



Survey Development Technical Data Support
Task Order HSFE06-15-J-0002
Blanco-San Marcos Watershed
(Guadalupe River Basin), Texas

FEMA Grant HSFE60-15-D-0003

May 31, 2016



FEMA

Federal Emergency Management Agency
Department of Homeland Security
FEMA Region VI
800 N. Loop288
Denton, TX 76209

TECHNICAL SUPPORT DATA NOTEBOOK (TSDN)
for the
Guadalupe River Basin FY2015 Risk MAP Project
Blanco-San Marcos Watershed, Texas

FIELD SURVEY PROJECT NARRATIVE

SUBMITTED BY:



DATE SUBMITTED: May 31, 2016

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ACRONYMS AND ABBREVIATIONS

CORS	Continuously Operating Reference System
DCS	Data Capture Standards
DEM	Digital Elevation Model
DTM	Digital Terrain Model
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FIPS	Federal Information Processing Standards
FIRM	Flood Insurance Rate Map
FY15	Fiscal Year 2015
G&S	<i>Guidelines and Specifications for Flood Hazard Mapping Partners</i> , as amended
GBRA	Guadalupe-Blanco River Authority
HUC	Hydrologic Unit Code
LiDAR	Light Detection And Ranging
MIP	Mapping Information Platform
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
NGS	National Geodetic Survey
NFIP	National Flood Insurance Program
NGVD29	National Geodetic Vertical Datum of 1929
pGDB	Personal Geodatabase
PM	Procedure Memoranda
Risk MAP	Risk Mapping, Assessment, and Planning
RTK	Real Time Kinematic
TIN	Triangulated Irregular Network
TNRIS	Texas Natural Resources Information System
TR	Technical References
TSDN	Technical Support Data Notebook
USACE	United States Army Corp of Engineers
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator
VRS	Virtual Reference Station

1.0 TASK SUMMARY

1.1 INTRODUCTION/PROJECT OVERVIEW

The Guadalupe Basin is the fourth largest river basin whose watershed area is entirely within Texas. The basin's namesake river, Guadalupe River, flows from the confluence of its North and South Forks in Kerr County to the San Antonio Bay in South Texas, which drains to the Gulf of Mexico. Other streams within the basin include the Blanco, Comal, and San Marcos Rivers and Sandies and Coletto Creeks. See Figure 1A for a location map of the Guadalupe River Basin. The watersheds within the Guadalupe Basin involved in this project is the Blanco-San Marcos Watershed.

The Perform Field Survey task covers the methods used for performing and obtaining the field surveyed data to support the Blanco-San Marcos Watershed Risk Mapping, Assessment, and Planning (Risk MAP) Project for Fiscal Year 2015 (FY15). This Survey Data Development is compliant with the Federal Emergency Management Agency's (FEMA's) Guidelines and Specifications (G&S) for Flood Hazard Mapping, Data Capture Standards (DCS), the Risk MAP Program Guidelines and Standards Policy for Flood Risk Analysis and Mapping, Technical References (TR), along with any effective Procedure Memoranda (PMs) as of December 2015.

The project area includes a total of 212 miles of stream draining a total land area of 1,359 square miles with an estimated affected population of 164,800 people.

Figures 1B and 1C shows the overall watershed study area for the Blanco-San Marcos FY15 Risk MAP Project. The revised area is located in United States Geological Survey (USGS) 8-digit HUC; 12100203 named San Marcos.

Gaea Engineering Consultants performed the field surveys.

1.2 PROJECT WORK SCOPE

To supplement any field reconnaissance conducted during the Project Discovery phase of this project, Compass shall conduct a detailed field reconnaissance of the specific study area to determine conditions along the floodplains, types and numbers of hydraulic and/or flood-control structures, apparent maintenance or lack thereof of existing hydraulic structures, locations of cross sections to be surveyed, and other parameters needed for the hydrologic and hydraulic analyses. Compass shall conduct field surveys, including obtaining channel and floodplain cross sections, identifying or establishing temporary or permanent bench marks, and obtaining the physical dimensions of hydraulic and flood-control structures. Compass shall coordinate with other entities that are involved in the Topographic Data Development process regarding ongoing activities and deliverables.

Compass shall collect survey data where needed to upgrade the leveraged GBRA studies and to support new detailed study areas to meet the level of detail required for FEMA Zone AE detailed studies. Compass will review stream reaches to identify structure crossings where record plans can be used, and will develop an inventory of field survey needs. Surveys will be collected at prioritized structure crossings along the proposed detail study reaches and as needed for cross sections through the channel reaches.

To upgrade the leveraged USACE/GBRA studies and incorporate them into future FIRM updates for these populated areas, Compass proposes to augment with field survey to increase the level of detail in order to map these areas in the future as Zone AE on the FIRMs. Compass will conduct new surveys at structure crossings and to supplement LiDAR at channel cross sections throughout stream reaches, as needed. The new survey will be incorporated into the existing HEC-RAS models. Subsequently, Compass will update Modified Puls routing and calculate flows for the 1%+ annual chance event to refine hydrology models through these reaches. Results of the new survey investment will be included in detail study products for use in refined flood risk analysis.

Based on the Work Ordering Template provided, 300 survey units were included. Compass reviewed all proposed detailed stream reaches and completed a detailed structure count. Compass assumes that as terrain and best practices necessitate, a combination of both structures and field cross sections is acceptable if the total is equal to 300 survey units.

All survey data collected will follow current FEMA standard for structure and cross-section survey and all data will be loaded to the MIP. Compass will use Texas State Plane South Central coordinate system, NAD 83 datum.

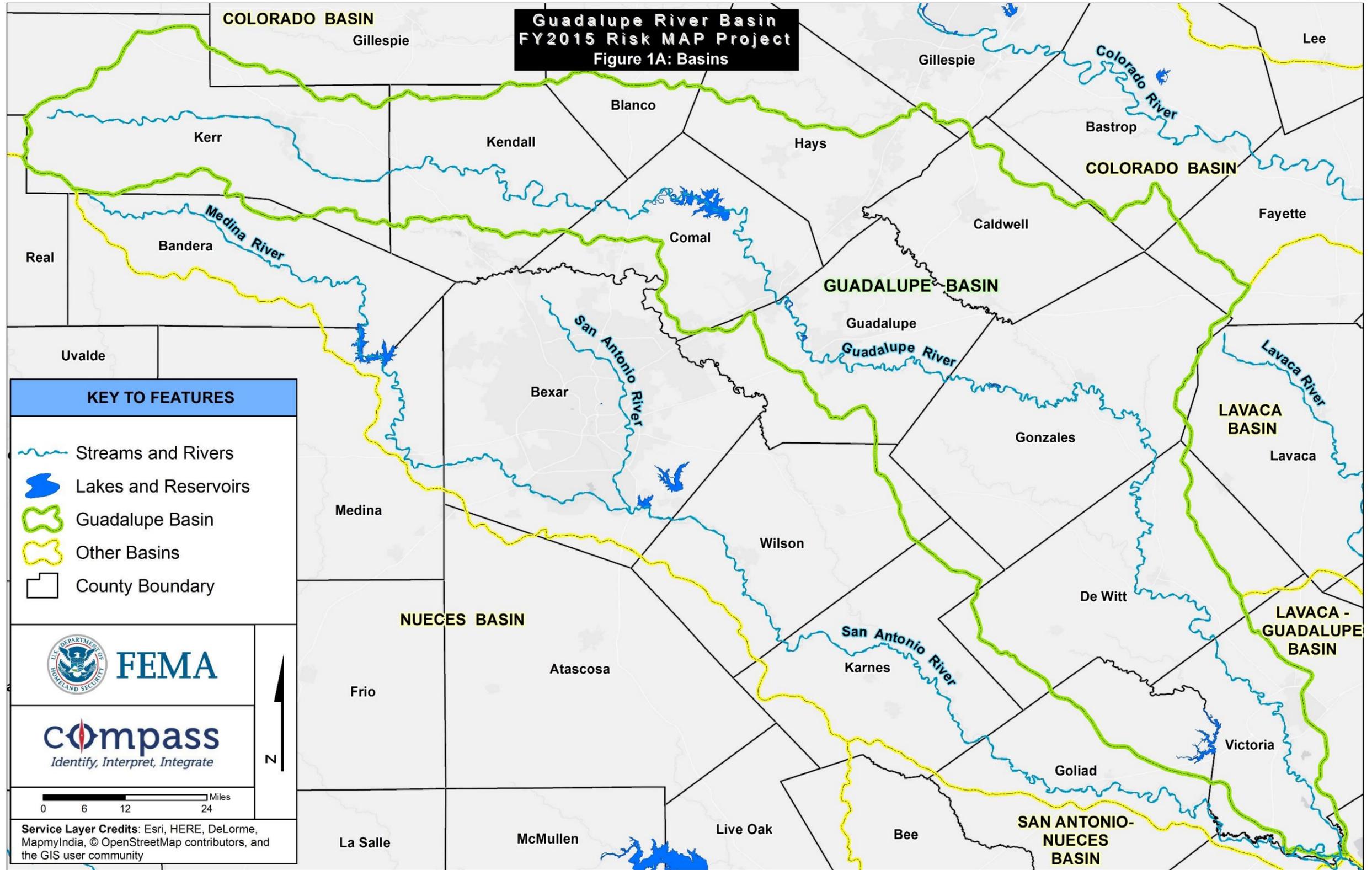


Figure 1A – Basins (Overview)

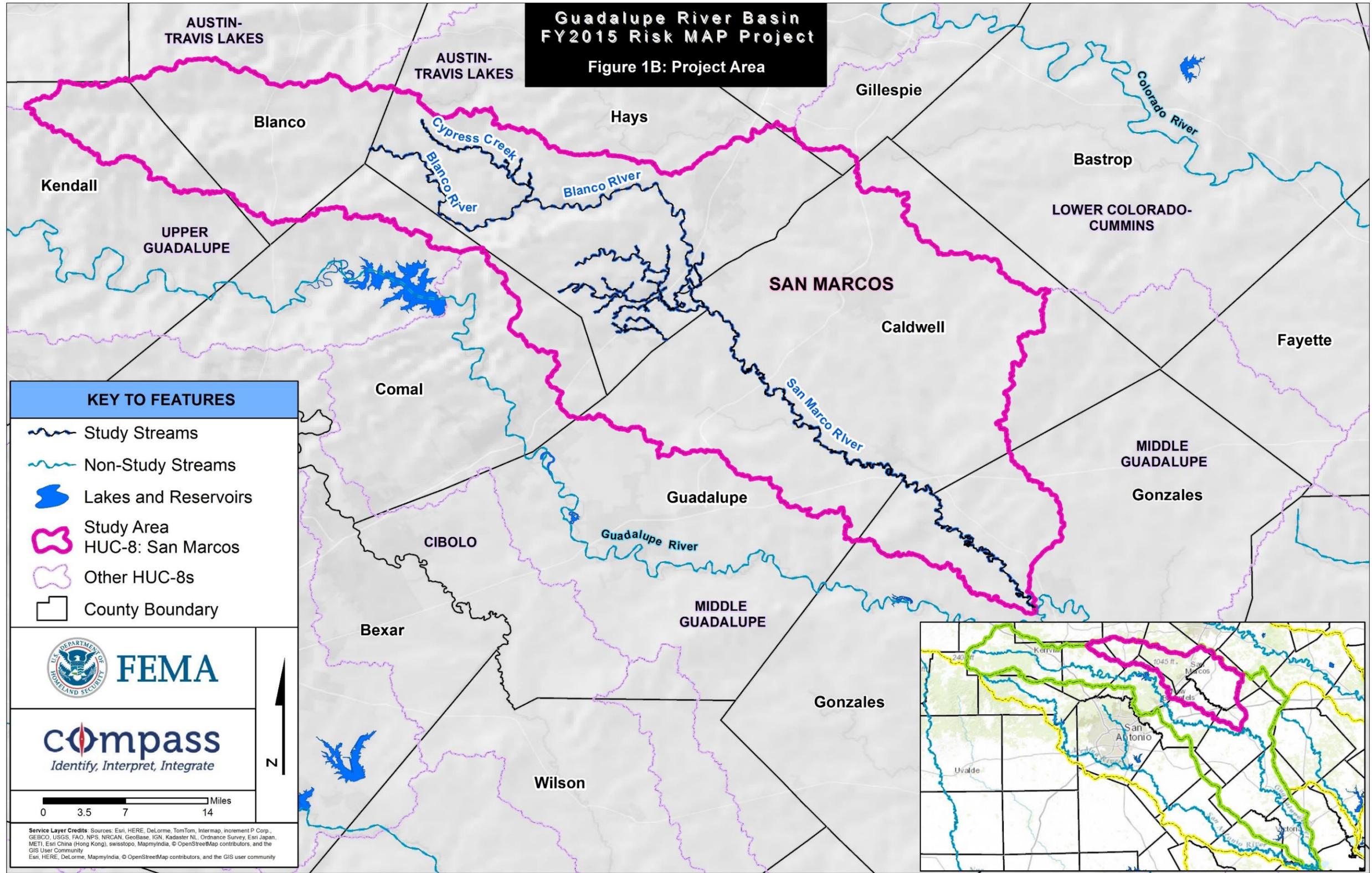


Figure 1B – Project Area (Overview)

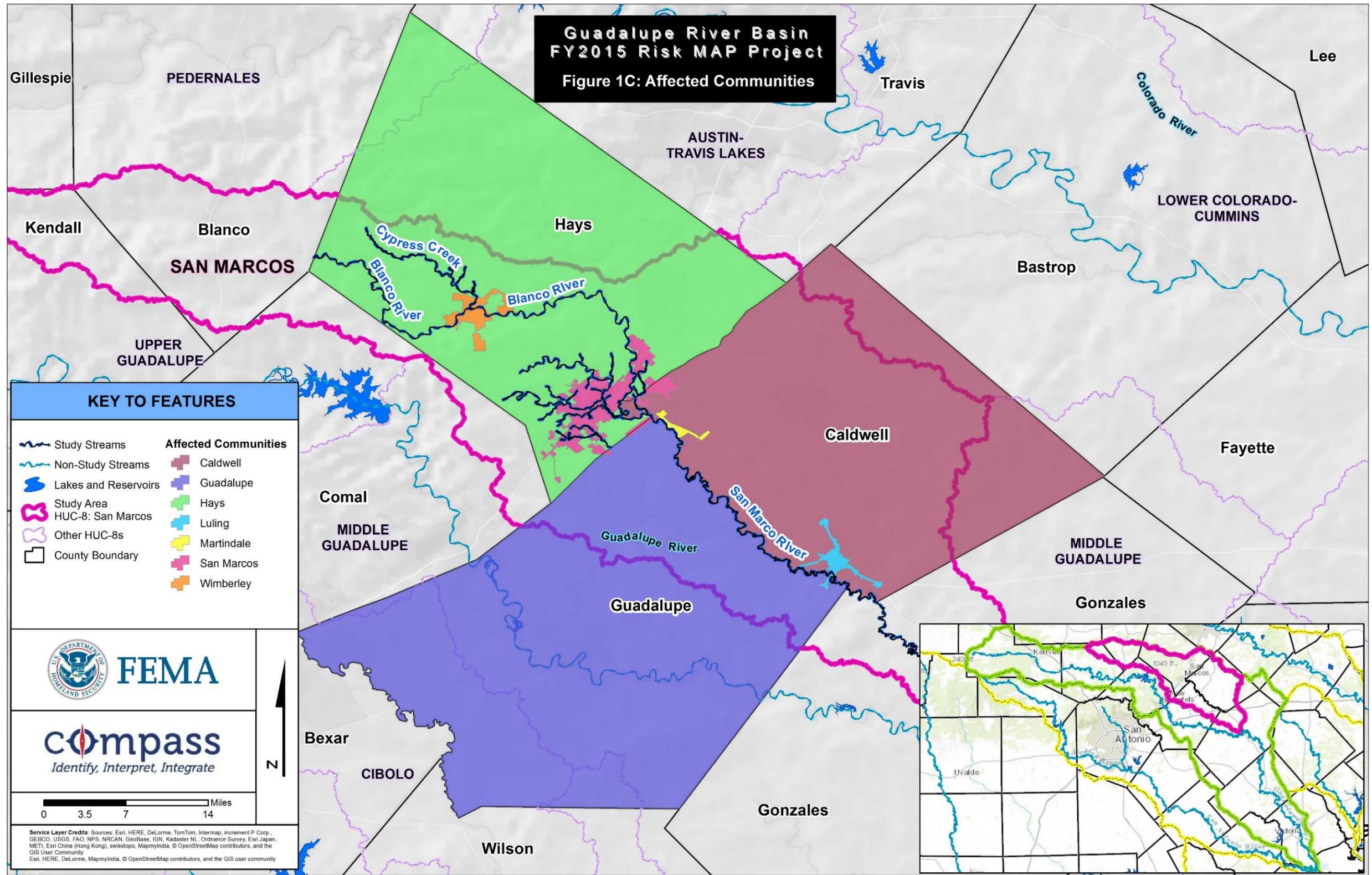


Figure 1C – Affected Communities

2.0 METHODOLOGY

2.1 ACQUISITION

The Perform Field Survey task consisted of both channel and structure surveys. All structure crossings along the studied streams were field surveyed in detail. Surveyed items for bridges include deck, low chord, and channel sections at the upstream and downstream faces. Surveyed items for culverts include the culvert soffit, invert, top of road, and channel sections at the upstream and downstream faces.

Several different methods were used to obtain survey data throughout this project. These methods included conventional surveying with an electronic total station, a GPS base station and GPS rover receiver connected via Radio link and a GPS rover receiver connected to a Trimble VRS network.

The data acquisition also included sketches and photographs. Five digital photos were taken for each structure. This included downstream channel, downstream face of structure, overtopping cross section looking left to right, upstream face of structure, and upstream channel. Two digital photos were taken at each channel section: downstream channel and upstream channel.

Survey sketches with measurements and notations were prepared for all structures and channel sections. The field survey data is documented in the FEMA DCS format and submitted to the FEMA data-centric MIP.

2.2 PROCESSING AND EVALUATION

Survey data files were processed in ESRI ArcGIS software version 10.2 into point files and checked against the field sketches and photographs. Elevations and horizontal measurements were checked for any anomalies. The processed surveys were used to obtain the cross section geometry for hydraulic modeling. All cross section overbank ground information was obtained from the DTM developed from LiDAR data available through the coordination with the GBRA and TNRIS for the Topographic Data Development. The survey data sketches provided information on the physical dimensions of hydraulic and flood control structures as well as other physical obstructions to conveyance. The survey data photos provided information used in determining channel roughness.

The horizontal datum for this project is Texas South Central State Plane Coordinate System, NAD83 Zone 4204. The vertical datum for this project is NAVD88. All measurements were made in U.S. Survey Feet.

2.3 CONTROL

The temporary controls established and used for the structure surveys meet 3 centimeters (0.1 feet) or better horizontal and vertical positional accuracy relative to the Primary Controls. Both the horizontal and vertical accuracy of the channel centerlines and alignment points at each structure meet conventional surveying accuracy standard.

All GPS horizontal control was established via Static, RTK, Fast Static, or VRS observations. Multiple primary control base stations and redundant observations are used to ensure the accuracy of the GPS control. Whenever feasible, local benchmarks are observed via the same GPS observation methods used to establish the survey control throughout the project.

Vertical control was established via direct observations using either the NGS CORS network or a combination of the CORS data and the highest level of local benchmark vertical control available. The referenced datum, unless otherwise specified, is the NAVD 88 vertical datum. All GPS control was established via Static, RTK, Fast Static, or VRS observations. Multiple primary control base stations and redundant observations were used to ensure the accuracy of the GPS control. Whenever feasible, local benchmarks were observed via the same GPS observation methods used to establish the survey control throughout the project. Table 1 shows the elevation of the Primary Controls used in this Perform Field Survey Task.

2.4 DEVIATION FROM STANDARDS

There were no deviations for the standard in the Perform Field survey task.

2.5 ISSUES

There were no issues related to the Perform Field survey task.

3.0 RESULTS

Results are included in the digital data uploaded on the MIP.

4.0 INFORMATION FOR THE NEXT MAPPING PARTNER

The survey data is available on FEMA's Mapping Information Platform (MIP) in the project's study-centric folder.

5.0 REFERENCES

1. FEMA Data Capture Standards Technical Reference (May 2014).
2. FEMA FIRM Database Technical Reference (May 2015).
3. FEMA Standards Policy for Flood Risk Analysis and Mapping (July 2015)

APPENDIX A
TSDN DOCUMENTS

- **Deliverables Checklist**

TSDN CATEGORY	DATA TYPE	DATA SUBMITTED
General Documentation	Special Problem Reports Index	
	Special Problem Reports	
	Contact Reports Index	
	Contact Reports	
	Meeting Minutes/Reports Index	
	Meeting Minutes/Reports	
	Correspondence with/from FEMA	
	Correspondence with/from Contractor	
	Other General Correspondence	
Engineering Analyses	Hydrologic Analyses Index	
	Summary Report of Hydrologic Analyses	
	Computer Models, Calculations, and Execution	
	Summary Report for Independent QA/QC	
	Hydraulic Analyses Index	
	Cross Section Information	
	Floodway Analyses	
	Key to Cross-Section Labeling	
	Computer Models, Calculations, and Execution	
	Cross-Section Plots	
	Computer Models, Calculations, and Execution	
	Summary Report for Independent QA/QC	
	Key to Transect Labeling	
	Transect and Surge Data	
	Wave Height Information	

TSDN CATEGORY	DATA TYPE	DATA SUBMITTED
Engineering Analyses (Cont'd)	Computer Models, Calculations, and Execution	
	Summary Report for Independent QA/QC	
	Shallow Flooding Models, Calculations, and	
	Summary Report for Independent QA/QC	
	Ice-Jam Flooding Models, Calculations, and	
	Summary Report for Independent QA/QC	
	Alluvial Fan Flooding Models, Calculations	
	Summary Report for Independent QA/QC	
Draft FIS Report	FIS Report Narrative (Complete)	
	FIS Report Narrative (Revisions Summary)	
	Summary of Discharges Table	
	Floodway Data Table	
	Summary of Elevations Table	
	Transect Locations Table	
	Surge Elevations Table	
	Flood Profiles	
	Certification of Compliance for Work	X
	Other Relevant Data	
Mapping Information	Mapping Information Index	X
	Topographic Mapping (Hardcopy Version)	
	Topographic Mapping (Digital Version)	
	Summary Report for Independent QA/QC	
	Work Maps (Hardcopy Version)	
	Work Maps (Digital Version)	

TSDN CATEGORY	DATA TYPE	DATA SUBMITTED
Mapping Information (Cont'd)	Work Map Delineation Summary	
	Preliminary DFIRM (Hardcopy Version)	
	CD-ROM with DFIRM Data	
	USGS Digital Orthophoto Quadrangle(s)	
	Soil and Vegetation Maps	
	USGS Topographic Quadrangle Maps	
	Flood Hazard Boundary Map	
	Community Maps	
	All Other Maps	
	DFIRM Database Data (Basic)	
	DFIRM Database Data (Enhanced)	
	Digital Data Submission Checklist	X
	Narrative	X
	Photogrammetric Survey Documentation	
	GPS Survey Documentation	
Miscellaneous Reference Materials	Field Survey Notes/Notebook	X
	SCS/NRCS Flood Hazard Analyses Report(s)	
	USGS Floodplain Information Report(s)	
	USACE Feasibility Study Reports	
	Watershed Studies	
	Site Visit Photographs	
	Community Population and Demographic	
	Tax Base Reports	
	Legal References	
	(Other Relevant Materials)	

Certificate of Compliance Form	
Project Name:	Guadalupe River Basin FY2015 Risk MAP Project - Blanco-San Marcos Watershed
Statement of Work No.:	HSFE60-15-D-0003/HSFE06-15-J-0002
Interagency Agreement No.:	N/A
CTP Agreement No.:	N/A
Statement/Agreement Date:	October 23, 2015
Certification Date:	May 31, 2016
Tasks/Activities Covered by This Certification (Check All That Apply)	
<input type="checkbox"/>	Base Map
<input type="checkbox"/>	Topographic Data Development
<input checked="" type="checkbox"/>	Survey
<input type="checkbox"/>	Hydrologic Analysis
<input type="checkbox"/>	Hydraulic Analysis
<input type="checkbox"/>	Alluvial Fan Analysis
<input type="checkbox"/>	Coastal Analysis
<input type="checkbox"/>	Floodplain Mapping
<input type="checkbox"/>	Flood Risk Assessment
<input type="checkbox"/>	FEDD File
<p>This is to certify that the work summarized above was completed in accordance with the statement/agreement cited above and all amendments thereto, together with all such modifications, either written or oral, as the Regional Project Officer and/or Assistance Officer or their representative have directed, as such modifications affect the statement/agreement, and that all such work has been accomplished in accordance with the provisions contained in <i>Guidelines and Specifications for Flood Hazard Mapping Partners</i> cited in the contract document, and in accordance with sound and accepted engineering practices within the contract provisions for respective phases of the work. This is also to certify that data files submitted for the work summarized above are complete and final. Any revisions made to the already submitted data are included in the final submittal. The content of the files submitted is sufficient for subsequent users with appropriate professional expertise to be able to understand the scientific and technical basis of the analysis and reproduce the findings.</p>	
Name:	Daniel Harris, P.E., CFM
Title:	Project Manager
Firm/Agency Represented:	Half Associates Inc.
Registration No.:	104646
Signature:	
<p>This form must be signed by a representative of the firm or agency contracted to perform the work, who must be a registered or certified professional in the area of work performed, in compliance with Federal and State regulations.</p>	

MAPPING INFORMATION INDEX

Community Name:	Guadalupe River Basin FY2015 Risk MAP Project – Blanco-San Marcos Watershed						
Community ID No.	Caldwell County (48055), Guadalupe County (48187), Hays County (48209), City of Luling (480096), City of San Marcos (485505), Town of Martindale (481587), Village of Wimberley (481694)						
Compiled By:	Halff Associates, Inc.						
Date TSDN Submitted:	May 31, 2016						
Type/Purpose of Map	Date	Paper Copy		Electronic Media			
		No. of Sheets	Exhibit No.	File Type	File Name	Projection	Exhibit No.
Survey Points	May 2016			ArcShape	Guad_FY15_Survey_Points	State Plane 4204, NAD83 Feet	MIP
Sketches	May 2016			PDF	<survey ID>_SKETCH		MIP
Photos	May 2016			JPG	<survey ID>_<DXN>		MIP
Survey Files	May 2016			ASCII	<survey ID>	State Plane 4204, NAD83 Feet	MIP
Submittal Info	May 2016			pGDB feature	S_Submittal_Info	State Plane 4204, NAD83 Feet	MIP
Source Citation	May 2016			pGDB Table	L_Source_Cit	State Plane 4204, NAD83 Feet	MIP
Field Survey Points	May 2016			pGDB Table	L_Survey_Pt	State Plane 4204, NAD83 Feet	MIP
Metadata	May 2016			Xml	48187C_Survey_Metadata		MIP

L.5 Federal Emergency Management Agency Digital Mapping Information Checklist

Federal Emergency Management Agency Digital Mapping Information Checklist

The following checklist is intended to solicit basic information about the format of digital mapping data submitted to the Federal Emergency Management Agency (FEMA) for preparation of a Digital Flood Insurance Rate Map (DFIRM). Please note that metadata compliant with the Federal Geographic Data Committee's *Content Standard for Digital Geospatial Metadata* should be submitted also. This metadata must include the following information and further details about the data submitted.

Point of Contact:

Name and/or Title Daniel Harris
Community/Agency Half Associates
Department 4030 West Braker Lane, #450
Address Austin, TX 78759

Telephone 512-777-4600
Fax 512-252-8141
Email dharris@half.com

Data Type:

Pertinent information includes the following:

Format:

- ESRI Coverage
- ESRI Shapefile
- ESRI Geodatabase
- MapInfo
- Intergraph
- AutoCAD
- Digital Line Graph
- Other ESRI Personal Geodatabase, XLS, PDF
- Digital Photo
 - Black & white
 - Color
 - TIF
 - JPEG
 - SID
 - PNG
 - Raw
- Scanned
 - Georeferenced? _____
 - Dots per inch _____
 - Black & white
 - Grey scale
 - Color

Source Information:

How and when were the data compiled? By whom? At what scale? Pertinent information includes the following:

- Photogrammetrically compiled
- Digitized from a hardcopy source
 - Parcel maps/Plat maps
 - USGS quadrangles
 - Orthophotos
 - Aerial photos
 - Other community map _____
 - Generated using coordinate geometry (COGO)
 - Scanned

Date of photography or source material Field Surveys

Scale of data creation 1:12000

Agency or firm that produced the data: Halff Associates, Inc.

Date of creation (if incomplete, provide estimated completion date May 2016)

Projection, Datums, Accuracy:

What coordinate system and projection were used? What horizontal and vertical datums were used? What is the stated accuracy of the data?

Coordinate system/projection:

- State Plane
- UTM
- Geographic (latitude and longitude)
- Other Lambert Conformal Conic Projection - Texas State Plane 4204

Units:

- Feet
- Meters
- Decimal degrees
- Degrees, minutes, seconds
- Other _____

Horizontal datum:

- NAD27, Clarke 1866 spheroid
- NAD83, GRS80 spheroid

Vertical datum:

- NGVD29
- NAVD88
- Other _____

Accuracy: All GPS surveys conducted herein meet a vertical positional accuracy standard of 2 cm to 5 cm, with a 95% confidence level, relative to the established primary control.

Data Contents:

What features are contained in the data set(s)? Are feature names included? If so, are they available as attributes and/or graphic text (annotation)? Please provide file structure details in the form of metadata, a data dictionary, or a layer list in addition to this form

- Roads
 - Centerlines
 - Edge of pavement
- Road names
 - Scale(s) at which they were intended to be used _____
- Railroads
 - Railroad names
- Airports
 - Airport names
- Streams, lakes, other water bodies
 - Feature names
- Range & township/section lines and numbers
- Political boundaries
 - Area names
- Flood control structures (dams, weirs, jetties, culverts, etc.)
- Floodplain boundaries and/or other FIRM features
- Contours
 - Contour interval _____
- DEM/DTM/TIN
- Building outlines
 - Parcels
- Horizontal and Vertical Geodetic Control Points

Transfer Media:

What options are there for transferring the data to other users? What are the platform options?

Media:

- CD-ROM
- 8mm tape
- 4mm tape
- Zip disk
- Diskettes
- DVD
- Email
- Other FEMA MIP

Platforms:

- UNIX
- PC
- NT

APPENDIX B
DIGITAL DATA

APPENDIX B: DIGITAL DATA

- Survey Files (ASCII, XLS, and Point shapefiles)
- Survey Sketches
- Survey Photos

All data is available on FEMA's Mapping Information Platform (MIP) following the folder structure below.

Folder Structure:

- ***As-Built: Any As-Built information received during project***
- ***Correspondence: Emails, letters to\from community stakeholders***
- ***General: Project XML file and Project Narrative***
- ***Photos: Structure and cross section photos***
- ***Sketches: Structure and cross section sketches with plan and profile views along with dimensions***
- ***Spatial Files: Shapefiles of survey points***
- ***Supplemental Data: Data notebooks, miscellaneous project findings,***
- ***Survey Data: Excel spreadsheets of survey points***