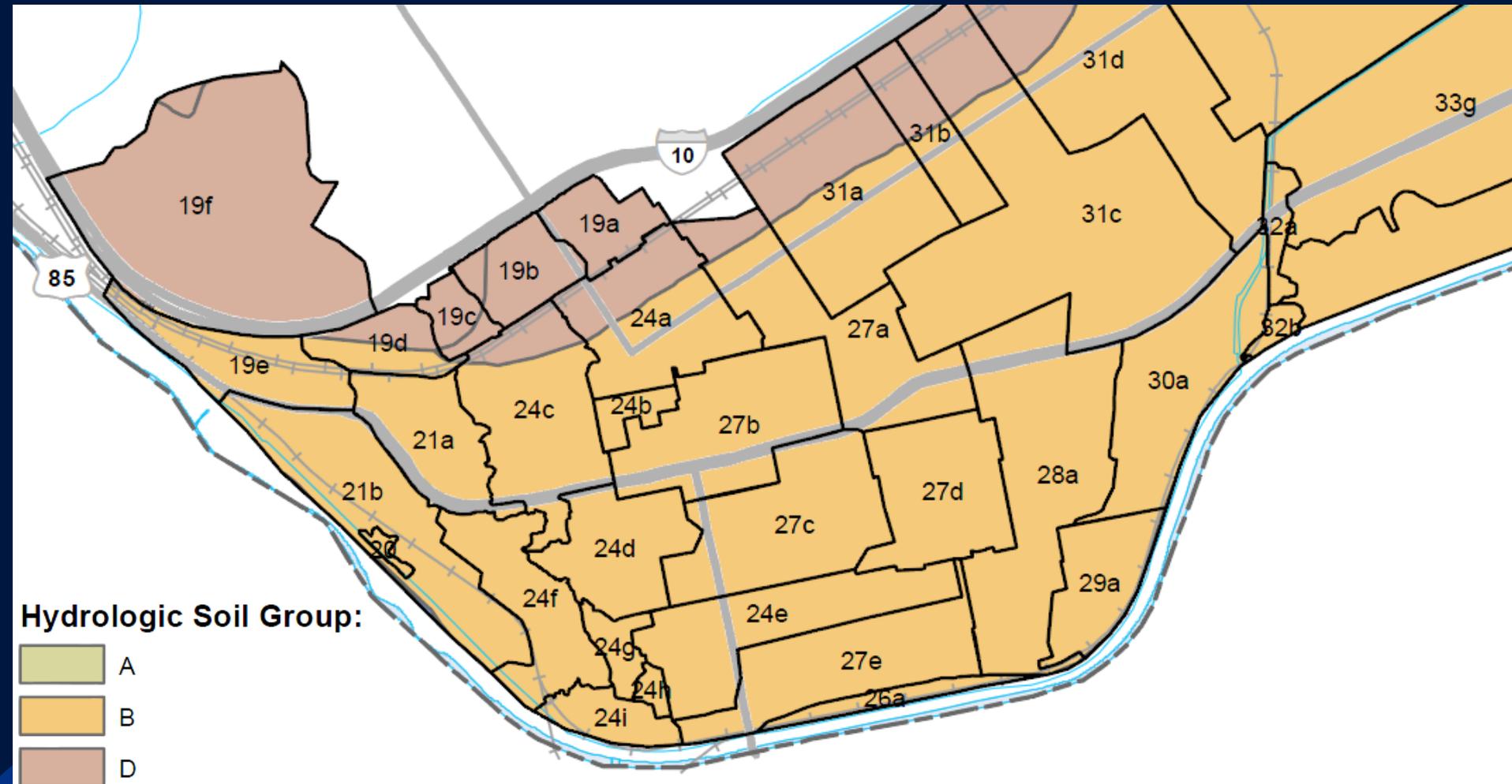
Landuse

Landuse – Type of development or use of property as defined by the City of El Paso



Soil Data

Hydrologic Soil Group – Rating A (high infiltration rate) - D (low infiltration rate)
as defined by USDA/NRCS

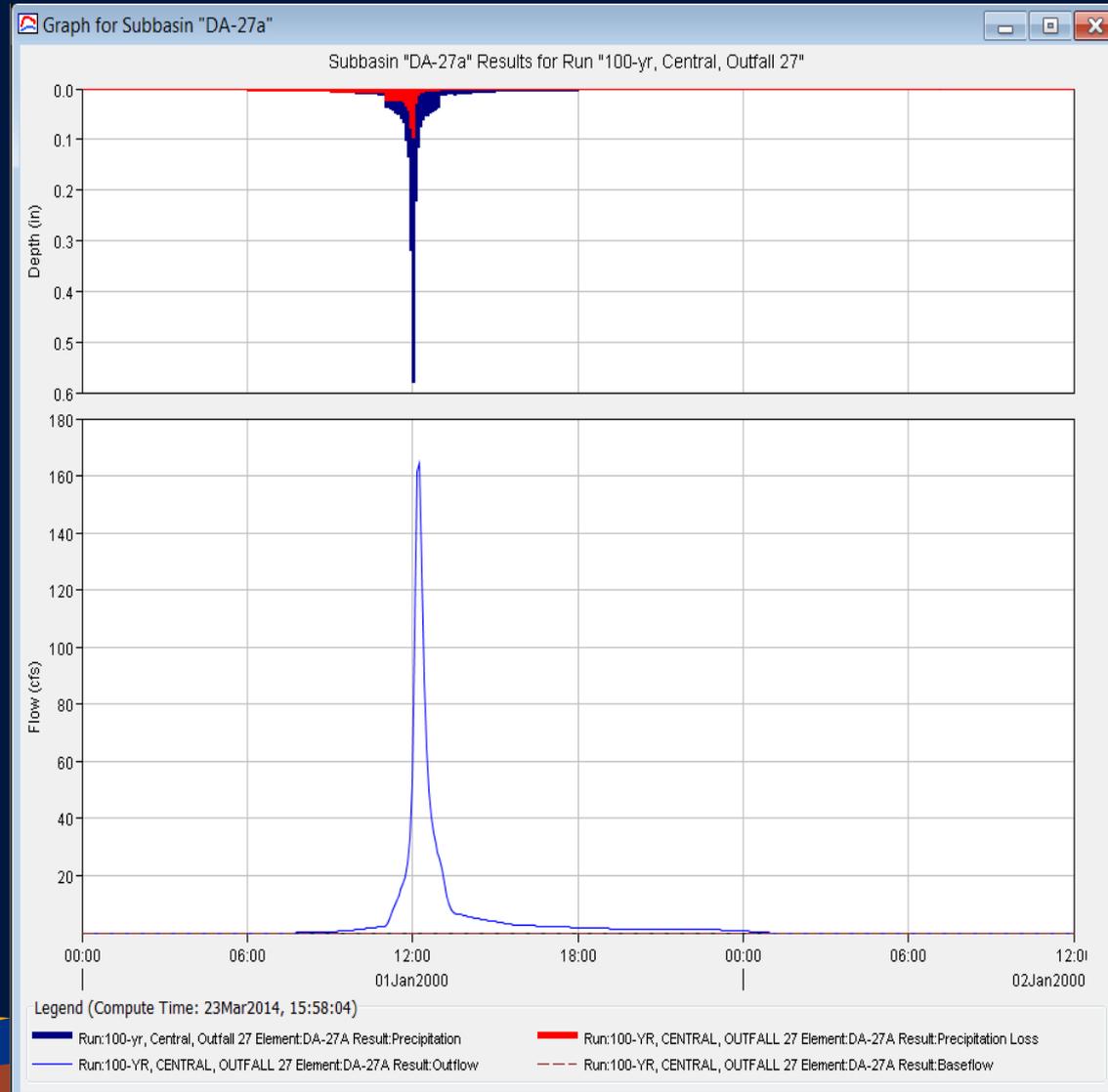


Hydrology Results

HEC-HMS Result Hydrographs

- Peak Discharge (cfs)
- Runoff Volume (in or ac-ft)
- Time of Peak Discharge

Results were computed for each drainage area.



Hydraulic Analysis

Sub-Surface Flow:
Storm Sewer Systems

Overland Flow:
Topography
Curb & Gutter Street Flow



Storm Sewer Analysis

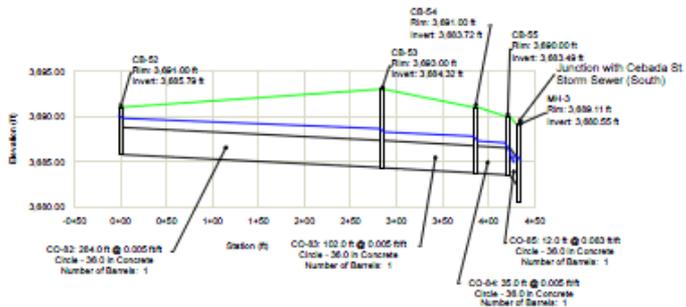
Sub-Surface Storm Sewer Systems

- Discharge directly into Rio Grande
- Larger than 36" RCP
- Only functional during Rio Grande base flow conditions
- Pump Stations
- Peak discharge applied

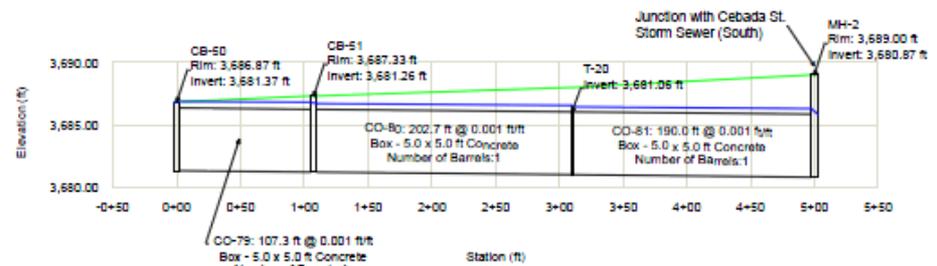


Storm Sewer Analysis Results

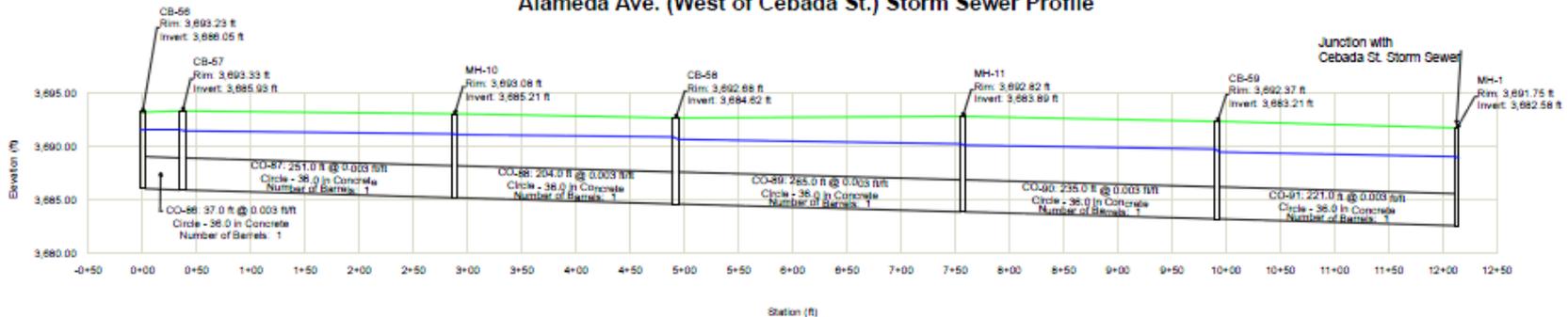
Paisano St. Storm Sewer Profile (East)



Paisano St. Storm Sewer Profile (West)



Alameda Ave. (West of Cebada St.) Storm Sewer Profile



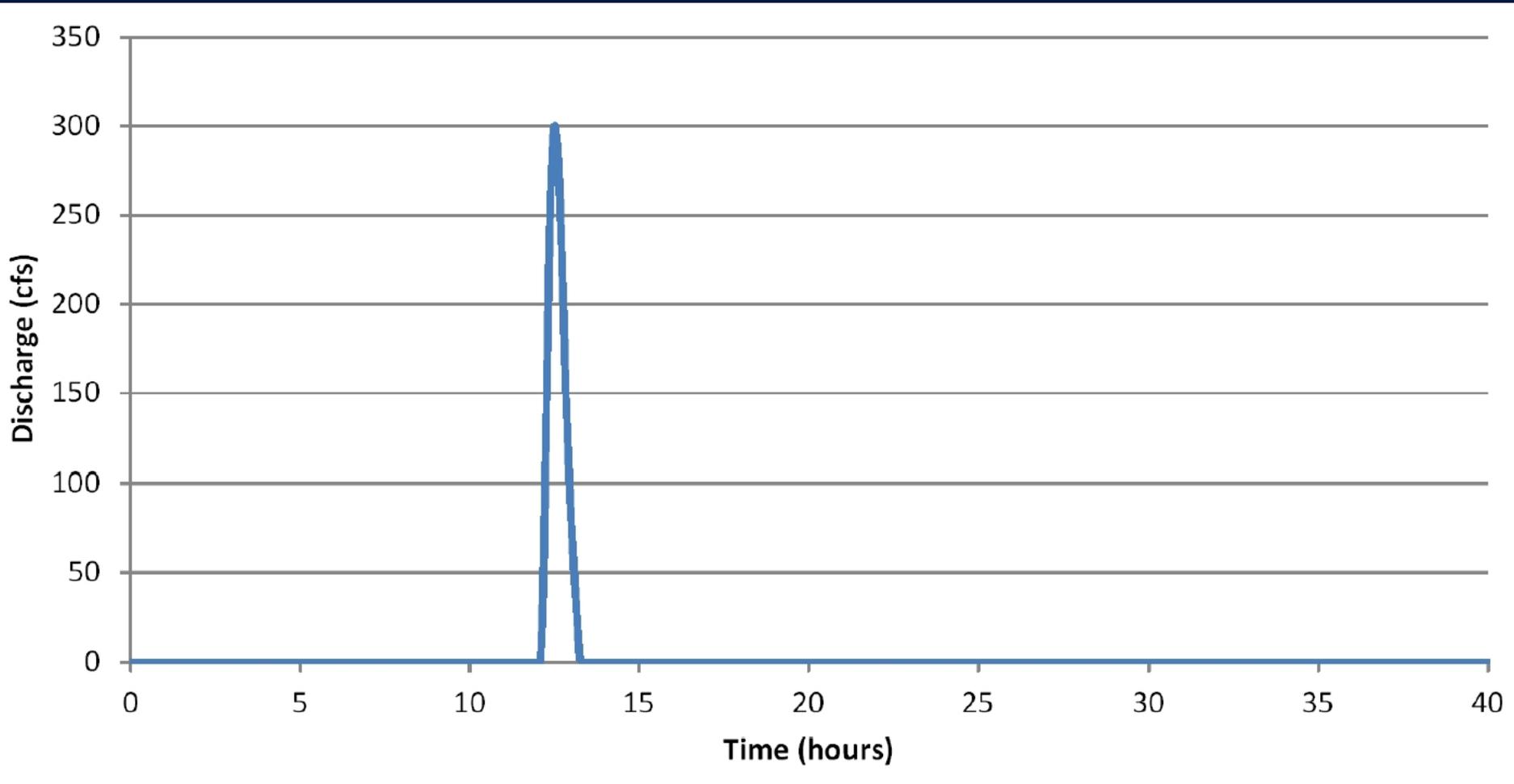
Overland Flow Analysis

Above Ground Drainage

- Street flow along curb and gutter
- Flow around structures
- Excess flow not captured in storm sewer
- Higher flood depths during Rio Grande high flow conditions



FLO-2D Inflow Hydrograph



FLO-2D Inflow Hydrograph



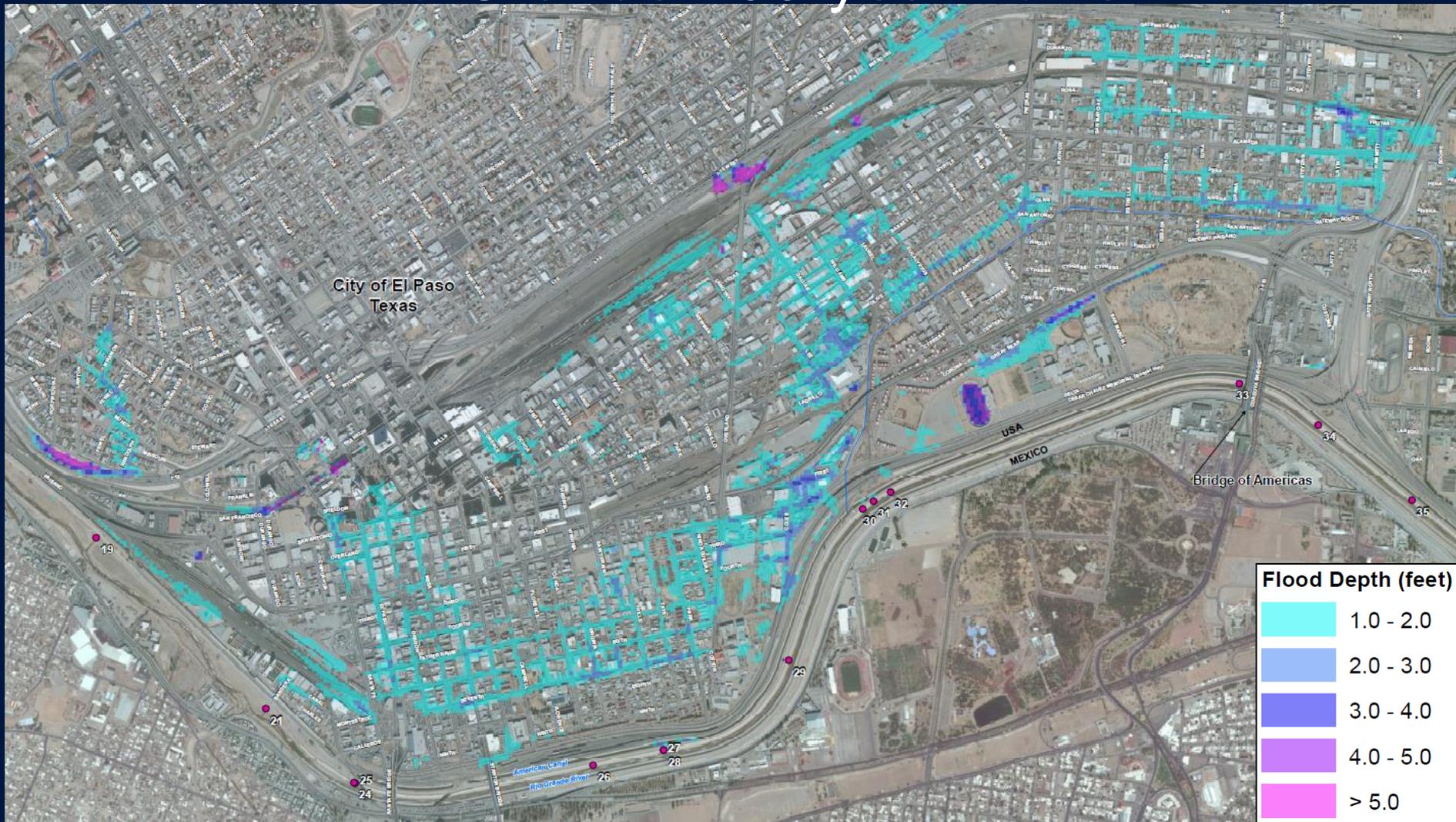
Flow Around Structures



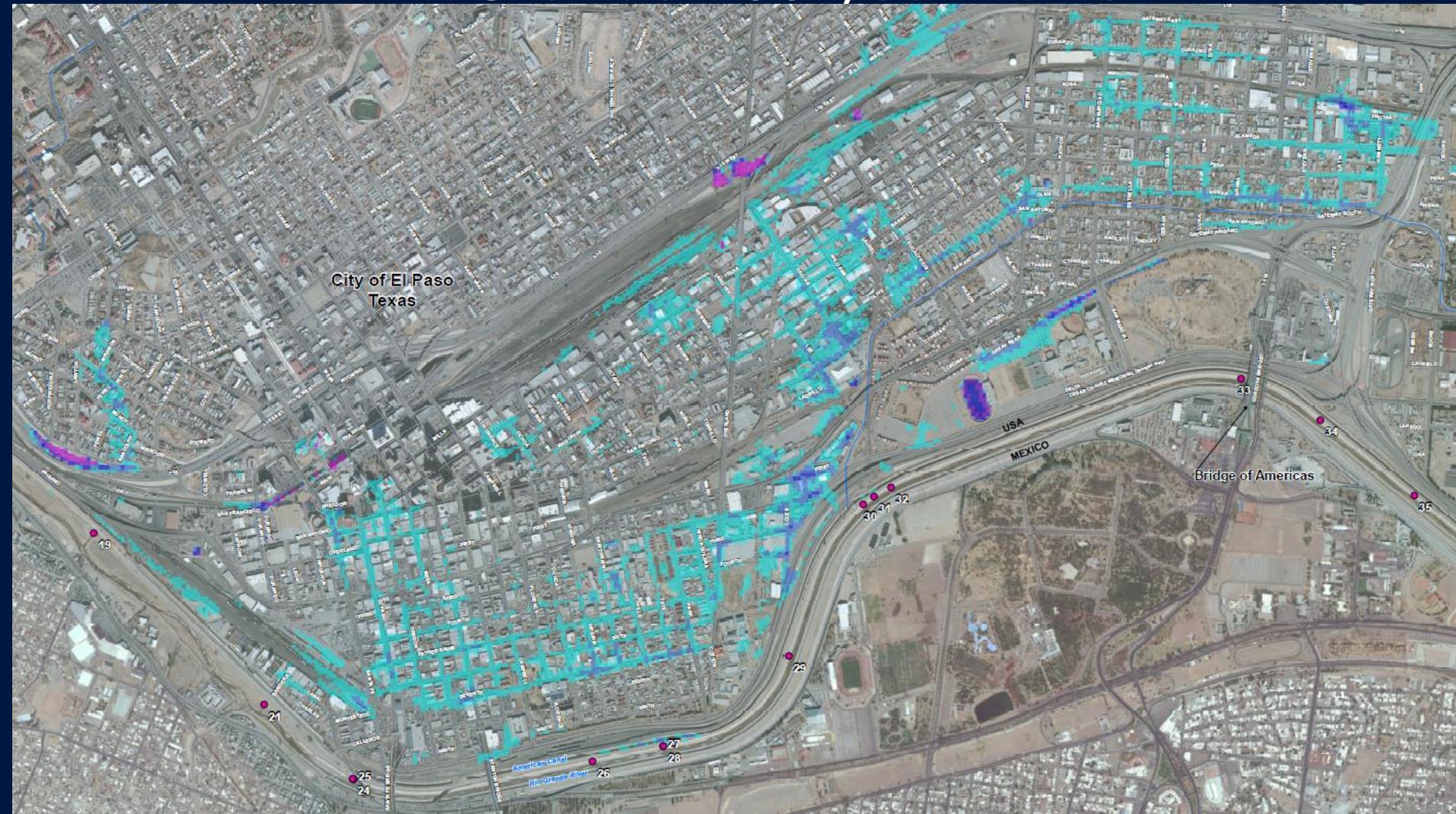
Legend

Blocked Obstructions (Building Footprint)

Flood Depths Without Levee Improvements Rio Grande 100-year flows



Flood Depths With Levee Improvements Rio Grande 100-year flows



Flood Depth Increase Rio Grande 100-year flows



IBWC requirements fulfilled



OFFICE OF THE COMMISSIONER
UNITED STATES SECTION

INTERNATIONAL BOUNDARY AND WATER COMMISSION
UNITED STATES AND MEXICO

August 16, 2016

Mr. Jeff Irvin, P.E.
Principal Engineer
URS Corporation
PO Box 201088
Austin, TX 78720-1088

RE: Interior Drainage Hydrologic and Hydraulic Analysis for El Paso, TX International Dam
to Riverside Weir Draft Report (March 2014)

Dear Mr. Irvin:

The U.S. Section of the International Boundary and Water Commission (USIBWC) is in receipt of your response letter dated June 17, 2016, to the USIBWC's review comments dated June 12, 2014 on the URS report entitled "Interior Drainage Hydrologic and Hydraulic Analysis for El Paso, TX International Dam to Riverside Weir Draft Report" (March 2014). We have also received the final report updated based on our comments sent to El Paso Water Utilities. We appreciate your effort to resolve the issues, specifically to the refinement of the FLO-2D modeling with volume conservation errors. We have no further comments on your models and report.

If you have any questions, please contact me at (915) 832-4742.

Sincerely,

A handwritten signature in blue ink, appearing to read "P. Unnikrishna".

Padinare Unnikrishna, Ph.D., P.E., CFM
Supervisory Civil Engineer
Engineering Service Division

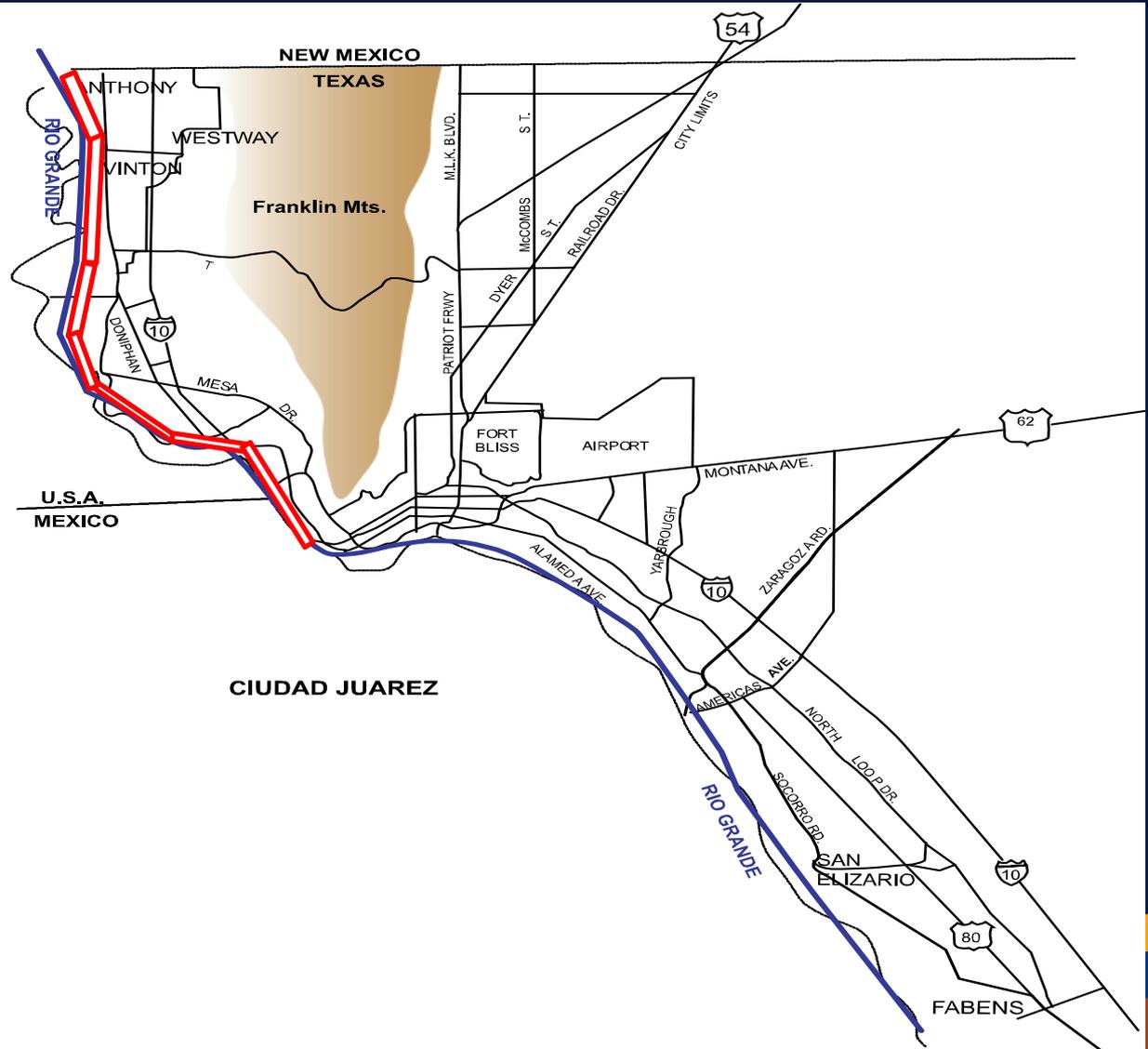
cc: Gonzalo Cedillos, P. E.
Stormwater Engineering Manager
El Paso Water Utilities
1154 Hawkins Blvd
El Paso, TX 79925



**United States Army Corps of
Engineers (USACE) El Paso County
Interior Drainage Study**

Cost Share Agreement

USACE El Paso County Interior Drainage Study



■ Project Site

USACE El Paso County Interior Drainage Study



USACE El Paso County Interior Drainage Study

- **Background**
- El Paso Water (EP Water) has plans to complete the planning required to identify areas adjacent to the Rio Grande within El Paso County that could be prone to flooding as a result of work carried out by the U.S. International Boundary and Water Commission's (USIBWC) levee certification process.
 - The USACE has agreed to provide up to \$184,000 to complete this planning
 - Matching funds in the same amount were approved by PSB
 - Cost share agreement to be signed by EP Water and USACE
 - Scope of Work to be approved by the USACE

USACE El Paso County Interior Drainage Study

Scope of Work

- The USACE El Paso County Interior Drainage Study (Study) will identify:
 - Source(s) of flooding
 - Extent of flooded area(s)
 - Depict water surface elevation(s) of the base flood when depth of flooding exceeds one foot
 - Facilities to mitigate any flooding identified in either the existing or proposed conditions
- The Study will address the capacities of stormwater facilities including drainage lines and pumps.
- The Study must be based on the joint probability of interior and exterior flood waters.

These efforts will assist in the certification of the USIBWC levees along the Rio Grande within El Paso County.



Questions?

