Georgetown – San Gabriel River Flood Protection Planning Study

Prepared for:

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300-1 Industrial Avenue
Georgetown, TX 78626

Texas Water Development Board
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TWDB CONTRACTS

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Acronyms and Abbreviations

%	Percent
‘	Foot
AC	Acre
AC-FT	Acre-foot
AMC	Antecedent moisture conditions
BC	Berry Creek
BCR	Benefit/Cost Ratio
Berry	Berry Creek
BLVD	Boulevard
CFS	Cubic feet per second
CM	Centimeter
CMP	Corrugated metal pipe
CN	Curve Number
COA	City of Austin
COG	City of Georgetown
CONFL	Confluence
CR	County Road
CWA	Clean Water Act
CY	Cubic Yard
D+C	Doucet + Chan, a Division of Doucet & Associates, Inc.
DIA	Diameter

Eng	Engineering
EO	Executive Order
EOR	Element of Occurrence Records
ESA	Endangered Species Act
ETJ	Extraterritorial Jurisdiction
F	Fahrenheit
FEMA	Federal Emergency Management Agency
FFE	Finished floor elevation
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FM	Farm to Market Road
FPPA	Farmland Protection Policy Act
FPPS	Flood Protection Planning Study
FT	Foot
GARR	Gauge Adjusted Radar Rainfall
HEC-GeoHMS	Hydrologic Engineering Center – Geospatial Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center – River Analysis System
HMAC	Hot Mix Asphaltic Concrete
HYDCON	Hydraulic Conductivity
I.H. 35	Interstate Highway 35
IMC	Initial Moisture Condition

IPaC	Information for Planning and Consultation
KPA	Kasberg, Patrick & Associates, LP
LF	Linear Feet
LOMR	Letter of Map Revision
LPST	Leaking petroleum storage tanks
LS	Lump sum
LWC	Low Water Crossing
Mankins	Mankins Branch
ML	Main Lanes
MSD	Municipal setting designation
MSW	Municipal solid waste
NAIP	National Agriculture Imagery Program
NAVD 88	North American Vertical Datum of 1988
NE	North East
NF	North Fork San Gabriel River
NHD	National Hydrography Dataset
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O&M	Operations & Maintenance
OHWM	Ordinary high water mark
PB	Pecan Branch

PECAN	Pecan Branch
PST	Petroleum storage tanks
RAS	River Analysis System
RBC	Reinforced box culvert
RCP	Reinforced concrete pipe
RD	Road
RM	Ranch to Market Road
SB	Smith Branch
SF	Square Foot
SFSG	South Fork San Gabriel River
SG	San Gabriel River
SH	State Highway
SMITH	Smith Branch
SQ	Square
Sq. Mi.	Square Mile
STUDY AREA	Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, North Fork San Gabriel River, Middle Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River watersheds
SWMM	Storm Water Management Model
SWPPP	Storm Water Pollution Prevention Plan
SY	Square Yard
T_C	Time of concentration

TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
T_L	Lag Time
TPWD	Texas Parks & Wildlife Department
Trib	Tributary
TWDB	Texas Water Development Board
TX	Texas
TxDOT	Texas Department of Transportation
TXNDD	Texas Natural Diversity Database
U.S. 183	U.S. Highway 183
USCG	U.S. Coast Guard
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
Vieux	Vieux & Associates, Inc.
WCAD	Williamson County Appraisal District
WCJJC	Williamson County Juvenile Justice Center
WSEL	Water surface elevation
ZONE A	Areas subject to inundation by the 1-percent-annual-chance flood event
ZONE AE	Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods

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Executive Summary

The Georgetown – San Gabriel River Flood Protection Planning Study (hereinafter referred to as the FPPS) is flood hazard mitigation assessment and stormwater planning for the Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, North Fork San Gabriel River, Middle Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River watersheds (hereinafter referred to as the Study Area).

This FPPS is a combination of two planning grants to develop flood hazard mitigation plans for the following watersheds:

- TWDB Contract No. 1448321724: flood hazard mitigation planning for the Pecan Branch, Berry Creek, Mankins Branch, Smith Branch and Middle Fork San Gabriel River watersheds under a joint funding effort by the City of Georgetown and the Texas Water Development Board (TWDB); and

- TWDB Contract No. 1548321877: flood hazard mitigation planning for the North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River under a joint funding effort by the City of Georgetown, Williamson County, City of Leander, City of Liberty Hill and the TWDB.

This FPPS focuses on the referenced watersheds that have experienced flooding problems ranging from localized storms to the major Tropical Storm Hermine of 2010. The flood hazard mitigation planning criteria that was identified in the two flood hazard mitigation planning grant applications was used as the basis for preparing the FPPS, though some criteria was modified and adapted for the study as actual hydrologic and hydraulic conditions were identified and the needs of each community were refined.

Public input was an important component of this FPPS. Input was received, with TWDB approval, from three public meetings, interviews with residents in the flood prone areas, and coordination with city and county officials. In addition to the public meetings, a series of technical working meetings were held with representatives from the City of Georgetown, Williamson County and the City of Leander.

The FPPS has identified a total of 62 proposed projects totaling $349,014,535 in construction cost to address flood hazard mitigation issues throughout the Study Area. Obviously, not all projects can be funded at once, so an effort was made to prioritize the projects. In a series of working meetings, representatives from the City of Georgetown, Williamson County and City of Leander identified the flood hazard problems (flooded structures and flooded channel crossings) and approved flood hazard mitigation improvements prioritization criteria. The proposed flood hazard mitigation improvement projects were divided into two tiers: Tier I (highest priority projects) and Tier II (all remaining projects that are not Tier I projects). These prioritizations were not intended to be an absolute ranking of projects, but intended to provide the stakeholders and communities with input considerations for future flood hazard mitigation improvement projects. A table summarizing the prioritized Tier I projects is shown below.

Table ES-1. Summary of Prioritized Projects

Jurisdiction	Number of Projects	Total Construction Cost
City of Georgetown & ETJ		
Tier I	10	$20,080,072
Tier II	5	$30,780,783
All Other Improvement Projects	31	$177,858,912
Williamson County		
	1	$4,919,573
City of Liberty Hill		
	3	$47,222,621
Burnet County		
	11	$56,771,245

It is important to recognize that these projects are needed to address existing flood hazard problems based on existing development. It is essential that future developments control stormwater flows so that they do not increase flooding.

1.0 Introduction

The watersheds of Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, Middle Fork San Gabriel River, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River (Study Area) in Williamson County and Burnet County (see Figure 2-1). The Study Area covers approximately 25% of the land area of Williamson County and 20% of the land area of Burnet County. Williamson County is one of the fastest growing counties in the State of Texas. Furthermore, the Central Texas area, including both Williamson and Burnet Counties, is one of the fastest growing regions in the Nation. The Texas Colorado River Floodplain Coalition All Hazards Plan reports that as of 2008 the population of Williamson County had grown 182.5% since 1990. The population in 2008 was reported at 394,193. The population growth is expected to continue to increase putting more property at potential flood risk. Table 1-1 presents the latest growth statistics within the Study Area as reported by the United States Census Bureau. Roughly 66% of the Study Area is undeveloped, with over half of the Study Area located in the ETJ of Georgetown, and approximately 33% of the Study Area currently in the City of Georgetown incorporated limits. Accurate flood risk information coupled with flood reduction measures are essential to the long-term viability of the Planning Area.

Table 1-1 Study Area Growth Statistics

	Population 2010 (Base)	Population 2013 (Estimate)	% Change
City of Georgetown	47,438	54,898	15.7
Williamson County	422,617	471,014	11.5
Burnet County	42,753	43,823	2.5
City of Leander	26,310	31,717	20.6
City of Liberty Hill	8,397	8,836	5.2

The City of Georgetown is the central hub of Williamson County, with its rich history pre-dating European settlements and unique culture. This region provides numerous opportunities for businesses and residential development. With the heart of the Study Area located off I.H. 35, this region is key to major transport routes from Mexico to the remainder of the United States, making the successful management of this region a critical goal for local governments, the State of Texas and the remainder of the United States.

In 2008, the Georgetown City Council adopted the 2030 Comprehensive Plan, which guides Georgetown into the 21st Century faced with new opportunities and challenges. Two of the 2030 Georgetown Comprehensive Plan vision statements included "Quality of Life" and "Quality Growth/Sustainable Development". These two statements include language such as "conserve land and natural resources", "preserve our irreplaceable natural resources, our lakes, rivers and hill country scenery" and "encourage conservation development and other approaches that retain rural character and promote retention of open space". It is clear from the 2030 Comprehensive Plan that conservation of water resources is a critical goal of the city and is essential to the long-term goals of this region.

The City of Georgetown conducted a Master Drainage Plan Study in 2000, which included portions of the watershed areas within the Study Area. However, of the watersheds studied in 2000, the previously developed hydrologic and hydraulic information for these watersheds is now outdated. Development (commercial and residential) has occurred in the Study Area and it is now important to evaluate the impact of this development and the current growth patterns on the hydrologic/hydraulic conditions within the Study Area.

In 2009, the Williamson County Commissioners' Court adopted the Williamson County Long-Range Transportation Plan which presented the roadway and transit improvements to be built or improved over the next 20 years to help address anticipated growth in the County. The Williamson County Long-Range Transportation Plan identified many new and existing roadway improvements within the Study Area. Updated hydrologic and hydraulic information is needed to assist Williamson County in its design the roadway crossings at the existing waterways.

In 2013, The Burnet County Commissioners' Court adopted the Burnet County Comprehensive Plan. The Comprehensive Plan identified citizen's quality of life including "manage growth", "economic development", and "required water (and traffic) impact studies with new development" as well as "identify and address Critical Road Safety Issues". Updated hydrologic and hydraulic information is needed to assist Burnet County to manage the quality of life goals identified in its Comprehensive Plan.

In 2015, the City of Leander adopted the updated Comprehensive Plan to service as a guide to the City's future growth. The Comprehensive Plan included emphasis on open spaces, restriction on development within the 100-year floodplains, Low Impact Development approach to site development and stormwater management, and reduction of stormwater pollution.

A portion of the Study Area is subject to frequent flooding due to inadequate drainage infrastructure and development within the floodplains. This was evidenced by the widespread destruction from the September 8, 2010 Tropical Storm Hermine event and the June 27, 2007 flood event. It is critical to the communities that detailed hydrologic/hydraulic analyses and floodplain mapping be performed using the latest modeling techniques and more accurate topographic information so that the flooding problems can be identified and economical, effective and prioritized flood hazard mitigation measures can be implemented.

The current Flood Insurance Rate Map (FIRM) for the watersheds within the planning area is over 20 years old and is based on outdated and inaccurate peak discharges and base flood information. Specifically, although the FIRM was updated in April 2008, new hydrologic/hydraulic analyses and floodplain mappings were not performed. The 2008 updates were formed to convert the FIRM into a digital format and incorporated approved Letter of Map Revisions (LOMRs) at the time. Based on a review of the Federal Emergency Management Agency (FEMA) website, there has been over forty LOMR approvals since 2008. An updated comprehensive drainage plan, with accurate hydrologic/hydraulic modeling of the floodplains, was identified as a needed effective tool to manage quality and sustainable growth in the Study Area floodplains and to provide the necessary information as the first step in revising FIRM if the communities desire to do so.

2.0 Scope of Flood Protection Planning Study

2.1 Flood Protection Planning Study Overview

The FPPS Study Area consists of the Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, Middle Fork San Gabriel River, North Fork San Gabriel River, South Fork San Gabriel River, and San Gabriel River (from the confluence of the North and South Forks to the City of Georgetown ETJ Limit). The studied creeks within the Study Area are all tributaries of the San Gabriel River located within Williamson County and Burnet County. The Study Area is within the Brazos River Basin.

The Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, and Middle Fork San Gabriel River watersheds cover approximately 90% of the most populated area within the City of Georgetown limits and its ETJ areas and experienced significant flooding during the 2010 Tropical Storm Hermine event. Stormwater runoff along North Fork San Gabriel River through the City of Georgetown is regulated by Lake Georgetown located on the west side of Georgetown.

2.2 Technical Standards and Assumptions Impacting the Plan

The FPPS utilized the standards and assumptions outlined in the two applications to the Texas Water Development Board (TWDB) for flood protection planning grants for comprehensive flood protection planning studies of the Study Area watersheds. The criteria outlined in the grant applications describe standards that are commonly used in Central Texas for evaluating risk and drainage infrastructure design and construction. Drainage structures are typically designed to handle a specific design storm, which is selected based on the desired level of safety and economic risk. The design storms utilized in the FPPS are as follows:

- Assessment and protection of flooded structures (i.e. homes, businesses, etc.) within Problem Areas: 24-hour, 100-year storm event under Existing Conditions land development density;
- Assessment and improvements to flooded road crossings within the City of Georgetown jurisdiction: 24-hour, 100-year storm event under Existing Conditions land development density;
- Assessment and improvements to flooded crossings outside the City of Georgetown jurisdiction: 24-hour, 25-year storm event under Existing Conditions land development density.

The use of the 100-year design storm is standard in flood evaluations and flood protection of structures. It is the standard used by flood insurance providers, funding entities, and regulators in making determinations with respect to flooded structures.

The 100-year design storm was used to assess flooded crossings within the City of Georgetown jurisdiction to comply with the City of Georgetown hydraulic design criteria and to reflect the high level of risk to the public posed by flooding significant crossings within the highly developed urban setting.

The 25-year design storm was used to assess local crossings within the City of Georgetown's ETJ and flooded crossings outside the City of Georgetown jurisdiction to comply with the Williamson County hydraulic design criteria and to reflect the current rural or undeveloped conditions within Williamson County and Burnet County.

While hydrologic and hydraulic modeling of potential future development conditions were analyzed as part of this study, all hydraulic analyses of flooded structures and crossings were based upon existing development conditions and do not account for future development. It is assumed that future development will be regulated by the governmental jurisdictions to a sufficient degree so that flood risk will not be significantly increased. This is a very important concept and is consistent with standard drainage design practices. However, it is incumbent on the governmental jurisdictions and communities involved to properly manage future development and to enforce development regulations to ensure that these conditions are met.

2.3 Public Meetings and Technical Working Meetings

Throughout the FPPS process, a series of four public meetings were held to communicate the planning process, status and results, and to solicit valuable input from the public to help focus ongoing analysis efforts (one public meeting has yet to be held as of the Draft FPPS Report submittal). The first public meeting was held in April 2015 to present the proposed study watershed delineations to be included in the FPPS and to gather input regarding existing flooding issues in these areas. The second public meeting was held in July 2016 to present the update proposed study watershed delineations, to continue to gather input regarding existing flooding issues in these areas, and to present draft floodplain mappings within the watersheds. The third public meeting was held in July 2017 to present updated floodplain mappings and identification of structures within the floodplains of the study watersheds. The fourth public meeting was held in March 2018 to gather input on the Draft FPPS Report regarding the recommended flood hazard mitigation improvements.

In addition to the public meetings, a series of technical working sessions were held with representatives from the City of Georgetown, Williamson County, and the City of Leander. During these working meetings, alternatives were discussed and the criteria for prioritization and selection of the recommended flood hazard mitigation improvements were determined. These working meetings provided an excellent opportunity for the affected stakeholders to collaboratively identify the impacts of the flood hazards and to assist in developing a prioritized list of projects to address flood hazard issues throughout the Study Area.

A summary of the Study Area watersheds is provided in Table 2-1.

Table 2-1 Study Area Summary

Watershed	Drainage Area (Sq. Miles)	Study Stream Miles (1)
Berry Creek (2)	126	35.2
Mankins Branch (3)	13	10.1
Pecan Branch (4)	7	9.2
Smith Branch (5)	10	9.4
Middle Fork San Gabriel River	17	13.1
North Fork San Gabriel River	251	50.1
South Fork San Gabriel River	134	37.3
San Gabriel River (6)	19	11.1

Notes:
(1) Study Stream miles represents stream miles along main channels only.
(2) Berry Creek, Dry Berry Creek, and Cowan Creek
(3) Mankins Branch and Mankins Branch Tributary #2
(4) Pecan Branch and Pecan Branch Tributary #1
(5) Smith Branch and West Fork Smith Branch
(6) From confluence of North Fork San Gabriel River and South Fork San Gabriel River downstream to City of Georgetown ETJ, excluding Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, and Middle Fork San Gabriel River watersheds.

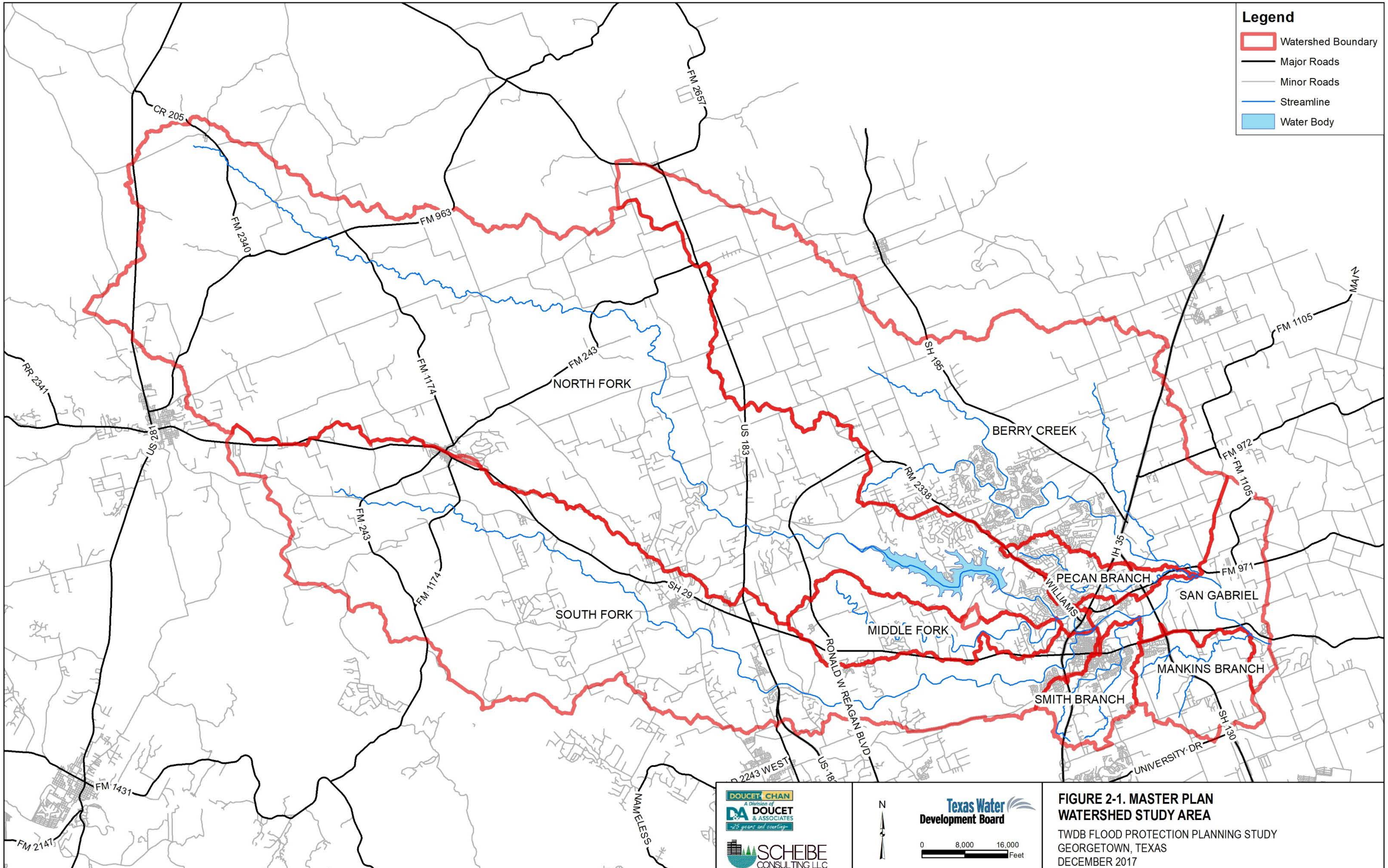

FIGURE 2-1. MASTER PLAN WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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3.0 Overview of Watershed Study Areas

The Georgetown – San Gabriel River Flood Protection Planning Study's (FPPS) watershed study area (Study Area) encompasses approximately 25% of Williamson County and 20% of Burnet County. Average daily temperatures range from a high of 60 to a low of 36 degrees Fahrenheit (F) in January, and a high of 96 degrees F to a low of 66 degrees F in August. The mean annual precipitation is approximately 37.3 inches with the majority occurring between May and October. Williamson County has an average of 50.5 days of precipitation (i.e. measurable precipitation over 0.01 inch), and its average daily humidity ranges from a high of 90% in March to a low of 65% in September, for an overall annual average humidity of 75.3%. Heavy rainfall can occur over the Study Area from a variety of atmospheric conditions including tropical storm and hurricane events originating from the Gulf of Mexico.

The San Gabriel River watershed encompasses a total of 1,366.5 square miles, including 790.6 square miles outside (downstream) of the limits of the Study Area. The Study Area topography is characterized by the Balcones Fault Zone, forming the Edwards Escarpment, that is aligned roughly parallel to I.H. 35 from southwest to northeast, dividing the Study Area into two distinct topographic and geologic regions: (1) Edwards Plateau (forming the Texas Hill Country) west of the Escarpment and (2) Texas Coastal Plan east of the Escarpment. The San Gabriel River bisects the Escarpment, flowing roughly from the northwest to the southwest within the Study Area and connecting to the Brazos River southeast of the Study Area.

The U.S. Army Corps of Engineers' Lake Georgetown impoundment on the North Fork San Gabriel River provides significant flood protection within the Study Area, especially north of Downtown. Additionally, local floodplain regulations provide a significant measure of protection for newly developed areas.

Significant portions of the Study Area, along the Balcones Fault Zone primarily west of Dry Berry Creek and Smith Branch, are within the Edwards Aquifer Zone, consisting of the Recharge Zone, Contributing Zone, and Transition Zone. The environmental sensitivity of the Edwards Aquifer Zone is protected by the Edwards Aquifer Chapter 213 Rules, administered by the Texas Commission on Environmental Quality (TCEQ).

The Study Area consists of the following eight watershed areas, which are discussed in the following sections:

- Berry Creek Watershed Study Area
- Mankins Branch Watershed Study Area
- Pecan Branch Watershed Study Area
- Smith Branch Watershed Study Area
- Middle Fork San Gabriel River Watershed Study Area
- North Fork San Gabriel River Watershed Study Area
- South Fork San Gabriel River Watershed Study Area

- San Gabriel River Watershed Study Area

An overview of the limits of the above watershed study areas is shown on Figure 2-1 and is summarized in Table 2-1.

3.1 Berry Creek Watershed Study Area

3.1.1 Watershed Topography

The Berry Creek Watershed Study Area is located within Williamson County along the north side of the City of Georgetown and extending northwestward into Burnet County. Its confluence with the San Gabriel River is east of SH 130 near its FM 971 crossing. The drainage features in this watershed include two primary topographic features: (1) Texas Coastal Plain generally east of I.H. 35, and (2) Edwards Plateau generally west of I.H. 35.

West of I.H. 35, the contributing watersheds of Berry Creek and its Cowan Creek and Dry Berry Creek study tributaries lie within the Edwards Plateau, and are characterized by karst topography, rugged hills of limestone or granite, thin layers of topsoil, large areas of exposed rocks and boulders which make the area prone to flash flooding. After Berry Creek and Dry Berry Creek flow across the Balcones Escarpment near I.H. 35, the slope of the land begins to flatten resulting in broader floodplains.

Ground topography ranges from a high point of approximately 1150 feet NAVD 88 at the northwest limits of the watershed to a low point of approximately 610 feet NAVD 88 at the southeast limits of the watershed within the Study Area.

A portion of the Berry Creek Watershed, along the Balcones Fault Zone, is within the Edwards Aquifer Zone.

An overview of the Berry Creek Watershed is shown on Figure 3-1.

3.1.2 Watershed Surficial Geology

The areas within the Berry Creek watershed west of I.H. 35 consist of soils that are classified as hydrologic soil group “D” per U.S. Department of Agriculture standard classification. These soils are primarily clays at or near the surface causing low infiltration with high runoff potential. The Lower Berry Creek and Dry Berry Creek areas consist of soils that are a mix of soils that are classified as hydrologic soil groups “B”, “C” and “D”. These soils are primarily gravel and clay at or near the surface causing moderate permeability. Gravel pits within the watershed reduce the runoff to the creek.

3.1.3 Watershed Residential/Commercial Development

The Berry Creek watershed is highly developed within the City of Georgetown jurisdiction primarily from the Sun City Boulevard creek crossing to its confluence with the San Gabriel River. Upstream portions of the watershed are primarily undeveloped.

3.2 Mankins Branch Watershed Study Area

3.2.1 Watershed Topography

The Mankins Branch Study Area is located within Williamson County along the southeast side of the City of Georgetown, east of the Smith Branch Watershed. Its confluence with the San Gabriel River is east of SH 130 near its McShepherd Road crossing. The drainage features in this watershed are in the Texas Coastal Plain generally east of I.H. 35, characterized by flattened land slopes resulting in broader floodplains.

Ground topography ranges from a high point of approximately 852 feet NAVD 88 at the northwest limits of the watershed to a low point of approximately 578 feet NAVD 88 at the southeast limits of the watershed within the Study Area.

A portion of the Mankins Branch Watershed is located within the Edwards Aquifer Transition Zone.

An overview of the Mankins Branch Watershed is shown on Figure 3-2.

3.2.2 Watershed Surficial Geology

The areas within the Mankins Branch watershed consist of a range of soils that are classified as hydrologic soil groups “B” through “D” per U.S. Department of Agriculture standard classification. The hydrologic soil group “B” is located along the lower portion of Mankins Branch and adjacent to the San Gabriel River. This soil group has well-draining soils with lower runoff potential. The hydrologic soil groups “C” and “D” are located in a low density residential and agricultural area. These soils are primarily clay at or near the surface causing limited infiltration with high runoff potential.

3.2.3 Watershed Residential/Commercial Development

The Mankins Branch watershed is lightly developed within the City of Georgetown jurisdiction, primarily or totally residential.

3.3 Pecan Branch Watershed Study Area

3.3.1 Watershed Topography

The Pecan Branch Watershed Study Area is located within Williamson County on the north-central side of the City of Georgetown. Its confluence with the San Gabriel River is east of SH 130, just upstream of the Berry Creek confluence, and its watershed extends east-northeast of the San Gabriel River to Williams Drive. The drainage features in this area include two primary topographic features: Texas Coastal Plain generally east of I.H. 35, and Edwards Plateau west of I.H. 35.

West of I.H. 35, the contributing subbasins of Pecan Branch are composed of the Edwards Plateau, characterized by shallow soils and steep topography (up to 10% slopes). As the flows approach I.H. 35, the slope of the land begins to flatten resulting in broader floodplains. Pecan Branch crosses I.H. 35 through a series of culverts, and on the east side of I.H. 35 the watershed is within prairieland characterized by flat to gently rolling topography (less than 0.5% slopes).

Ground topography ranges from a high point of approximately 904 feet NAVD 88 at the northwest limits of the watershed to a low point of approximately 610 feet NAVD 88 at the southeast limits of the watershed.

The Pecan Branch Watershed is located entirely within the Edwards Aquifer Recharge Zone.

An overview of the Pecan Branch Watershed is shown on Figure 3-3.

3.3.2 Watershed Surficial Geology

The areas within the Pecan Branch watershed west of I.H. 35 consist of soils that are classified as hydrologic soil group D per U.S. Department of Agriculture standard classification. Group "D" soils are primarily clayey at or near the surface causing low infiltration with high runoff potential.

The areas within the Pecan Branch watershed east of I.H. 35 consist of soils that are classified as hydrologic soil group "B" generally within the channel, group "C" generally in upland areas, and group "D" in lower-lying areas outside the channel per U.S. Department of Agriculture standard classification. Group "B" soils are primarily silt loam or loam at or near the surface causing moderate infiltration with moderately low runoff potential. Group "C" soils are primarily sandy clay loam at or near the surface causing moderately low infiltration with moderately high runoff potential.

3.3.3 Watershed Residential/Commercial Development

The Pecan Branch watershed is nearly fully developed within the City of Georgetown City Limits and ETJ west of I.H. 35 consisting mostly of low- and medium-density residential with limited agricultural, commercial, and airport land uses. East of I.H. 35, the watershed is less developed with impervious coverage generally less than 20% and consists mostly of agricultural and rural residential with limited commercial and institutional land uses (primarily along I.H. 35 corridor).

3.4 Smith Branch Watershed Study Area

3.4.1 Watershed Topography

The Smith Branch Watershed Study Area is located within Williamson County on the south side of the City of Georgetown. Its confluence with the San Gabriel River is west of SH 130, and its watershed extends southeast of the San Gabriel River west of I.H. 35 and south of Leander Road (Ranch Road 2243). The study area includes the West Fork of Smith Branch with headwaters west of I.H. 35 and main stem confluence east of Quail Valley Drive near Hutto Street. The drainage features in this area include two primary topographic features: Texas Coastal Plain generally east of I.H. 35, and Edwards Plateau west of I.H. 35.

East of I.H. 35, the contributing subbasins of Smith Branch are composed of the Edwards Plateau, characterized by shallow soils and steep topography (up to 10% slopes). As the flows approach I.H. 35, the slope of the land begins to flatten resulting in broader floodplains. Smith Branch crosses I.H. 35 through a series of culverts and a bridge (northbound access road), and on the east side of I.H. 35 the watershed is within prairieland characterized by flat to gently rolling topography (less than 0.5% slopes).

Ground topography ranges from a high point of approximately 956 feet NAVD 88 at the southern limits of the watershed to a low point of approximately 636 feet NAVD 88 at the northeast limits of the watershed.

The Smith Branch Watershed is located entirely within the Edwards Aquifer Recharge Zone.

An overview of the Smith Branch Watershed is shown on Figure 3-4.

3.4.2 Watershed Surficial Geology

The areas within the Smith Branch watershed west of I.H. 35 consist of soils that are classified as hydrologic soil group "D" per U.S. Department of Agriculture standard classification. Group "D" soils are primarily clayey at or near the surface causing low infiltration with high runoff potential. The areas within the Smith Branch watershed east of I.H. 35 consist of soils that are classified primarily as hydrologic soil group "D" per U.S. Department of Agriculture standard classification with limited areas of group "B" within the channel up to the West Fork Confluence and group "C" in upland areas. Group "B" soils are primarily silt loam or loam at or near the surface causing moderate infiltration with moderately low runoff potential. Group "C" soils are primarily sandy clay loam at or near the surface causing moderately low infiltration with moderately high runoff potential.

3.4.3 Watershed Residential/Commercial Development

The Smith Branch watershed is highly developed within the City of Georgetown City Limits along the west and north portions of the watershed consisting mostly of residential and commercial development with limited institutional land uses. The south and east portions of the watershed along the outer edges of the City Limits are less developed with impervious coverage generally less than 20% and consist mostly of agricultural and rural residential with limited low- and medium-density residential land uses.

3.5 Middle Fork San Gabriel River Watershed Study Area

3.5.1 Watershed Topography

The Middle Fork San Gabriel River Watershed Study Area is located within Williamson County along the west side of the City of Georgetown and extending westward into Williamson County. Its confluence with the San Gabriel River is west of I.H. 35 downstream of the Country Club Road crossing over the San Gabriel River. The drainage features in this watershed are within the Edwards Plateau generally west of I.H. 35, which is characterized by karst topography, rugged hills of limestone or granite, thin layers of topsoil, large areas of exposed rocks and boulders making the area prone to flash flooding.

Ground topography ranges from a high point of approximately 1074 feet NAVD 88 at the northwest limits of the watershed to a low point of approximately 678 feet NAVD 88 at the southeast limits of the watershed within the Study Area.

A portion of the Middle Fork San Gabriel River, along the Balcones Fault Zone, is within the Edwards Aquifer Zone.

An overview of the Middle Fork San Gabriel River Watershed is shown on Figure 3-5.

3.5.2 Watershed Surficial Geology

The areas within the Middle Fork San Gabriel River watershed west of I.H. 35 consist predominately of soils that are classified as hydrologic soil group "D" per U.S. Department of Agriculture standard classification. These soils are primarily clay at or near the surface causing low infiltration with high runoff potential. There are gravel pits within the watershed that reduce the runoff to the river.

3.5.3 Watershed Residential/Commercial Development

The Middle Fork San Gabriel River is lightly developed within the City of Georgetown and Williamson County jurisdictions.

3.6 North Fork San Gabriel River Watershed Study Area

3.6.1 Watershed Topography

The North Fork San Gabriel River Watershed Study Area is located within Williamson County along the north side of the City of Georgetown and extending northwestward into Burnet County. Its confluence with the San Gabriel River is east of SH 130 near its FM 971 crossing. The drainage features in this watershed are within two primary topographic features: (1) Texas Coastal Plain generally east of I.H. 35, and (2) Edwards Plateau generally west of I.H. 35.

West of I.H. 35, the contributing North Fork San Gabriel River watershed lies within the Edwards Plateau and is characterized by karst topography, rugged hills of limestone or granite, thin layers of topsoil, large areas of exposed rocks and boulders making the area prone to flash flooding. East of I.H. 35, the slope of the land begins to flatten resulting in broader floodplains.

Ground topography ranges from a high point of approximately 1595 feet NAVD 88 at the northwest limits of the watershed to a low point of approximately 659 feet NAVD 88 at the southeast limits of the watershed within the Study Area.

A portion of the North Fork San Gabriel River, along the Balcones Fault Zone, is within the Edwards Aquifer Zone.

Flooding along the North Fork San Gabriel River, as it flows into the urban Georgetown area, is controlled by Lake Georgetown.

An overview of the North Fork San Gabriel River Watershed is shown on Figure 3-6.

3.6.2 Watershed Surficial Geology

The areas within the North Fork San Gabriel River watershed consist of soils that are classified as hydrologic soil group "D" per U.S. Department of Agriculture standard classification. These soils are primarily clay at or near the surface causing low infiltration with high runoff potential. The areas near the North Fork San Gabriel River consist of soils that are classified as hydrologic soil group "B". These soils are primarily well-draining at or near the surface causing higher infiltration with low runoff potential. Areas upstream of Lake Georgetown are rural with little development.

3.6.3 Watershed Residential/Commercial Development

The North Fork San Gabriel River is highly developed within the City of Georgetown jurisdiction primarily from the River Road creek crossing downstream of Lake Georgetown to its confluence with the San Gabriel River.

3.7 South Fork San Gabriel River Watershed Study Area

3.7.1 Watershed Topography

The South Fork San Gabriel River Watershed Study Area is located primarily within Williamson County with upper portions extending northwest into Burnet County. The watershed includes portions of the Cities of Burnet, Bertram, Liberty Hill, and Leander, and the southwest and central (downtown) portions of the City of Georgetown. The southern watershed boundary roughly follows the Travis County boundary line within the upper-central portion of the watershed, and the northern watershed boundary general follows S.H. 29. Its confluence with the North Fork San Gabriel River is east of I.H. 35. The drainage features in this area include one primary topographic feature: the Edwards Plateau.

The contributing subbasins of South Fork San Gabriel River are composed of the Edwards Plateau, characterized by shallow soils and steep topography (up to 10% slopes). The channel slope is as steep as 0.7% slope within the upper 7 miles and flattens out to a consistent 0.25% slope in the lower 30 miles.

Ground topography ranges from a high point of approximately 1,516 feet NAVD 88 at the northwest limits of the watershed to a low point of approximately 659 feet NAVD 88 at the eastern limits of the watershed.

Portions of the South Fork San Gabriel River Watershed are located within the Edwards Aquifer Contributing Zone and Recharge Zone.

An overview of the South Fork San Gabriel River is shown in Figure 3-7.

3.7.2 Watershed Surficial Geology

The South Fork San Gabriel River watershed primarily consists of soils that are classified as hydrologic soil group “D” per U.S. Department of Agriculture standard classification. Group “D” soils are primarily clayey at or near the surface causing low infiltration with high runoff potential. The watershed also includes limited areas of group “B” within the channel and group “C” in upland areas. Group “B” soils are primarily silt loam or loam at or near the surface causing moderate infiltration with moderately low runoff potential. Group “C” soils are primarily sandy clay loam at or near the surface causing moderately low infiltration with moderately high runoff potential.

3.7.3 Watershed Residential/Commercial Development

The South Fork San Gabriel River watershed is mostly undeveloped, primarily consisting of pasture land, woods, and rural residential land uses. Areas within the City of Georgetown City Limits and ETJ include low- to high-density residential, regional commercial, and mining land uses. Areas along the S.H. 29, U.S. 183, and Ronald Reagan Boulevard corridors also include low- to high-density residential and regional commercial land uses.

3.8 San Gabriel River Watershed Study Area

3.8.1 Watershed Topography

The San Gabriel River Watershed Study Area is located within Williamson County along the central portion of the City of Georgetown, from the confluence of the North Fork San Gabriel River with the South Fork San Gabriel River and extending to the east limits of the FPPS (i.e. the ETJ of the City of Georgetown). The drainage features in this watershed are within two primary topographic features: (1) Texas Coastal Plain generally east of I.H. 35, and (2) Edwards Plateau generally west of I.H. 35.

West of I.H. 35, the contributing watersheds of the San Gabriel River, within the Edwards Plateau, are characterized by karst topography, rugged hills of limestone or granite, thin layers of topsoil, large areas of exposed rocks and boulders making the area prone to flash flooding. After the San Gabriel River flows across the Balcones Escarpment near I.H. 35, the slope of the land begins to flatten resulting in broader floodplains.

Ground topography ranges from a high point of approximately 1595 feet NAVD 88 at the west limits of the watershed to a low point of approximately 575 feet NAVD 88 at the east limits of the watershed within the Study Area.

A portion of the San Gabriel River, along the Balcones Fault Zone, is within the Edwards Aquifer Zone.

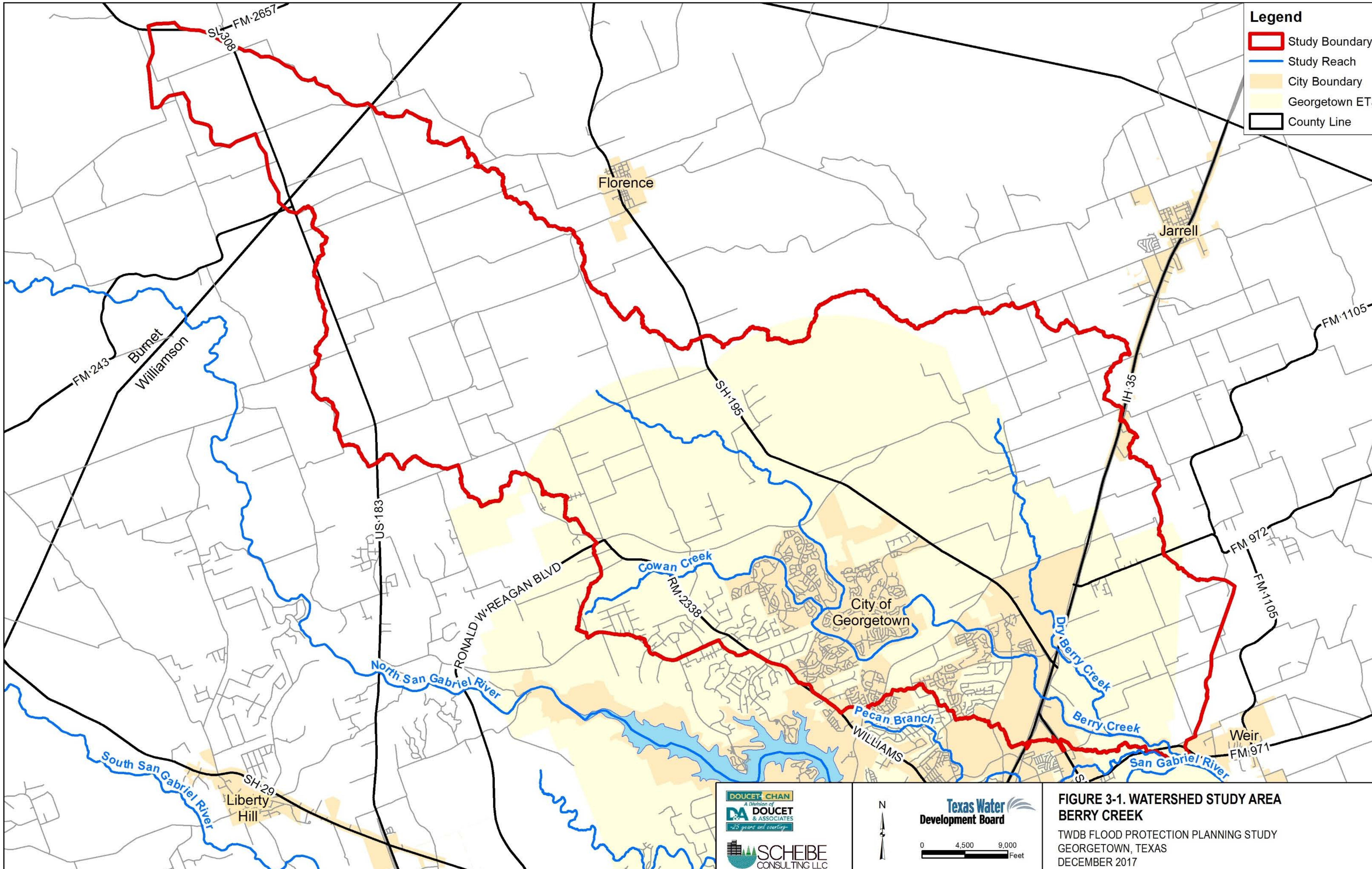
An overview of the San Gabriel River Watershed, starting from the confluence of the north and south forks of the San Gabriel Rivers to the City of Georgetown ETJ is shown on Figure 3-8.

3.8.2 Watershed Surficial Geology

The areas within the San Gabriel River watershed from the confluence of the north and south forks of the San Gabriel River to the City of Georgetown ETJ consist of soils that range in classification as hydrologic soil groups “B” through “D” per U.S. Department of Agriculture standard classification. The hydrologic soil group “B” is located along the river’s alluvial system. This soil group has well-draining soils with lower runoff potential. The hydrologic soil groups “C” soils and “D” soils are in both urban and rural areas. The soils are primarily clays at or near the surface which has limited infiltration and have a high runoff potential.

3.8.3 Watershed Residential/Commercial Development

The area adjacent to the San Gabriel River is highly developed within the City of Georgetown jurisdiction primarily from its confluence with the north and south forks of the San Gabriel River to the SH 130 crossing. Downstream of the SH 130 crossing the area is dominantly agriculture with low development.


Legend
Study Boundary
Study Reach
City Boundary
Georgetown ETJ
County Line
Florence
Jarrell
City of Georgetown
Liberty Hill
Weir
Burnet
Williamson
Cowan Creek
North San Gabriel River
South San Gabriel River
Pecan Branch
Dry Berry Creek
Berry Creek
San Gabriel River
FM 2657
SL 308
FM 243
US 183
SH 195
IH 35
FM 1105
FM 972
FM 971
RM 2338
RONALD W REAGAN BLVD
WILLIAMS
SH 29
DOUCET CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0 4,500 9,000 Feet
FIGURE 3-1. WATERSHED STUDY AREA
BERRY CREEK
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

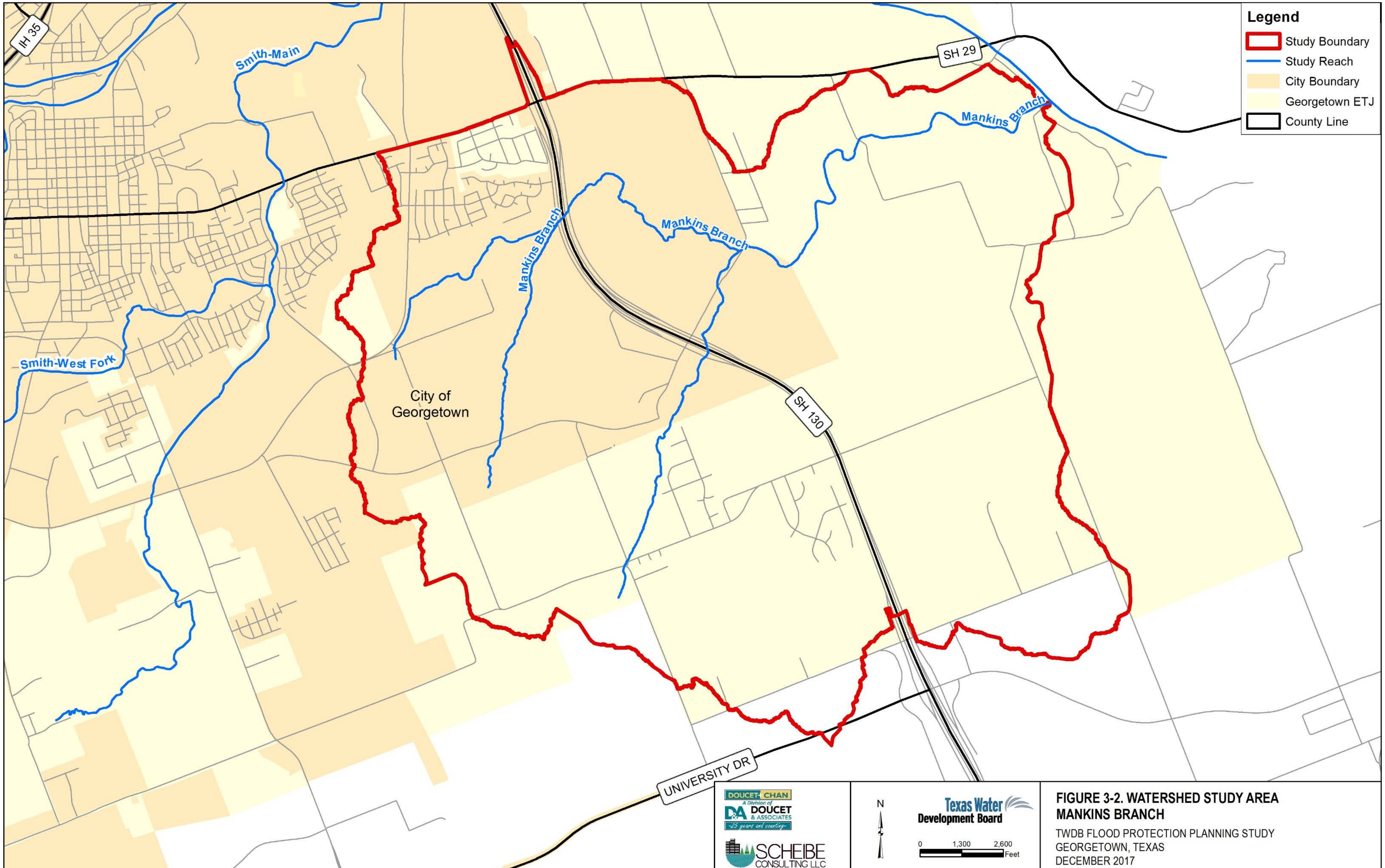


FIGURE 3-2. WATERSHED STUDY AREA MANKINS BRANCH
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

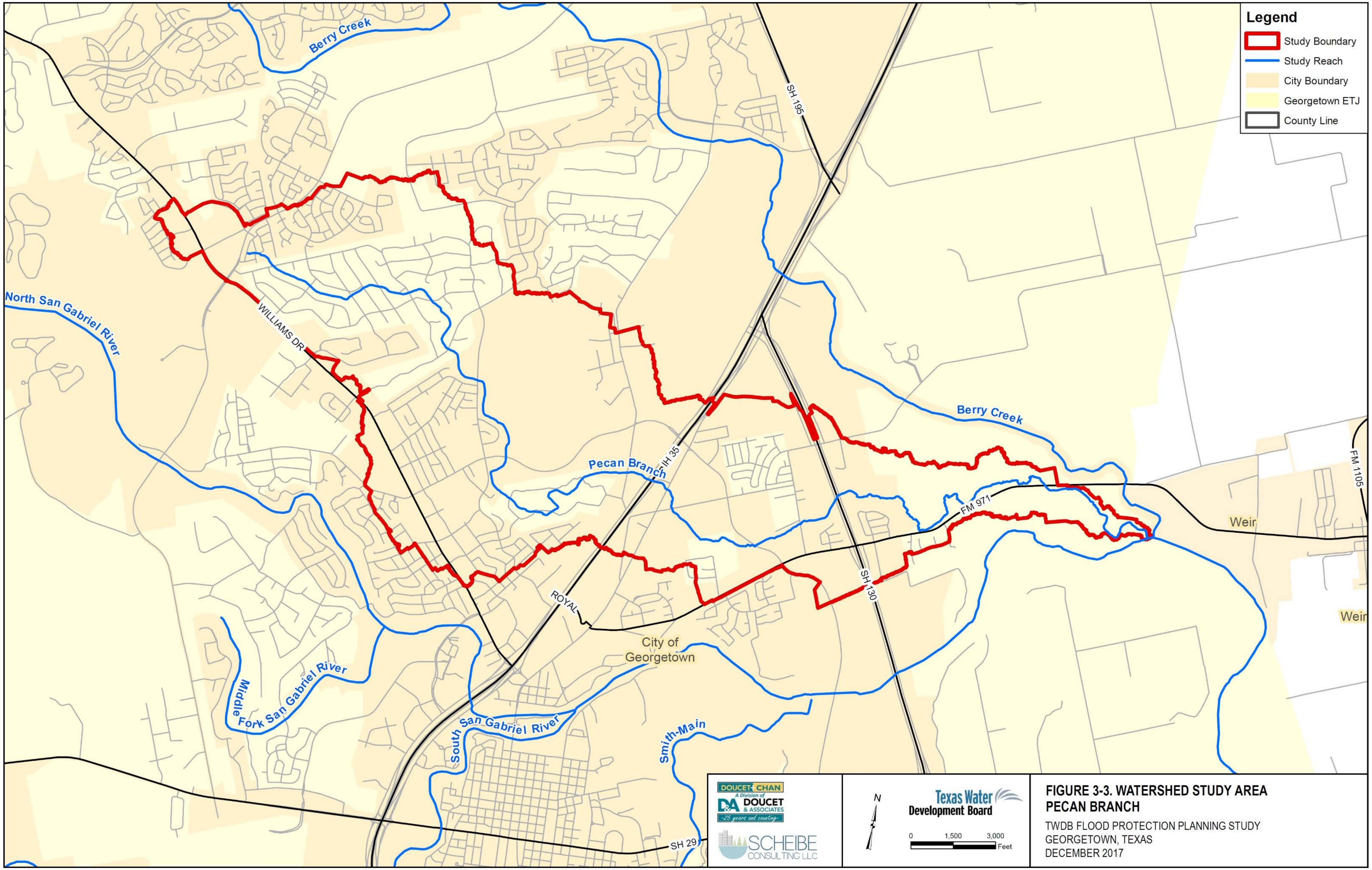


FIGURE 3-3. WATERSHED STUDY AREA PECAN BRANCH
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

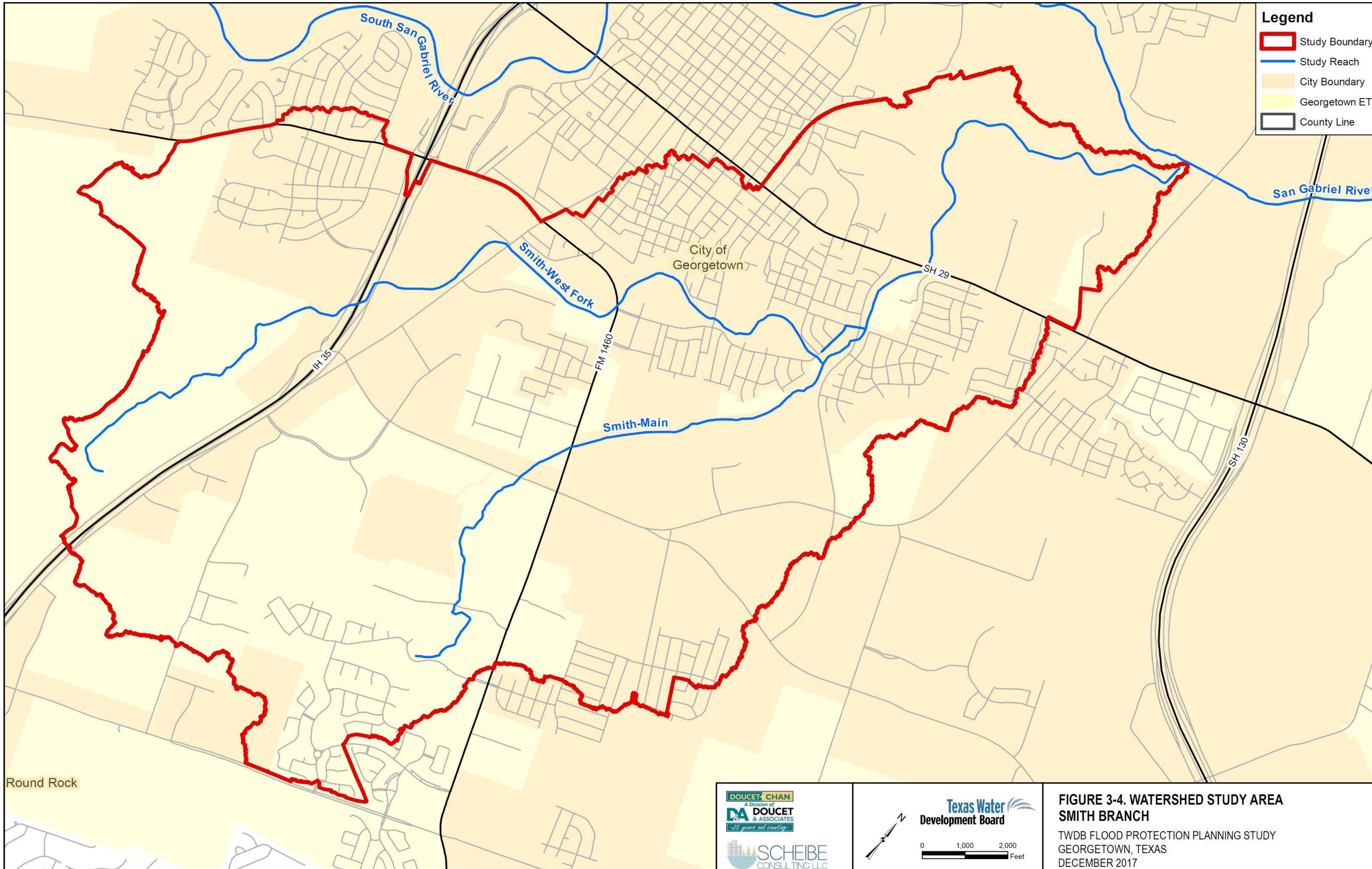


FIGURE 3-4. WATERSHED STUDY AREA SMITH BRANCH
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

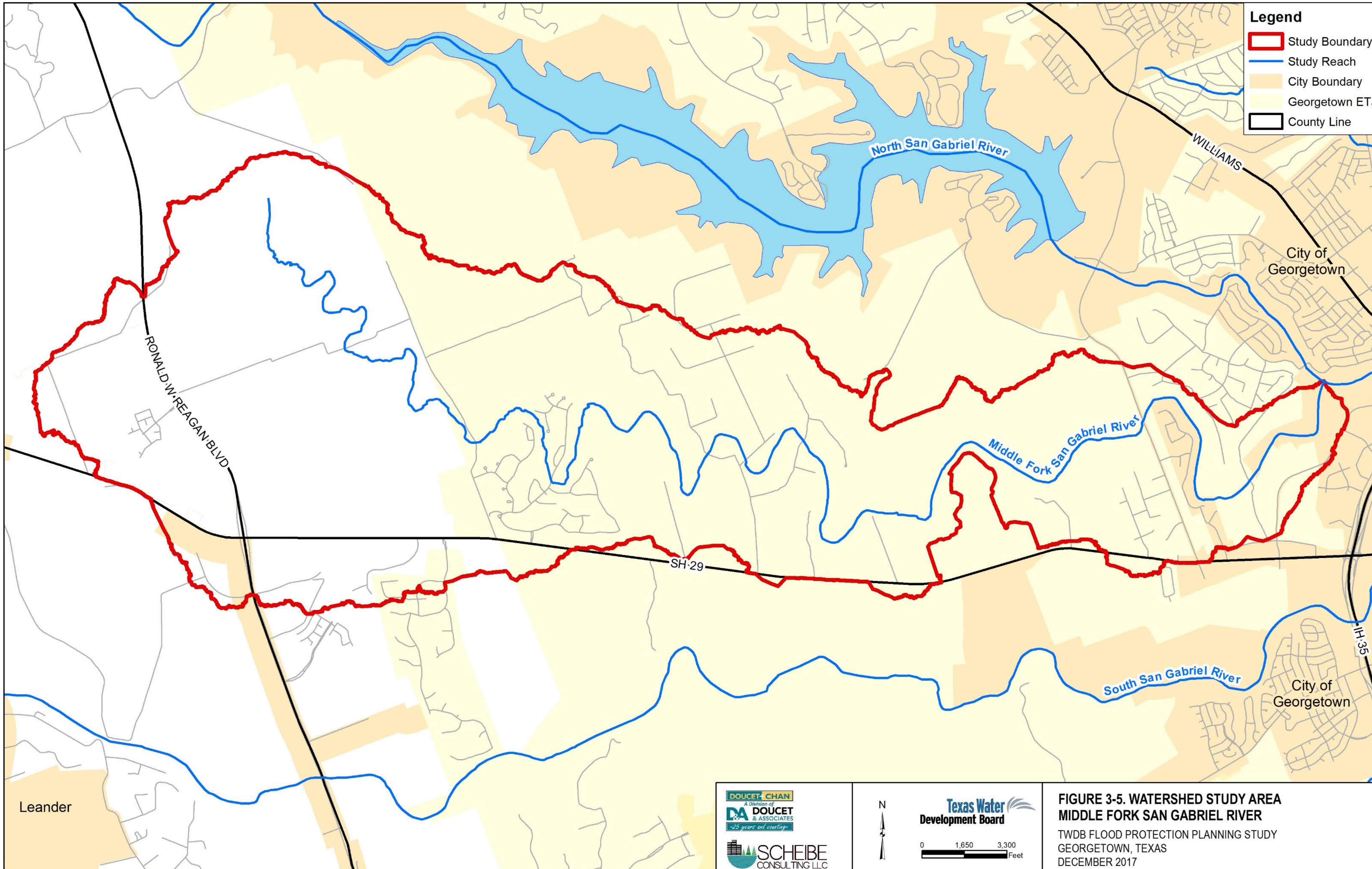


FIGURE 3-5. WATERSHED STUDY AREA
MIDDLE FORK SAN GABRIEL RIVER
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

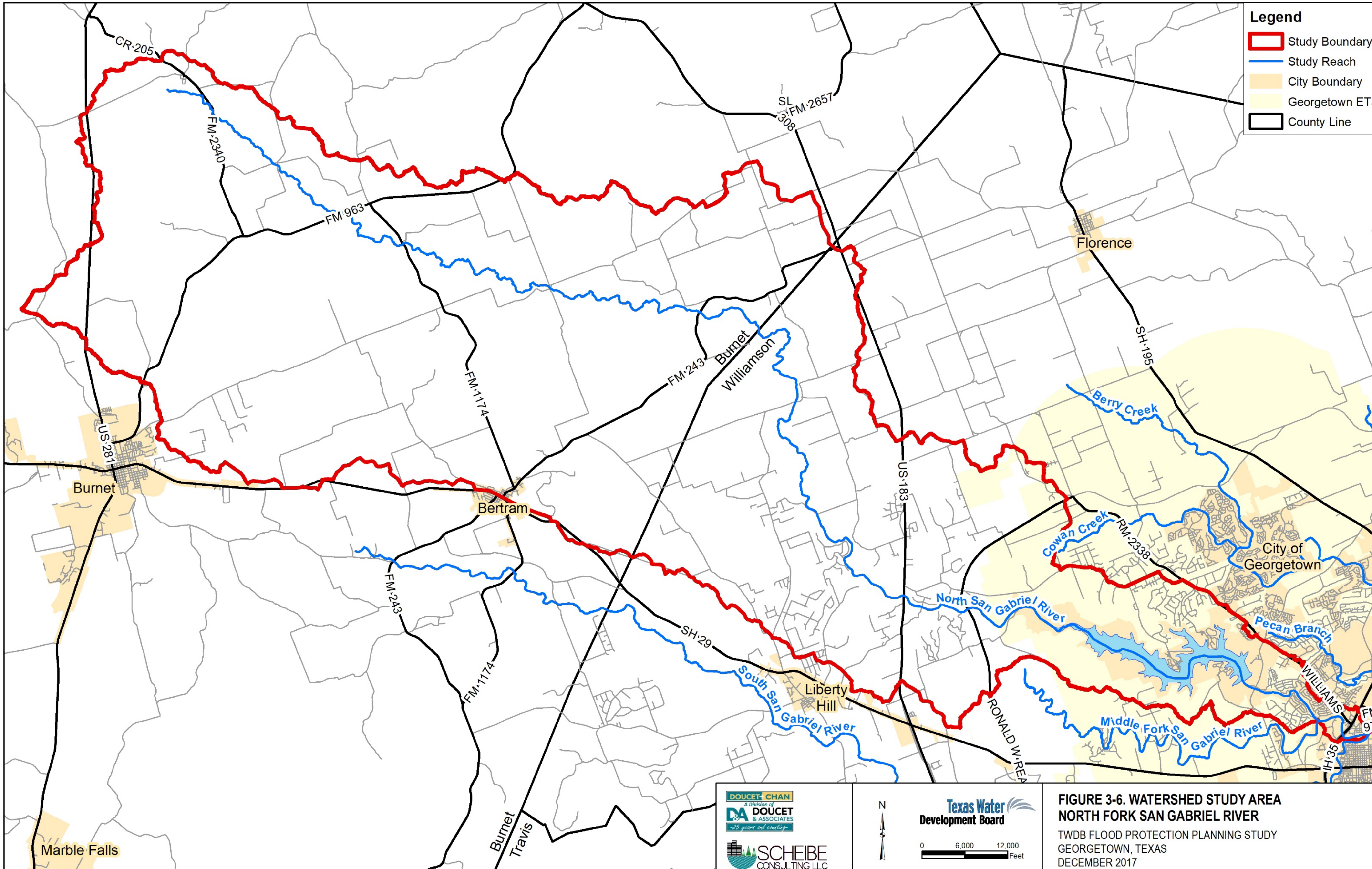


FIGURE 3-6. WATERSHED STUDY AREA
NORTH FORK SAN GABRIEL RIVER
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

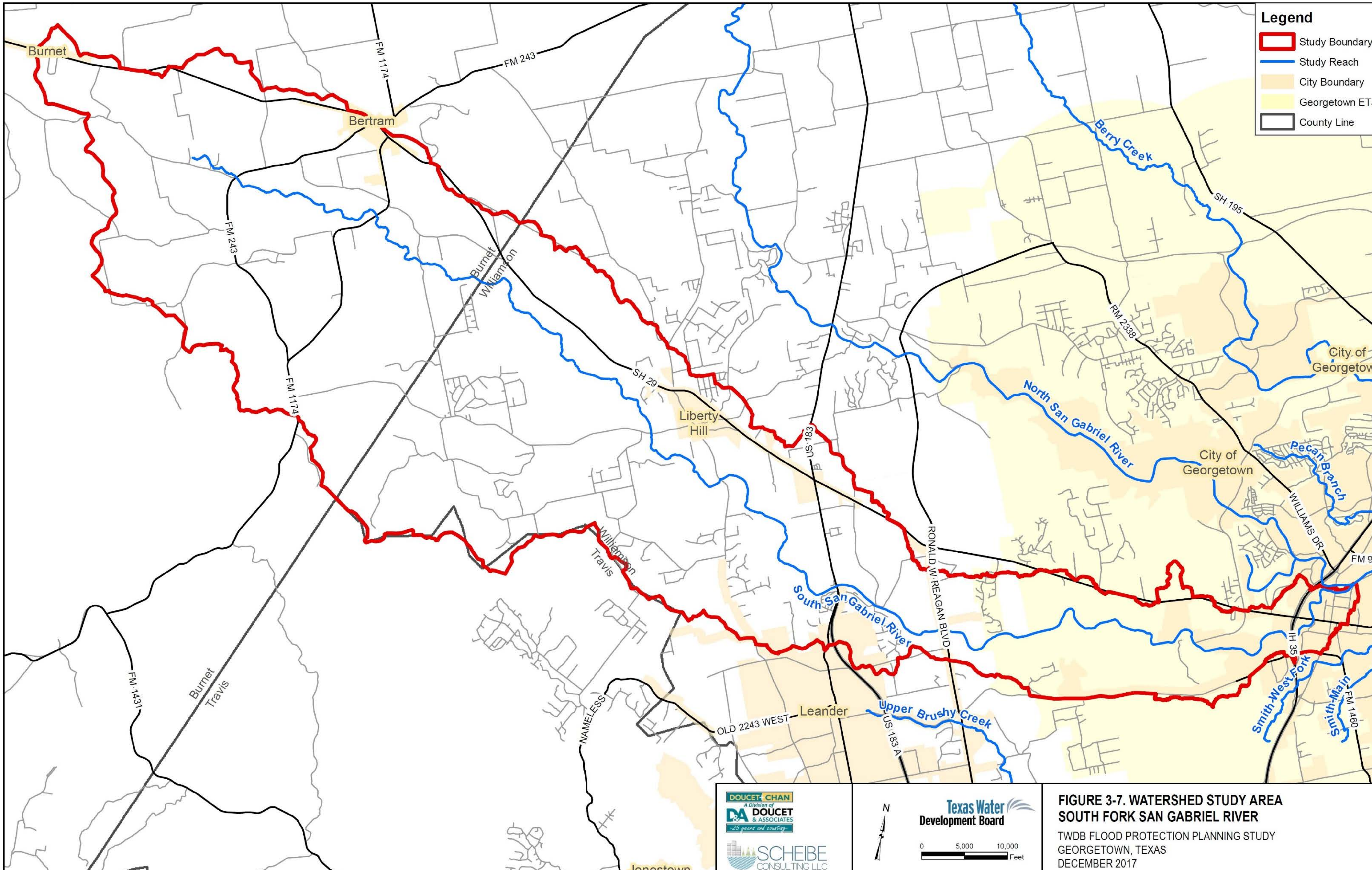


FIGURE 3-7. WATERSHED STUDY AREA SOUTH FORK SAN GABRIEL RIVER
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

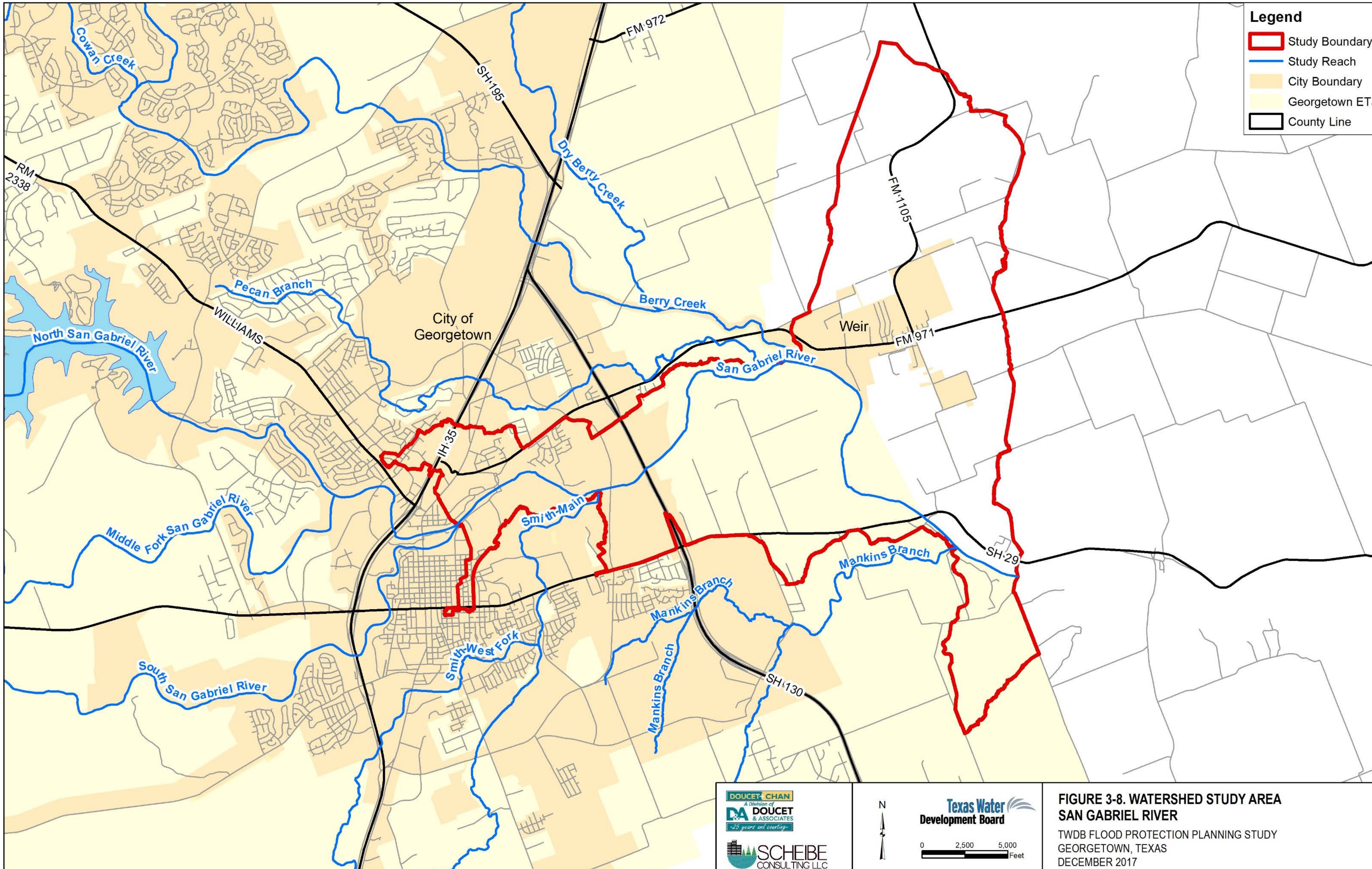


FIGURE 3-8. WATERSHED STUDY AREA SAN GABRIEL RIVER
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

4.0 Flood Protection Planning Study Methodology

Certain areas within the Study Area experience flooding problems on an annual basis. Other areas experience flooding only during significant rainfall events. The specific study areas included in this flood protection planning study were selected based on the data provided in the two applications to the Texas Water Development Board (TWDB) for flood protection planning grants and the impacts of relatively recent significant rainfall events. This FPPS provides mapping of the effective regulatory FEMA floodplains, existing development flow conditions floodplains, and future development flow conditions floodplains, as well as identifies structures that currently lie within the FEMA and updated existing development flow conditions floodplains. Areas with a significant number of structures shown to be at risk of flooding by the 100-year flood were initially considered as the study area focus for this FPPS. Based on meetings with Stakeholders and the public as well as site visits, a more specific list of problem areas was created.

Watershed delineations were generated for the identified problem areas based on available topographic information. The watershed boundaries were used in the hydrologic analysis, which led to the analysis of the 100-year storm events. Respective peak discharge rates and runoff hydrographs were developed for the existing development conditions available at the time of this analysis as well as for the projected fully developed conditions within the Study Area watersheds.

Following the hydrologic analysis, the water surface elevations and flood profiles were developed for the existing development and future development flow conditions for each Study Area stream. Hydrologic and hydraulic evaluations were performed in accordance with the criteria discussed in Appendix A and Appendix B of this report.

In general, the approach to evaluating the identified Study Area's existing stream systems included the following steps:

- Review the existing data available to be used in this study, including existing studies and plans;
- Subdivide the major watersheds into sub-watersheds based on watershed topography and drainage systems;
- Determine the subbasin hydrologic properties;
- Supplement available data with field reconnaissance and surveying;
- Determine the geometric properties of the channel and overbank features from available data, site reconnaissance, and field surveying;
- Develop design storm rainfall totals and time distribution;
- Develop the hydrologic modeling to estimate peak discharge rates and volumes at key locations;
- Develop detailed hydraulic models to determine water surface elevations and floodplain limits;
- Identify stream system and road crossing conveyance inadequacies;
- Develop and analyze conceptual alternatives to improve stream and crossing conveyance performance and minimize potential flooding and flood damages; and

- Select and prioritize the preferred alternatives for flood hazard mitigation.

This FPPS did not include validation of regulatory FEMA floodplains or formal delineation of new FEMA floodplains in currently unmapped areas of the Study Area. This FPPS is a planning document, and so, identified solutions will require further analysis and detailed definition in order to develop final plans to protect structures and road crossings from flooding.

4.1 Review of Historical Flooding and Existing Studies

Multiple data sources were used to determine where historical flooding problems have occurred and to identify potential solutions. Valuable input and information was received from:

- City of Georgetown Staff;
- Williamson County Staff;
- Texas Water Development Board Staff;
- The general public during Public Meetings and during follow-up conversations;
- U.S. Army Corps of Engineers.

This information was compiled during the FPPS and was constantly evaluated and updated throughout the planning process. In addition, the following specific information was received:

Table 4-1 Historical Flooding and Existing Studies

Report	Date	Author	Description
Interviews with City of Georgetown	2015	D+C	Interviews were conducted with floodplain administrator, engineering and maintenance personnel to help identify problem areas, causes of problems, and obtain recent floodplain studies.
City of Georgetown Drainage Master Plan	2000	Raymond Chan & Associates	This report details the drainage areas of Berry Creek, Mankins Branch, Pecan Branch, Smith Branch, and Middle Fork.
Hermine Storm Flood Complaints	2010	City of Georgetown	Compilation of Hermine Storm flood complaints
FEMA FIS and FIRM	2008	FEMA	FIS and FIRM panels

4.1.1 Berry Creek Watershed Study Area

The Sun City development is located within the Berry Creek Watershed. The development's plans and LOMR for Berry Creek were reviewed and incorporated into the study.

4.1.2 Mankins Branch Watershed Study Area

Excluding the City of Georgetown Drainage Master Plan, this FPPS study team is unaware of any ongoing or prior drainage studies relating to the Mankins Branch Study Area.

4.1.3 Pecan Branch Watershed Study Area

Local drainage studies have been performed for various developments within the Pecan Branch watershed (e.g., Georgetown Municipal Airport). While these studies generally focus on local drainage along tributaries and upland areas, and are not directly applicable to the regional focus of this FPPS, drainage information (i.e., flow patterns, land use, impervious coverage, etc.) were reviewed and used as appropriate. An informal report prepared by Paul J. Hanley documenting flooding issues within the Golden Oaks Estates Subdivision during the May 20, 2015 storm event was also incorporated into this study as appropriate.

4.1.4 Smith Branch Watershed Study Area

In June 2014, a FEMA LOMR application was submitted by Kasberg, Patrick & Associates, LP (KPA) on behalf of the City of Georgetown and was later accepted as effective on September 15, 2016. The 2016 LOMR detailed study established new peak flow rates and water surface elevations for the entire West Fork of Smith Branch and the main stem of Smith Branch up to approximately 1,000 feet north of CR 166. The LOMR models, results, and floodplains were reviewed and assessed as part of this study.

4.1.5 Middle Fork San Gabriel River Watershed Study Area

Excluding the City of Georgetown Drainage Master Plan, this FPPS study team is unaware of any ongoing or prior drainage studies relating to the Middle Fork Study Area.

4.1.6 North Fork San Gabriel River Watershed Study Area

The Water Management Section within the U.S. Corp of Engineers- Fort Worth District provided stage/storage/discharge information and historical data on Lake Georgetown.

4.1.7 South Fork San Gabriel River Watershed Study Area

The HEC-HMS hydrology models and spatial files developed as part of the Upper Brushy Creek Watershed Study and Flood Protection Plan and provided by Williamson County were reviewed for consistency with the South Fork San Gabriel River Watershed Study Area. Excluding the City of Georgetown Drainage Master Plan, the FFP study team is unaware of any other ongoing or prior drainage studies relating the South Fork San Gabriel River Watershed Study Area.

4.1.8 San Gabriel River Watershed Study Area

This FPPS study team is unaware of any ongoing or prior drainage studies relating to the San Gabriel River Study Area downstream of South Fork San Gabriel River confluence.

4.2 Hydrology Methodology

The purpose of the hydrologic analysis was to estimate peak discharge rates in key locations that were then used to evaluate capacities of the existing stream systems as well as assess proposed flood hazard mitigation measures. In general, the hydrologic analysis performed as part of this FPPS utilized the Unit Hydrograph Method and design storms as outlined in the Appendix A

Hydrology. Detailed information regarding the hydrologic analysis and the results of the analysis can be found in Appendix A.

4.3 Hydraulics and Floodplain Mapping Methodology

The purposes of the hydraulic analysis were to determine the flooding extents and depths within each community, evaluate capacities of existing streams and structures, and ultimately to size proposed flood hazard mitigation measures. The level of detail for hydraulic analysis was consistent throughout each study area, roughly equivalent to a FEMA Flood Insurance Study by detailed methods (Zone AE) with the exception that no floodway analyses were performed. A HEC-RAS hydraulic model was developed for each study stream to evaluate flows based on both existing and future watershed conditions. The HEC-RAS models were improved with collected field survey data and information from as-built construction plans. Detailed information regarding the hydraulic analyses inputs, methods, and results can be found in Appendix B.

4.4 Stakeholder and Public Input

Throughout the FPPS process, technical input was received from the City of Georgetown, Williamson County, TxDOT (and its consultants), U.S. Army Corps of Engineers, and key stakeholders during formal and informal working sessions as well as telephone consultation meetings. The first two working sessions were with the City of Georgetown staff and included identification of historic flood problem areas and flooded channel crossings and development of future land use assumptions. The third working session was with City of Georgetown staff and included discussion of preliminary floodplain mapping findings and preliminary identification of flooded structures and crossings within the Study Area floodplains. The fourth working session included City of Georgetown staff, Williamson County staff, and City of Leander staff and included discussion of proposed flood hazard mitigation alternatives, including selection of alternatives and prioritization of projects.

Working sessions were also conducted with TxDOT and its consultants with respect to TxDOT plans for improvements to I.H. 35 roadway, bridges and drainage structures through the City of Georgetown. Telephone consultations were conducted with the U.S. Army Corps of Engineers with respect to its normal and flood operations of Lake Georgetown and to obtain updated reservoir flood routing data.

Also throughout the FPPS process, public input was received at formal public meetings and through telephone consultation meetings. The first two public meetings received public comment on preliminary floodplain mappings and identification of historic flood problem areas and flooded channel crossings. Public comment continued after these first two meetings to further clarify the extent of flooding experienced by the public, especially during the Tropical Storm Hermine event. The third public meeting provided more detailed floodplain mapping and identification of flood problem areas and channel crossings throughout the Study Area.

4.5 Flood Hazard Problem Definition Methodology

Flood hazard problems, in the form of flooded structures in problem areas and flooded road crossings over streams were defined within each study area based on information provided by the stakeholders, information gathered at the public meetings, field reconnaissance, the hydrologic and hydraulic analyses performed as part of the FPPS, and information from previous studies. Areas and channel crossings currently experiencing flooding and areas at risk for potential flooding under Existing Conditions were identified as problem areas and as flooded road crossings. In some cases, multiple flooding issues were combined into a single problem area. The identified problem areas and flooded road crossings were discussed with the stakeholders during the second through fourth working sessions and agreed upon by the parties present.

Section 5 provides a summary of the identified flood hazard problems. The Appendix C "Project Alternatives Evaluation and Selection" provides a more detailed discussion of the methodology used to define the problem areas and flooded channel crossings.

4.6 Development of Project Alternative Methodology

For each identified problem area including flooded structures, multiple alternatives including structural and non-structural measures were initially considered to mitigate flooding issues associated with the problem area. For problem areas with a single clear and feasible solution, only one alternative was carried forward. Mitigation alternatives were developed with input from the community during public and stakeholder meetings. Each project alternative consisted of proposed improvements designed to meet the 100-year storm criteria whenever possible. Consideration was also given to the potential of causing or worsening any downstream problems with proposed improvements. Significant adverse impacts were identified in a few instances (e.g. Pecan Branch) but final designs of any improvements will need to consider this in each improvement location. Improvements considered include:

Structural Approach:

- Detention/Retention Facility;
- Channel Improvements, particularly using the Natural Channel Method;
- Roadway Bridge/Culvert Improvements;
- Levees/Berms/Floodwalls; and
- Combination of any of two or more of the above.

Non-Structural Approach:

- Update the COG Drainage Criteria Manual and existing land development ordinance as well as the other participating communities flood protection regulations, if necessary;
- Buy-outs of the flooded properties;
- Installation of Early Flood Warning systems;
- Installation of flood warning signs and barricades at frequent inundated roadway crossings; and
- Develop pubic information publications describing flood risks and flood insurance.

For each identified flooded road crossing, a crossing upgrade was designed to achieve the flood protection criteria of the local drainage criteria manual, subdivision regulations, or design & construction standards for each applicable jurisdiction (i.e., City of Georgetown, Williamson County, City of Leander, or City of Liberty Hill). Crossing upgrades were designed based on the current roadway classification (i.e., local, collector, or arterial) based on the City of Georgetown Transportation Plan and other available data. Crossing upgrades included upgrades to existing culvert crossings, replacement of existing culvert crossings with bridges, and upgrades to existing bridges as required to meet the local criteria.

4.7 Alternatives Evaluation & Selection Methodology

The identified flood mitigation alternatives were evaluated and selected based on their flood mitigation benefits, total project cost, and overall feasibility. Benefit/cost analyses were performed using ESRI ArcMap and spreadsheet software to evaluate the cost effectiveness of each alternative as described in Section 4.8. Flood mitigation benefits included estimated reduction in damages for structures (residences, commercial and public facilities).

Estimates of total project cost were developed for each problem area mitigation alternative and flooded crossing upgrade, which included structural costs associated with new culverts, bridges, and ponds, excavation and grading, demolition, potential utility relocations, temporary and permanent erosion controls, and repaving as applicable. Material and construction costs were based on unit prices from recent bid tabulations for similar regional construction projects. Design contingencies, engineering, permitting, and administrative costs were then added to develop a total project cost. At the request of the communities, easement and ROW acquisition costs were not included due to high level of variability. Therefore, potential easement acquisition efforts are qualitatively considered in final project prioritization as discussed in Section 4.9. The methodologies used for concept design and cost estimation of alternatives are described in Appendix C.

Two meetings were also conducted to present identified problem areas and obtain citizens and stakeholders input on the potential flood mitigation alternatives. A public meeting was held in July 2017 to review and discuss the new 100-year floodplain maps, identified problem areas, and potential mitigation alternatives for each area. The public meeting included representatives from the City of Georgetown, Williamson County, and TWDB. Additionally, a stakeholder meeting was held in November 2017 to review and discuss the various mitigation alternatives and roadway crossing upgrades. The stakeholder meeting included representatives from the City of Georgetown, the City of Leander, and Williamson County. In each meeting, problem areas and potential mitigation alternatives were presented, and technical input was provided to the meeting participants. Discussion items during the meeting included:

- Known flood problems and extent of identified problem areas;
- Basic issue(s) to be addressed by each project;
- Types of improvements associated with each project,
- Cost, location, and level of flood protection of each project;
- Technical and qualitative factors for each project; and
- The most favorable alternative for each project.

Tables C-2 through C-5 in Appendix C list the principal improvement components of each alternative. Table C-6 provides a listing of each mitigation alternative and crossing upgrade and its associated estimated construction cost.

4.8 Benefit-To-Cost Analysis Methodology

The relative feasibility of improvement alternatives is primarily measured by reviewing and comparing respective benefit factors. The total project cost for each alternative was estimated as described in Section 4.7 and Appendix C. The benefit of each alternative is the relative monetary savings (damage reduction) of a given improvement being "in-place", compared to it "not being in-place". This value is determined from the difference between estimated damages without the project and estimated damage with the project for a range of storm events with each having a defined frequency of occurrence.

For this analysis, in the absence of field surveyed finished floor elevation data, it was conservatively assumed that a structure fully or partially within the limits (foot print) of flooding was flooded, resulting in damages equal to the full WCAD improvement value for that flooded structure. The total structural damages associated with each storm frequency was multiplied by the annual probability for that frequency (e.g., total 5-year structural damage x 0.2), resulting in an annualized damage associated with each storm frequency. The sum of annual damages for all storm frequencies results in a total annualized damage estimate. The present value of the total annualized damage estimate over an assumed project life of 50-years were compared for with- and without-project conditions. The difference of these present values for each alternative is the flood mitigation benefit. The methodologies used for benefit/cost analyses of alternatives are described in detail in Appendix C.

The benefit-cost ratio is the most commonly applied tool for determining the cost-effectiveness of undertaking an improvement. In general, when the benefits expected exceed the cost of implementation, the project can be deemed viable. However, the methodology used in this analysis provides a more qualitative benefit-cost ranking factor for the purposes of project prioritization and may not definitively indicate project viability. The methodology does provide a good tool for comparing various alternatives in the context of costs and benefits and allows comparisons between alternatives.

4.9 Flood Hazard Mitigation Definition and Prioritization Methodology

During working sessions three and four, the stakeholders agreed to the general evaluation criteria and the prioritization criteria of the recommended flood hazard mitigation projects. The result of the working session was a prioritized list of projects throughout the Study Area that will help identify the relative priority for funding the various projects.

Section 6 provides a summary of the recommended flood hazard mitigation projects and their construction costs. Section 7 provides a summary of the prioritization of the recommended flood hazard mitigation projects. Appendix C provides detailed discussion of the costs and methodology used to prioritize the recommended flood hazard mitigation projects.

5.0 Identified Flood Hazard Problems

Initial phases of the Georgetown – San Gabriel FPPS process included:

- Review of previous studies;
- Field reconnaissance of the study areas;
- Hydrologic and hydraulic analyses and floodplain mapping for each study area;
- Discussions with the public and stakeholders.

These activities resulted in identifying specific problem areas and flooded road crossings within each study area. The problem areas with flooded structures are identified with an alpha-numeric identification numbers representing the study area and numbered sequentially. For example, the specific problem areas discussed in this FPPS for the Berry Creek Watershed Study Area are identified as BC01, BC02, BC03, etc. The flooded road crossings are identified by the roadway name. The following sections provide a general description of the problems and flooded crossings identified in each study area followed by more detailed description of each identified problem area and flooded crossing.

5.1 Berry Creek Watershed Study Area

Flooding issues were identified in the Berry Creek Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of residences, property and road crossings located along Berry Creek are the primary concern in this area.

Berry Creek has a total drainage area of 125.4 square miles, causing a significant amount of uncontrolled water to be carried to downstream residential areas lining tributaries and the main channel. As large flows reach the residential areas, limited stream flow capacity results in the flooding of homes, property and road crossings.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the Berry Creek, Dry Berry Creek and Cowan Creek channels. However, there are several locations where the 100-year Existing Conditions floodplain significantly exceeds the boundaries of the existing 100-year Effective FEMA floodplain as shown on floodplain mapping in Appendix B.

There are a significant number of identified flood hazard issues associated with the Berry Creek main channel and along its tributaries Cowan Creek and Dry Berry Creek. Along the Berry Creek, Cowan Creek and Dry Berry Creek channels there were 25 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event within the floodplain (there were more reports of flooded structures outside the floodplain), and there are 54 structures identified in this FPPS as potentially flooded by the 100-year Existing Conditions flood event within five problem areas. It also must be considered that some homes flooded during Tropical

Storm Hermine but homeowners elected to not report the flooding. Eleven significant roadway channel crossings are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flood problem area and flooded channel crossing shown on Figure 5-1.

5.1.1 RM 2338/Andice Road Crossing

The existing crossing (eight 9'x7' box culverts) across Cowan Creek is flooded beginning at the 50-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 1.2 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through its Right-of-Way.

5.1.2 CR 245 Crossing

The existing crossing (two 8'x4' box culverts and two 3' arch culverts) across Cowan Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 2.0 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through its Right-of-Way.

5.1.3 BC01 Problem Area

Uncontrolled flows originating in the Cowan Creek watershed and development within the watershed result in the flooding of 6 residential structures along Independence Creek Lane, upstream of the Cool Spring Way crossing. Approximately 1,300 feet of the floodplain along the south side of the Cowan Creek channel experiences flooding due to inadequate conveyance capacity.

5.1.4 CR 241

The existing crossing (bridge with 155' length of opening) across Berry Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 1.1 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.5 CR 245

The existing crossing (bridge with 180' length of opening) across Berry Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 4.7 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.6 BC02 Problem Area

Uncontrolled flows originating in the main Berry Creek watershed and development within the watershed result in the flooding of 14 residential structures along Bonham Loop, Crockett Loop, Dawson Trail, Dove Hollow Trail, and Fox Home Lane, upstream of the Sun City Boulevard crossing. Approximately 1,400 feet of the floodplain along the north and south sides of the Berry Creek channel experiences flooding due to inadequate conveyance capacity.

5.1.7 Sun City Boulevard Crossing

The existing crossing (bridge with 110' length of opening) across Berry Creek is flooded beginning at the 50-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 2.0 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.8 BC03 Problem Area

Uncontrolled flows originating in the main Berry Creek watershed and tributary Cowan Creek watershed and development within the watersheds result in the flooding of 15 residential structures along Great Frontier Drive, Stockman Trail, Warbler Way, and Painted Bunting Lane, between the Sun City Boulevard crossing and the Del Webb Boulevard crossing. Approximately 1,300 feet of the floodplain along the north and south sides of the Berry Creek channel experiences flooding due to inadequate conveyance capacity.

5.1.9 BC04 Problem Area

Uncontrolled flows originating in the main Berry Creek and Cowan Creek watersheds as well as from development within those watersheds result in flooding of 8 residential structures along Durango Trail and Crystal Springs Drive, downstream of the Del Webb Boulevard crossing. Approximately 3,400 feet of the floodplain along the north and south sides of the Berry Creek channel experiences flooding due to inadequate conveyance capacity.

5.1.10 BC05 Problem Area

Uncontrolled flows originating in the main Berry Creek and Cowan Creek watersheds as well as from development within those watersheds result in flooding of 11 residential structures along Lone Star Drive and Trail Rider Way, downstream of the Del Webb Boulevard crossing. Approximately 1,600 feet of the floodplain along the north side of the Berry Creek channel experiences flooding due to inadequate conveyance capacity.

5.1.11 CR 152

The existing crossing (bridge with 200' length of opening) across Berry Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 7.6 feet over the approach roadway profile and a maximum of 0.6' over the bridge crossing profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.12 FM 971

The existing crossing (bridge with 300' length of opening) across Berry Creek is flooded beginning at the 25-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 4.6 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.13 Live Oaks Trail

The existing crossing (four 8'x4' box culverts) across Dry Berry Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 4.0 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.14 CR 234

The existing crossing (eight 7' arch culverts) across Dry Berry Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 4.4 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.15 CR 143

The existing crossing (five 12'x6' box culverts) across Dry Berry Creek is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 5.6 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.1.16 CR 152

The existing crossing (bridge with 400' length of opening) across Dry Berry Creek is flooded beginning at the 50-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 1.3 feet over the approach roadway surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.2 Mankins Branch Watershed Study Area

Flooding issues were identified in the Mankins Branch Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of road crossings located along Mankins Branch are the primary concern in this area.

Mankins Branch has a total drainage area of 13.2 square miles, causing a significant amount of uncontrolled water to be carried to the main and tributary channels. As the large flows reach these channels, the channels become restricted, resulting in the flooding of several road crossings.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries all along the Mankins Branch channel as shown on floodplain mapping in Appendix B.

The only identified flood hazard issues associated with Mankins Branch are the four significant roadway channel crossings that are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flooded channel crossing shown on Figure 5-2.

5.2.1 Hutto Road Crossing

The existing crossing (four 4.5’ arch culverts) is flooded beginning at the 25-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 1.0 feet over the crossing’s road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.2.2 CR 104/Bell Gin Road Crossing

The existing crossing (4’ culvert) is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 2.0 feet over the crossing’s road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.2.3 CR 100/McShepherd Road Crossing

The existing crossing (three 4’ arch culverts) is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 10.9 feet over the crossing’s road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.2.4 Rockridge Lane Crossing (not shown on Figure 5-2)

The existing crossing (nine 3.5’ arch culverts) is flooded beginning at the design 100-year Existing Conditions event, and the design 100-year Existing Conditions event flood depth is a maximum of 0.2 feet over the crossing’s road surface profile. This crossing is not considered a significant crossing due to its proximity to S.E. Inner Loop to bypass the crossing in case of flood overtopping.

5.3 Pecan Branch Watershed Study Area

Flooding issues were identified in the Pecan Branch Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of residences, property and road crossings located along Pecan Branch are the primary concern in this area. It should be noted that this study focuses on the main stem of Pecan Branch as the source of flooding and does not evaluate local flooding potential or flooding due to tributaries to Pecan Branch.

Pecan Branch has a total drainage area of 7.3 square miles, causing a significant amount of uncontrolled water to be carried to downstream residential areas lining the tributaries and main channel. As the large flows reach the residential areas, the channels become restricted, resulting in the flooding of homes, property and several road crossings.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the Pecan Branch channel. However, there are several areas (primarily upstream of I.H. 35) where the FPPS floodplain differs from the boundaries of the Effective FEMA floodplain as shown on floodplain mapping in Appendix B.

There are a significant number of identified flood hazard issues associated with the main stem of Pecan Branch. There were 24 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event, and there are 33 structures identified as potentially flooded by the 100-year Existing Conditions flood event within five problem areas. Eleven (11) significant road crossings are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flood problem area and flooded road crossing shown on Figure 5-3.

5.3.1 PB01 Problem Area – Golden Oaks Subdivision

The Golden Oaks Subdivision located within the City of Georgetown ETJ between Lakeway Drive and Airport Road just west of I.H. 35 includes 17 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event and 8 structures identified as potentially flooded by the 100-year Existing Conditions flood event. The subdivision includes two local roads as emergency access routes: Shady Hollow Drive and Golden Oaks Road, both of which are flooded in storm events as frequent as the 5-year event. Homes within this subdivision are located within the heavily wooded channel and overbank areas and may experience property and structure flooding in storm events as frequent as the 5-year event.

5.3.2 PB02 Problem Area – I.H. 35 Crossing

The Pecan Branch crossing of the I.H. 35 southbound access and main lanes/northbound access road each consist of three (3) 10’x8’ concrete box culverts and are flooded in storm events as frequent as the 25-year event and 100-year event, respectively. Due to its undersized culverts, I.H. 35 impounds a significant amount of water roughly one quarter mile upstream (west) of the crossing; however, no structures appear to be flooded due to the crossing. In the past, this flooded crossing has resulted in loss of life, and therefore, is considered a significant flood problem area. Mitigation alternatives for this problem area must consider hydrologic impacts of removing flood volume storage if the culvert capacity is increased.

5.3.3 PB03 Problem Area – Serenada Subdivision

The Serenda Subdivision located within the City of Georgetown ETJ between West Sequoia Spur and Northwest Boulevard north of Williams Drive 8 structures identified as potentially flooded by the 100-year Existing Conditions flood event. There were no residents who reported flooding during the Tropical Storm Hermine event; however, significant development has occurred within the watershed since this event in 2010. The subdivision includes a number of flooded crossings along collector roadways including West Sequoia Spur, Esparada Drive, and Serenada Drive, as well as flooded local roadways with alternate emergency access routes including La Paloma Drive, Val Verde Drive, and Seville Drive. Homes within this subdivision are located within the heavily wooded channel and overbank areas and may experience property and structure flooding in storm events as frequent as the 5-year event.

5.3.4 PB04 Problem Area – Canyon Road / Reata Trails

Canyon Road is located within the Georgetown City Limits in the Reata Trails Subdivision on the east side of Northwest Boulevard. This area includes 9 structures along the east side of Canyon Road whose residents reported some degree of flooding during the Tropical Storm Hermine event and 13 structures identified as potentially flooded by the 100-year Existing Conditions flood event. These homes are located along the west side of Pecan Branch where the channel capacity is reduced due to a large earthen outcropping along the east bank.

5.3.5 PB05 Problem Area – Lonnie Thomas Road

Lonnie Thomas Road is located within the City of Georgetown ETJ just west of CR 152. This area includes 4 structures identified as potentially flooded by the 100-year Existing Conditions flood event. There were no residents who reported flooding during the Tropical Storm Hermine event; however, significant development has occurred within the watershed since this event in 2010. Homes in this area are located in close proximity to the channel along the north side of Pecan Branch.

5.3.6 West Sequoia Spur Crossing

The existing crossing (single 48” dia. CMP) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 2.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.7 Esperada Drive Crossing

The existing crossing (one (1) 3.25’ and three (3) 5’ CMP arch culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 2.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.8 Serenada Drive Crossing

The existing crossing (two (2) 3’ and three (3) 5’ CMP arch culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 2.8 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.9 West Shady Hollow Drive Crossing

The existing crossing (four (4) 4’ CMP arch culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 4.5 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. This crossing is a classified as a local roadway with no alternate emergency access route.

5.3.10 West Golden Oaks Road Crossing

The existing crossing (three (3) 5’ CMP arch culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 5.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. This crossing is a classified as a local roadway with no alternate emergency access route.

5.3.11 Airport Road Crossing

The existing crossing (four (4) 3.2’ CMP arch culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 10.2 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. Since the City of Georgetown has indicated no plans to upgrade this crossing and the possibility of closing the roadway altogether, this crossing is not included in further analysis. Hydraulic impacts due to removal of the crossing were found to be negligible due to the low elevation of the roadway and its close proximity to the backwater effects of I.H. 35.

5.3.12 Austin Avenue Crossing

The existing crossing (three (3) 8’ x 8’ concrete box culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 2.4 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.13 CR 151 Crossing

The existing crossing (five (5) 6.4’ CMP arch culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 2.9 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.14 Northeast Inner Loop Crossing

The existing crossing (six (6) 6.4’ CMP arch culverts) across Pecan Branch is flooded beginning at the 25-year flood event, and the design 100-year Existing Conditions event flood depth is 2.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.15 CR 152 Crossing

The existing crossing (single 1.6’ CMP arch culvert) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 4.1 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.3.16 FM 971 Crossing

The existing crossing (five (5) 8’ x 5’ concrete box culverts) across Pecan Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 3.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.4 Smith Branch Watershed Study Area

Flooding issues were identified in the Smith Branch Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of residences, property and road crossings located along main stem and west fork of Smith Branch are the primary concern in this area.

Smith Branch has a total drainage area of 9.2 square miles, causing a significant amount of uncontrolled water to be carried to downstream residential areas lining the tributaries and main channels. As the large flows reach the residential areas, the channels become restricted, resulting in the flooding of homes, property and several road crossings.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the Smith Branch channel as shown on floodplain mapping in Appendix B.

There are a significant number of identified flood hazard issues associated with the main stem of Smith Branch. There were 29 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event, and there are 17 structures identified as potentially flooded by the 100-year Existing Conditions flood event within three problem areas. Seven (7) significant road crossings are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flood problem area and flooded road crossing shown on Figure 5-4.

5.4.1 SB01 Problem Area – West Fork Confluence

The area surrounding the West Fork confluence with Smith Branch, located primarily within the Georgetown City Limits and entirely within its ETJ, includes 18 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event (8 of which have since been bought out by the City of Georgetown) and 6 remaining structures identified as potentially flooded by the 100-year Existing Conditions flood event. Flooded structures are located within the Quail Valley Subdivision along the main stem of Smith Branch and within the University Park Subdivision due to overflows from the West Fork to the north along Quail Valley Drive. Channel capacity in this problem area is limited due to a constriction along the east bank of the main stem immediately downstream of the West Fork confluence. The hydraulic efficiency of the confluence is also impaired by the near 90-degree angle at which the West Fork enters the main stem. Furthermore, the undersized culvert crossing at Quail Valley Drive has the potential to back water up to the north through the University Park Subdivision in extreme storm events.

5.4.2 SB02 Problem Area – Rabbit Hollow Subdivision

The Rabbit Hollow Subdivision located within the City of Georgetown ETJ along the main stem of Smith Branch northwest of the intersection of FM 1460 and the Southeast Inner Loop includes 6 structures identified as potentially flooded by the 100-year Existing Conditions flood event. There were no residents who reported flooding during the Tropical Storm Hermine event; however, development has occurred within the watershed since this event in 2010, and the event itself may not have resulted in 100-year flood levels within this area. Homes within this subdivision are located within a low-lying area near the channel and may experience property and structure flooding in storm events as frequent as the 5-year event.

5.4.3 SB03 Problem Area – Williamson County Juvenile Justice Center

The Williamson County Juvenile Justice Center (WCJJC) is located along the main stem of Smith Branch within the Georgetown City Limits just inside of the Southeast Inner Loop. While outside of the 100-year Existing Conditions floodplain limits, WCJJC has been identified as a potentially flooded structure by Williamson County staff, as it has experienced some degree of flooding since its construction circa 2002.

5.4.4 CR 166 Crossing

The existing crossing (two (2) 3.2’ CMP arch culverts) across Smith Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 2.7 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. This crossing is a classified as a local roadway with no alternate emergency access route.

5.4.5 I.H. 35 Southbound Frontage Road Crossing

The existing crossing (three (3) 7’ x 6’ concrete box culverts) across the West Fork of the Smith Branch is flooded beginning at the 100-year flood event, and the design 100-year Existing Conditions event flood depth is 3.5 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.4.6 Madison Oaks Avenue Crossing

The existing crossing (four (4) 10’ x 6’ concrete box culverts) across Smith Branch is flooded beginning at the 25-year flood event, and the design 100-year Existing Conditions event flood depth is 1.6 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. This crossing is a commercial driveway serving several businesses including a Greyhound bus station with no alternate emergency access route.

5.4.7 S. Austin Avenue Crossing

The existing crossing (four (4) 9’ x 7’ concrete box culverts) across Smith Branch is flooded beginning at the 100-year flood event, and the design 100-year Existing Conditions event flood depth is 0.8 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.4.8 Quail Valley Drive Crossing

The existing crossing (six (6) 8’ x 4’ concrete box culverts) across Smith Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 3.8 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. This crossing is included in flood problem area SB01.

5.4.9 E. University Avenue Crossing

The existing crossing (118’ span bridge) across Smith Branch is flooded beginning at the 25-year flood event, and the design 100-year Existing Conditions event flood depth is 1.8 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing. This crossing is a classified as a local roadway with no alternate emergency access route.

5.4.10 Smith Creek Road Crossing

The existing crossing (single 4.6’ x 8.1’ concrete box culvert) across Smith Branch is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is 6.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 100-year Existing Conditions flood event through the crossing.

5.5 Middle Fork San Gabriel River Watershed Study Area

Flooding issues were identified in the Middle Fork San Gabriel River Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of road crossings located along the Middle Fork San Gabriel River are the primary concern in this area.

Middle Fork San Gabriel River has a total drainage area of 16.9 square miles, causing a significant amount of uncontrolled water to be carried to the main channel. As the large flows reach the channel, the channel becomes restricted, resulting in the flooding of several road crossings.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the Middle Fork San Gabriel River channel. However, the 100-year Existing Conditions floodplain significantly exceeds the boundaries of the existing 100-year Effective FEMA floodplain from Estancia Way to Gabriel Forest as shown on floodplain mapping in Appendix B.

The only identified flood hazard issues associated with Middle Fork San Gabriel River are the three significant road crossings that are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flooded channel crossing shown on Figure 5-5.

5.5.1 Cross Creek Road Crossing

The existing crossing (four 5’ culverts) is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 4.0 feet over the crossing’s road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.5.2 Cedar Hollow Road Crossing

The existing crossing (four 4’ arch culverts) is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 7.1 feet over the crossing’s road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.5.3 Rancho Bueno Drive Crossing

The existing crossing (six 4’ culverts) is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 5.3 feet over the crossing’s road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.6 North Fork San Gabriel River Watershed Study Area

Flooding issues were identified in the North Fork San Gabriel River Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of residences, property and road crossings located along North Fork San Gabriel River are the primary concern in this area.

North Fork San Gabriel River has a total drainage area of 251.0 square miles. Approximately 246.4 square miles of its drainage area discharges into Lake Georgetown (an in-line U.S. Army Corps of Engineers flood control reservoir), and approximately 4.6 square miles of its drainage area is between Lake Georgetown and the confluence with the San Gabriel River. The runoff from the uncontrolled drainage area upstream of Lake Georgetown causes a significant amount of uncontrolled water to be carried to downstream residential areas lining the main channel. As the large flows reach the residential areas, the channels become restricted, resulting in the flooding of homes, property and several road crossings.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the North Fork San Gabriel River channel and within the Lake Georgetown 100-year flood pool. However, the 100-year Existing Conditions floodplain significantly exceeds the boundaries of the existing 100-year Effective FEMA floodplain between Lake Georgetown and Northcross Road as shown on floodplain mapping in Appendix B.

There are several identified flood hazard issues associated with the North Fork San Gabriel River main channel. There were 3 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event within the floodplain (there were more reports of flooded structures outside the floodplain), and there are 15 structures identified as potentially flooded by the 100-year Existing Conditions flood event within three flood problem areas. Nine significant road crossings are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flood problem area and flooded road crossings shown on Figure 5-6.

5.6.1 FM 2340 Crossing

The existing crossing (bridge with 36' length of opening) is flooded beginning at the 5-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 3.6 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.2 CR 203 Crossing

The existing crossing (9" culvert) is flooded beginning at the 5-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 4.2 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.3 CR 202 Crossing

The existing crossing (two 2' culverts) is flooded beginning at the 5-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 1.2 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.4 RM 963 Crossing

The existing crossing (bridge with 100' length of opening) is flooded beginning at the 25-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 0.6 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.5 RM 1174 Crossing

The existing crossing (bridge with 250' length of opening) is flooded beginning at the 25-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 0.7 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.6 CR 200 Crossing

The existing crossing (bridge with 140' length of opening) is flooded beginning at the 10-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 2.8 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.7 FM 243 Crossing

The existing crossing (bridge with 200' length of opening) is flooded beginning at the 25-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 1.7 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.8 NF01 Problem Area

Uncontrolled flows originating in the North Fork San Gabriel River watershed upstream of Lake Georgetown and development within the watershed result in the flooding of 9 residential structures along River Road, approximately 2.5 miles upstream of U.S. 183. Approximately 4,600 feet of the floodplain along the south and west side of the North San Gabriel River channel experiences flooding due to inadequate conveyance capacity.

5.6.9 CR 257 Crossing

The existing crossing (bridge with 175' length of opening) is flooded beginning at the 10-year flood event, and the design 25-year Existing Conditions event flood depth is a maximum of 3.7 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 25-year Existing Conditions flood event through the Right-of-Way.

5.6.10 NF02/NF03 Problem Areas

Uncontrolled flows originating in the North Fork San Gabriel River watershed upstream of Lake Georgetown and development within the watershed result in the flooding of 6 residential structures (with possibility of one or two commercial structures in this area as well) along CR 256, between U.S. 183 and Ronald W. Reagan Boulevard crossings. Approximately 3,100 feet of the floodplain along the north side of the North Fork San Gabriel River channel experiences flooding due to inadequate conveyance capacity.

5.6.11 CR 258 Crossing

The existing crossing (bridge with 70' length of opening) is flooded beginning at the 5-year flood event, and the design 100-year Existing Conditions event flood depth is a maximum of 22.6 feet over the crossing's road surface profile. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to safely convey the design 100-year Existing Conditions flood event through the Right-of-Way.

5.7 South Fork San Gabriel River Watershed Study Area

Flooding issues were identified in the South Fork San Gabriel River Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of residences, property and road crossings located along the main stem of the South Fork San Gabriel River are the primary concern in this area.

South Fork San Gabriel River has a total drainage area of 134.5 square miles, causing a significant amount of uncontrolled water to be carried to downstream residential areas lining the tributaries and main channel.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the South Fork San Gabriel River as shown on Figure B-8 of Appendix B.

There are several identified flood hazard issues associated with the South Fork San Gabriel River. There were 2 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event, and there are 9 structures identified as potentially flooded by the 100-year Existing Conditions flood event within a single flood problem area. Three significant roadway crossings are flooded within this study area.

The following sections describe the specific flood hazard issues associated with each flood problem area and flooded channel crossing shown on Figure 5-7.

5.7.1 SFSG01 Problem Area – High Gabriel / S. San Gabriel Ranches

The High Gabriel and South San Gabriel Ranches Subdivisions located within the City of Leander ETJ just east of U.S. 183 includes 9 structures identified as potentially flooded by the 100-year Existing Conditions flood event. There were no residents who reported flooding during the Tropical Storm Hermine event; however, significant development has occurred within the watershed since this event in 2010. Homes within this subdivision are located within the low-lying overbank areas of the river and may experience property and structure flooding during the 100-year storm event.

5.7.2 CR 330B Crossing

The existing crossing (two (2) 4’ CMP culverts) is flooded beginning at the 5-year flood event, and the design 25-year Existing Conditions event flood depth is 2.7 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 25-year Existing Conditions flood event through the crossing.

5.7.3 CR 323 Crossing

The existing crossing (60’ span bridge) is flooded beginning at the 5-year flood event, and the design 25-year Existing Conditions event flood depth is 15.0 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 25-year Existing Conditions flood event through the crossing.

5.7.4 FM 1869 Crossing

The existing crossing (210’ span bridge) is flooded beginning at the 25-year flood event, and the design 25-year Existing Conditions event flood depth is 1.9 feet over the crossing. Based on site reconnaissance observations and hydraulic analysis, the crossing does not have sufficient capacity to convey the design 25-year Existing Conditions flood event through the crossing.

5.8 San Gabriel River Watershed Study Area

Flooding issues were identified in the San Gabriel River Watershed Study Area based on information gathered from City of Georgetown staff, public input, information gathered from site visits, previous studies, FPPS hydrologic and hydraulic analyses, as well as floodplain mapping. Flooding of residences and property located along the San Gabriel River are the primary concern in this area.

San Gabriel River has a total drainage area of 575.9 square miles, although 246.4 square miles empty into Lake Georgetown that captures and controls a majority of storm runoff, even runoff from a 100-year event. The runoff from the remaining 329.5 square mile uncontrolled drainage area causes a significant amount of uncontrolled water to be carried to downstream residential areas lining the main channel. As the large flows reach the developed areas, the channels become restricted, resulting in the flooding of homes and property.

The 100-year Existing Conditions floodplain developed by this FPPS reasonably follows the Effective FEMA floodplain boundaries along most of the San Gabriel River channel. However, the 100-year Existing Conditions floodplain significantly exceeds the boundaries of the existing 100-year Effective FEMA floodplain at the San Gabriel River’s confluence with Pecan Branch and Berry Creek as shown on floodplain mapping in Appendix B.

There are several identified flood hazard issues associated with the San Gabriel River main channel. There were 3 structures whose residents reported some degree of flooding during the Tropical Storm Hermine event within the floodplain (there were more reports of flooded structures outside the floodplain), and there are 26 structures identified as potentially flooded by the 100-year Existing Conditions flood event within two flood problem areas. There are no significant road crossings that are flooded within this study area.

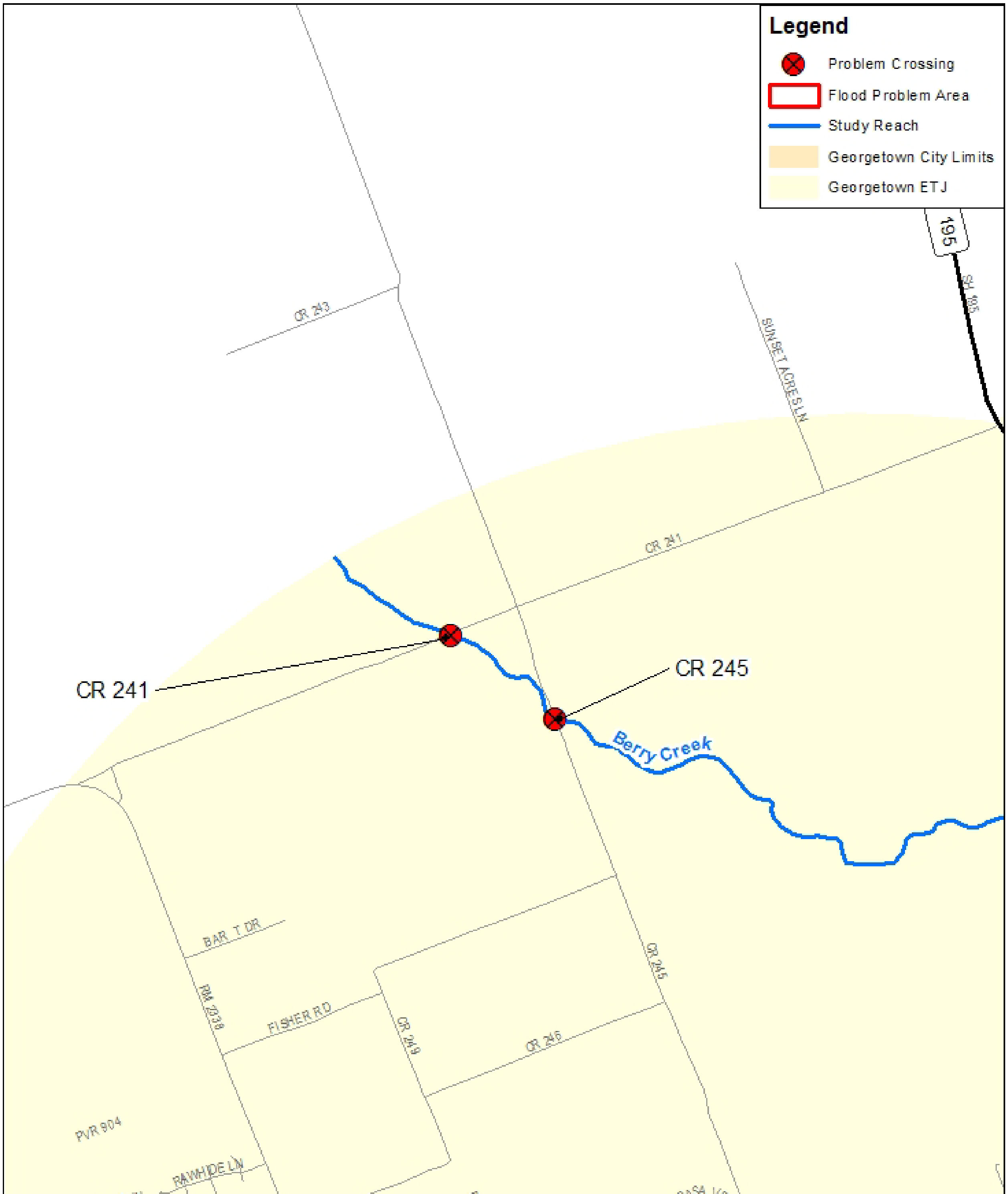
The following sections describe the specific flood hazard issues associated with each flood problem area shown on Figure 5-8.

5.8.1 SG01 Problem Area

Flows originating in the North Fork San Gabriel River downstream of Lake Georgetown, South Fork San Gabriel River, Middle Fork San Gabriel River, Pecan Branch, Berry Branch, and Mankins Branch and development within the watershed are resulting in the flooding of 10 residences along CR 103, downstream of the confluence with Berry Creek and Pecan Branch. Approximately 5,400 feet of the floodplain along the south side of the San Gabriel River channel is experiencing flood hazard flooding due to inadequate conveyance capacity.

5.8.2 SG02 Problem Area

Flows originating in the North Fork San Gabriel River downstream of Lake Georgetown, South Fork San Gabriel River, Middle Fork San Gabriel River, Pecan Branch, Berry Branch, and Mankins Branch and development within the watershed are resulting in the flooding of 16 residences (excluding RV trailers in a mobile home park in this area) along McShepherd Road, S.H. 29, Water Valley Drive, and Grist Mill Loop, downstream of the CR 100 crossing. Approximately 4,100 feet of the floodplain along the south and north sides of the San Gabriel River channel are experiencing flood hazard flooding due to inadequate conveyance capacity.



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Texas Water Development Board
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FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
Page 1 of 7

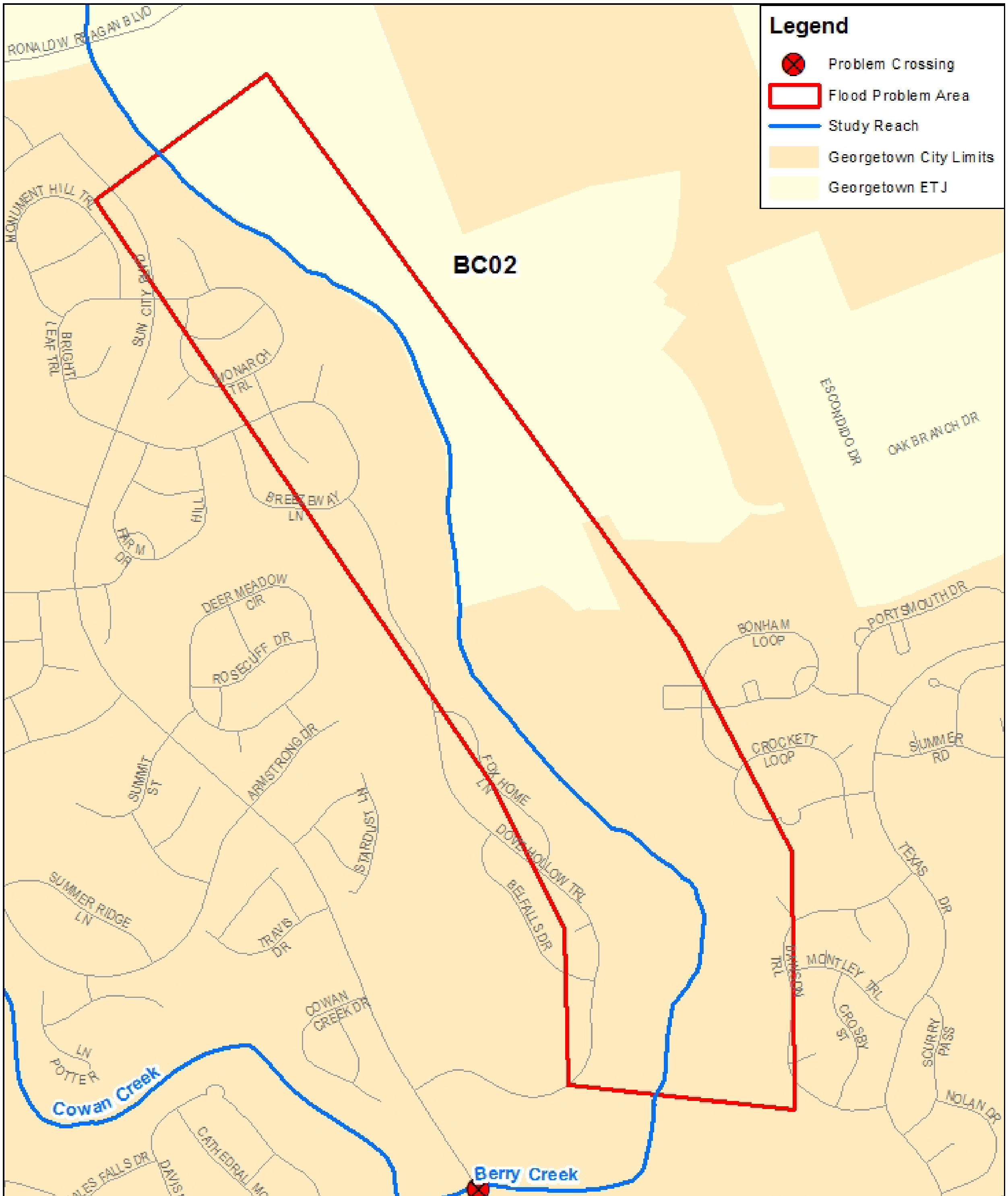

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FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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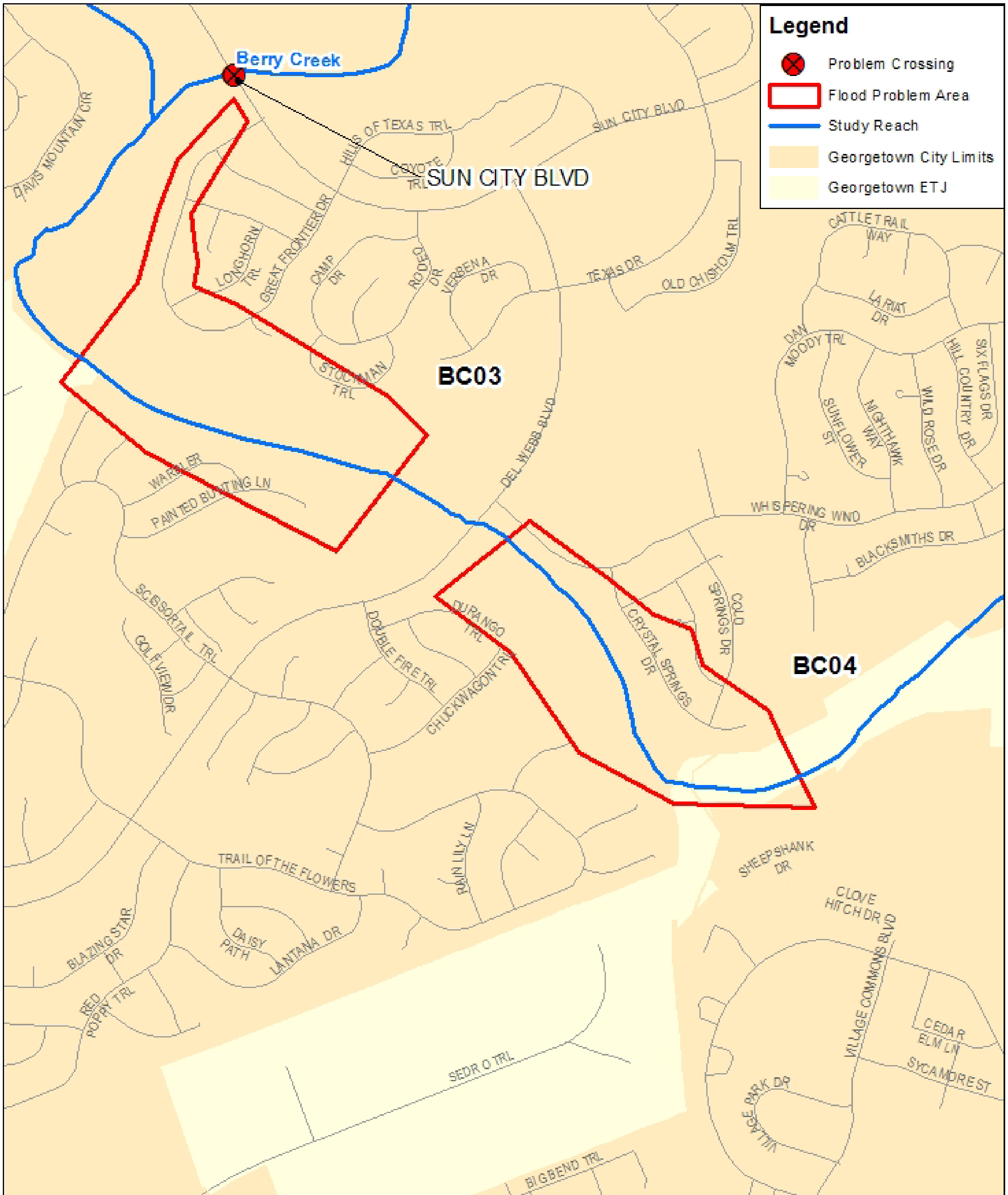

FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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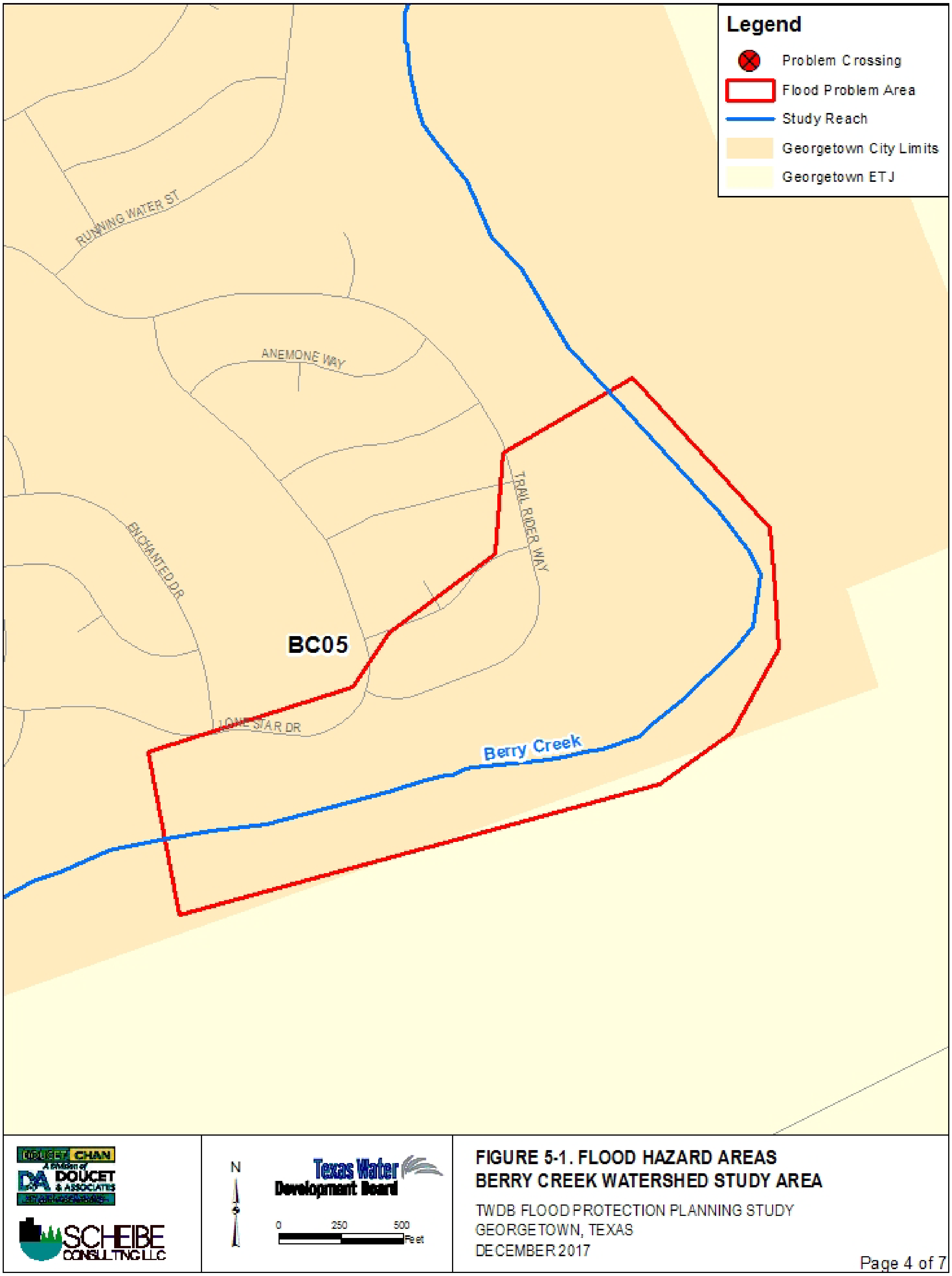

FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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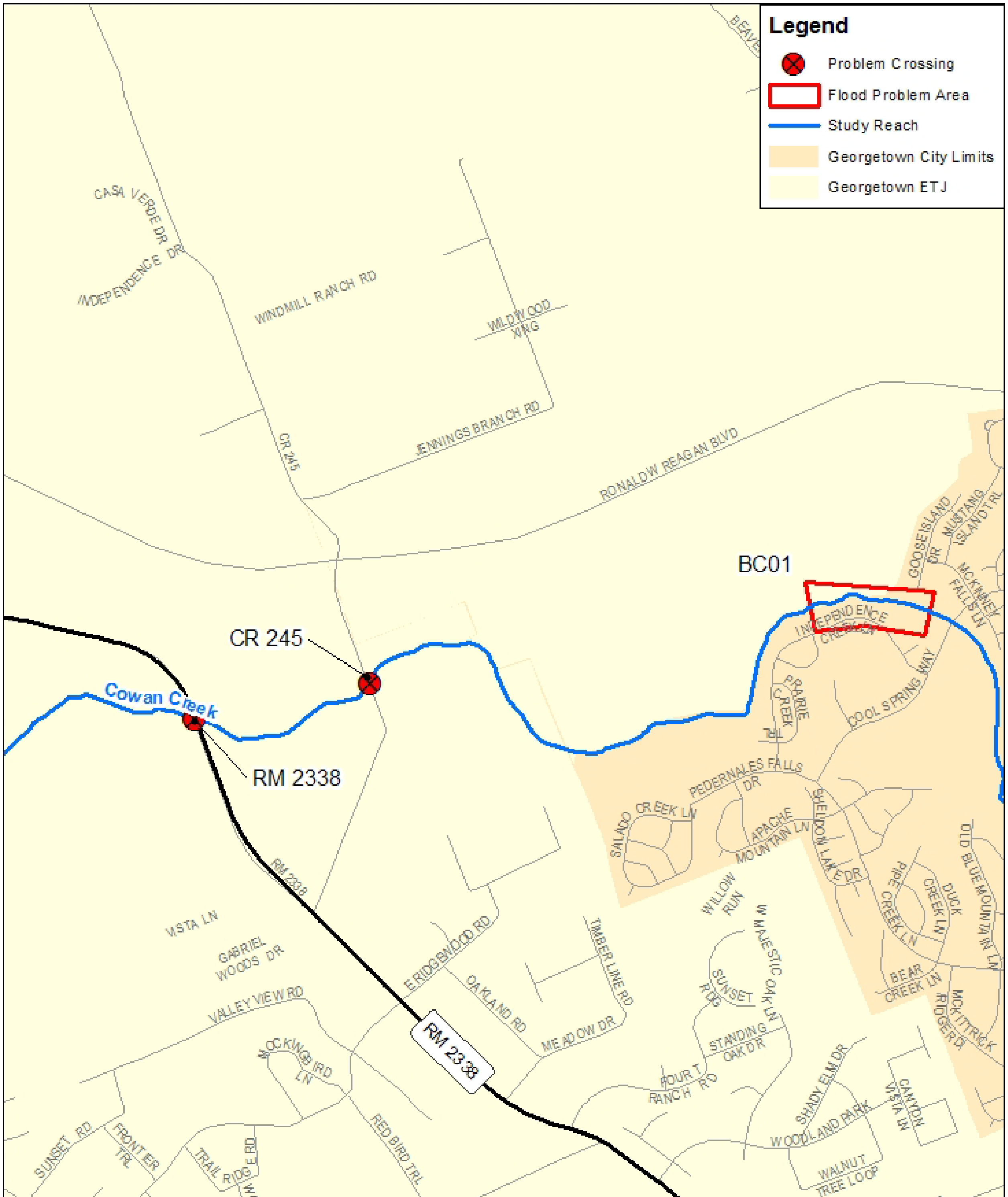

FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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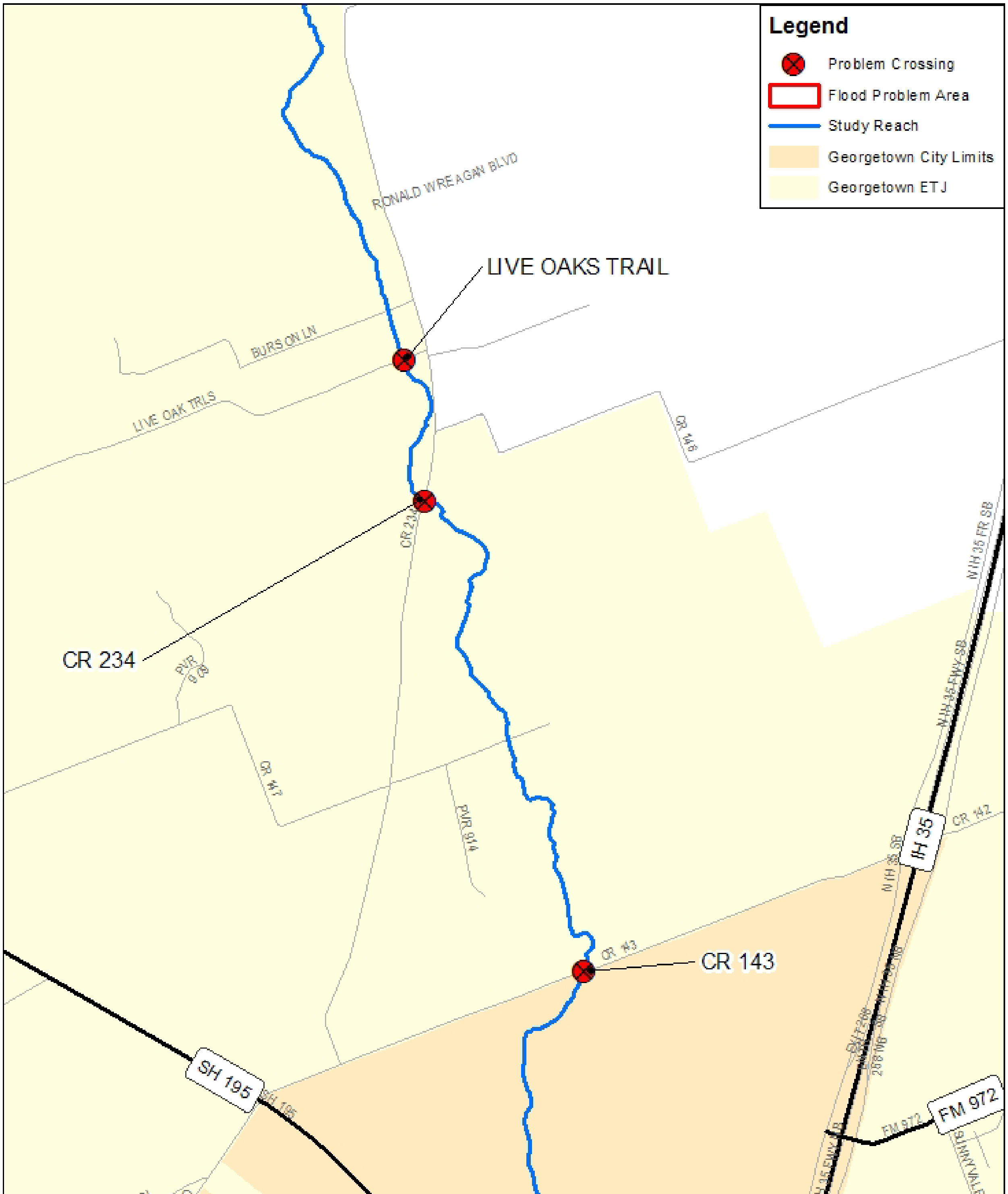

FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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Texas Water Development Board
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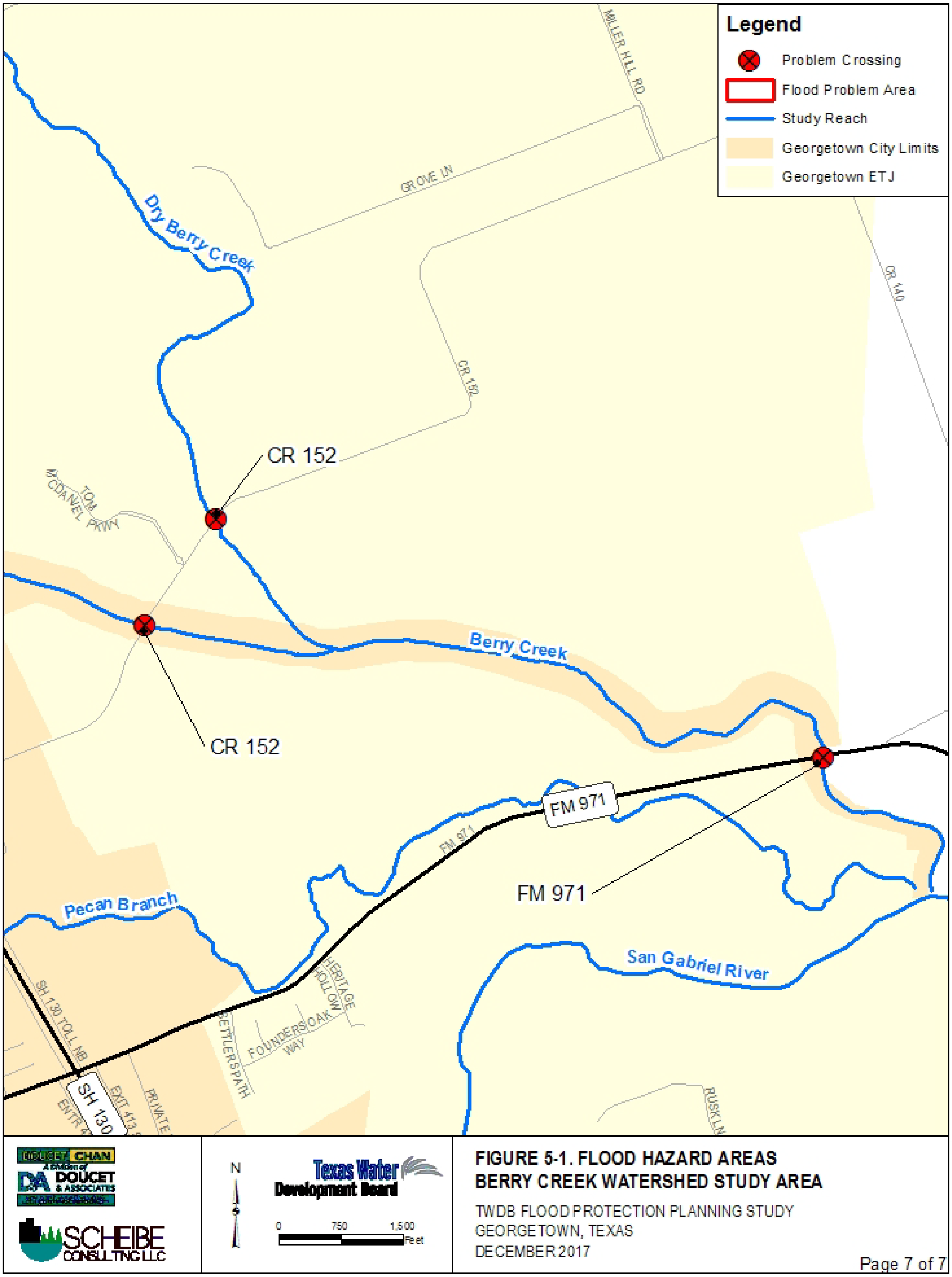
Legend
Problem Crossing
Flood Problem Area
Study Reach
Georgetown City Limits
Georgetown ETJ
MILLER HILL RD
GROVE LN
CR 152
CR 140
Dry Berry Creek
CR 152
TOM McDANEL PKWY
Berry Creek
CR 152
FM 971
FM 971
FM 971
Pecan Branch
San Gabriel River
SH 130 TOLL NB
SH 130
HERITAGE HOLLOW
FOUNDERS OAK WAY
SETTLERS PATH
PRIVATE
RUSK LN
N
Texas Water Development Board
0 750 1,500 Feet
FIGURE 5-1. FLOOD HAZARD AREAS
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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Legend
Problem Crossing
Flood Problem Area
Study Reach
Georgetown City Limits
Georgetown ETJ
Mankins Branch
MCSHEPHERD RD
CR 104/BELL GIN RD
HUTTO RD
FIGURE 5-2. FLOOD HAZARD AREAS
MANKINS BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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FIGURE 5-3. IDENTIFIED PROBLEM AREAS PECAN BRANCH WATERSHED STUDY AREA

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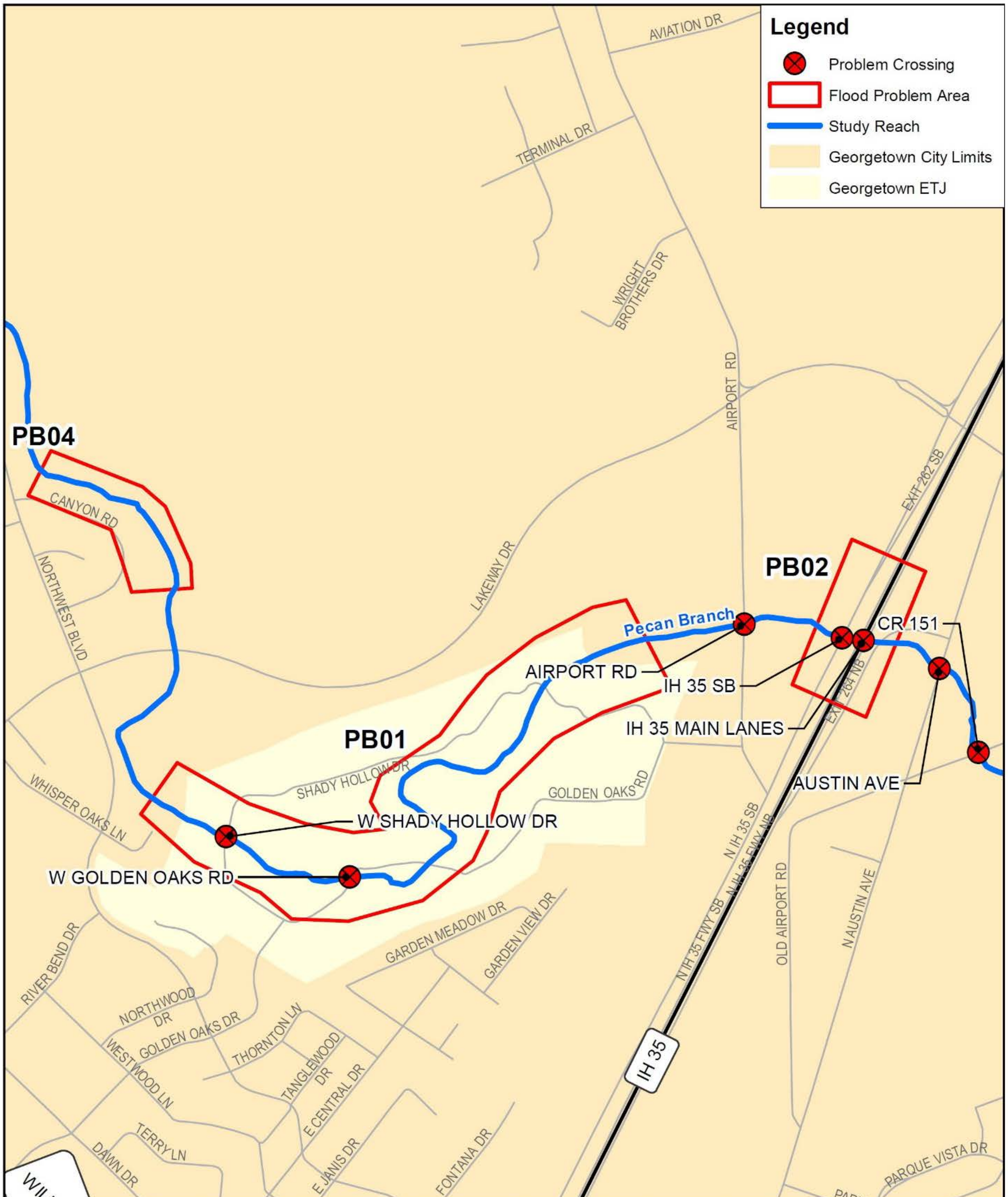

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FIGURE 5-3. IDENTIFIED PROBLEM AREAS PECAN BRANCH WATERSHED STUDY AREA

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FIGURE 5-3. IDENTIFIED PROBLEM AREAS
PECAN BRANCH WATERSHED STUDY AREA

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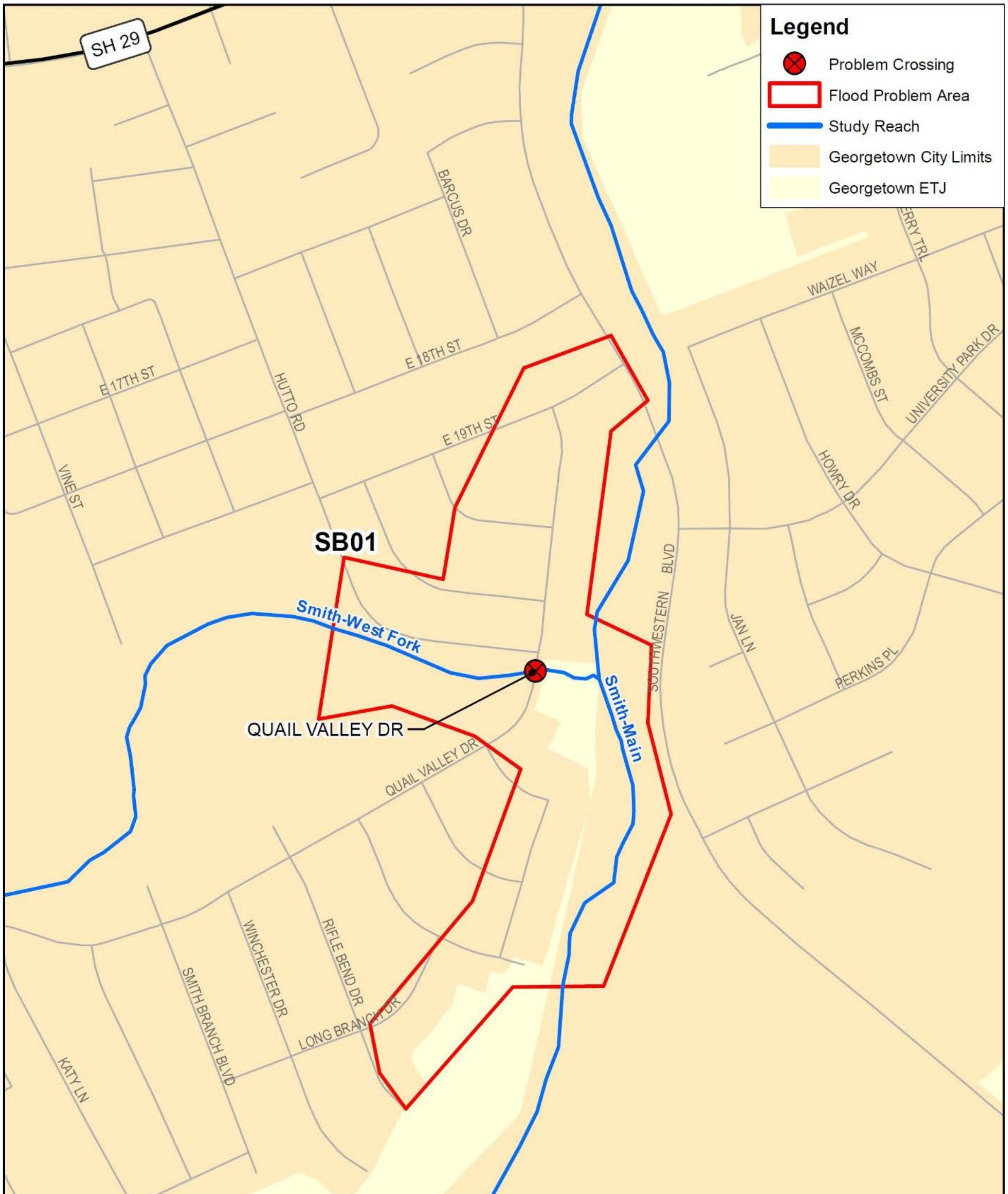

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SCHEIBE CONSULTING LLC

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Texas Water Development Board

0 250 500 Feet

FIGURE 5-4. IDENTIFIED PROBLEM AREAS
SMITH BRANCH WATERSHED STUDY AREA

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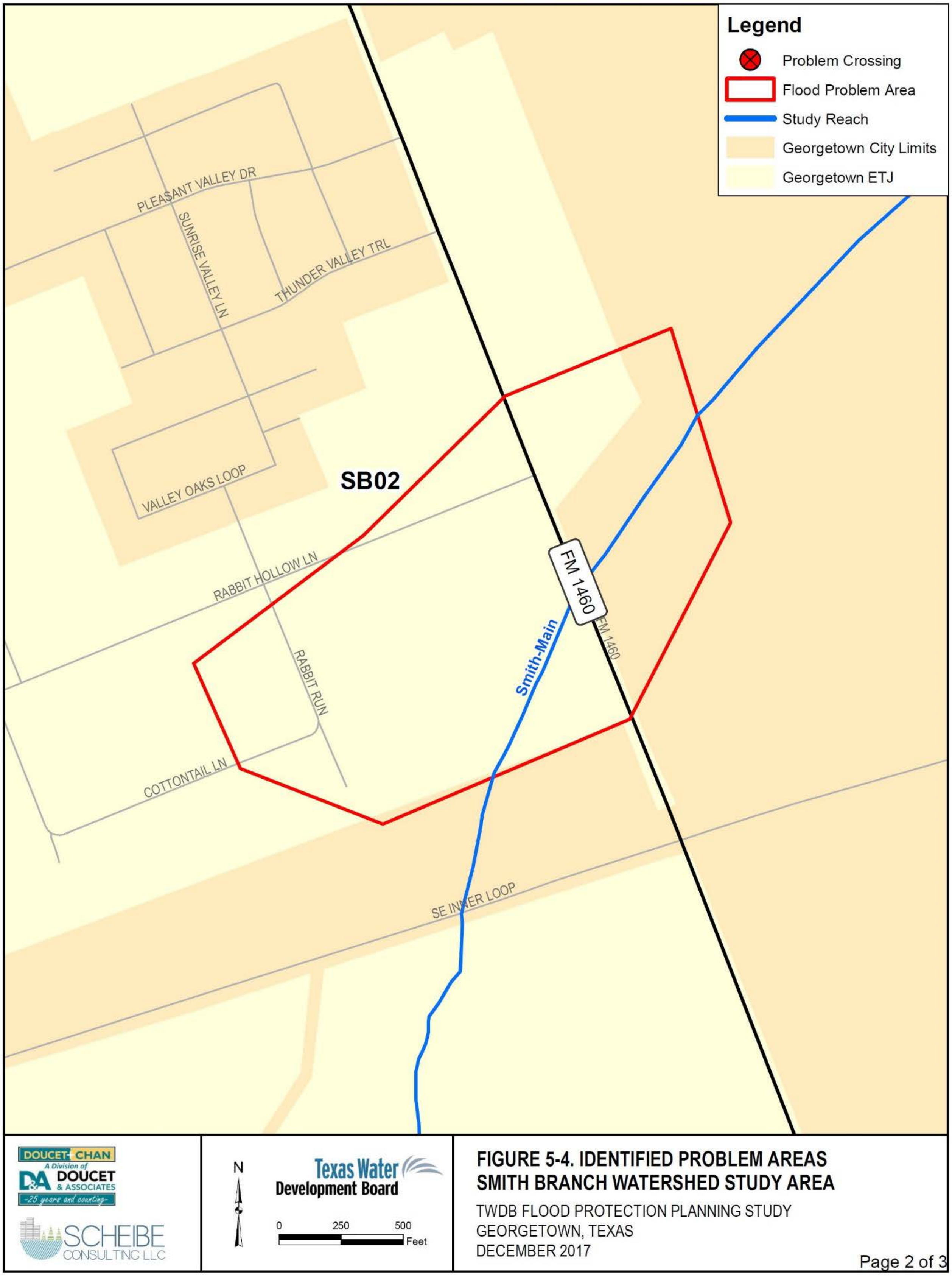

FIGURE 5-4. IDENTIFIED PROBLEM AREAS
SMITH BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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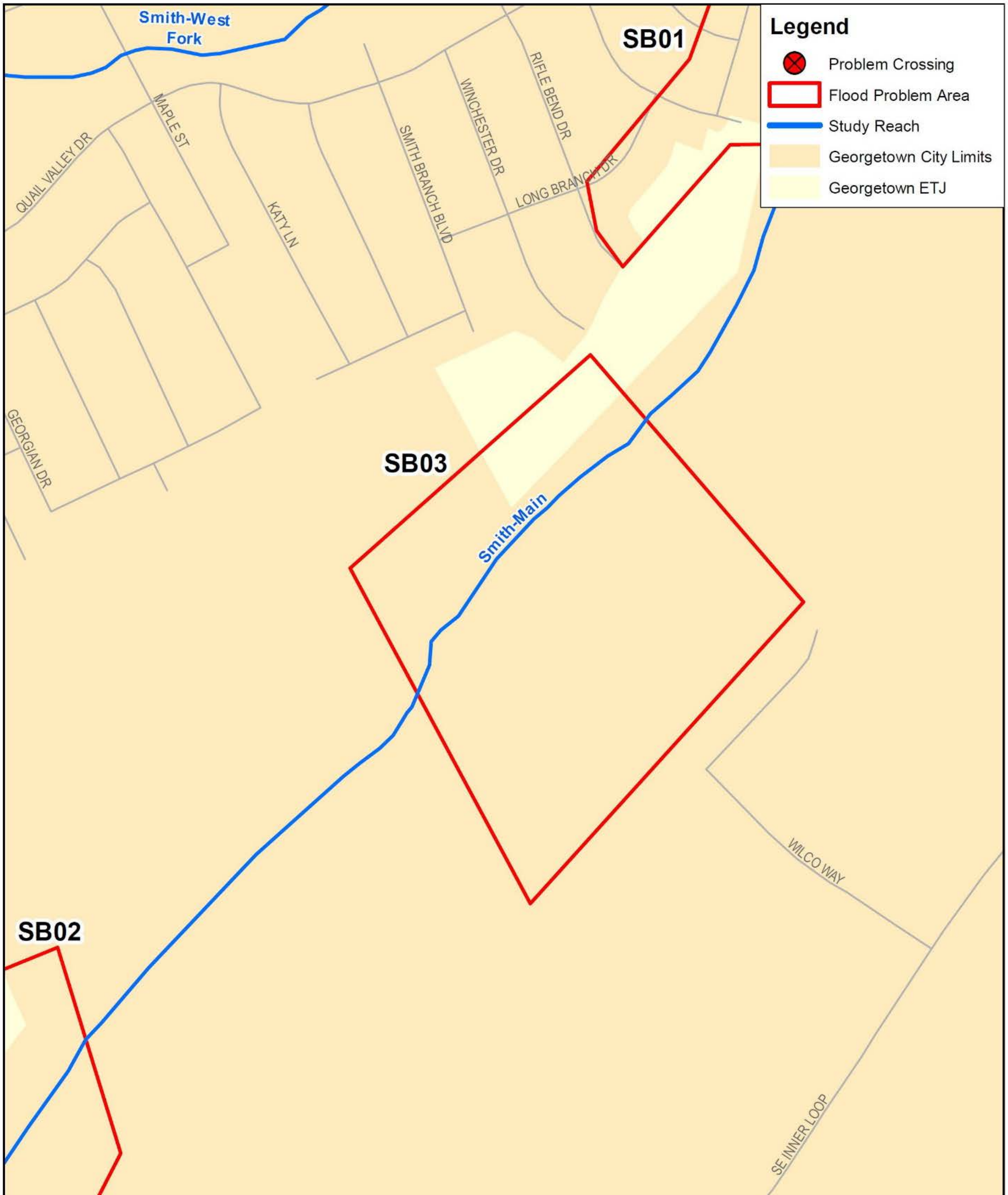

FIGURE 5-4. IDENTIFIED PROBLEM AREAS
SMITH BRANCH WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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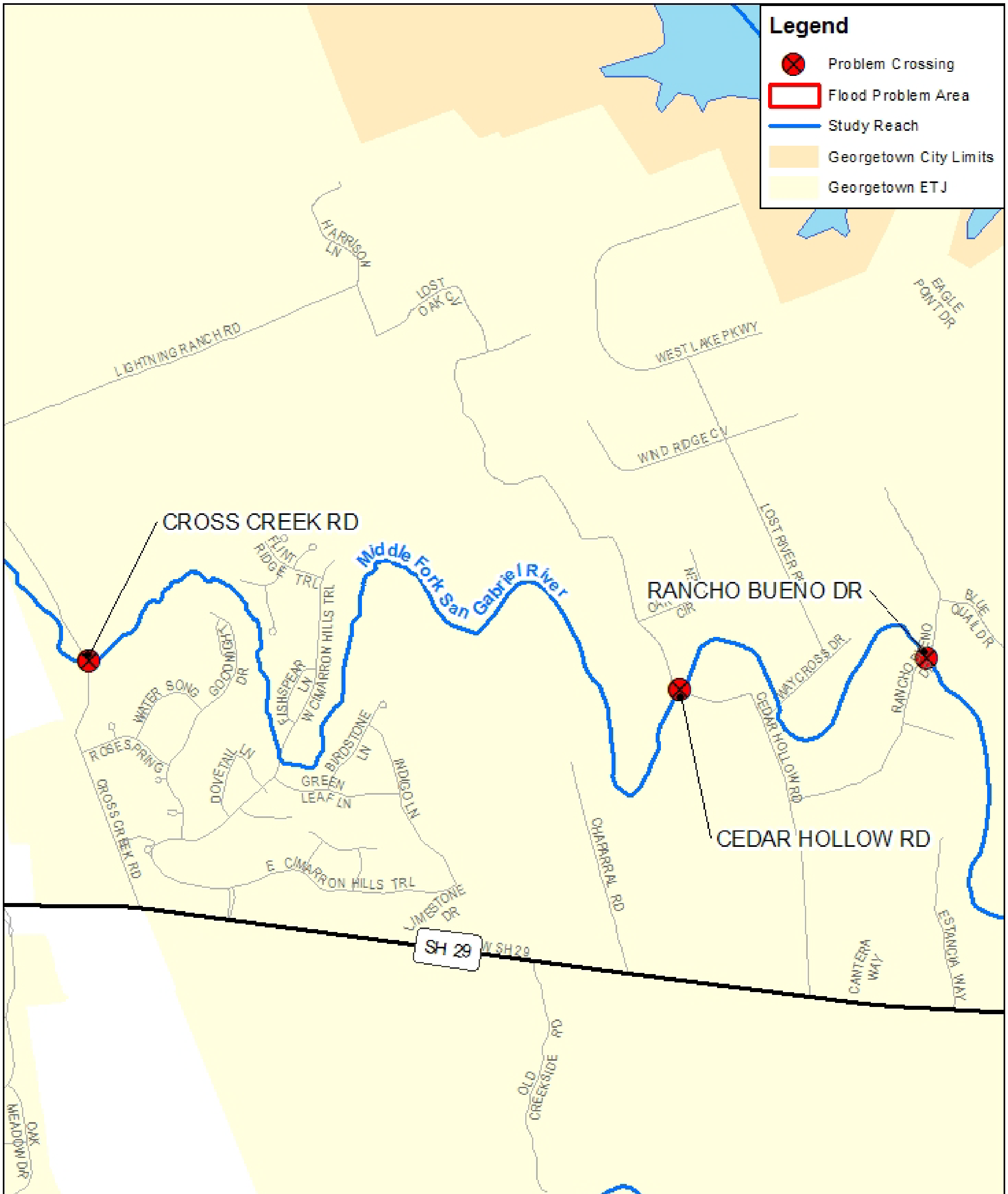

FIGURE 5-5. FLOOD HAZARD AREAS
MIDDLE FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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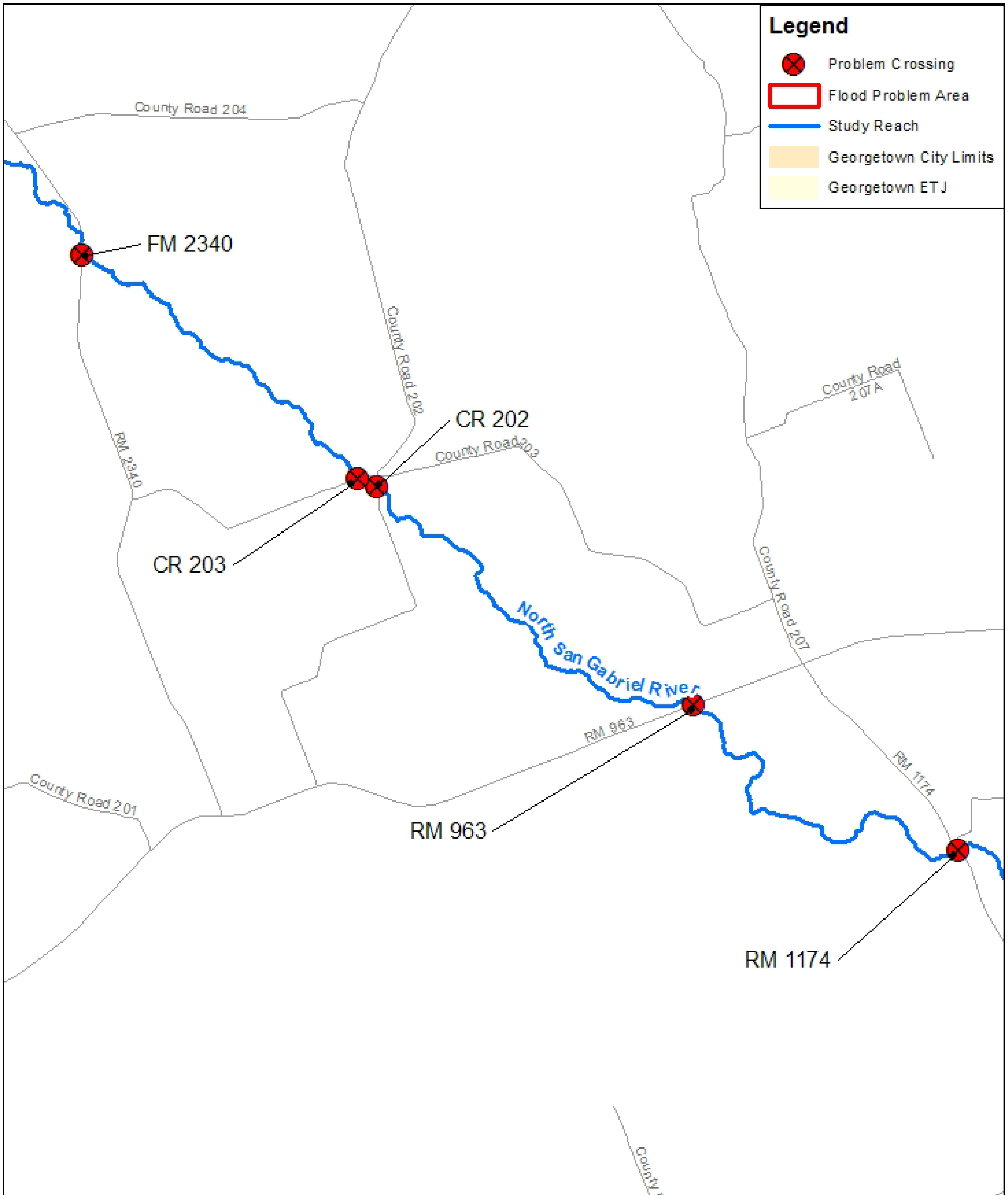

FIGURE 5-6. FLOOD HAZARD AREAS
NORTH SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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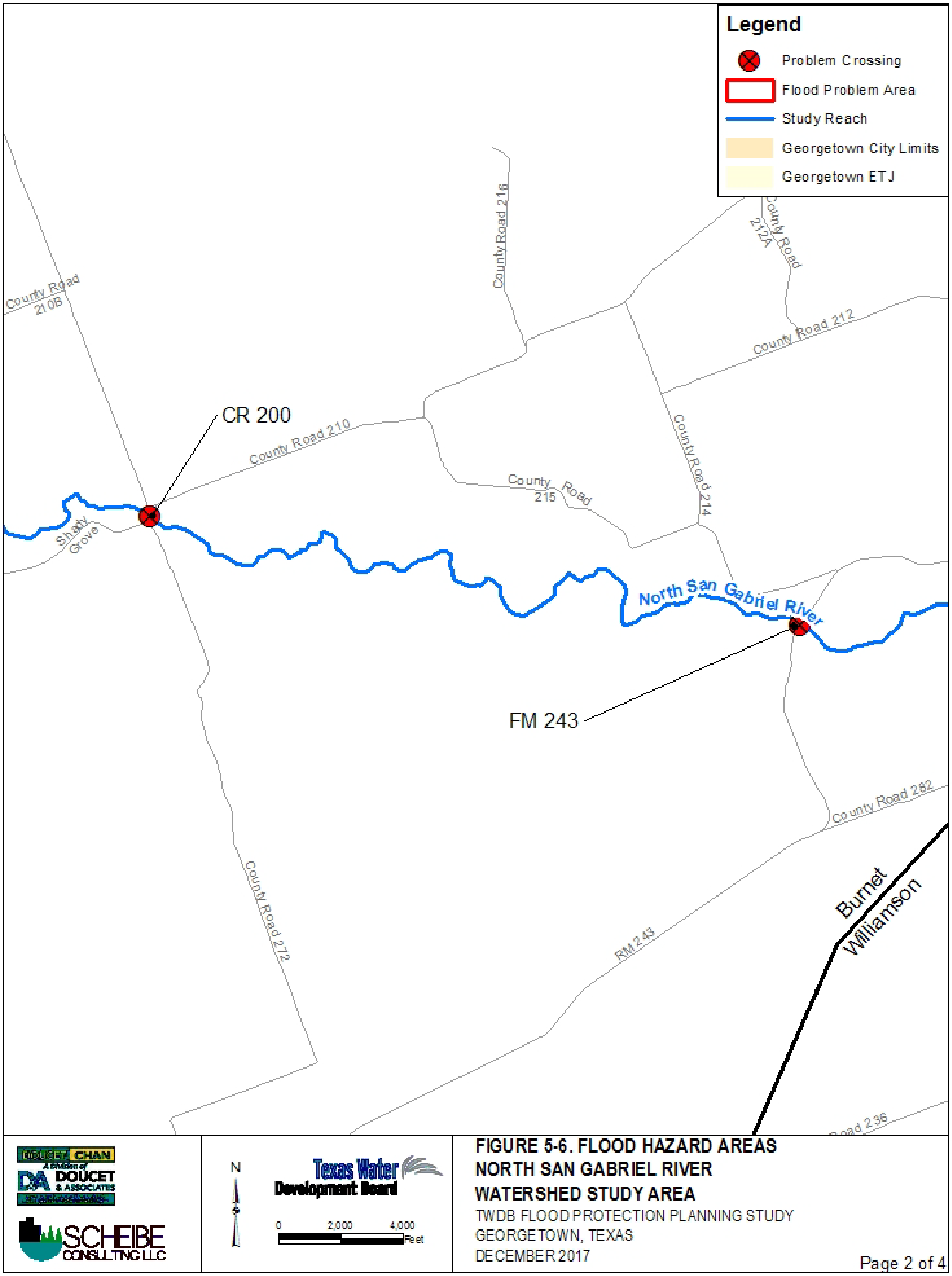
Legend
Problem Crossing
Flood Problem Area
Study Reach
Georgetown City Limits
Georgetown ETJ
CR 200
FM 243
North San Gabriel River
County Road 210B
County Road 210
County Road 216
County Road 212A
County Road 212
County Road 215
County Road 214
Shady Grove
County Road 272
County Road 282
RM 243
Burnet
Williamson
N
0
2,000
4,000
Feet
FIGURE 5-6. FLOOD HAZARD AREAS
NORTH SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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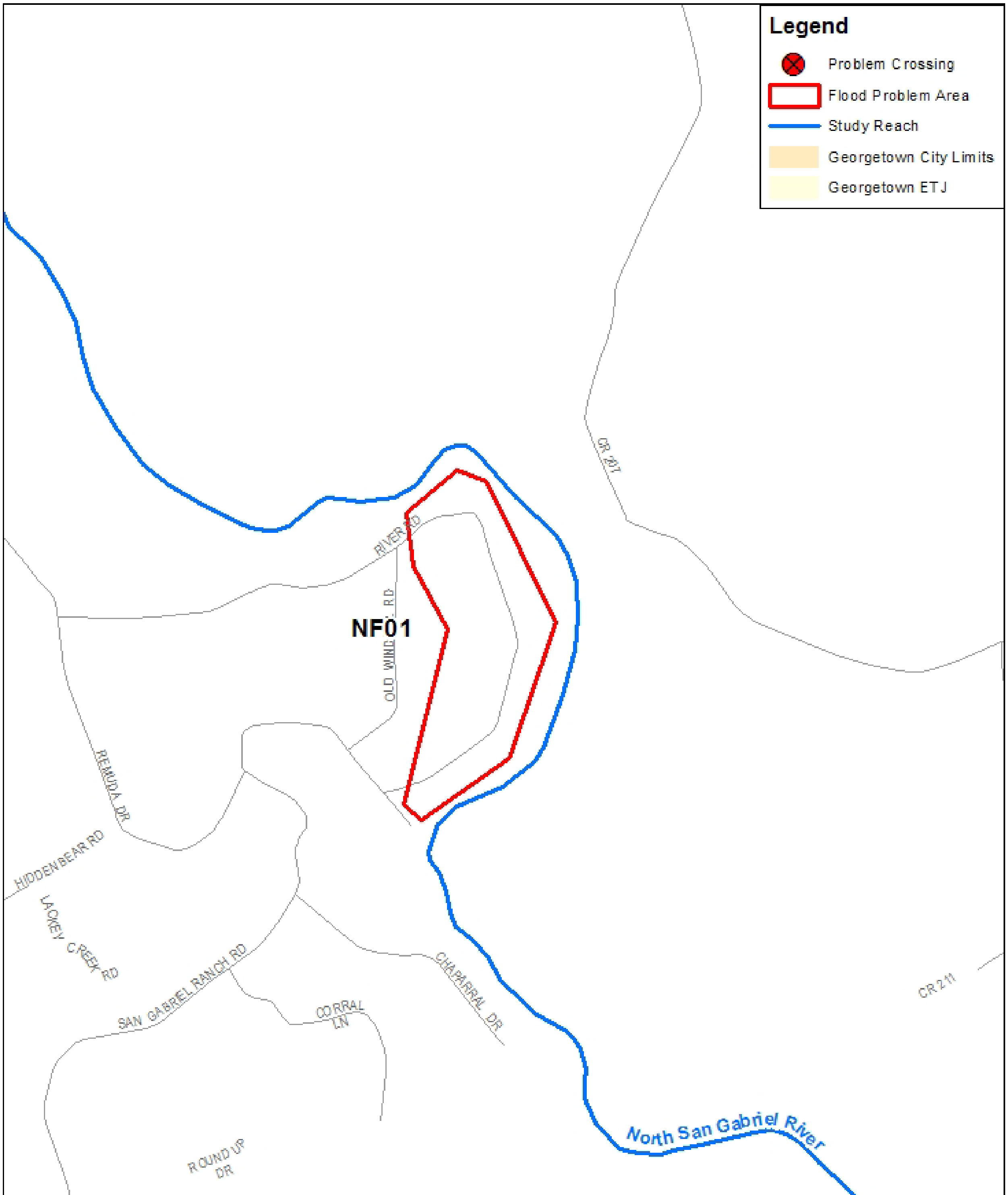

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FIGURE 5-6. FLOOD HAZARD AREAS
NORTH SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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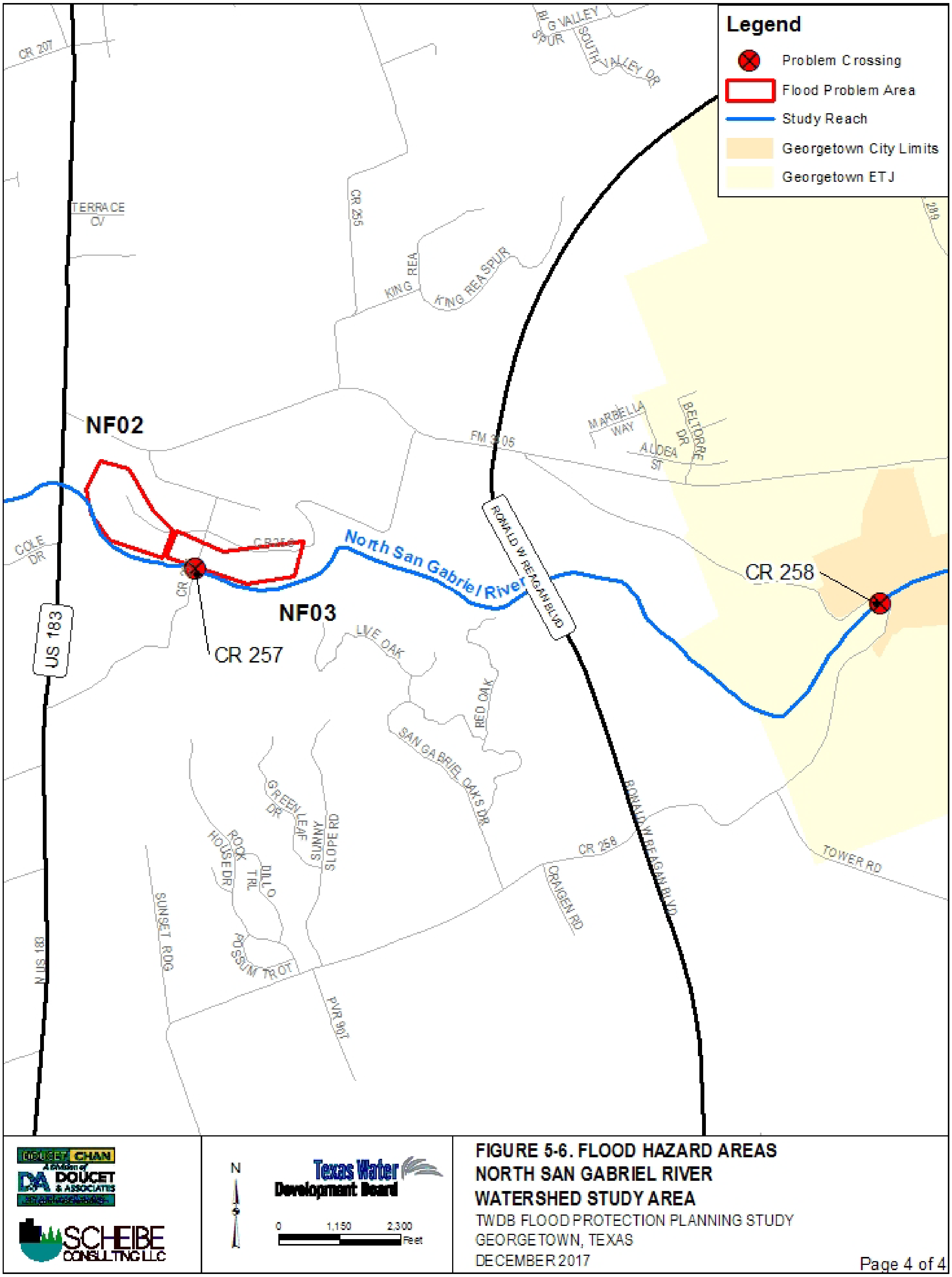

FIGURE 5-6. FLOOD HAZARD AREAS NORTH SAN GABRIEL RIVER WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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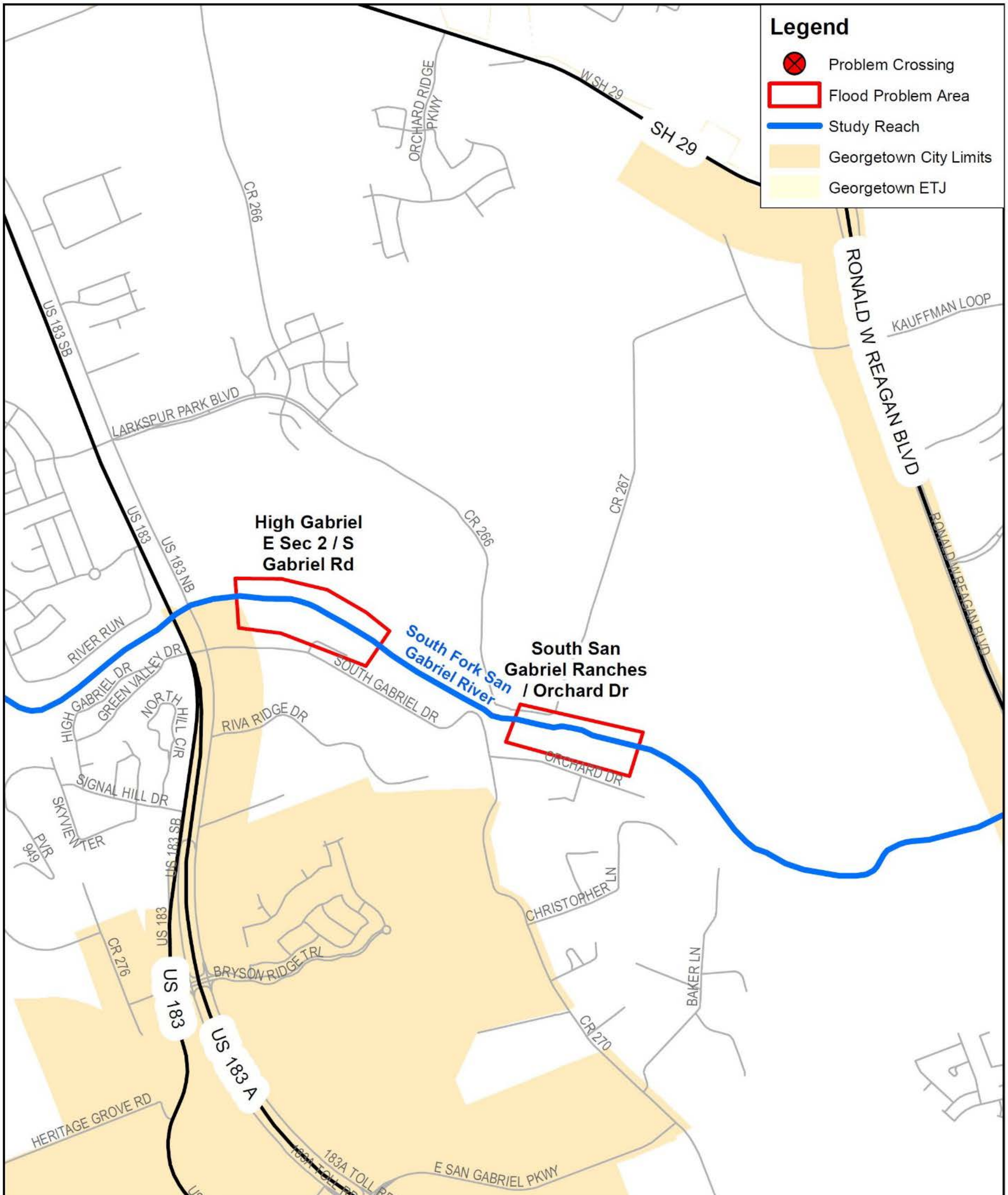

FIGURE 5-7. IDENTIFIED PROBLEM AREAS
SOUTH FORK SAN GABRIEL WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

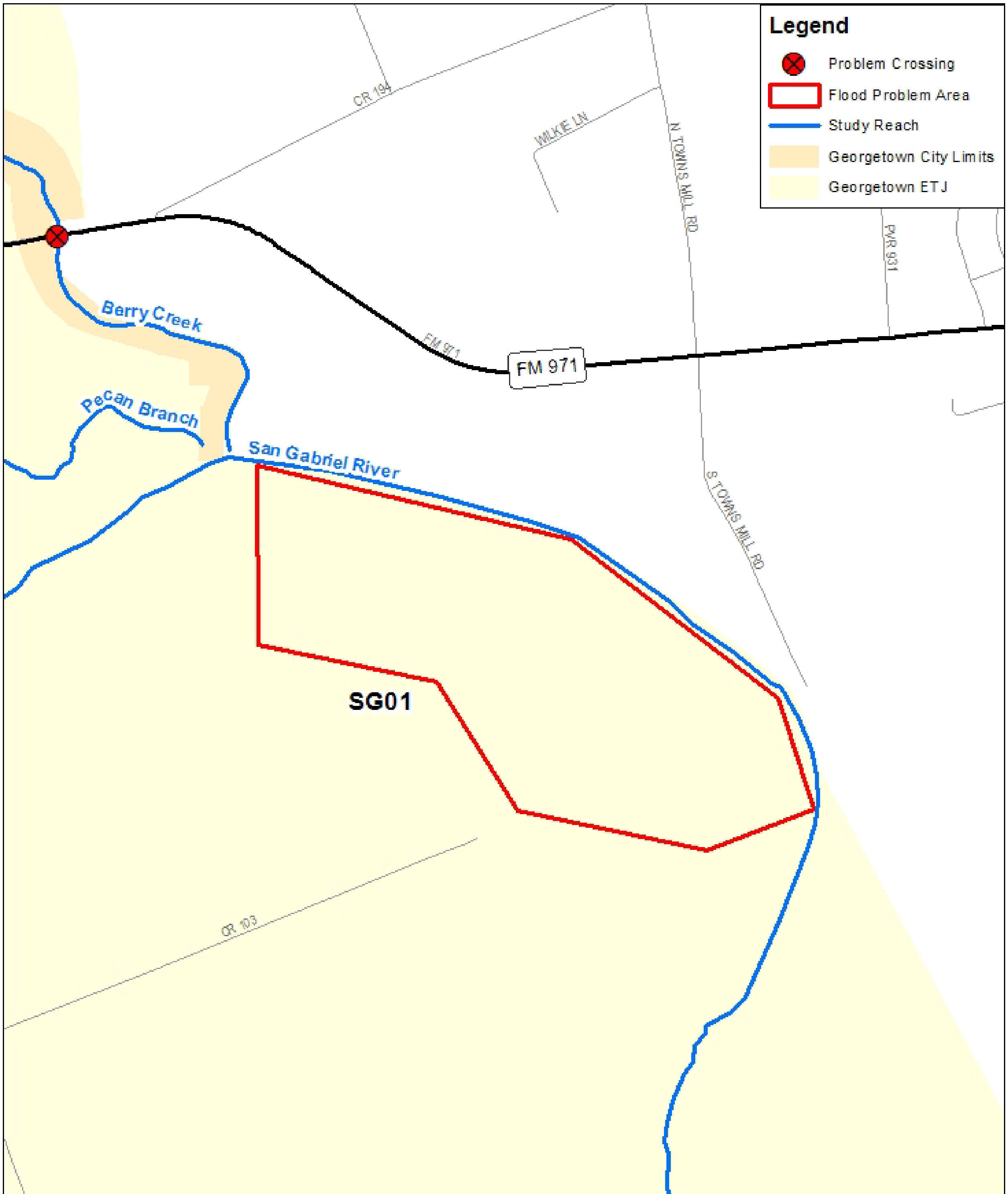

FIGURE 5-8. FLOOD HAZARD AREAS
SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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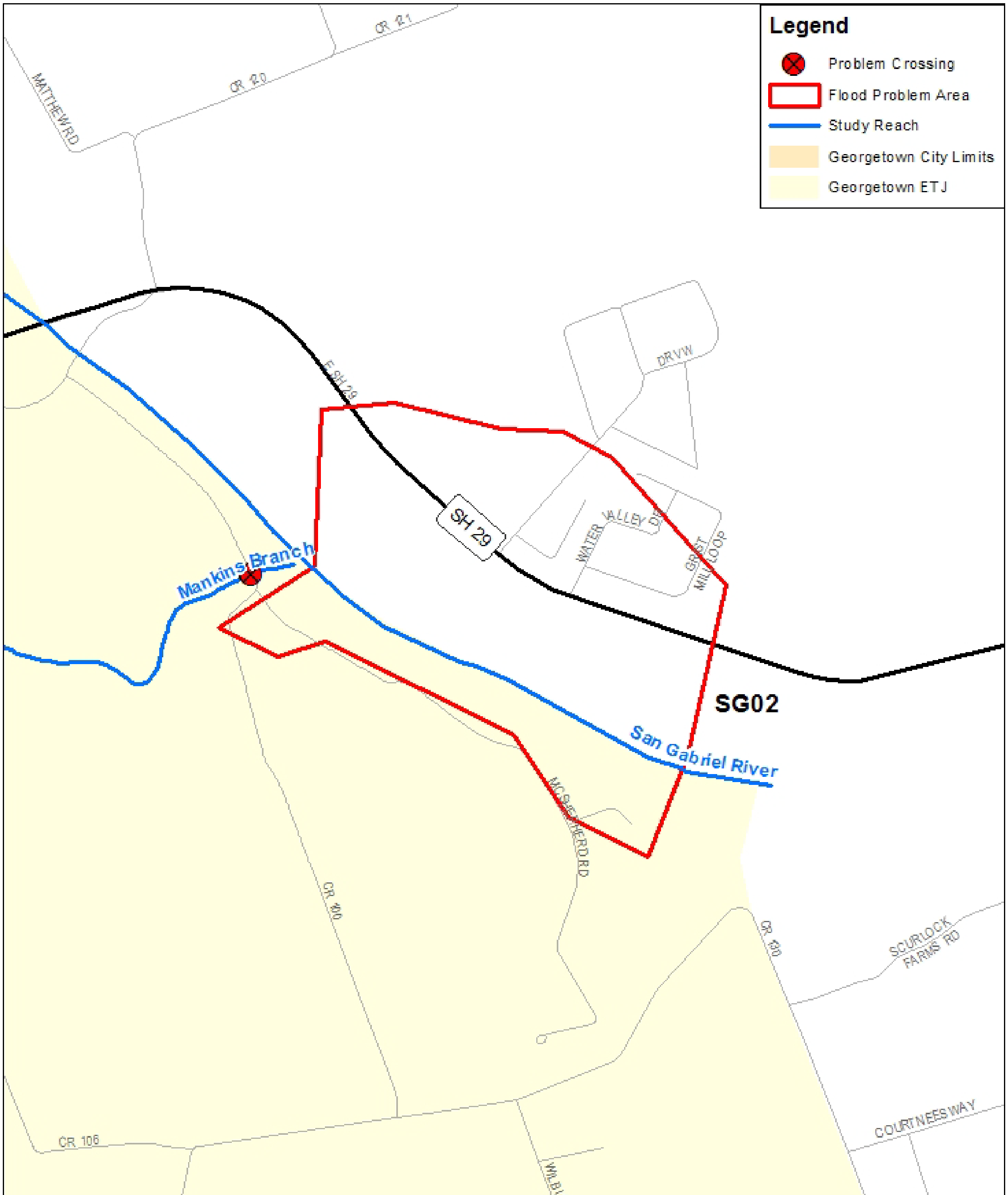

FIGURE 5-8. FLOOD HAZARD AREAS
SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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6.0 Recommended Flood Hazard Mitigation Improvements

Stormwater infrastructure deficiencies are identified in Section 5 for each watershed of the Study Area. Various project alternatives were developed to address these inadequacies. During working meetings with the stakeholders, alternatives were developed to address these inadequacies. Prioritization of the proposed improvements is discussed in Section 7.

Projects and project construction costs are summarized in Table 6-1. All costs presented in this section are conceptual in nature and were estimated using the methodology discussed in Appendix C. The selected alternatives for each Study Area are discussed below. Information on the other alternatives can be found in Appendix C.

6.1 Berry Creek Watershed Study Area Specific Projects

The issues of concern within the Berry Creek Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of structures, property and road crossings. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-1.

6.1.1 RM 2338/Andice Road Crossing

This project involves replacing the existing culverts at this Cowan Creek crossing with larger box culverts that do not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be seven 9’ x 7’ box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.2 CR 245 Crossing

This project involves replacing the existing culverts at this Cowan Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 350’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.3 BC01 Problem Area

This project involves improvements to this Cowan Creek channel reach to prevent flooding of the 6 residential structures within this problem area. To protect the residential structures, 7,066 cubic yards of channel excavation along 1,275 feet of Cowan Creek is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.1.4 CR 241

This project involves replacing the existing bridge at this Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 700' opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.5 CR 245

This project involves replacing the existing bridge at this Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with an 800' opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.6 BC02 Problem Area

This project involves improvements to this Berry Creek channel reach to prevent flooding of the 14 residential structures within this problem area. To protect the residential structures, 47,954 cubic yards of channel excavation along 1,350 feet of Berry Creek is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.1.7 Sun City Boulevard Crossing

This project involves lengthening the existing bridge at this Berry Creek crossing with an additional span such that the lengthened bridge does not impede the flow of water in the channel. For the crossing to not impede flow, the existing bridge should be lengthened by 60' to result in a total length of 170'. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.8 BC03 Problem Area

This project involves improvements to this Berry Creek channel reach to prevent flooding of the 15 residential structures within this problem area. To protect the residential structures, 24,570 cubic yards of channel excavation and 2,000 feet of berms along 1,300 feet of Berry Creek is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.1.9 BC04 Problem Area

This project involves improvements to this Berry Creek channel reach to prevent flooding of the 8 residential structures within this problem area. To protect the residential structures, 90,277 cubic yards of channel excavation along 3,355 feet of Berry Creek is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.1.10 BC05 Problem Area

This project involves improvements to the Berry Creek channel to prevent flooding of the 11 residential structures within this problem area. To protect the residential structures, 105,297 cubic yards of channel excavation along 1,580 feet of Berry Creek is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.1.11 CR 152

This project involves replacing the existing bridge at this Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 700’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.12 FM 971

This project involves replacing the existing bridge at this Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 500’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.13 Live Oaks Trail

This project involves replacing the existing bridge at this Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 500’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.14 CR 234

This project involves replacing the existing culverts at this Dry Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 450’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.15 CR 143

This project involves replacing the existing culverts at this Dry Berry Creek crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with an 800’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.16 CR 152

This project involves raising the roadway approach to this existing bridge at the Dry Berry Creek crossing such that the existing bridge and raised roadway crossing do not impede the flow of water in the channel. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.1.17 Regional Detention (not shown on Figure 6-1)

This potential future project involves construction of an off-channel peak flow shaving detention reservoir within the Berry Creek watershed upstream of the CR 241 crossing as an alternative to constructing the Problem Areas BC02 through BC05 improvements and the CR 241, CR 245, Sun City Boulevard, and CR 152 crossing improvements on Berry Creek. For the detention reservoir to significantly reduce peak design 100-year Existing Condition flows along Berry Creek to eliminate the reference flood hazard mitigation measures, the reservoir would require a storage volume of between 1,000 to 1,400 acre-feet.

6.2 Mankins Branch Watershed Study Area Specific Projects

The issues of concern within the Mankins Branch Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of road crossings. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-2.

6.2.1 Hutto Road Crossing

This project involves replacing the existing culverts at this Mankins Branch crossing with larger box culverts that do not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be four 5’ x 4’ box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.2.2 CR 104/Bell Gin Road Crossing

This project involves replacing the existing culvert at this Mankins Branch crossing with larger box culverts that do not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be four 4’ x 5’ box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.2.3 CR 100/McShepherd Road Crossing

This project involves replacing the existing culverts at this Mankins Branch crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 200’ opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3 Pecan Branch Watershed Study Area Specific Projects

The issues of concern within the Pecan Branch Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of structures, property and road crossings. To address these inadequacies in the current channel systems, several mitigative measures were developed as shown on Figure 6-3.

6.3.1 PB01 Problem Area – Golden Oaks Subdivision

This project involves constructing a 100 ac-ft peak-shaving detention pond along the east side of Pecan Branch. The pond would include an earthen lateral weir to divert flows into the detention pond and an outlet pipe with a flap gate to prevent flow entering the pond during the rising limb of the hydrograph. The purpose of the pond is to significantly reduce downstream peak flow rates within the Golden Oaks Subdivision during events greater than the 25-year storm event.

6.3.2 PB02 Problem Area – I.H. 35 Crossing

This project involves upgrading the existing southbound frontage and main lane/northbound frontage culverts at the Pecan Branch crossing with two (2) additional 10’ x 8’ concrete box culverts and three (3) additional 10’ x 8’ concrete box culverts, respectively. The purpose of this improvement is to provide sufficient capacity to prevent the 100-year Existing Conditions flood event from flooding the main lanes of I.H. 35. In order to prevent downstream hydrologic impacts, this alternative would require mitigation of lost flood volume storage upstream of the improved crossing. Therefore, the 100 ac-ft peak shaving detention pond included in PB01 is proposed as part of this alternative. Detention ponds in other locations or configurations within the I.H. 35 corridor may also be feasible as long as they can be sized to sufficiently mitigate downstream flow increases.

6.3.3 PB03 Problem Area – Serenada Subdivision

This project involves 3,550 feet of channel improvements along Pecan Branch between Val Verde Drive and Serenda Drive. Channel improvements would require clearing of brush and vegetation within a 75’ wide area. Permanent easements within existing residential properties must be obtained in order to maintain the efficiency and improved hydraulic capacity of the channel. The purpose of this improvement is to provide improved channel capacity and flood protection thereby reducing flooding of residential structures along the channel. Full 100-year flood protection for all structures cannot be attained without significant channel improvements that may not be feasible due to project cost, easement requirements, and environmental impacts.

6.3.4 PB04 Problem Area – Canyon Road / Reata Trails

This project involves 1,200 feet of channel improvements including 8,175 cubic yards of excavation along the west bank of Pecan Branch behind Canyon Road. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures. In order to provide full 100-year Existing Conditions flood protection for these homes, excavation within the channel banks is required and may result in environmental impacts. Additionally, permanent easements within existing residential properties must be obtained within limits of proposed excavation.

6.3.5 PB05 Problem Area – Lonnie Thomas Road

This project involves 1,050 feet of channel improvements along Pecan Branch south of Lonnie Thomas Road and west of CR 152. Channel improvements would require clearing of brush and vegetation within a 10-acre area. Permanent easements within existing residential properties must be obtained in order to maintain the efficiency and improved hydraulic capacity of the channel. The purpose of this improvement is to provide improved channel capacity and flood protection thereby reducing flooding of residential structures along the channel. Full 100-year flood protection for all structures cannot be attained without significant channel improvements that may not be feasible due to project cost, easement requirements, and environmental impacts.

6.3.6 West Sequoia Spur Crossing

This project involves replacing the existing culvert at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include four (4) 5’ RCP culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.7 Esperada Drive Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include five (5) 10’ x 6’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.8 Serenada Drive Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include five (5) 10’ x 6’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.9 West Shady Hollow Drive Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include seven (7) 10’ x 6’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.10 West Golden Oaks Road Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include seven (7) 10’ x 6’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.11 Airport Road Crossing

Since the City of Georgetown has indicated no plans to upgrade this crossing and the possibility of closing the roadway altogether, no upgrades are recommended to this crossing. Hydraulic impacts due to removal of the crossing were found to be negligible due to the low elevation of the roadway and its close proximity to the backwater effects of I.H. 35.

6.3.12 Austin Avenue Crossing

This project involves upgrading the existing culverts to include six (6) 8’ x 8’ concrete box culverts that do not impede the flow of water in the channel. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.13 CR 151 Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include ten (10) 10’ x 8’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.14 Northeast Inner Loop Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include ten (10) 10’ x 6’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.15 CR 152 Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include ten (10) 10’ x 6’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.3.16 FM 971 Crossing

This project involves replacing the existing culverts at the Pecan Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include fifteen (15) 10’ x 10’ concrete box culverts or a bridge with an equivalent hydraulic capacity. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.4 Smith Branch Watershed Study Area Specific Projects

The issues of concern within the Smith Branch Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of structures, property and road crossings. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-4.

6.4.1 SB01 Problem Area – West Fork Confluence

This project involves channel improvements including 14,500 cubic yards of excavation near the West Fork confluence of Smith Branch and the addition of four (4) 10’ x 4’ concrete box culverts at the Quail Valley Drive crossing. The purpose of this project is to improve channel capacity and hydraulic efficiency of the West Fork confluence to minimize overtopping and flooding of residential structures in the area.

6.4.2 SB02 Problem Area – Rabbit Hollow Subdivision

This project involves the buy-out of flood prone structures within the low-lying problem area. No viable structural alternatives were identified as part of this study. Structural alternatives evaluated included channel improvements, upgrades to FM 1460, and detention ponds.

6.4.3 SB03 Problem Area – Williamson County Juvenile Justice Center

This project involves channel improvements and added inline flood volume storage adjacent to and upstream of the WCJJC. The purpose of this project is to improve channel capacity and reduce peak flows to minimize flooding potential at the WCJJC. Maintenance of the abandoned Maple Street roadway embankment located immediately upstream of the WCJJC is critical to the success of this project, as its removal would exacerbate flooding potential of the WCJJC.

6.4.4 CR 166 Crossing

This project involves replacing the existing culverts at the Smith Branch crossing with a new culvert crossing that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should include four (4) 5’ x 5’ concrete box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.4.5 I.H. 35 Southbound Frontage Road Crossing

Since the tailwater from the I.H. 35 main lanes culvert crossing controls flooding at this crossing of the West Fork of Smith Branch, and no structures are affected upstream of the crossing, cost-effective improvements were not able to be developed for this crossing at a water level that meets applicable criteria.

6.4.6 Madison Oaks Avenue Crossing

This project involves raising the roadway a minimum of 1.5’ in order for the 100-year Existing Conditions flood event to be conveyed through the crossing. No improvements to the existing culvert configuration are recommended at this crossing at a water level that meets applicable criteria.

6.4.7 S. Austin Avenue Crossing

This project involves raising the roadway a minimum of 0.7’ in order for the 100-year Existing Conditions flood event to be conveyed through the crossing. No improvements to the existing culvert configuration are recommended at this crossing at a water level that meets applicable criteria.

6.4.8 Quail Valley Drive Crossing

This project involves the addition of four (4) 10’ x 4’ concrete box culverts at the Quail Valley Drive crossing. These crossing improvements are included in project SB01.

6.4.9 E. University Avenue Crossing

This project involves replacing the existing culverts at the Smith Branch crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new bridge should include a 150' span. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.4.10 Smith Creek Road Crossing

This project involves replacing the existing culverts at the Smith Branch crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new bridge should include a 150' span. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.5 Middle Fork San Gabriel River Watershed Study Area Specific Projects

The issues of concern within the Middle Fork San Gabriel River Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of road crossings. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-5.

6.5.1 Cross Creek Road Crossing

This project involves replacing the existing culverts at this Middle Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 550' opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.5.2 Cedar Hollow Road Crossing

This project involves replacing the existing culverts at this Middle Fork San Gabriel River crossing with larger box culverts that do not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be nine 12' x 10' box culverts. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.5.3 Rancho Bueno Drive Crossing

This project involves replacing the existing culverts at this Middle Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 90' opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6 North Fork San Gabriel River Watershed Study Area Specific Projects

The issues of concern within the North Fork San Gabriel River Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of structures, property and road crossings. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-6.

6.6.1 FM 2340 Crossing

This project involves replacing the existing low water bridge at this North Fork San Gabriel River crossing with box culverts that do not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be eight 9' x 7' box culverts. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.2 CR 203 Crossing

This project involves replacing the existing low water culvert at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 200' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.3 CR 202 Crossing

This project involves replacing the existing low water culverts at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 200' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.4 RM 963 Crossing

This project involves replacing the existing bridge at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 250' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.5 RM 1174 Crossing

This project involves replacing the existing bridge at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 300' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.6 CR 200 Crossing

This project involves replacing the existing bridge at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 300' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.7 FM 243 Crossing

This project involves replacing the existing bridge at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 300' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.8 NF01 Problem Area

This project involves improvements to this North Fork San Gabriel River channel reach to prevent flooding of the 9 residential structures within this problem area. To protect the residential structures, 731,945 cubic yards of channel excavation along 4,580 feet of North Fork San Gabriel River is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.6.9 CR 257 Crossing

This project involves replacing the existing bridge at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 200' opening length. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.6.10 NF02/NF03 Problem Areas

This project involves improvements to this North Fork San Gabriel River channel reach to prevent flooding of the 6 residential structures (with possibility of one or two commercial structures in this area as well) within this problem area. To protect the residential structures, 820,326 cubic yards of channel excavation along 3,090 feet of North Fork San Gabriel River is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.6.11 CR 258 Crossing

This project involves replacing the existing bridge at this North Fork San Gabriel River crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new crossing should be a bridge with a 300' opening length. The purpose of this improvement is to provide sufficient capacity for the design 100-year Existing Conditions flood event to be safely conveyed through the Right-of-Way.

6.7 South Fork San Gabriel River Watershed Study Area Specific Projects

The issues of concern within the South Fork San Gabriel River Watershed Study Area are largely due to the lack of conveyance capacity and/or road crossing openings. This lack of conveyance capacity results in flooding of structures, property and road crossings. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-7.

6.7.1 SFSG01 Problem Area – High Gabriel / S. San Gabriel Ranches

This project involves the buy-out of flood prone structures within the low-lying problem area. No viable structural alternatives were identified as part of this study. Structural alternatives evaluated included channel improvements and detention ponds.

6.7.2 CR 330B Crossing

This project involves replacing the existing culverts at the Smith Branch crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new bridge should include a 50’ span. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.7.3 CR 323 Crossing

This project involves replacing the existing culverts at the Smith Branch crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new bridge should include a 100’ span. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.7.4 FM 1869 Crossing

This project involves replacing the existing culverts at the Smith Branch crossing with a new bridge that does not impede the flow of water in the channel. For the crossing to not impede flow, the new bridge should include a 300’ span. The purpose of this improvement is to provide sufficient capacity for the design 25-year Existing Conditions flood event to be conveyed through the crossing at a water level that meets applicable criteria.

6.8 San Gabriel River Watershed Study Area Specific Projects

The issues of concern within the San Gabriel River Watershed Study Area are largely due to the lack of conveyance capacity of the channels and/or road crossing openings. This lack of conveyance capacity results in flooding of structures and property. To address these inadequacies in the current channel systems, several mitigation measures were developed as shown on Figure 6-8.

6.8.1 SG01 Problem Area

This project involves improvements to this San Gabriel River channel reach to prevent flooding of the 10 residential structures within this problem area. To protect the residential structures, 227,568 cubic yards of channel excavation along 5,310 feet of San Gabriel River is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.8.2 SG02 Problem Area

This project involves improvements to this San Gabriel River channel reach to prevent flooding of the 16 residential structures (excluding RV trailers in a mobile home park in this area) within this problem area. To protect the residential structures, 279,669 cubic yards of channel excavation along 4,070 feet of San Gabriel River is required. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.

6.9 Summary of Recommended Flood Hazard Mitigation Improvement Costs

Table 6-1 shows a summary of all the recommended flood hazard mitigation projects and their estimated construction costs. Unit costs and development are described in Appendix C.

Table 6-1 Flood Hazard Mitigation Project Construction Costs

Watershed	Description	Issue to be Addressed	Description of Improvements	Total Cost
Berry Creek	CR 241 (Berry)	Overtopped Roadway	Upgrade to 700-ft span Bridge	$ 14,331,000
	CR 245 (Berry)	Overtopped Roadway	Upgrade to 800-ft span Bridge	$ 9,667,000
	BC02 - Dove Hollow/Dawson (Berry)	Flooded Structures	1,350 LF Channel Improvements 47,954 CY Excavation	$ 2,310,000
	Sun City Boulevard	Overtopped Roadway	Lengthen Existing Bridge 60-ft	$ 639,000
	BC03 - Painted Bunting (Berry)	Flooded Structures	1,300 LF Channel Improvements 2,000 LF Berms 24,570 CY Excavation	$ 3,648,000
	BC04 - Crystal Springs (Berry)	Flooded Structures	3,355 LF Channel Improvements 90,277 CY Excavation	$ 4,016,000
	BC05 - Trail Rider (Berry)	Flooded Structures	1,580 LF Channel Improvements 105,297 CY Excavation	$ 4,116,000
	RM 2338 (Cowan)	Overtopped Roadway	Upgrade to (7) 9'x7' RBC	$ 2,473,000
	CR 245 (Cowan)	Overtopped Roadway	Upgrade to 350-ft span Bridge	$ 9,667,000
	BC01 - Independence Creek (Cowan)	Flooded Structures	1,275 LF Channel Improvements 7,066 CY Excavation	$ 934,000
	Live Oaks Trail (Dry Berry)	Overtopped Roadway	Upgrade to 400-ft span Bridge	$ 4,613,000
	CR 234 (Dry Berry)	Overtopped Roadway	Upgrade to 450-ft span Bridge	$ 8,150,000
	CR 143 (Dry Berry)	Overtopped Roadway	Upgrade to 800-ft span Bridge	$ 12,774,000
	CR 152 (Dry Berry)	Overtopped Roadway	Raise Overbank Roadway	$ 1,913,000
	CR 152 (Berry)	Overtopped Roadway	Upgrade to 700-ft span Bridge	$ 9,345,000
	FM 971 (Berry)	Overtopped Roadway	Upgrade to 500-ft span Bridge	$ 14,961,000
	Hutto Road	Overtopped Roadway	Upgrade to (4) 5'x4' RBC	$ 1,538,000
	CR 104/Bell Gin Road	Overtopped Roadway	Upgrade to (4) 4'x5' RBC	$ 1,067,000
	McShepherd Road	Overtopped Roadway	Upgrade to 200-ft span Bridge	$ 4,657,000

Table 6-1 Flood Hazard Mitigation Project Construction Costs (continued)

Watershed	Description	Issue to be Addressed	Description of Improvements	Total Cost
Pecan Branch	PB01 - Golden Oaks Subdivision	Flooded Structures	Construct 100 ac-ft Peak Shaving Pond	$ 8,899,000
	PB02 - I.H. 35	Overtopped Roadway	Upgrade SB to (5) 10'x8' RBC Upgrade ML to (6) 10'x8' RBC	$ 10,823,000
	PB03 - Serenada Subdivision	Flooded Structures	3,550 LF Channel Clearing & Maintenance	$ 408,000
	PB04 - Canyon Rd	Flooded Structures	1,200 LF Channel Improvements 8,175 CY Excavation	$ 814,000
	PB05 - Lonnie Thomas Dr	Flooded Structures	1,050 LF Channel Clearing & Maintenance	$ 295,000
	West Sequoia Spur	Overtopped Roadway	Upgrade to (4) 5' Dia RCP	$ 1,303,000
	Esperada Drive	Overtopped Roadway	Upgrade to (5) 10'x6' RBC	$ 2,771,000
	Serenada Drive	Overtopped Roadway	Upgrade to (5) 10'x6' RBC	$ 2,028,000
	West Shady Hollow Drive	Overtopped Roadway	Upgrade to (7) 10'x6' RBC	$ 1,850,000
	West Golden Oaks Road	Overtopped Roadway	Upgrade to (7) 10'x6' RBC	$ 2,454,000
	Airport Road	Overtopped Roadway	No Improvements Recommended	n/a
	North Austin Avenue	Overtopped Roadway	Upgrade to (6) 8'x8' RBC	$ 4,040,000
	CR 151	Overtopped Roadway	Upgrade to (10) 10'x8' RBC	$ 6,051,000
	NE Inner Loop	Overtopped Roadway	Upgrade to (10) 10'x6' RBC	$ 3,572,000
	CR 152	Overtopped Roadway	Upgrade to (10) 10'x6' RBC	$ 4,815,000
	FM 971	Overtopped Roadway	Upgrade to (15) 10'x10' RBC	$ 8,272,000

Table 6-1 Flood Hazard Mitigation Project Construction Costs (continued)

Watershed	Description	Issue to be Addressed	Description of Improvements	Total Cost
Smith Branch	SB01 - West Fork Confluence	Flooded Structures	750 LF Channel Improvements 14,500 CY Excavation Improvements to Quail Valley Dr. Crossing	$ 1,887,000
	SB02 - Rabbit Hollow Subdivision	Flooded Structures	Buy-out flood prone structures	$ 765,000
	SB03 - Wilco Juvenile Justice Center	Flooded Property	Not included in this study	n/a
	CR 166	Overtopped Roadway	Upgrade to (4) 5'x5' RBC	$ 660,000
	I.H. 35 Southbound Frontage Road	Overtopped Roadway	No Improvements Recommended	n/a
	Madison Oaks Avenue	Overtopped Roadway	Raise roadway 1.5'	$ 668,000
	S. Austin Avenue	Overtopped Roadway	Raise roadway 0.7'	$ 3,083,000
	Quail Valley Drive	Overtopped Roadway	Add (4) 10'x4' RBC	see SB01
	E. University Avenue	Overtopped Roadway	Upgrade to 150-ft span Bridge	$ 2,750,000
	Smith Creek Road	Overtopped Roadway	Upgrade to 150-ft span Bridge	$ 8,306,000
Middle Fork San Gabriel River	Cross Creek Road	Overtopped Roadway	Upgrade to 550-ft span Bridge	$ 9,166,000
	Cedar Hollow Road	Overtopped Roadway	Upgrade to (9) 12'x10' RBC	$ 5,931,000
	Rancho Bueno Drive	Overtopped Roadway	Upgrade to 90-ft span Bridge	$ 4,165,000

Table 6-1 Flood Hazard Mitigation Project Construction Costs (continued)

Watershed	Description	Issue to be Addressed	Description of Improvements	Total Cost
North Fork San Gabriel River	FM 2340	Overtopped Roadway	Upgrade to (8) 9'x7' RBC	$ 3,623,000
	CR 203	Overtopped Roadway	Upgrade to 200-ft span Bridge	$ 6,860,000
	CR 202	Overtopped Roadway	Upgrade to 200-ft span Bridge	$ 7,209,000
	RM 963	Overtopped Roadway	Upgrade to 250-ft span Bridge	$ 4,257,000
	RM 1174	Overtopped Roadway	Upgrade to 300-ft span Bridge	$ 4,551,000
	CR 200	Overtopped Roadway	Upgrade to 300-ft span Bridge	$ 6,406,000
	FM 243	Overtopped Roadway	Upgrade to 300-ft span Bridge	$ 10,581,000
	NF01 - River Road	Flooded Structures	4,580 LF Channel Improvements 731,945 CY Excavation	$ 21,773,000
	CR 257	Overtopped Roadway	Upgrade to 200-ft span Bridge	$ 3,174,000
	NF02, NF 03 - CR 257	Flooded Structures	3,090 LF Channel Improvements 820,326 CY Excavation	$ 22,275,000
	CR 258	Overtopped Roadway	Upgrade to 300-ft span Bridge	$ 6,745,000
South Fork San Gabriel River	SFSG01 - High Gabriel / S. San Gabriel Ranches	Flooded Structures	Buy-out flood prone structures	$ 2,385,000
	CR 330B	Overtopped Roadway	Upgrade to 50-ft span Bridge	$ 2,629,000
	CR 323	Overtopped Roadway	Upgrade to 100-ft span Bridge	$ 3,909,000
	FM 1869	Overtopped Roadway	Upgrade to 300-ft span Bridge	$ 4,920,000
San Gabriel River	SG01 - CR 103	Flooded Structures	5,310 LF Channel Improvements 227,568 CY Excavation	$ 8,794,000
	SG02 - McShepherd Road	Flooded Structures	4,070 LF Channel Improvements 279,669 CY Excavation	$ 11,470,000


Legend
Problem Crossing
Study Reach
Channel Improvements
Georgetown City Limits
Georgetown ETJ
CR 243
SUNSET ACRES LN
SH 195
CR 241
CR 245
Upgrade to 800-ft Bridge
CR 241
Upgrade to 700-ft Bridge
Berry Creek
BAR T DR
RM 2338
FISHER RD
CR 249
CR 246
CR 245
PVR 904
RAWHIDE LN
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
-25 years and counting-
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0
1,150
2,300
Feet
FIGURE 6-1. RECOMMENDED IMPROVEMENTS
BERRY CREEK
TWDB FLOOD PROTECTION PLANNING STUDY
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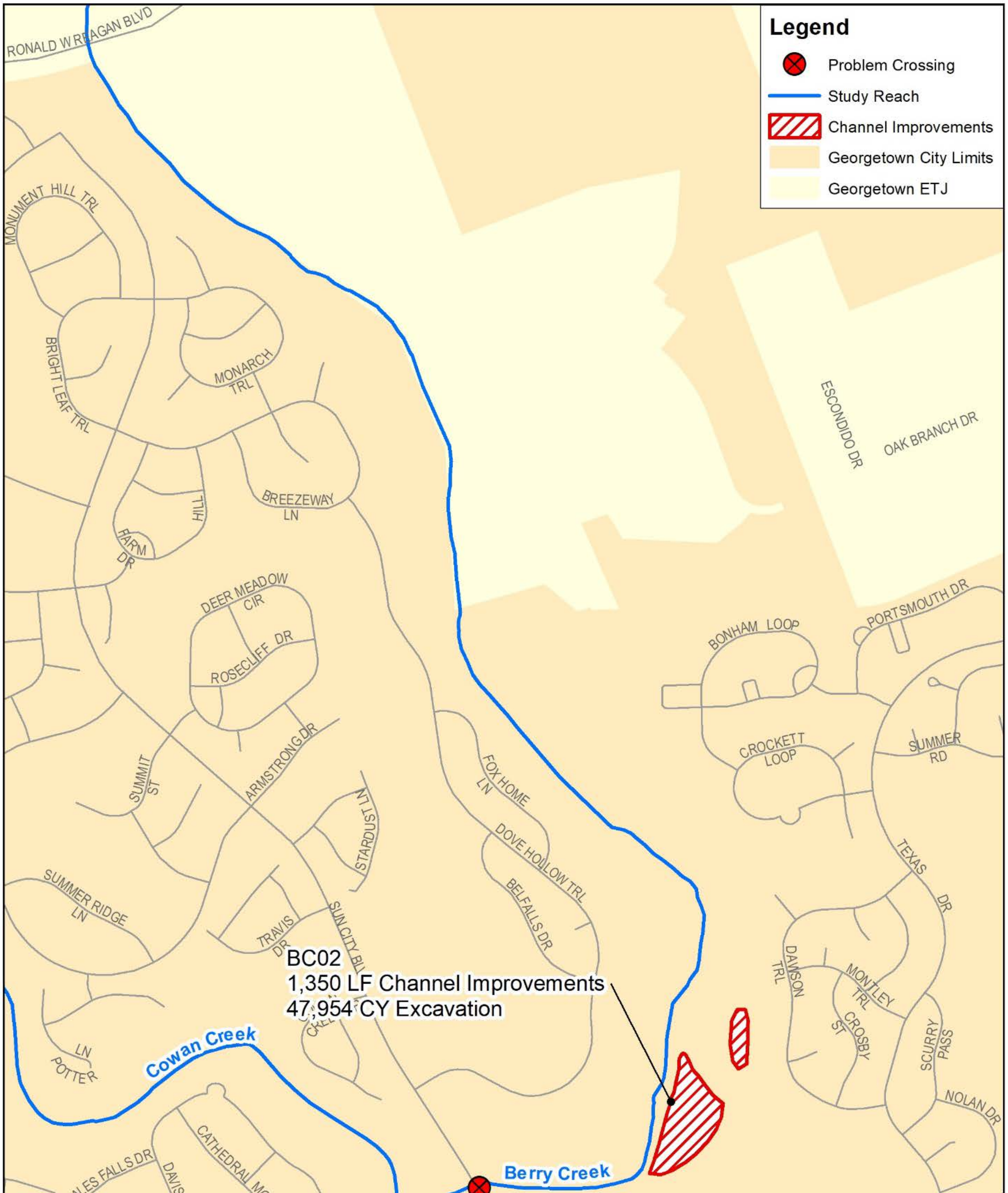

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Texas Water Development Board

DOUCET-CHAN A Division of D&A DOUCET & ASSOCIATES -25 years and counting-

SCHEIBE CONSULTING LLC

FIGURE 6-1. RECOMMENDED IMPROVEMENTS
BERRY CREEK BC02

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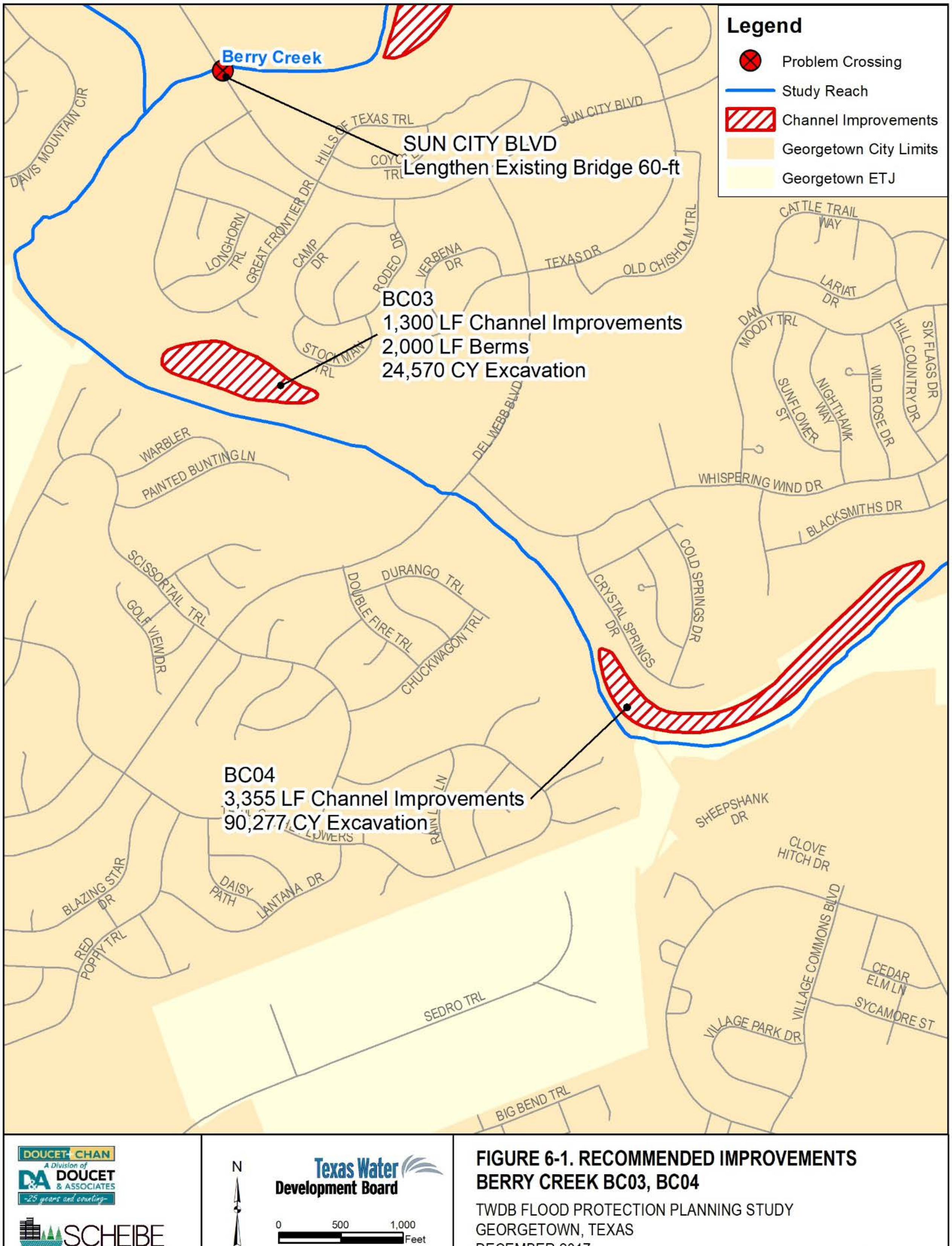

FIGURE 6-1. RECOMMENDED IMPROVEMENTS
BERRY CREEK BC03, BC04

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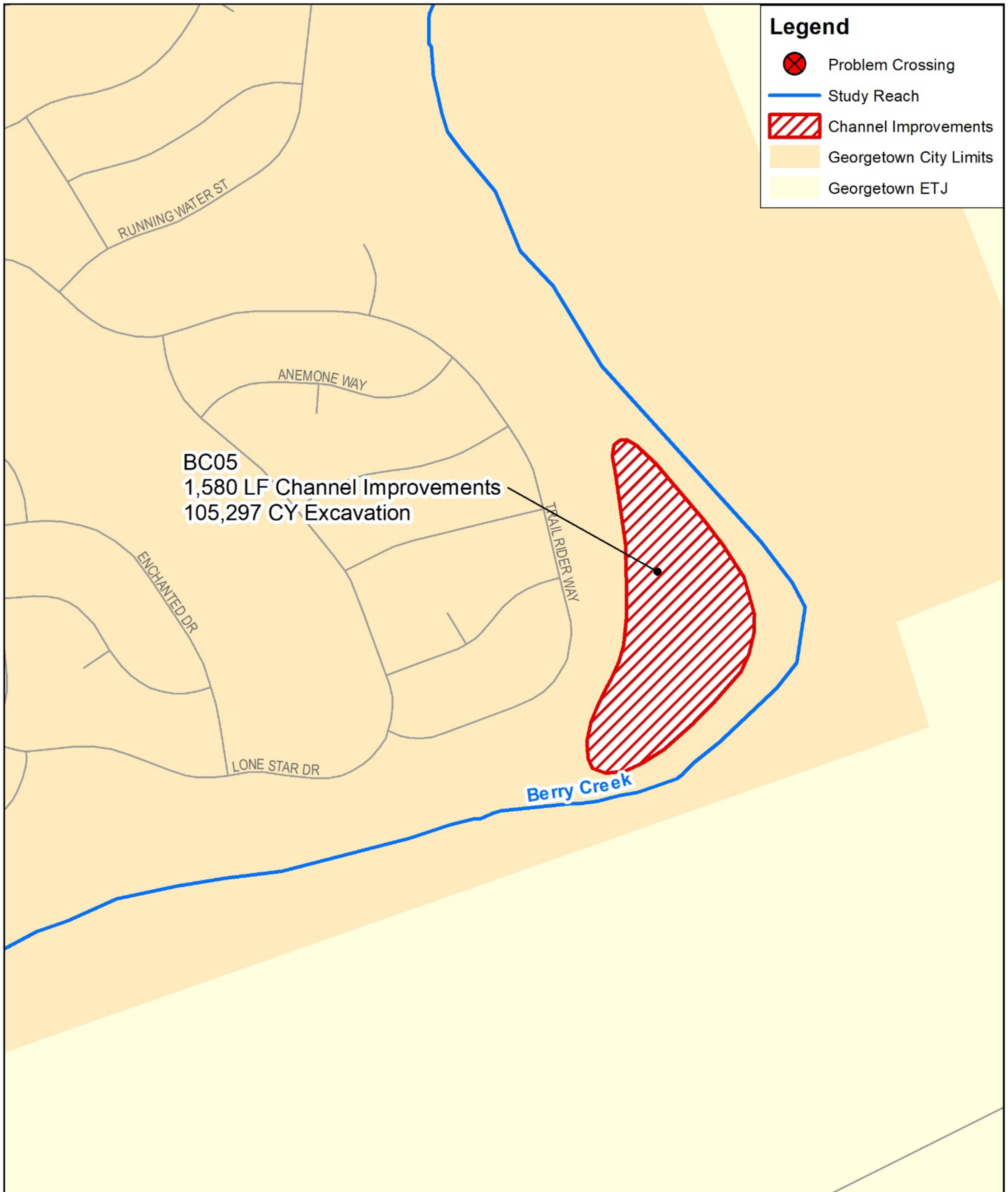

FIGURE 6-1. RECOMMENDED IMPROVEMENTS
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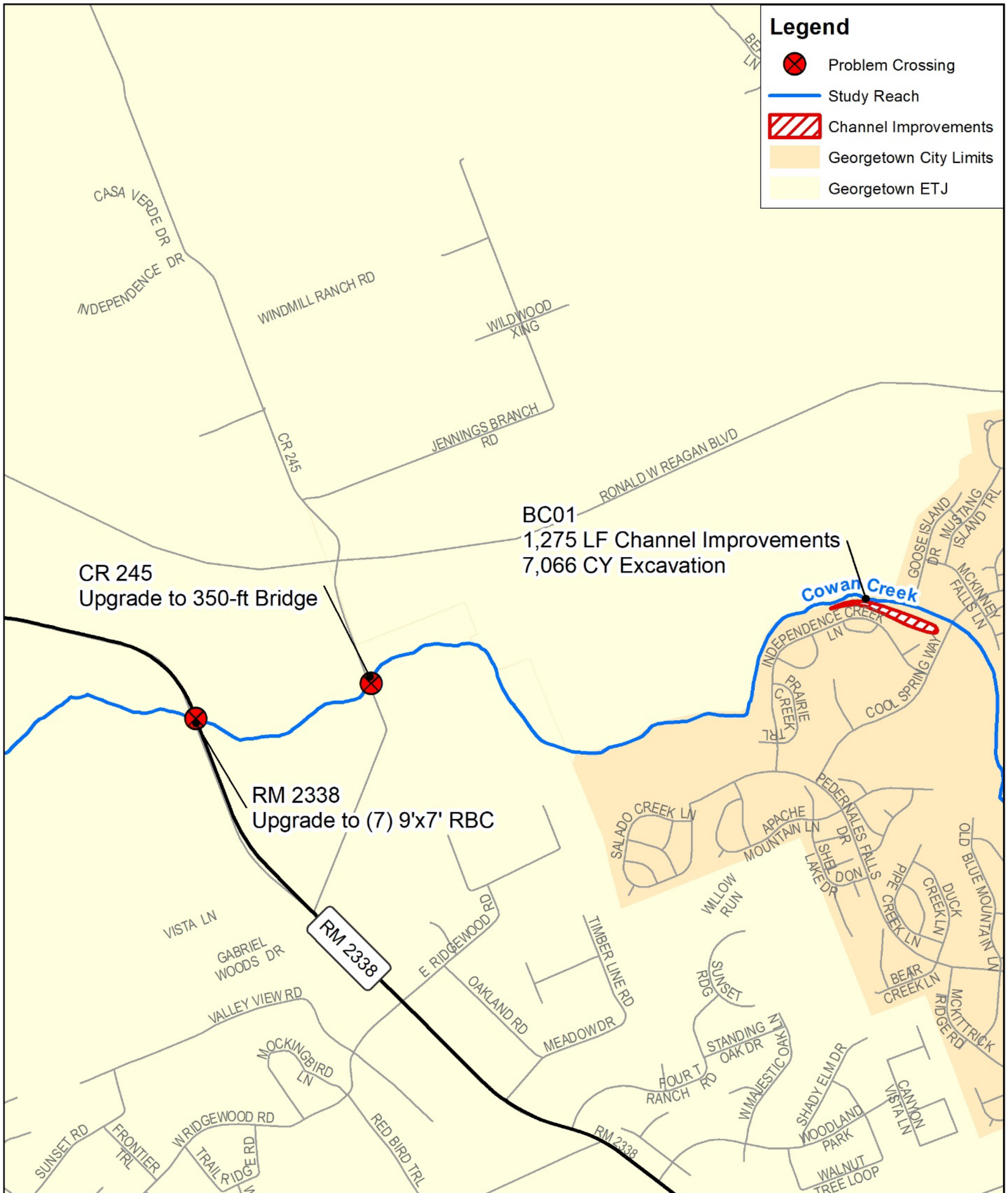

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FIGURE 6-1. RECOMMENDED IMPROVEMENTS BERRY CREEK BC01

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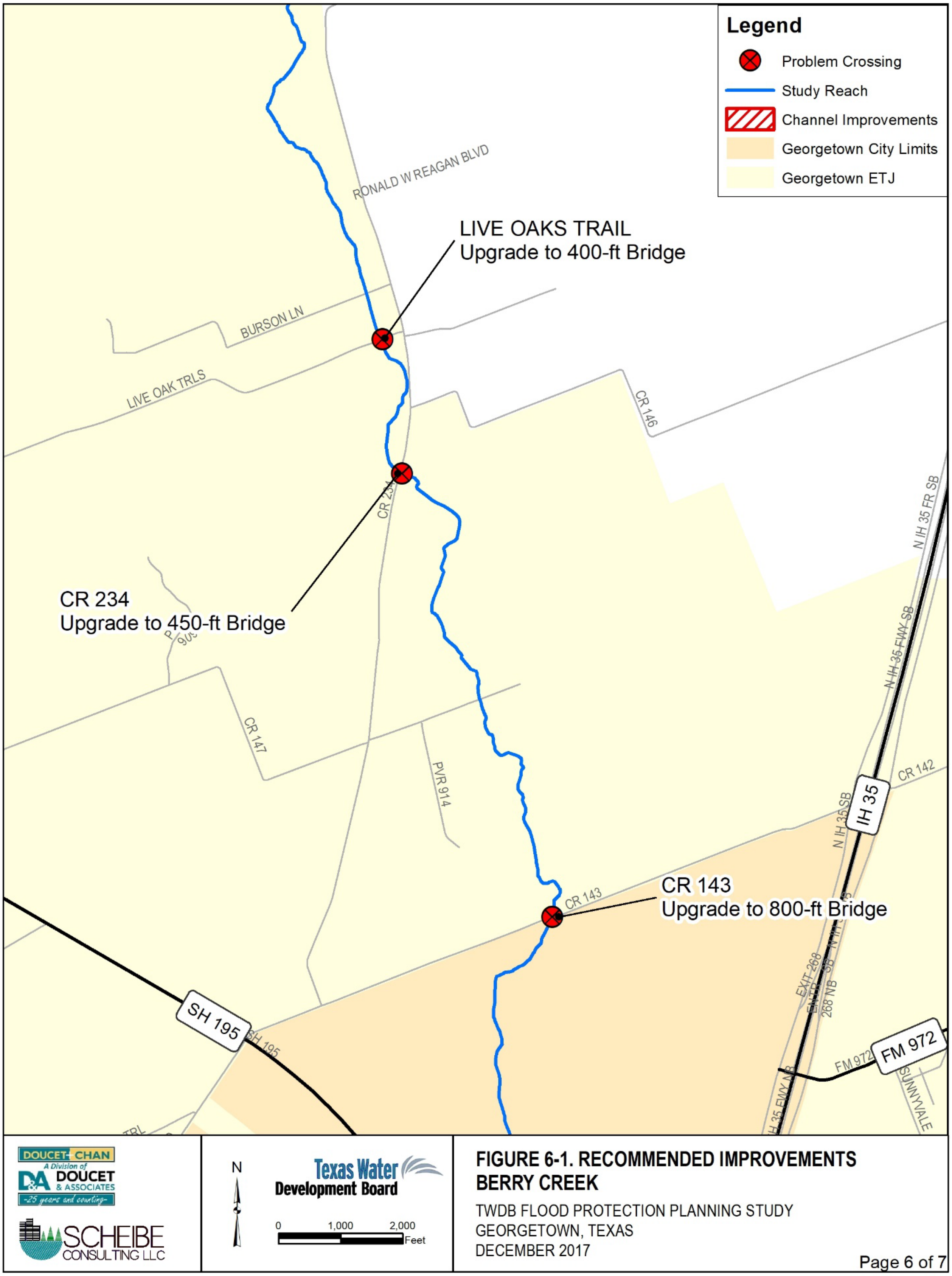

FIGURE 6-1. RECOMMENDED IMPROVEMENTS BERRY CREEK

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FIGURE 6-1. RECOMMENDED IMPROVEMENTS
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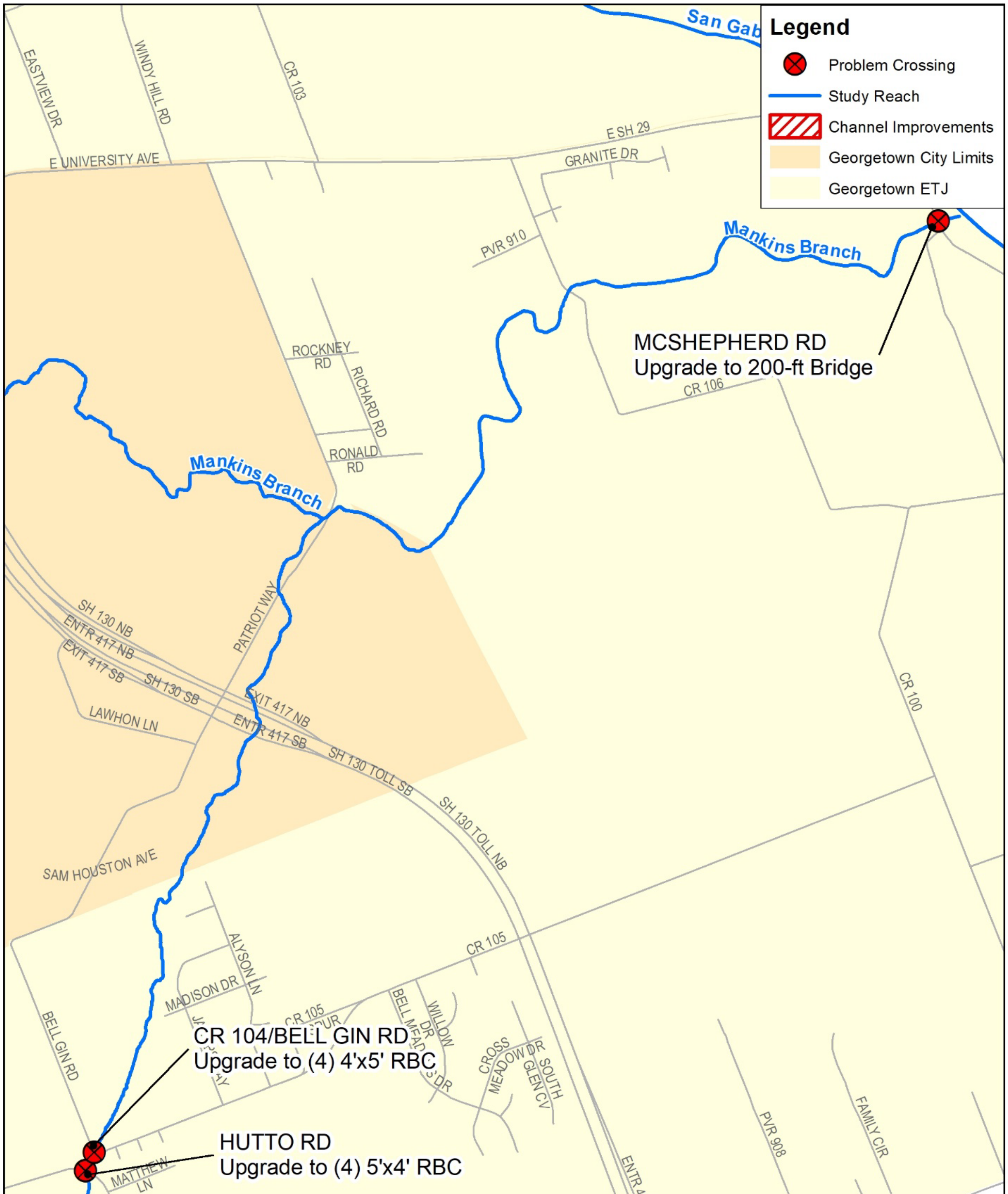

DOUCET-CHAN A Division of DOUCET & ASSOCIATES -25 years and counting-

SCHEIBE CONSULTING LLC

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Texas Water Development Board

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FIGURE 6-2. RECOMMENDED IMPROVEMENTS MANKINS BRANCH

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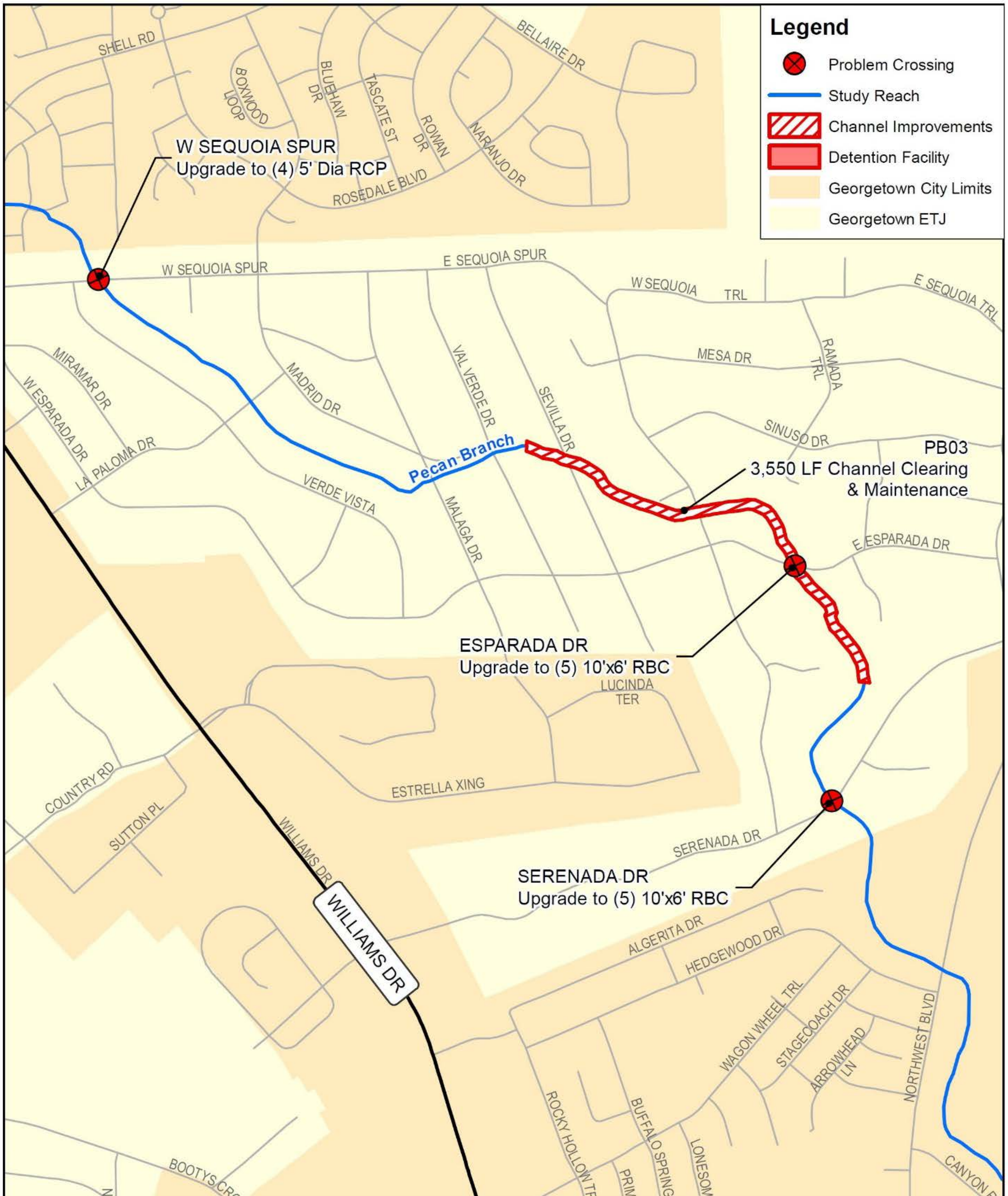

FIGURE 6-3. RECOMMENDED IMPROVEMENTS PECAN BRANCH

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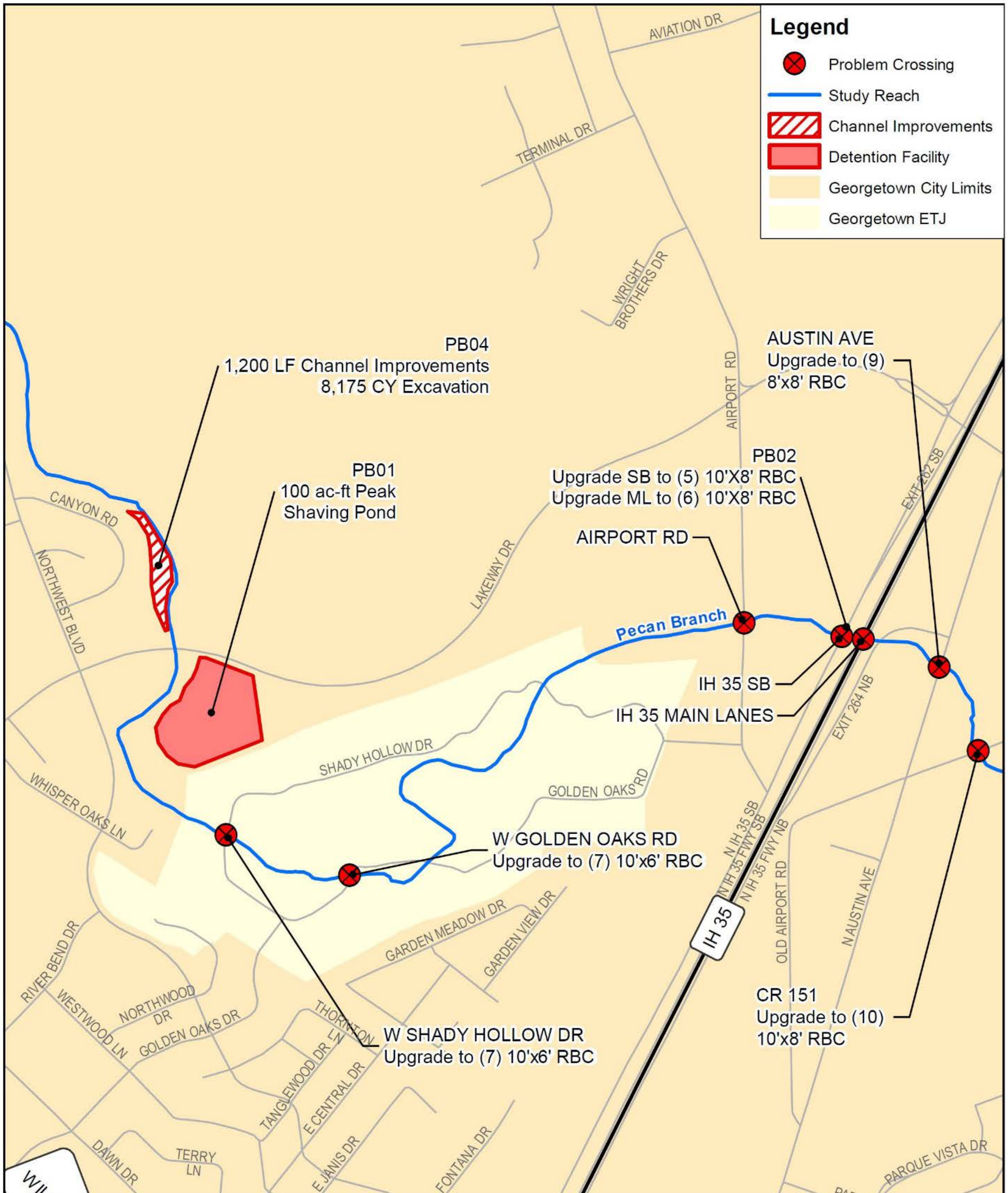

FIGURE 6-3. RECOMMENDED IMPROVEMENTS PECAN BRANCH

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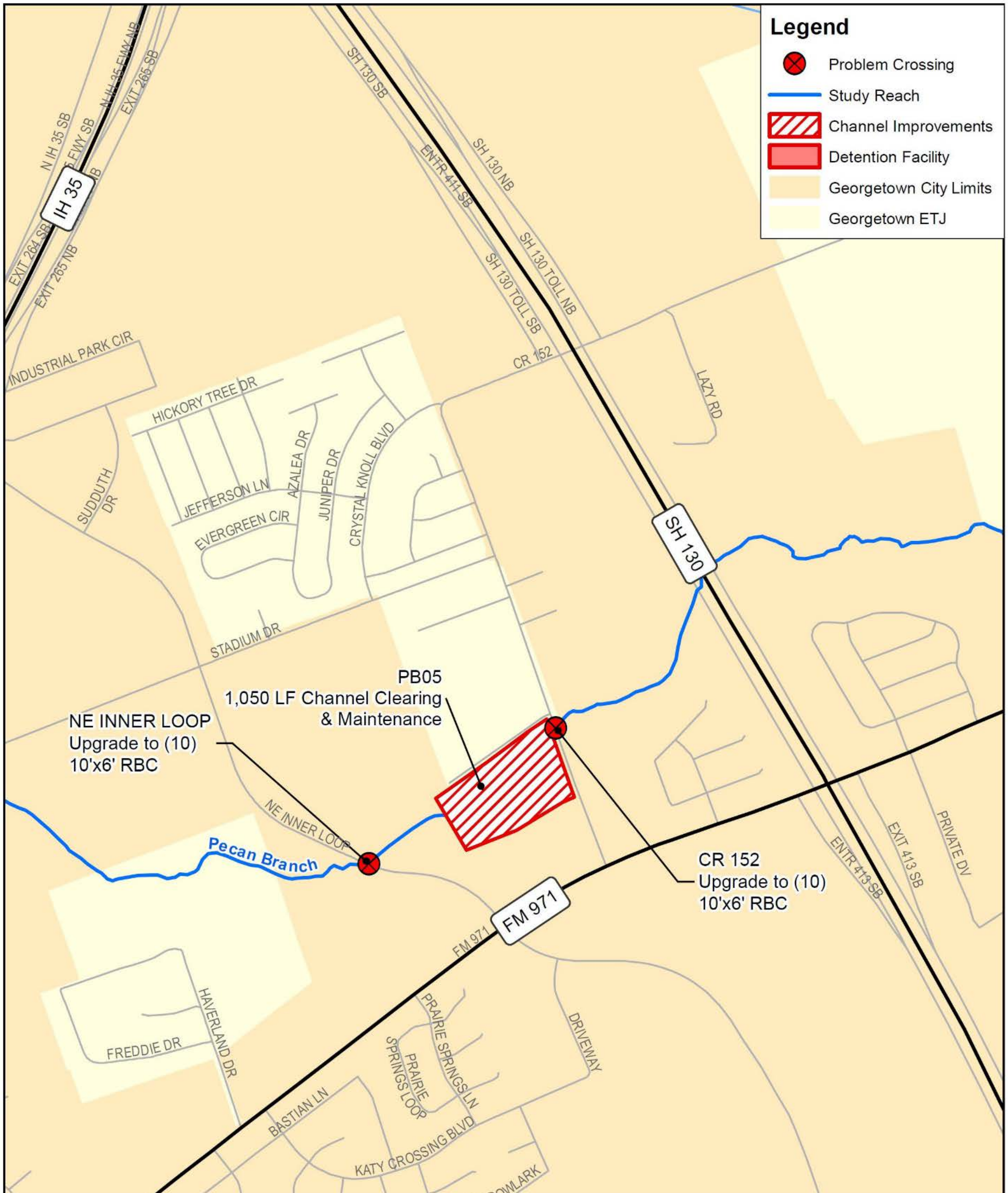

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FIGURE 6-3. RECOMMENDED IMPROVEMENTS PECAN BRANCH

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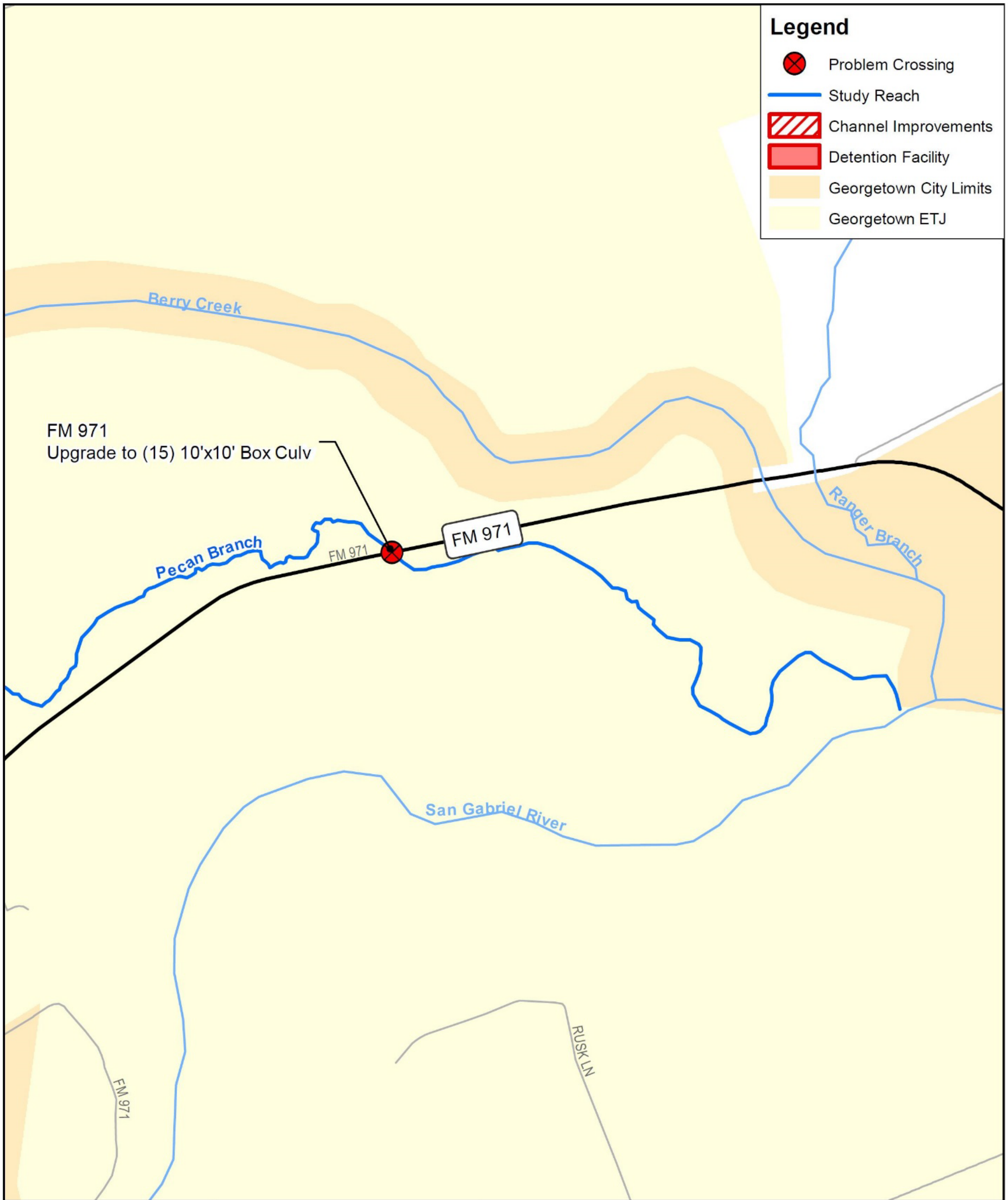

FIGURE 6-3. RECOMMENDED IMPROVEMENTS
PECAN BRANCH

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FIGURE 6-4. RECOMMENDED IMPROVEMENTS SMITH BRANCH

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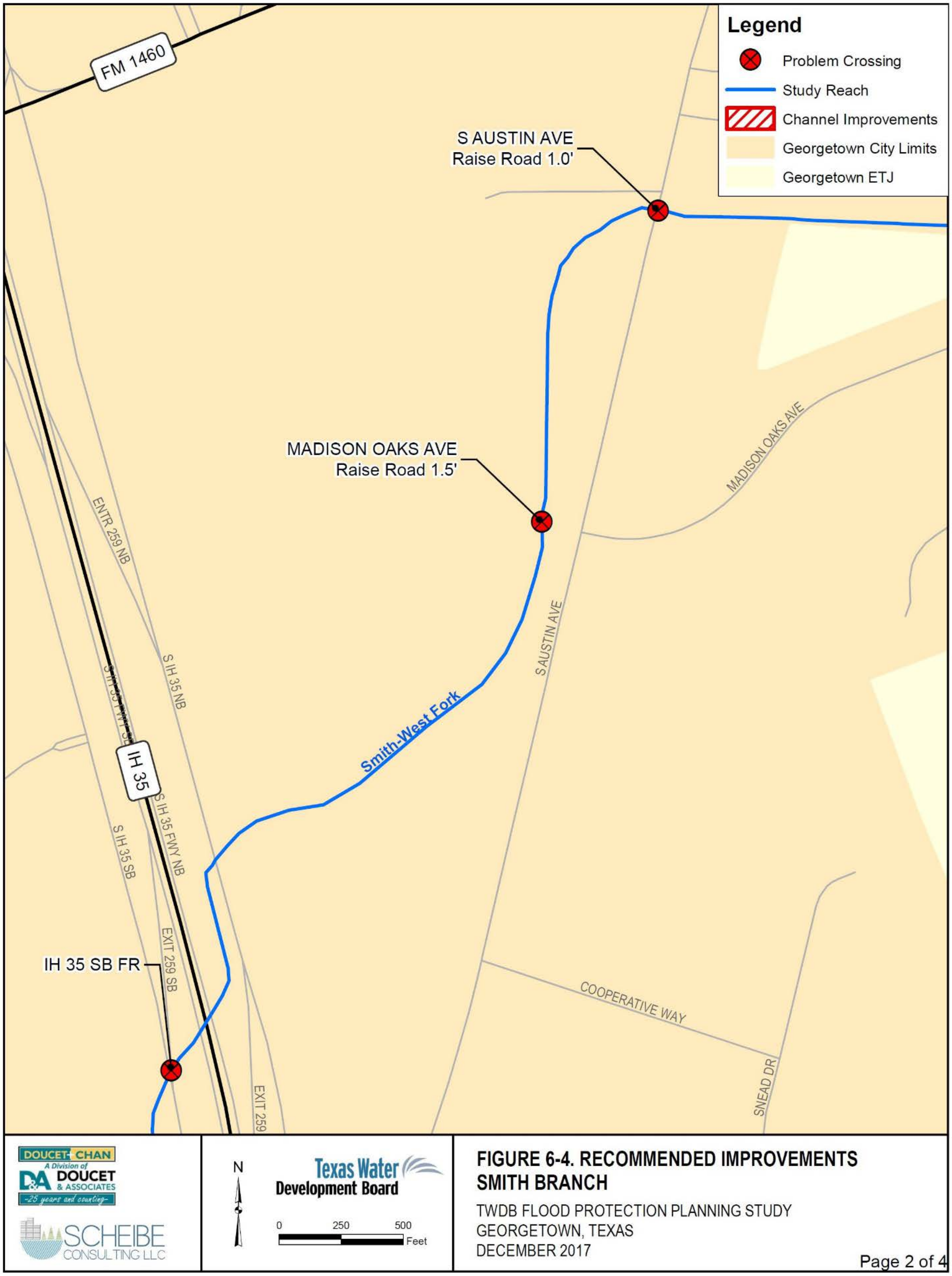

FIGURE 6-4. RECOMMENDED IMPROVEMENTS
SMITH BRANCH

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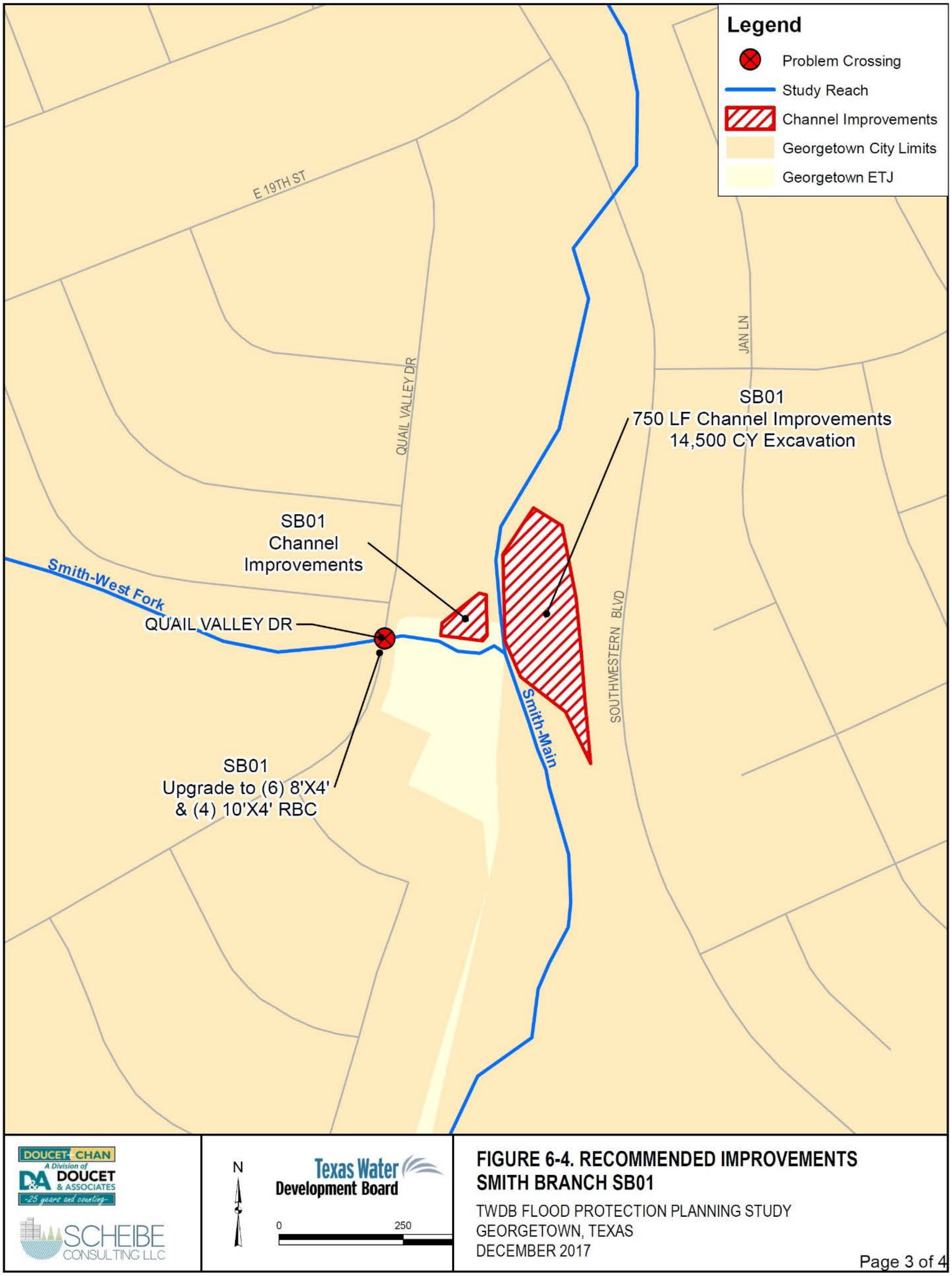

FIGURE 6-4. RECOMMENDED IMPROVEMENTS
SMITH BRANCH SB01

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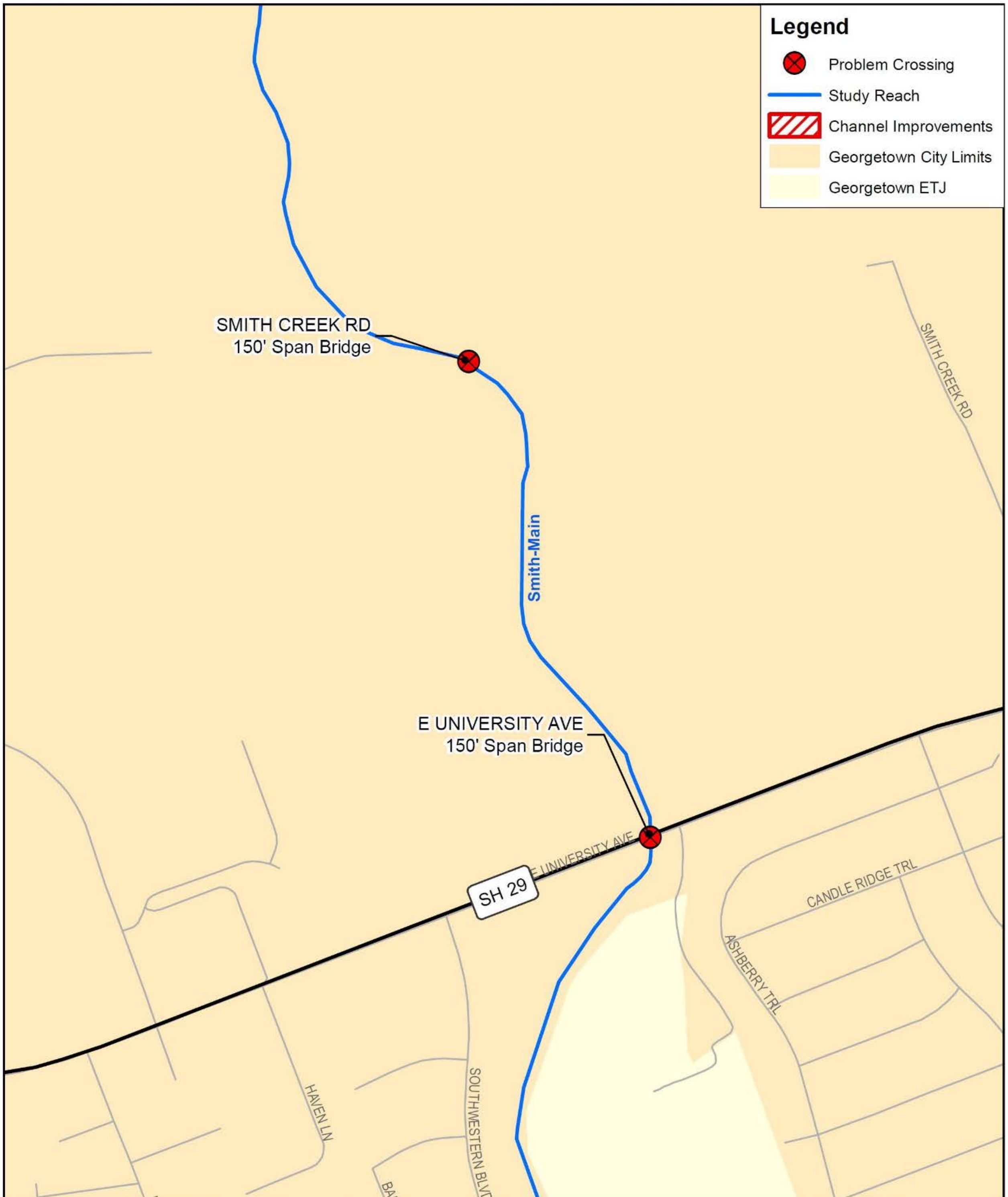

FIGURE 6-4. RECOMMENDED IMPROVEMENTS
SMITH BRANCH

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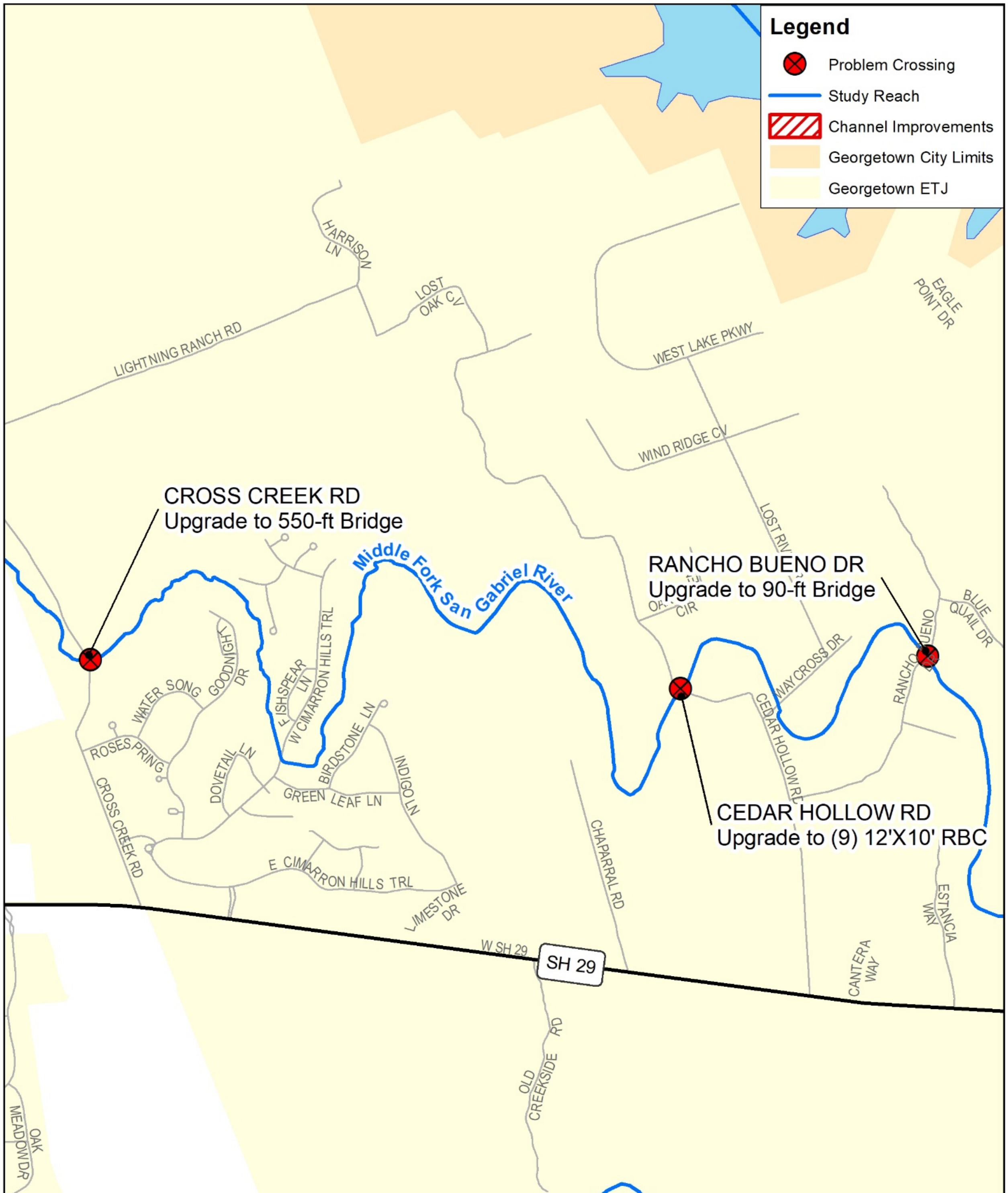

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Texas Water Development Board

FIGURE 6-5. RECOMMENDED IMPROVEMENTS MIDDLE FORK

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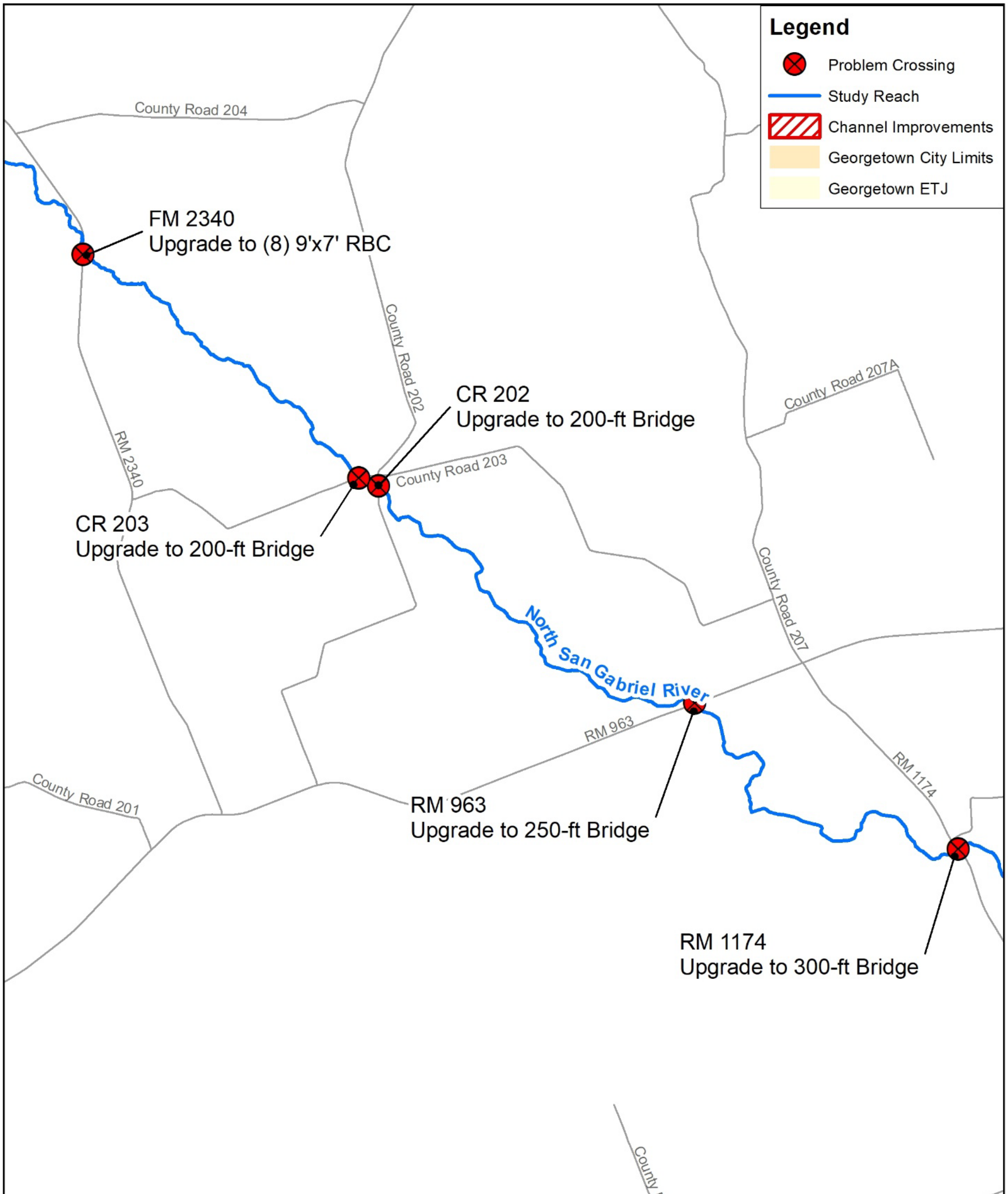

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FIGURE 6-6. RECOMMENDED IMPROVEMENTS NORTH SAN GABRIEL RIVER

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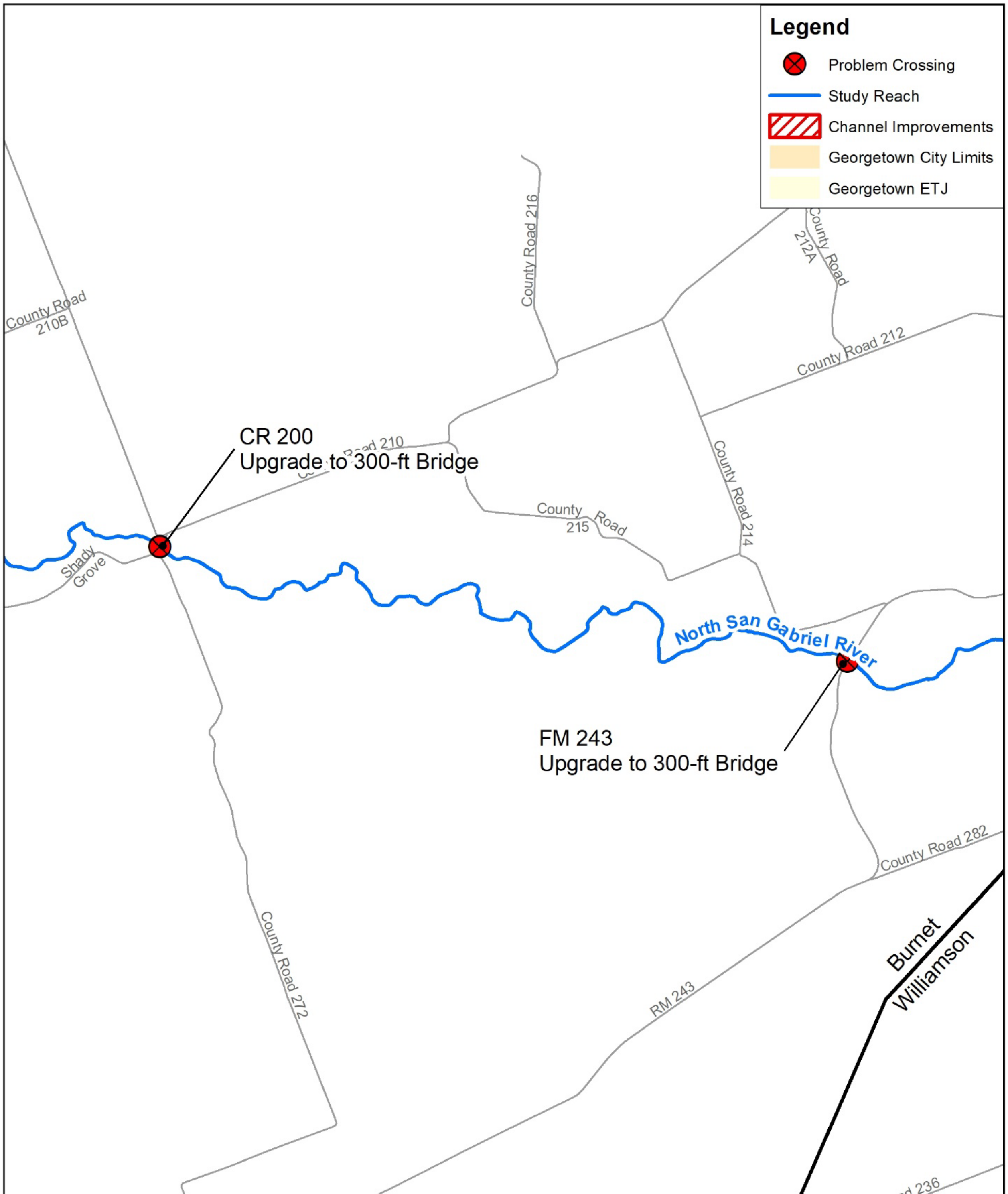

FIGURE 6-6. RECOMMENDED IMPROVEMENTS
NORTH SAN GABRIEL RIVER

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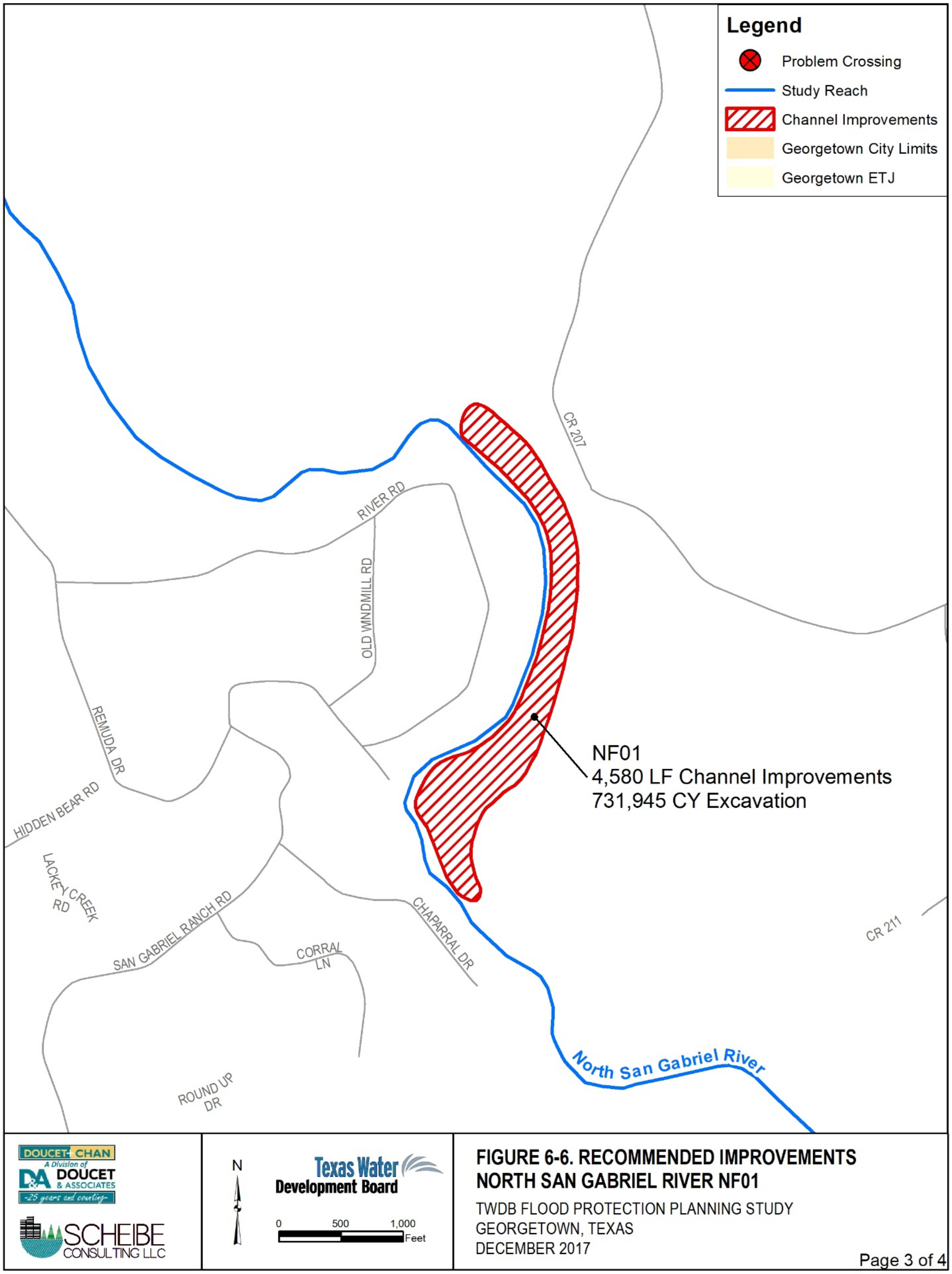

FIGURE 6-6. RECOMMENDED IMPROVEMENTS NORTH SAN GABRIEL RIVER NF01

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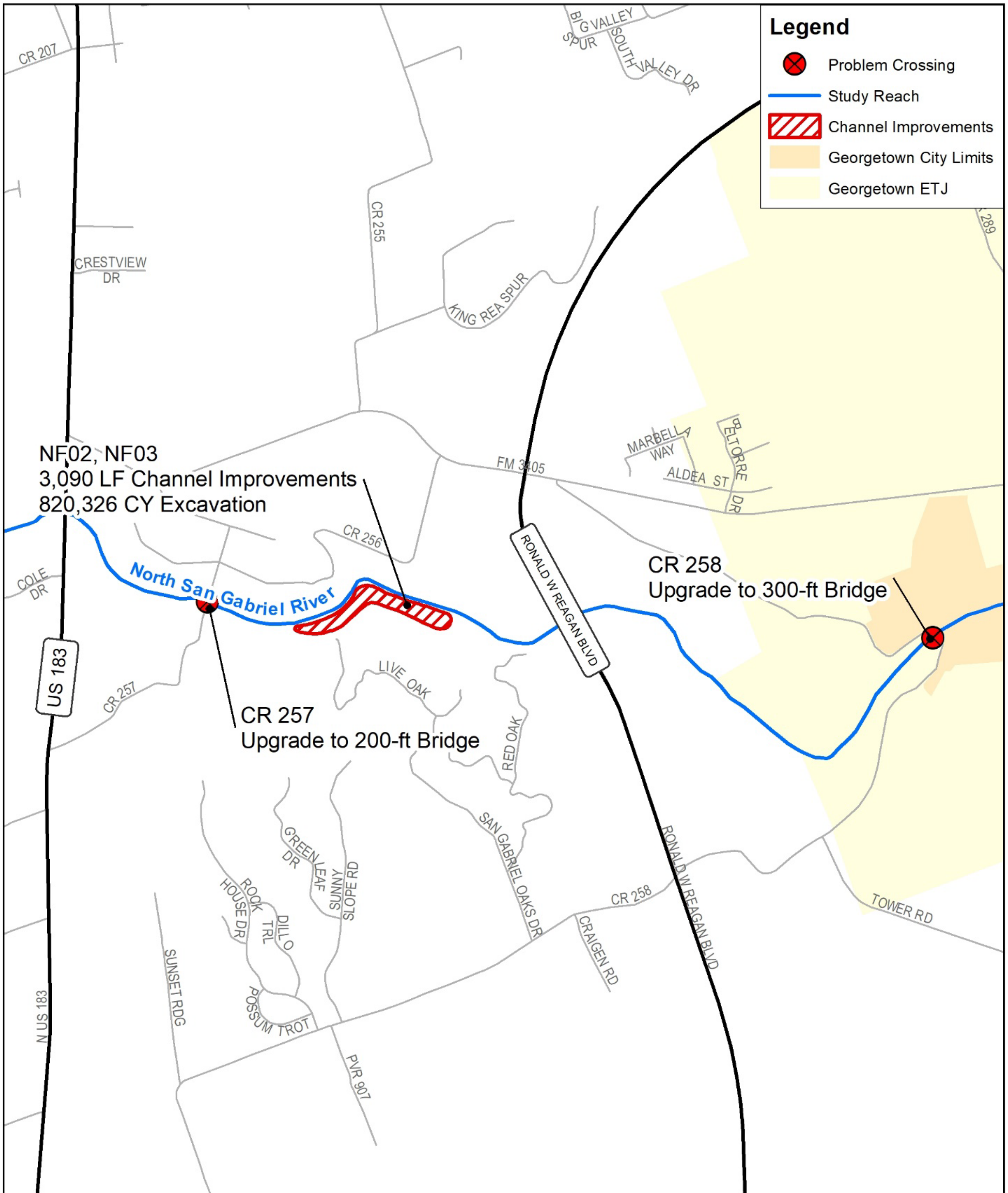

FIGURE 6-6. RECOMMENDED IMPROVEMENTS NORTH SAN GABRIEL RIVER NF02, NF03

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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Scheibe Consulting LLC
Texas Water Development Board

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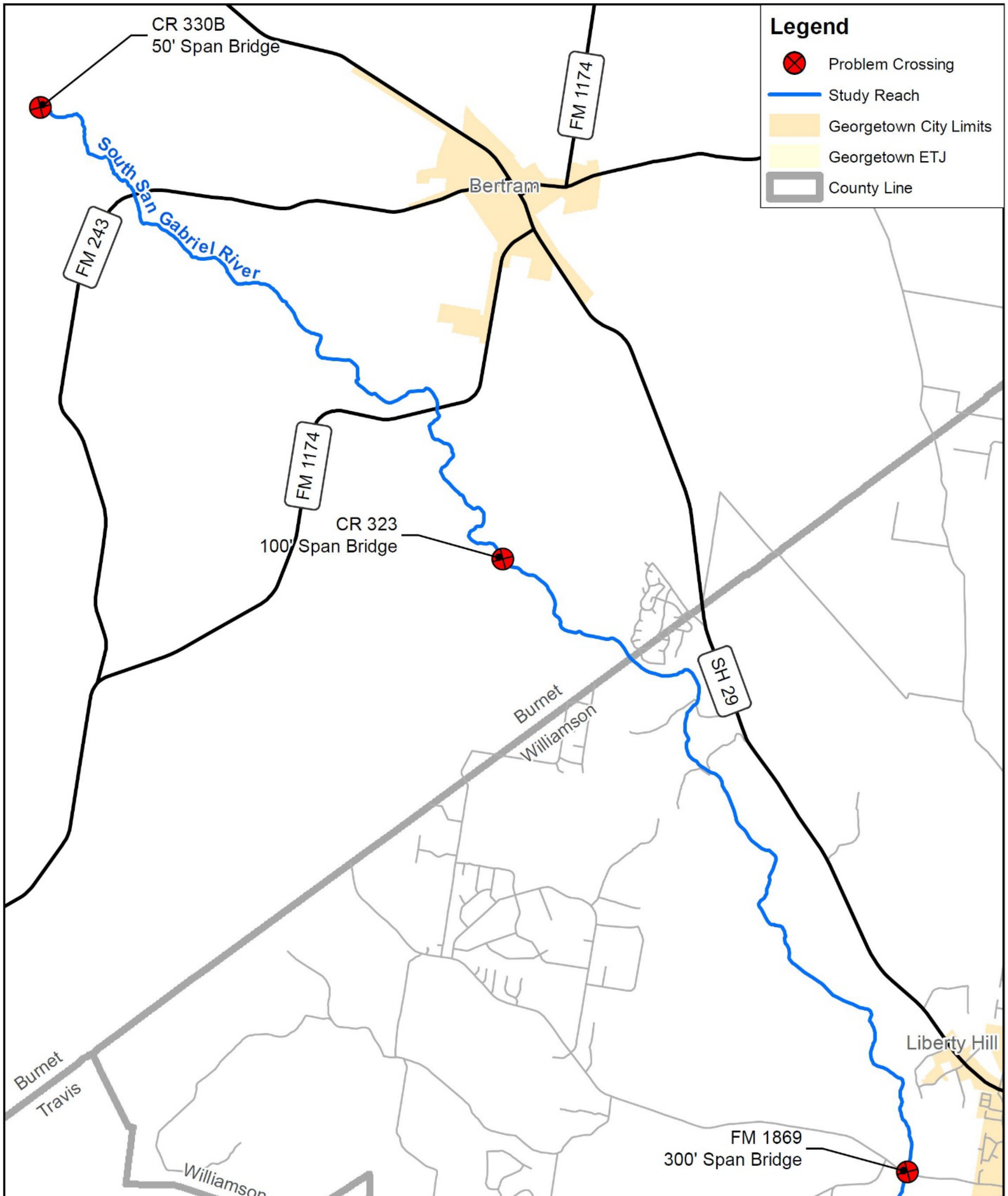

FIGURE 6-7. RECOMMENDED IMPROVEMENTS SOUTH FORK SAN GABRIEL RIVER

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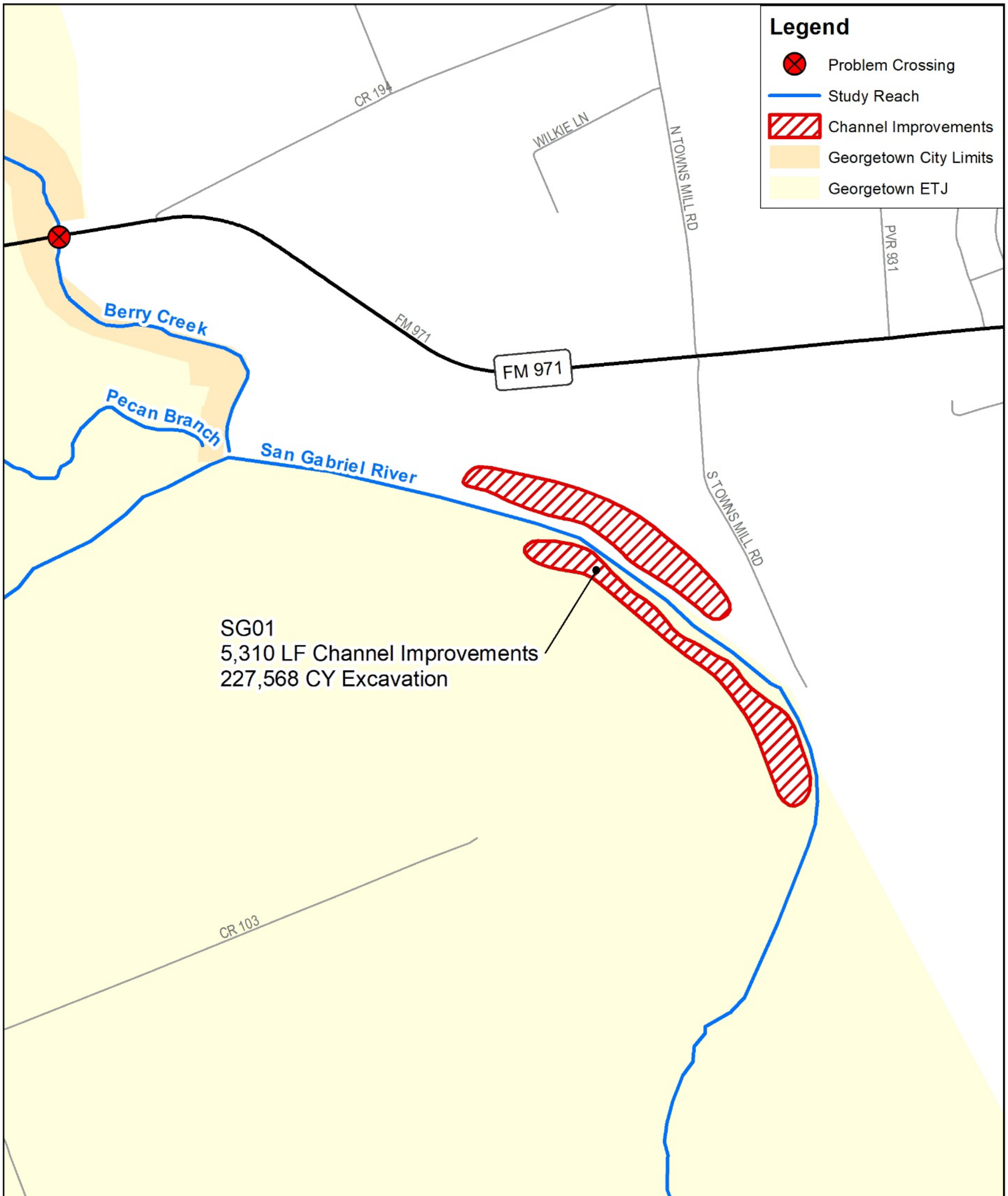

DOUCET-CHAN A Division of DOUCET & ASSOCIATES -25 years and counting-
SCHEIBE CONSULTING LLC
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FIGURE 6-8. RECOMMENDED IMPROVEMENTS
SAN GABRIEL RIVER SG01
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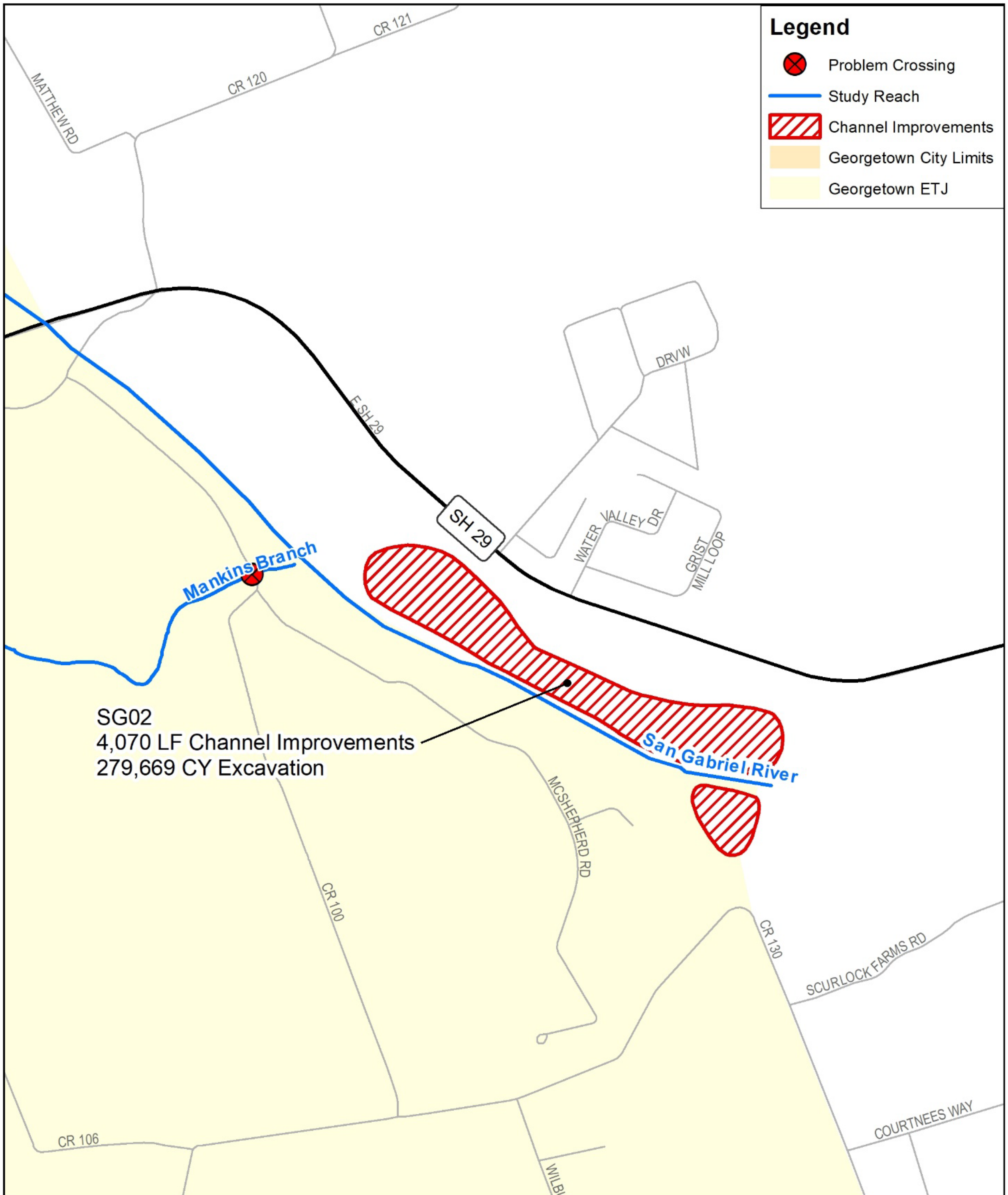

FIGURE 6-8. RECOMMENDED IMPROVEMENTS SAN GABRIEL RIVER SG02

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7.0 Prioritization of Recommended Flood Hazard Mitigation Improvements

The flood hazard mitigation projects presented in Section 6 provide protection from flooding for many affected individuals and their property as well as for public safety associated with road crossings over streams. The reality of public infrastructure improvement funding is that there are limited funds available and that not all the identified/recommended projects can be funded within a reasonable time period. Therefore, a prioritization process was developed and utilized to assist participating project sponsors in determining a practical way of selecting flood hazard mitigation projects to build over the next planning horizon or two. Additional detail of the prioritization process employed in this study is presented in Appendix C along with results obtained applying the process to the individual projects identified from the floodplain modeling and mapping efforts discussed in previous sections within this report.

The initial part of the prioritization process was to identify the major concerns as well as their respective importance associated with flood hazard mitigation management for flooded problem areas as well as for road crossings over streams. The major concerns identified to be addressed by the proposed flood hazard mitigation improvements for flooded problem areas (building/structures - e.g. residences, commercial buildings, offices, etc.) were:

- Public Safety, including consideration of impassibility of evacuation routes and overall benefits to the transportation system of the area;
- Flood Significance, including consideration of number of structures flooded during the 100-year Existing Conditions event and frequency of structure flooding;
- Dependence on Other Projects, including consideration of dependence on other projects to be fully effective;
- Environment, including consideration of environmental impacts of the proposed improvements;
- Easement/O&M, easement and O&M costs and requirements associated with project
- Benefit/Cost Ratio, including consideration of the ratio of benefits (flood damage reduction) and project costs.

The major concerns identified to be addressed by the proposed flood hazard mitigation improvements for road crossing flooding were:

- Public Safety, includes roadway classification (arterial, collector, or local) and whether an alternative route is readily available;
- Flood Significance, including consideration of number of structures flooded due to inadequacy of conveyance and the frequency of the flooding;
- Dependence on Other Project, including consideration of dependence on other projects to be fully effective;

- Environment, including consideration of the environmental impact of the proposed roadway improvement;
- Project Cost, including consideration of the total cost of the project including construction, engineering fees, and administrative fees.

To refine the prioritization process, representatives from the major stakeholders participated in the prioritization process during the Working Meeting in November of 2017. That meeting included representatives from the City of Georgetown, Williamson County, and the City of Leander.

As outlined in Appendix C, the second part of the prioritization process involved developing a flood severity index matrix for flooded problem areas (see Table C-4) as well as separate flood severity index risk index for flooded road crossings (see Table C-5). Using these two flood severity matrices, an overall (total) flood severity index value was developed for each identified project area. These project index values then allowed for individual projects to be ranked against one another and grouped by jurisdiction as shown in Table 7-1.

In recent meetings with the City of Georgetown, the City requested that projects located within their city limits and ETJ be further divided into Tier 1 and Tier II sets of projects. Tier I projects are the highest ranked projects within Georgetown's city limits and ETJ that total approximately $20 million in estimated implementation costs, almost equally split between problem areas and roadway crossings, without considering costs for easements or rights-of-way. This level of project implementation could possibly be accomplished in an upcoming planning horizon as directed by the Georgetown City Council and City staff leaders. Additionally, a Tier II level of projects was also developed that includes the next highest ranked projects beyond Tier I projects that total approximately $30 million in estimated costs excluding easement and rights-of-way costs. The Tier I and Tier II projects are specifically identified in Table 7-1.

Williamson County has one road crossing project identified in Table 7-1 but several road crossing projects located in Georgetown's ETJ may, in fact, be under Williamson County's jurisdictional control. Recommendations in Table 7-1 also include one project for the City of Leander, three for the City of Liberty Hill, and ten for Burnet County. Again, additional detail is in Appendix C.

This prioritization process has a subjective, qualitative ranking of the projects and is not intended to define the specific order in which projects are ultimately funded. Instead, it can be used as a tool to help the various jurisdictions in their own prioritization process. Actual prioritization and funding of projects will be determined by the Stakeholders and affected communities.

Table 7-1 Flood Hazard Mitigation Improvements Prioritization Summary

City of Georgetown & ETJ					
Priority	**Watershed**	**Description**	**Severity Index**	**Type of Project**	**Total Cost**
Tier I					
1	Smith	SB01 - West Fork Confluence	76	Channel	$ 1,885,000
2	Pecan	PB04 - Canyon Rd	76	Channel	$ 815,000
3	Berry	BC02 - Dove Hollow/Dawson Trail	64	Channel	$ 2,310,000
4	Berry	BC03 - Painted Bunting Ln	59	Channel	$ 3,648,000
5	Berry	BC01 - Independence Creek Ln	56	Channel	$ 934,000
6	Berry	Live Oak Trails	57	Roadway	$ 4,613,000
7	Pecan	N Austin Ave	55	Roadway	$ 4,040,000
8	Smith	CR 166	55	Roadway	$ 660,000
9	Smith	SB02 - Rabbit Hollow Subdivision	54	Channel	$ 765,000
10	Pecan	PB03 - Serenada Subdivision	54	Channel	$ 410,000
					$ 20,080,000
Tier II					
1	Pecan	FM 971	55	Roadway	$ 8,272,000
2	Pecan	Serenada Dr	53	Roadway	$ 2,028,000
3	Smith	University / SH 29	50	Roadway	$ 2,750,000
4	Pecan	Esperada Dr	49	Roadway	$ 2,771,000
5	Berry	FM 971	45	Roadway	$ 14,961,000
					$ 30,782,000
All Other Improvement Projects					
1	Berry	CR 234	45	Roadway	$ 8,150,000
2	Berry	CR 143	45	Roadway	$ 12,774,000
3	Berry	CR 245	45	Roadway	$ 16,312,000
4	Berry	CR 241	45	Roadway	$ 14,331,000
5	Pecan	PB01 - Golden Oaks Subdivision	45	Channel	$ 8,900,000
6	Mankins	McShepherd Road / CR 100	45	Roadway	$ 4,657,000
7	Middle Fork	Rancho Bueno Drive	45	Roadway	$ 4,165,000
8	Smith	Smith Creek Rd	45	Roadway	$ 8,306,000
9	Mankins	Bell Gin Rd / CR 104	45	Roadway	$ 1,067,000

Table 7-1 Flood Hazard Mitigation Improvements Prioritization Summary (continued)

City of Georgetown & ETJ					
Priority	**Watershed**	**Description**	**Severity Index**	**Type of Project**	**Total Cost**
10	Mankins	Hutto Road	45	Roadway	$ 1,538,000
11	Pecan	W Sequoia Spur	45	Roadway	$ 1,303,000
12	Pecan	W Shady Hollow Dr	45	Roadway	$ 1,850,000
13	Pecan	W Golden Oaks Rd	45	Roadway	$ 2,454,000
14	Smith	Madison Oaks Ave	45	Roadway	$ 668,000
15	Berry	BC05 - Trail Rider Way	41	Channel	$ 4,116,000
16	San Gabriel	SG02 - McShepherd Road	40	Channel	$ 8,306,000
17	Pecan	PB05 - Lonnie Thomas Dr	39	Channel	$ 295,000
18	Berry	BC04 - Crystal Springs Dr	37	Channel	$ 4,016,000
19	Berry	CR 245	35	Roadway	$ 9,667,000
20	Middle Fork	Cedar Hollow Rd	35	Roadway	$ 5,931,000
21	Middle Fork	Cross Creek Rd	35	Roadway	$ 9,166,000
22	San Gabriel	SG01 - CR 103	35	Channel	$ 1,067,000
23	Pecan	CR 151	35	Roadway	$ 6,051,000
24	Pecan	CR 152	35	Roadway	$ 4,815,000
25	Pecan	PB02 – I.H. 35	34	Channel	$ 10,825,000
26	Smith	S Austin Ave	30	Roadway	$ 3,083,000
27	Pecan	NE Inner Loop	30	Roadway	$ 3,572,000
28	Berry	Andice Rd / RM 2338	30	Roadway	$ 2,473,000
29	Berry	CR 152	25	Roadway	$ 9,345,000
30	Berry	CR 152	25	Roadway	$ 1,913,000
31	North Fork	CR 258	10	Roadway	$ 6,745,000

Williamson County					
Priority	**Watershed**	**Description**	**Severity Index**	**Type of Project**	**Total Cost**
1	South Fork	FM 1869	55	Roadway	$ 4,920,000

Table 7-1 Flood Hazard Mitigation Improvements Prioritization Summary (continued)

City of Liberty Hill					
Priority	**Watershed**	**Description**	**Severity Index**	**Type of Project**	**Total Cost**
1	North Fork	CR 257	73	Roadway	$ 3,174,000
2	North Fork	NF01 - River Road	30	Channel	$ 21,773,000
3	North Fork	NF02, NF 03 - CR 257	27	Channel	$ 22,275,000

Burnet County					
Priority	**Watershed**	**Description**	**Severity Index**	**Type of Project**	**Total Cost**
1	North Fork	FM 2340	55	Roadway	$ 3,623,000
2	South Fork	CR 330B	55	Roadway	$ 2,629,000
3	North Fork	CR 203	45	Roadway	$ 6,860,000
4	South Fork	CR 323	45	Roadway	$ 3,909,000
5	North Fork	RM 1174	40	Roadway	$ 4,551,000
7	North Fork	CR 202	38	Roadway	$ 7,209,000
8	North Fork	CR 200	35	Roadway	$ 6,406,000
9	North Fork	FM 243	35	Roadway	$ 10,581,000
10	North Fork	RM 963	30	Roadway	$ 4,257,000
11	North Fork	CR 258	20	Roadway	$ 6,745,000

8.0 References

Asquith, William H. and Roussel, Meghan C. 2004. "Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas". U.S. Geological Survey Report SIR 2004-5041.

Burnet County. 2010. "Burnet County Comprehensive Transportation Plan".

City of Georgetown. 2008. "2030 Comprehensive Plan".

City of Leander. 2015. "Destination Leander – Comprehensive Plan".

Hailey, James L. and McGill, H.N. 1983. "Runoff Curve Number Based On Soil-Cover Complex and Climatic Factors." Proceedings 1983 Summer Meeting ASAE, Montana State University, Boseman, MT.

Hershfield, D.M. 1961. "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years". Weather Bureau Technical Paper No. 40, U.S. Department of Commerce, Washington, DC.

Raymond Chan & Associates, Inc. 2002. "Berry Creek Watershed Master Plan". Prepared for City of Georgetown.

Raymond Chan & Associates, Inc. 2002. "Mankins Branch Watershed Master Plan". Prepared for City of Georgetown.

Raymond Chan & Associates, Inc. 2002. "Middle Fork Watershed Master Plan". Prepared for City of Georgetown.

Raymond Chan & Associates, Inc. 2002. "Pecan Branch Watershed Master Plan". Prepared for City of Georgetown.

Raymond Chan & Associates, Inc. 2002. "Smith Branch Watershed Master Plan". Prepared for City of Georgetown.

Texas Colorado River Floodplain Coalition. 2011. "Multi-Jurisdictional Hazard Mitigation Plan Update 2011-2016".

Thompson, David. 2000. "Climatic Influence on NRCS Curve Number Literature Review". 2000. Texas Department of Transportation Report TX/00/2104-1.

Williamson County. 2009. "Williamson County Long-range Transportation Plan".

United States Department of Agriculture. 1986. "Urban Hydrology for Small Watersheds". Technical Release 55 (Second ed.). Natural Resources Conservation Service, Conservation Engineering Division.

APPENDIX A
HYDROLOGY

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A.1.0 Background

Hydrologic analyses were performed for the study areas identified in the two Georgetown-San Gabriel Flood Protection Planning Study grant applications to the Texas Water Development Board (TWDB) (Figure A-1) to estimate peak storm flows that would occur for 5, 10, 25, 50, 100, and 500-year (20, 10, 4, 2, 1, and 0.2 percent annual chance exceedance) storm events for existing and future watershed conditions. The hydrologic analysis consisted of the following steps:

- Watershed boundaries were delineated
- Curve numbers were established for each watershed
- Flow paths and associated lag times were determined for each watershed
- Routing parameters were estimated for each flow path
- Large detention structures were researched and analyzed
- Precipitation was estimated
- Hydrologic models were calibrated based upon historical storm events; and
- Final hydrologic models were developed for each study area

The USACE HEC-HMS software version 4.2 was used for the hydrologic analyses. Detailed descriptions of the steps, assumptions, and results of the analyses are presented in this Appendix. Summaries of pertinent data, calculations, tables, and figures are located at the end of this Appendix. An overview of the project area is provided in Figure A-1.

A.2.0 Data Sources

Table A-1 lists the sources used in the hydrologic analysis, as well as the specific calculation(s) for which each source was used.

A.3.0 Watershed Delineation

A.3.1 Method Overview

Watershed boundaries were delineated for each study area based upon Light Detection and Ranging (LiDAR) ground elevation information from three available sources, including the 2015 City of Georgetown 50cm LiDAR for City of Georgetown and ETJ area, the 2007 CAPCOG 140cm LiDAR for Williamson County area outside of the Georgetown LiDAR, and the 2011 StratMap Bell/Burnet/McLennan 50cm LiDAR for Burnet County area. ESRI's ArcMap program and the Corp of Engineers HEC-GeoHMS program were utilized to delineate the subbasin boundaries for use in hydrologic analysis. Subbasin sizes were generally delineated based upon geography and land topography as follows to ensure consistency in subbasin rainfall-runoff modeling within the models:

- Subbasins for rural areas were sized to be close to 5 square miles, but not to exceed 8 square miles; and
- Subbasins for urban areas were sized to be close to 0.5 square miles, but not less than 0.25 square miles.

A.3.2 Watershed Delineation – Berry Creek Watershed Study Area

Hydrologic subbasins for the Berry Creek Study Area were delineated as described above, utilizing the Georgetown LiDAR and the CAPCOG LiDAR. The watershed consisted of 125.4 square miles and was delineated into 55 subbasins as shown in Figure A-2.

A.3.3 Watershed Delineation – Mankins Branch Watershed Study Area

Hydrologic subbasins for the Mankins Branch Study Area were delineated as described above, utilizing the Georgetown LiDAR. The watershed consisted of 13.2 square miles and was delineated into 16 subbasins as shown in Figure A-3.

A.3.4 Watershed Delineation – Pecan Branch Watershed Study Area

Hydrologic subbasins for the Pecan Branch Study Area were delineated as described above, utilizing the Georgetown LiDAR. The watershed consisted of 7.3 square miles and was delineated into 17 subbasins as shown in Figure A-4.

A.3.5 Watershed Delineation – Smith Branch Watershed Study Area

Hydrologic subbasins for the Smith Branch Study Area were delineated as described above, utilizing the Georgetown LiDAR. The watershed consisted of 9.2 square miles and was delineated into 23 subbasins as shown in Figure A-5.

A.3.6 Watershed Delineation – Middle Fork San Gabriel River Watershed Study Area

Hydrologic subbasins for the Middle Fork San Gabriel River Study Area were delineated as described above, utilizing the Georgetown LiDAR and the CAPCOG LiDAR. The watershed consisted of 16.9 square miles and was delineated into 25 subbasins as shown in Figure A-6.

A.3.7 Watershed Delineation – North Fork San Gabriel River Watershed Study Area

Hydrologic subbasins for the North Fork San Gabriel River Study Area were delineated as described above, utilizing the Georgetown LiDAR, the CAPCOG LiDAR, and the Burnet County LiDAR. The watershed consisted of 251.0 square miles and was delineated into 62 subbasins as shown in Figure A-7.

A.3.8 Watershed Delineation – South Fork San Gabriel River Watershed Study Area

Hydrologic subbasins for the South Fork San Gabriel River Study Area were delineated as described above, utilizing the Georgetown LiDAR and the CAPCOG LiDAR. The watershed consisted of 134.5 square miles and was delineated into 94 subbasins as shown in Figure A-8.

A.3.9 Watershed Delineation – San Gabriel River Watershed Study Area

Hydrologic subbasins for the San Gabriel River Study Area were delineated as described above, utilizing the Georgetown LiDAR and the CAPCOG LiDAR. A significant portion of the San Gabriel River Study Area is defined by the study areas detailed above. These detailed studies were incorporated in the San Gabriel River Study Area. The watershed consisted of 575.9 square miles and was delineated into 315 subbasins as shown in Figure A-9.

A.4.0 Curve Number Estimation

A.4.1 Method Overview

The volume of design storm rainfall estimated to become runoff was determined using the Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) program and employing the Soil Conservation Service (SCS) Curve Number (CN) Method. This curve number index method represents the effect of soil type, land use/land cover, hydrologic condition, and antecedent soil moisture in estimating runoff volume from event rainfall volumes. This method requires the user to input the SCS CN, percent impervious cover, and initial abstraction to fully develop runoff volumes in watershed subbasins. SCS Type II CN values were assigned based on the combination of hydrologic soil groups (HSGs) and land use cover description according to Table 2-2a of the Natural Resources Conservation Service (NRCS, formerly SCS) TR-55 "Urban Hydrology for Small Watersheds" as described below. The cover description selected for each land use type represents pervious areas only, since impervious coverage was input separately in the model (no nesting of imperviousness in CN). Table A-3 provides the pervious CN values utilized in this study. The CN values were then modified to AMC 1.5 for climate index based upon Figure 4 of the Climatic Influence of NRCS Curve Number Literature Review (TxDOT Report No. TX/00/2104-1, 1983 Hailey and McGill). Discussion on the verification for the adjustment to AMC 1.5 is included in Section A.10. The following formula was developed based upon the watershed location in Figure 4 of the report:

AMC 1.5 = AMC I + 0.46*(AMC II-AMC I)
AMC I = dry antecedent moisture conditions CN
AMC II = normal antecedent moisture conditions CN

The existing conditions percent impervious cover values were based upon the City of Georgetown's zoning districts for inside Georgetown's ETJ, Leander's ETJ, and estimated impervious cover values for agricultural areas. For areas within the City of Georgetown's jurisdiction, the future developed conditions were based upon the City of Georgetown's Future Land Use shapefile with assumed impervious cover values provided by the City of Georgetown. To obtain future development conditions impervious cover values for areas outside of the City of Georgetown's ETJ, the existing conditions impervious cover values were adjusted to reflect significant increase in impervious cover due to infill development. To estimate future impervious cover values, it was assumed that presently developed areas had a 5% increase in impervious cover while all presently undeveloped areas (i.e. agriculture, open space, crop land, woody areas, pasture) increased by assuming 50% of the undeveloped area would develop into low density residential area (20% impervious cover). When entering the CN parameters into the HEC-HMS model, the impervious cover values were input separately from the undeveloped conditions CN values used.

The initial abstraction parameter defines the ability of the watershed to retain storm precipitation before runoff occurs. The study used the default initial abstraction of 0.2 times the potential maximum retention which is calculated from the respective CN values.

HSGs were determined using the soil type shapefile for Texas downloaded from the USDA's Soil Survey Geographic Database (SSURGO). The SSURGO soil shapefile delineates soil according to soil types, which are correlated in the database to an HSG. A summary of the soil types and the associated HSGs are included in Table A-2. HSG classifies soils into four types: A, B, C, or D which are described below.

- Group A: Soils having a low runoff potential and a high infiltration rate even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission.

- Group B: Soils having a moderate infiltration rate when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

- Group C: Soils have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission.

- Group D: Soils have high runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent highwater table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. The soils have a very low rate of water transmission.

Undeveloped land use types were determined using ESRI's World Imagery. Polygons were delineated according to the land use cover categories provided by the City of Georgetown and the TR-55 manual. Table A-4 provided the land use categories and associated impervious cover values.

CN values were then assigned according to the undeveloped land use and soil for the area. An area-weighted average CN for each subbasin was calculated using the following equation:

$$CN_{avg} = \text{Sum (Area * CN) / Total Area}$$

A.4.2 CN Estimation – Berry Creek Watershed Study Area

CN values for the Berry Creek Study Area were estimated as described above. The results of the CN estimation are provided in Table A-5. A map of the soil types is provided on Figure A-10. A map showing the existing conditions land use categories is provided on Figure A-11 while the map showing the future development conditions land use categories is provided on Figure A-12.

A.4.3 CN Estimation – Mankins Branch Watershed Study Area

CN values for the Mankins Branch Study Area were estimated as described above. The results of the Curve Number estimation are provided in Table A-6. A map of the soil types is provided on Figure A-13. A map showing the existing conditions land use categories is provided on Figure A-14 while the map showing the future development conditions land use categories is provided on Figure A-15.

A.4.4 Curve Number Estimation – Pecan Branch Watershed Study Area

CN values for the Pecan Branch Study Area were estimated as described above. The results of the Curve Number estimation are provided in Table A-7. A map of the soil types is provided on Figure A-16. A map showing the existing conditions land use categories is provided on Figure A-17 while the map showing the future development conditions land use categories is provided on Figure A-18.

A.4.5 CN Estimation – Smith Branch Watershed Study Area

CN values for the Smith Branch Study Area were estimated as described above. The results of the CN estimation are provided in Table A-8. A map of the soil types is provided on Figure A-19. A map showing the existing conditions land use categories is provided on Figure A-20 while the map showing the future development conditions land use categories is provided on Figure A-21.

A.4.6 CN Estimation – Middle Fork San Gabriel River Watershed Study Area

CN values for the Middle Fork San Gabriel River Study Area were estimated as described above. The results of the CN estimation are provided in Table A-9. A map of the soil types is provided on Figure A-22. A map showing the existing conditions land use categories is provided on Figure A-23 while the map showing the future development conditions land use categories is provided on Figure A-24.

A.4.7 CN Estimation – North Fork San Gabriel River Watershed Study Area

CN values for the North Fork San Gabriel River Study Area were estimated as described above. The results of the CN estimation are provided in Table A-10. A map of the soil types is provided on Figure A-25. A map showing the existing conditions land use categories is provided on Figure A-26 while the map showing the future development conditions land use categories is provided on Figure A-27.

A.4.8 CN Estimation – South Fork San Gabriel River Watershed Study Area

CN values for the South Fork San Gabriel River Study Area were estimated as described above. The results of the CN estimation are provided in Table A-11. A map of the soil types is provided on Figure A-28. A map showing the existing conditions land use categories is provided on Figure A-29 while the map showing the future development conditions land use categories is provided on Figure A-30.

A.4.9 CN Estimation – San Gabriel River Watershed Study Area

CN values for the San Gabriel River Study Area were estimated as described above. The results of the CN estimation are provided in Table A-12. A map of the soil types is provided on Figure A-31. A map showing the existing conditions land use categories is provided on Figure A-32 while the map showing the future development conditions land use categories is provided on Figure A-33.

A.5.0 Lag Time Estimation

A.5.1 Method Overview

The lag time for each modeled watershed was calculated using the SCS method for calculating Unit Hydrograph lag time (T_{lag}) which is related to the time of concentration. The methodology for the lag time calculation is shown below:

$$T_{lag} = 0.6 * T_c$$

Time of concentration (T_c) is the time it takes for runoff to travel from the most hydraulically distant point in the watershed to the discharge point. This route is called the Flow Path.

The Flow Path was derived utilizing the most recent LiDAR topographic data available and ESRI's World Imagery for potential obstructions. A polyline in ArcView was drawn to connect this point to the watershed outlet, while following the path of decreasing elevation as water would flow.

T_c is a summation of travel time for three parameters, sheet flow, shallow concentrated flow, and channel flow.

Sheet flow is flow over land surface at very shallow depths, before flow concentrates into swales or channels. The equation for sheet flow is based upon Manning's kinematic solution and is provided below:

$$T_{Sheet} = \frac{0.007(n*L)^{0.8}}{(P_2)^{0.5}\, s^{0.4}} \qquad \text{[Eq. 3-3 from TR-55 manual]}$$

where: T_{sheet} = sheet flow travel time (hr)
n = Manning's overland flow roughness coefficient
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall depth in inches (this study used 3.4 inches based upon the City of Austin's Rainfall depth for a 2-year, 24-hour rainfall)
s = land slope (ft/ft)

After a maximum of approximately 300 feet, sheet flow usually turns to shallow concentrated flow. In this study, the maximum sheet flow lengths were assumed to be 200 feet in rural areas and 100 feet in urban areas. Based upon Appendix F of the TR-55 manual, the average velocity for shallow concentrated flow can be estimated as:

$$V = 16.1345 * s^{0.5} \quad \text{for flow over unpaved surfaces}$$
$$V = 20.3282 * s^{0.5} \quad \text{for flow over paved surfaces}$$

where: V = average velocity (ft/s)
s = land slope (ft/ft)

The shallow concentrate flow travel time is derived dividing the flow distance by the average velocity.

$T_{shallow} = L/(3600*V)$ [Eq. 3-1 from TR-55 manual]

where: $T_{shallow}$ = shallow concentrated flow (hr)

L = flow length (ft)
V = average velocity (ft/s)

Channel flow begins where well-defined stream banks form. The study used available LiDAR topographic data and ESRI's World Imagery to determine where this occurs. Channel input parameters such as slope, depth, and bottom widths were estimated from LiDAR topographic data. The average velocity for channel flow developed from the Manning's equation is provided below:

$V = (1.49/n) * R_h^{2/3} * S_e^{1/2}$ [Eq. 3-4 from TR-55 manual]

where: V = average velocity (ft/s)
n = Manning's channel flow roughness coefficient
R_h = hydraulic radius of the channel (ft)
S_e = channel bottom slope (ft/ft)

The channel flow travel time is derived dividing the flow distance by the average velocity.

$T_{channel} = L/(3600*V)$ [Eq. 3-1 from TR-55 manual]

where: $T_{channel}$ = channel flow (hr)
L = flow length (ft)
V = average velocity (ft/s)

For future developed conditions, the exact flow routes and drainage specifics are unknown. A general assumption that subbasin lag times would be reduced by 20% was made to reflect the expected changes to the lag times due to increased development in the watershed.

A.5.2 Lag Time Estimation – Berry Creek Watershed Study Area
Lag times for the Berry Creek Study Area subbasins were estimated using the method described above and are summarized in Table A-13.

A.5.3 Lag Time Estimation – Mankins Branch Watershed Study Area
Lag times for the Mankins Branch Study Area subbasins were estimated using the method described above and are summarized in Table A-14.

A.5.4 Lag Time Estimation – Pecan Branch Watershed Study Area
Lag times for Pecan Branch Study Area subbasins were estimated using the method described above and are summarized in Table A-15.

A.5.5 Lag Time Estimation – Smith Branch Watershed Study Area
Lag times for Smith Branch Study Area subbasins were estimated using the method described above and are summarized in Table A-16.

A.5.6 Lag Time Estimation – Middle Fork San Gabriel River Watershed Study Area

Lag times for the Middle Fork San Gabriel Area subbasins were estimated using the method described above and are summarized in Table A-17.

A.5.7 Lag Time Estimation – North Fork San Gabriel River Watershed Study Area

Lag times for the North Fork San Gabriel Area subbasins were estimated using the method described above and are summarized in Table A-18.

A.5.8 Lag Time Estimation – South Fork San Gabriel River Watershed Study Area

Lag times for the South Fork San Gabriel Area subbasins were estimated using the method described above and are summarized in Table A-19.

A.5.9 Lag Time Estimation – San Gabriel River Watershed Study Area

Lag times for the San Gabriel Area subbasins downstream of the North/South Fork San Gabriel River confluence were estimated using the method described above and are summarized in Table A-20.

A.6.0 Hydrologic Routing

A.6.1 Method Overview

Hydrologic routing is a method used to describe the movement and change of a hydrograph as it travels downstream through a channel or reservoir. The peak flow will be attenuated in a channel from junction to junction (a reach). The study utilized two standard methods for hydrologic routing, Muskingum-Cunge and Modified Puls. The Muskingum-Cunge routing method calculates the reach storage based upon the channel's cross-section geometry, length of the channel, slope, and roughness coefficients. Modified Puls routing method is based upon reach storage-discharge functions to determine the peak flow attenuation for the reach.

Since the Muskingum-Cunge method does not require a known storage function, but rather channel characteristics, it is the method used for all reaches not within a studied stream. Available LiDAR topographic data was used to develop the cross-section geometry and calculate the slope. ESRI's World Imagery was utilized to estimate the channel roughness coefficients.

Modified Puls method was used for a more refined analysis of storage along studied streams. The storage-discharge rating curve for each reach within a studied stream section was developed from information extracted from the hydraulic model. Each reach may have multiple subreaches. The number of subreaches may also be used to calibrate the model. Increasing the number of subreaches reduces the peak flow attenuation in the reach. The formula for the number of subreaches is based upon the wave celerity in the channel and the simulation time step.

$$\text{No.}_{\text{subreaches}} = \frac{L}{C * t}$$

where: $\text{No.}_{\text{subreaches}}$ = number of subreaches
L = reach length
C = wave celerity
t = simulation time step

The simulation time step in the hydrologic model for this study was 1 minute (60 seconds). Wave celerity was calculated using the average channel velocity for the reach.

$$C = \frac{5 * V}{3}$$

where: C = wave celerity
V = average channel velocity for a reach

A.6.2 Hydrologic Routing – Berry Creek Watershed Study Area

Routing for the Berry Creek Study Area was estimated using the method described above with a few adjustments. The number of subreaches were reduced to 1 for the immediate reaches upstream of the Sun City detention pond for calibration as this will closely resemble routing through a reservoir or detention facility. Modified Puls routing inputs for the Berry Creek Study Area are provided in Table A-21 and Munkingum-Cunge routing inputs are provided in Table A-29.

A.6.3 Hydrologic Routing – Mankins Branch Watershed Study Area

Routing for the Mankins Branch Study Area was estimated using the method described above. Modified Puls routing inputs for the Mankins Branch Study Area are provided in Table A-22 and Munkingum-Cunge routing inputs are provided in Table A-30.

A.6.4 Hydrologic Routing – Pecan Branch Watershed Study Area

Routing for the Pecan Branch Study Area was estimated using the method described above. Modified Puls routing inputs for the Pecan Branch Study Area are provided in Table A-23 and Munkingum-Cunge routing inputs are provided in Table A-31.

A.6.5 Hydrologic Routing – Smith Branch Watershed Study Area

Routing for the Smith Branch Study Area was estimated using the method described above. Modified Puls routing inputs for the Smith Branch Study Area are provided in Table A-24 and Munkingum-Cunge routing inputs are provided in Table A-32.

A.6.6 Hydrologic Routing – Middle Fork San Gabriel River Watershed Study Area

Routing for the Middle Fork San Gabriel River Study Area was estimated using the method described above. Modified Puls routing inputs for the Middle Fork San Gabriel River Study Area are provided in Table A-25 and Munkingum-Cunge routing inputs are provided in Table A-33.

A.6.7 Hydrologic Routing – North Fork San Gabriel River Watershed Study Area

Routing for the North Fork San Gabriel River Study Area was estimated using the method described above. Modified Puls routing inputs for the North Fork San Gabriel River Study Area are provided in Table A-26 and Munkingum-Cunge routing inputs are provided in Table A-34.

A.6.8 Hydrologic Routing – South Fork San Gabriel River Watershed Study Area

Routing for the South Fork San Gabriel River Study Area was estimated using the method described above. Modified Puls routing inputs for the South Fork San Gabriel River Study Area are provided in Table A-27 and Munkingum-Cunge routing inputs are provided in Table A-35.

A.6.9 Hydrologic Routing –San Gabriel River Watershed Study Area

Routing for the San Gabriel River Study Area was estimated using the method described above. Modified Puls routing inputs for the San Gabriel River Study Area are provided in Table A-28 and Munkingum-Cunge routing inputs are provided in Table A-36.

A.7.0 Modeling of Significant Detention Structures

A.7.1 Method Overview

A stage-storage-discharge rating curve was developed for each significant detention structure. Rating curves consists of a stage elevation (ft) versus a corresponding reservoir storage (ac-ft) and a facility discharge (cfs). The rating curve is defined by the components of the dam, the storage basin, the embankment height, and the outflow structures.

A significant detention structure is defined as a regional detention facility or a large-scale storm water impoundment facility that has more than 10 acres in surface area.

A.7.2 Significant Detention Structures – Berry Creek Watershed Study Area

Sun City regional pond is a significant detention facility within the Berry Creek Study Area. It is an in-line pond that was modeled as a reach in the hydrologic model. The storage capacity of the pond was measured using the Modified Puls method as described in section A.6.

A.7.3 Significant Detention Structures – Mankins Branch Watershed Study Area

There are no existing significant detention facilities in the Mankins Branch Study Area.

A.7.4 Significant Detention Structures – Pecan Branch Watershed Study Area

There are no existing significant detention facilities in the Pecan Branch Study Area.

A.7.5 Significant Detention Structures – Smith Branch Watershed Study Area

There are no existing significant detention facilities in the Smith Branch Study Area.

A.7.6 Significant Detention Structures – Middle Fork San Gabriel River Watershed Study Area

There are no existing significant detention facilities in the Middle Fork San Gabriel River Study Area.

A.7.7 Significant Detention Structures – North Fork San Gabriel River Watershed Study Area

Lake Georgetown is a significant detention facility in the North Fork San Gabriel River Study Area. The US Army Corps of Engineers regulates releases from the facility. The stage-storage-discharge rating curve is based upon information provided by the Corp of Engineers.

A.7.8 Significant Detention Structures – South Fork San Gabriel River Watershed Study Area

There are no existing significant detention facilities in the South Fork San Gabriel River Study Area.

A.7.9 Significant Detention Structures –San Gabriel River Watershed Study Area

There are no existing significant detention facilities in the San Gabriel River Study Area.

A.8.0 Estimation of Rainfall

A.8.1 Method Overview

This study estimated design storm precipitation utilizing the "SCS Storm" method (available in HEC-HMS). The rainfall depth was derived using USGS SIR 2004-5041, *Atlas of Depth Duration Frequency of Precipitation Annual Maxima for Texas.* The rainfall totals are provided in Table A-37.

Areal reduction of design storm rainfall was applied to watersheds greater than 10 sq. mi. since the possibility the amount of rainfall for a specified storm event would cover the complete watershed area decreases as the areal extent of the rainfall increases. The study followed the area-depth reduction curve in Figure 15 from U.S. Department of Commerce's Technical Paper No. 40, 1961. The areal reduction factor was applied to the rainfall depth for each storm event and every increment of 10 square miles of drainage area in the watershed. A table based upon the area-depth curve is provided below:

Area (Sq. Mi.)	**Areal Reduction Factor**
0	100
10	98.7
20	97.6
30	96.6
40	95.7
50	95
60	94.6
70	94.2
80	93.9
90	93.6
100	93.24
125	92.7
150	92.3
200	91.9
250	91.6
300	91.4
350	91.1
400	91.1
>400	91.1

A.9.0 Assembly of Hydrologic Models

A.9.1 Method Overview

Hydrologic models were developed for each of the eight study areas. These basin models described watershed physiography utilizing the following elements:

- Subbasin characteristics
- Flow diversions
- Junctions
- Routing reachs; and
- Storage facilities

Two scenarios were developed for each study area, existing conditions and future developed conditions. The specific approaches and assumptions used to model the various elements can be found in the individual study area descriptions.

A.9.2 Hydrologic Model – Berry Creek Watershed Study Area

The Berry Creek Study Area HEC-HMS model consists of 55 subbasins, 34 reaches, and 52 junctions. The Berry Creek Study Area HEC-HMS model schematic is shown on Figure A-43. Additionally, Table A-38 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.3 Hydrologic Model – Mankins Branch Watershed Study Area

The Mankins Branch Study Area HEC-HMS model consists of 16 subbasins, 9 reaches, and 13 junctions. The Mankins Branch Study Area HEC-HMS model schematic is shown on Figure A-44. Additionally, Table A-39 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.4 Hydrologic Model – Pecan Branch Watershed Study Area

The Pecan Branch Study Area HEC-HMS model consists of 17 subbasins, 15 reaches, 18 junctions, and 2 diversions. The Pecan Branch Study Area HEC-HMS model schematic is shown on Figure A-45. Additionally, Table A-40 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.5 Hydrologic Model – Smith Branch Watershed Study Area

The Smith Branch Study Area HEC-HMS model consists of 23 subbasins, 18 reaches, and 23 junctions. The Smith Branch Study Area HEC-HMS model schematic is shown on Figure A-46. Additionally, Table A-41 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.6 Hydrologic Model – Middle Fork San Gabriel Watershed Study Area

The Middle Fork San Gabriel Study Area HEC-HMS model consists of 25 subbasins, 14 reaches, and 21 junctions. The Middle Fork San Gabriel Study Area HEC-HMS model schematic is shown on Figure A-47. Additionally, Table A-42 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.7 Hydrologic Model – North Fork San Gabriel Watershed Study Area

The North Fork San Gabriel Study Area HEC-HMS model consists of 62 subbasins, 45 reaches, and 56 junctions. The North Fork San Gabriel Study Area HEC-HMS model schematic is shown on Figure A-48. Additionally, Table A-43 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.8 Hydrologic Model – South Fork San Gabriel Watershed Study Area

The South Fork San Gabriel Study Area HEC-HMS model consists of 94 subbasins, 80 reaches, and 95 junctions. The South Fork San Gabriel Study Area HEC-HMS model schematic is shown on Figure A-49. Additionally, Table A-44 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.9.9 Hydrologic Model –San Gabriel Watershed Study Area

The San Gabriel Study Area HEC-HMS model consists of 340 subbasins, 149 reaches, and 294 junctions. The San Gabriel Study Area HEC-HMS model schematic is shown on Figure A-50. Additionally, Table A-45 provides a listing the model elements, existing conditions 100-year flow results, the future developed conditions 100-year flow results, and the existing conditions 500-year flow results.

A.10.0 Model Calibration / Verification

Hydrologic calibration/verification efforts were conducted to simulate storm discharges and hydrograph trends for past flood events in the study area. Calibration and verification of model parameters used to estimate runoff volume and timing based upon a significant historic event can enhance model accuracy and confidence in model dependability. The June 2007 and September 2010 (Hermine) storm events were utilized in the model calibration. The calibration/verification models confirmed the use of the AMC I.5 CN values as stated in Section A.4.

For the June 2007 and September 2010 storm events, Vieux & Associates, Inc. (Vieux) processed radar and rain gauge data for the study. Rainfall radar data from the National Weather Service was adjusted to local rainfall gauges within the vicinity of the study and with available rainfall information. Based upon this information, Vieux developed individual rainfall hyetographs for each subbasin for both the June 2007 and September 2010 storm events. The Vieux reports are provided with the support materials for the project.

Hydrologic calibration models were developed utilizing the Vieux storm hyetographs. The calculated flows were compared with a South Fork USGS gage (USGS 08104900) recorded flow results for each storm event. Hydraulic calibration models were also developed utilizing the calculated flows from the hydrologic calibration models. See Appendix B for further discussion and more information.

Hydrologic calibration efforts were focused on the South Fork San Gabriel watershed, since this reach included the only USGS stage and discharge gage within the study area (USGS 08104900 S Fk San Gabriel Rv at Georgetown, TX) that provided acceptable data. Calibration results from the South Fork San Gabriel River were used to inform and adjust the remaining watersheds within this study.

The hydrologic models developed for this study utilize the SCS CN loss method as described in Section A.4.0, which is appropriate for use with the SCS 24-hour design storm duration also used in this analysis. However, the SCS CN loss method is based upon a 24-hour rainfall event and may not produce reasonable results for precipitation distributions greater than 24-hours. When utilizing the SCS CN loss method for storms with durations longer than 24-hours, infiltration rates approach zero, rather than a constant rate, and the default initial abstraction value do not depend upon storm characteristics, intensity, or timing. Therefore, to calibrate based upon the June 2007 and September 2010 storm events which were longer than 24-hours, an auxiliary South Fork San Gabriel River basin model was developed using the Green and Ampt rainfall loss method. New Green & Ampt soil parameters including saturated moisture content, suction, and conductivity were developed based on soil data, while initial moisture content (i.e., saturated content minus initial moisture deficit) was used as a calibration parameter based on assumed watershed conditions prior to each of the two calibration storm events. Green & Ampt parameters developed for each basin within the South Fork San Gabriel River watershed for each calibration event are provided in Table A-46.

A comparison of observed hydrographs of the South Fork San Gabriel River at USGS 08104900 station versus computed hydrographs using the calibrated Green & Ampt loss parameters during the two calibration events are provided in Figures A-51 and A-52. The observed versus computed hydrograph comparisons are summarized in Tables A-47 and A-48.

This exercise indicates that the peak timing, flow rates, and hydrograph volume computed by the hydrologic model compare well to observed values for the June 2007 and September 2010 storm events. The calibrated Green & Ampt parameters were correlated back to the SCS CN loss method. A comparison of hydrographs computed using various Green & Ampt initial moisture content values versus SCS AMC I, AMC 1.5, and AMC II with an SCS Type III 24-hour storm distribution is provided in Figure A-53. Based upon the comparison of hydrographs, an SCS AMC value of 1.5 considerably correlates to an IMC value of 0.37. As compared to the initial moisture deficit values shown in Table A-49, this value is conservative for dry soil climates predominantly consisting of clay loam, silty clay loam, silty clay, and clay soils (Estimation of Green-Ampt Infiltration Parameters, www.water-research.net/Waterlibrary/Stormwater/greenamp.pdf

TABLES

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Table A-1 Data Sources Utilized in Hydrologic Analysis

Source	Used For
Burnet County 2011 LiDAR topography	Watershed Delineation Lag Time
CAPCOG 2006 LiDAR topography	Watershed Delineation Lag Time
City of Austin, 2017. City of Austin Drainage Criteria Manual	Precipitation
City of Georgetown 2015 LiDAR topography	Watershed Delineation Lag Time
City of Georgetown Future Land Use	Impervious Cover
City of Georgetown Zoning Profile	Impervious Cover
ESRI ArcView, Version 10.5 (2016)	Watershed Delineation Curve Number Lag Time
ESRI World Imagery	Watershed Delineation Curve Number Lag Time
US Army Corps of Engineers (USACE), 2015. Hydrologic Engineering Center's Hydraulic Modeling System (HEC-HMS), V. 4.1	HEC-HMS
USACE, March 2000. HEC-HMS Technical Reference Manual.	HEC-HMS
USDA Soil Conservation Service, Engineering Division, Technical Release 55 (TR-55), June 1986. Urban Hydrology for Small Watersheds	Curve Number Lag Time
USGS Rainfall Gage and Stream Flow data	HEC-HMS Calibration
U.S. Department of Agriculture (USDA) National Resource Conservation Commission (NRCS), 2004. Soil Survey Geographic Database (SSURGO) Soil Data for Burnet County, Texas	Curve Number
U.S. Department of Agriculture (USDA) National Resource Conservation Commission (NRCS), 2004. Soil Survey Geographic Database (SSURGO) Soil Data for Williamson County, Texas	Curve Number
Vieux and Associates, 2017. GARR dataset	HEC-HMS Calibration
Vieux and Associates, 2017. Radar Rainfall Analysis of San Gabriel, TX between June 26-28, 2007.	HEC-HMS Calibration
Vieux and Associates, 2017. Radar Rainfall Analysis of San Gabriel, TX between September 7-9, 2010.	HEC-HMS Calibration

Table A-2 Hydrologic Soil Groups in the Study Area

Soil Type	Soil Abbreviation	HSG
Aledo association, undulating	1	D
Altoga silty clay loam, 3 to 5 percent slopes, eroded	AgC2	B
Altoga silty clay loam, 5 to 8 percent slopes, eroded	AgD2	B
Anhalt clay, 0 to 1 percent slopes	2	D
Anhalt clay, 1 to 3 percent slopes	3	D
Austin-Whitewright complex, 1 to 5 percent slopes, eroded	AwC2	C
Austin silty clay, 0 to 1 percent slopes	AuA	C
Austin silty clay, 1 to 3 percent slopes	AuB	C
Bolar clay loam, 1 to 3 percent slopes	4	C
Bolar clay loam, 3 to 5 percent slopes	5	C
Brackett-Real association, hilly	7	D
Brackett-Rock outcrop complex, 1 to 12 percent slopes	BlD	D
Brackett-Rock outcrop complex, 16 to 30 percent slopes	BkG	D
Brackett association, undulating	6	D
Brackett clay loam, 1 to 5 percent slopes	BkC	D
Brackett gravelly clay loam, 3 to 16 percent slopes	BkE	D
Branyon clay, 0 to 1 percent slopes	BrA	D
Branyon clay, 1 to 3 percent slopes	BrB	D
Castephen silty clay, 1 to 3 percent slopes	CaB	D
Castephen silty clay, 3 to 5 percent slopes	CaC	D
Crawford clay, 0 to 1 percent slopes	CfA	D
Crawford clay, 1 to 3 percent slopes	CfB	D
Dams	DAM	D
Denton silty clay, 0 to 1 percent slopes	DnA	D
Denton silty clay, 1 to 3 percent slopes	DnB	D
Denton silty clay, 3 to 5 percent slopes	DnC	D
Doss silty clay, 1 to 5 percent slopes	DoC	D
Eckrant-Rock outcrop association, hilly	12	D
Eckrant-Rock outcrop complex, hilly	ErG	N/A
Eckrant-Rock outcrop complex, rolling	ErE	D
Eckrant association, undulating	11	D
Eckrant cobbly clay, 1 to 8 percent slopes	EaD	D
Eckrant extremely stony clay, 0 to 3 percent slopes	EeB	D
Eddy very gravelly clay loam, 0 to 3 percent slopes	EyB	D
Eddy very gravelly clay loam, 3 to 8 percent slopes	EyD	D
Fairlie clay, 0 to 1 percent slopes	FaA	D
Fairlie clay, 1 to 2 percent slopes	FaB	D
Ferris-Heiden complex, 5 to 20 percent slopes, severely eroded	FhE	D

Table A-2 Hydrologic Soil Groups in the Study Area (continued)

Soil Type	Soil Abbreviation	HSG
Georgetown clay loam, 0 to 2 percent slopes	GeB	D
Georgetown stony clay loam, 1 to 3 percent slopes	GsB	D
Heiden clay, 1 to 3 percent slopes	HeB	D
Heiden clay, 3 to 5 percent slopes, eroded	HeC2	D
Heiden clay, 5 to 8 percent slopes, eroded	HeD2	D
Heiden extremely stony clay, 3 to 12 percent slopes	HsE	D
Hensley association, undulating	17	D
Hensley loam, 1 to 3 percent slopes	15	D
Hensley loam, 3 to 5 percent slopes	16	D
Houston Black clay, 0 to 1 percent slopes	HuA	D
Houston Black clay, 1 to 3 percent slopes	HuB	D
Houston Black clay, 3 to 5 percent slopes, eroded	HuC2	D
Krum clay, 1 to 3 percent slopes	24	C
Krum clay, 3 to 5 percent slopes	25	C
Krum silty clay, 0 to 1 percent slopes	KsA	C
Krum silty clay, 1 to 3 percent slopes	KsB	C
Lewisville clay loam, 0 to 1 percent slopes	26	B
Lewisville clay loam, 1 to 3 percent slopes	27	B
Luckenbach clay loam, 1 to 3 percent slopes	29	C
Oakalla loam, occasionally flooded	31	B
Oakalla silty clay loam, occasionally flooded	Oa	B
Oakalla soils, channeled	Oc	B
Oakalla soils, frequently flooded	Of	B
Pedernales fine sandy loam, 1 to 3 percent slopes	35	C
Pedernales fine sandy loam, 3 to 5 percent slopes	36	C
Purves association, undulating	38	D
Purves gravelly clay, 1 to 3 percent slopes	37	D
Quarry	QU	N/A
Queeny clay loam, 1 to 5 percent slopes	QuC	D
Riverwash, frequently flooded	RW	A
Sunev silty clay loam, 0 to 1 percent slopes	SuA	B
Sunev silty clay loam, 1 to 3 percent slopes	SuB	B
Tarpley association, undulating	42	D
Tarpley clay, 1 to 3 percent slopes	41	D
Tarrant and Speck soils, 0 to 2 percent slopes	TcA	D
Tarrant soils, 5 to 18 percent slopes	TaD	D
Tinn clay, frequently flooded	Tn	D
Water	W	N/A
Whitewright silty clay loam, 1 to 5 percent slopes	WhC	D

Table A-3 Runoff CN Values

Hydrologic Soil Group		A	B	C	D
Pasture, grassland, or range - continuous forage for grazing.	Fair	49	69	79	84
Row Crops - Contoured (C)	Good	65	75	82	86
Wood	Fair	36	60	73	79

Table A-4 Land Use Categories for Impervious Cover

Land Use Categories	
Agricultural / Rural Residential	ARR
Community Commercial	CC
Employment Center	EC
High Density Residential	HDR
Institutional	INST
Low Density Residential	LDR
Mining	M
Mixed Use Community	MUC
Mixed Use Neighborhood Center	MUNC
Moderate Density Residential	MDR
Parks, Recreation, Protected Open Space	OS
Pasture	P
Regional Commercial	RC
Right of Way	ROW
Row Crop	ROCR
Rural Residential	RR
Specialty Area Mixed Use	SMUA
Wood	W

Table A-5 CN Number Summary – Berry Creek

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
72	4.47	74	3.13%	11.57%
73	4.35	76	3.13%	11.56%
74	4.08	76	3.19%	11.59%
75	4.29	76	3.12%	11.56%
76	6.35	76	3.28%	11.64%
80	7.19	76	3.26%	11.71%
81	5.48	75	3.07%	11.51%
82	2.51	76	3.24%	11.62%
84	1.91	76	3.16%	11.58%
87	1.57	76	3.10%	11.55%
89	4.62	76	3.34%	11.67%
90	2.71	76	3.33%	11.66%
91	2.72	76	3.19%	11.60%
92	3.61	75	3.29%	11.64%
93	0.59	76	3.61%	11.81%
98	2.44	76	3.44%	13.40%
101	2.63	76	3.38%	11.69%
102	2.43	76	3.27%	17.42%
103	1.61	74	3.40%	11.74%
106	1.72	75	3.37%	28.91%
107	2.09	76	3.17%	19.81%
110	1.97	75	3.47%	13.68%
111	1.02	75	3.24%	14.50%
112	1.80	74	14.31%	41.80%
113	3.53	74	3.21%	29.37%
114	3.73	75	3.06%	12.05%
116	1.80	76	3.01%	21.25%
119	3.87	75	28.59%	35.64%
120	3.54	76	6.37%	29.21%
123	1.63	72	5.84%	33.36%
124	1.38	75	7.35%	22.72%
125	1.00	76	22.46%	44.97%
126	0.55	74	24.09%	30.51%
127	2.47	73	3.86%	17.67%
128	1.83	76	24.93%	44.09%

Table A-5 CN Number Summary – Berry Creek (continued)

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
129	5.08	75	25.69%	36.76%
130	0.67	69	5.29%	49.18%
131	0.89	73	8.10%	48.88%
133	1.29	69	4.22%	18.68%
134	1.80	73	3.09%	11.55%
135	1.71	75	19.35%	38.15%
136	3.18	73	3.00%	11.50%
138	0.40	67	3.71%	11.86%
142	1.35	71	3.49%	11.74%
149	0.44	67	22.51%	47.30%
154	0.41	68	3.97%	24.19%
159	0.23	71	12.14%	56.33%
164	0.50	73	4.78%	52.75%
179	0.20	67	11.12%	39.50%
184	0.90	75	18.98%	47.15%
189	0.49	75	19.66%	42.86%
190	1.07	74	3.68%	47.61%
195	0.77	76	3.00%	54.16%
204	3.57	75	3.09%	11.55%
212	1.00	75	30.04%	39.07%

Table A-6 CN Number Summary – Mankins Branch

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
34	0.13	61	3.93%	11.97%
39	0.82	72	30.24%	44.21%
40	0.68	73	6.18%	36.60%
41	0.64	69	12.08%	29.02%
42	1.05	73	9.97%	51.36%
43	0.87	71	3.48%	49.66%
49	1.17	71	3.09%	12.95%
50	1.08	70	5.45%	45.64%
52	1.51	69	3.17%	17.22%
53	0.74	72	3.54%	21.92%
54	0.29	72	3.19%	11.59%
55	0.56	71	3.24%	11.62%
56	0.78	72	3.00%	27.74%
57	0.56	75	5.13%	20.17%
60	0.90	73	3.10%	11.55%
66	1.45	74	5.69%	21.49%

Table A-7 CN Number Summary – Pecan Branch

Watershed Name	Watershed Area (mi^2)	Existing Conditions Weighted Curve Number	Existing Conditions Impervious Cover	Future Developed Weighted Curve Number	Future Developed Impervious Cover
01	0.42	73.61	24.76%	71.64	44.79%
02	0.46	74.2	23.44%	72.45	38.53%
03	0.46	75	21.18%	75.01	23.28%
04	0.46	75.79	18.83%	75.63	19.75%
05	0.39	74.26	24.12%	72.53	37.97%
06	0.76	70.96	42.65%	70.76	49.47%
07	0.27	75.25	9.21%	71.63	36.92%
08	0.28	72.25	34.34%	71.27	44.79%
09	0.68	73.24	24.32%	70.99	42.65%
10	0.33	73.07	22.57%	70.65	46.80%
11	0.56	72.67	22.10%	70.08	49.76%
12	0.48	72.28	19.95%	69.94	41.37%
13	0.38	69.44	16.05%	65.33	50.29%
14	0.28	73.13	16.59%	70.9	36.99%
15	0.35	71.68	6.95%	66.59	54.07%
16	0.26	71.13	16.68%	69.41	32.42%
17	0.52	68.69	3.71%	68.69	3.71%

Table A-8 CN Number Summary – Smith Branch

Watershed Name	Watershed Area (mi^2)	Existing Conditions Weighted Curve Number	Existing Conditions Impervious Cover	Future Developed Weighted Curve Number	Future Developed Impervious Cover
01	0.54	71.72	37.76%	70.65	52.36%
02	0.68	74.75	17.67%	70.96	56.87%
03	0.57	75.63	6.41%	70.31	57.41%
04	0.35	72.61	32.76%	71.13	53.67%
05	0.53	72.12	31.93%	69.86	57.03%
06	0.36	70.21	38.76%	69.3	50.18%
07	0.36	74.07	3.01%	68.71	54.61%
08	0.41	71.79	11.88%	67.75	46.41%
09	0.27	68.32	31.25%	66.59	50.91%
10	0.27	72.88	28.24%	72.37	36.22%
11	0.26	72.42	17.48%	69.03	39.97%
12	0.33	74.47	10.30%	70.85	45.88%
13	0.45	71.71	38.78%	71.57	43.08%
14	0.50	74.97	5.72%	71.12	46.24%
15	0.56	72.41	12.81%	68.61	50.82%
16	0.37	71.17	40.14%	71.17	44.36%
17	0.62	74.2	13.67%	71.13	42.73%
18	0.26	71.94	28.04%	71.39	32.83%
19	0.30	70.41	23.41%	69.85	28.89%
20	0.33	70.21	34.16%	69.22	47.12%
21	0.26	69.22	5.76%	65.15	30.56%
22	0.26	68.56	20.90%	65.94	38.89%
23	0.37	71.79	3.33%	65.22	45.83%

Table A-9 CN Number Summary – Middle Fork San Gabriel River

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
53	0.74	76	8.14%	14.07%
55	0.85	76	4.73%	13.10%
56	1.37	76	4.30%	12.15%
57	0.76	76	4.45%	14.55%
58	0.52	76	14.98%	19.20%
59	0.39	76	3.74%	11.87%
62	0.91	73	11.17%	34.85%
64	1.66	75	9.30%	18.30%
65	0.76	76	17.82%	20.57%
66	0.47	73	15.10%	26.91%
68	0.72	76	16.18%	23.51%
69	0.26	76	5.00%	48.13%
73	0.39	76	5.00%	52.75%
74	0.48	73	5.65%	38.18%
75	1.02	76	7.04%	13.52%
76	0.82	75	18.54%	22.20%
79	0.56	74	5.00%	48.10%
81	0.65	76	4.17%	12.09%
82	0.28	76	18.18%	37.99%
83	0.86	75	8.12%	16.00%
88	0.35	76	11.31%	19.16%
89	0.29	76	15.01%	33.54%
90	0.44	76	17.92%	23.67%
92	1.03	74	14.90%	38.39%
95	0.35	74	10.63%	44.62%

Table A-10 CN Number Summary – North Fork San Gabriel River

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
379	6.46	73	3.91%	11.95%
390	6.59	73	4.07%	12.04%
399	5.89	74	2.87%	11.43%
400	3.50	74	3.26%	11.63%
401	6.21	73	4.58%	12.29%
412	5.24	73	1.81%	10.90%
417	2.73	76	0.91%	10.45%
423	7.09	74	1.68%	10.84%
443	6.23	72	1.47%	10.73%
445	5.64	73	5.10%	12.55%
454	3.47	74	2.94%	11.47%
455	5.34	71	2.84%	11.42%
467	2.57	76	2.84%	11.42%
475	4.08	72	5.17%	12.58%
477	6.52	74	3.94%	11.97%
478	4.03	72	3.00%	11.50%
489	5.31	71	6.58%	13.29%
497	2.67	72	1.95%	10.97%
498	4.38	75	1.56%	10.78%
508	3.66	71	2.75%	11.38%
522	9.22	74	4.79%	12.40%
532	6.21	73	3.20%	11.60%
533	4.31	75	2.92%	11.46%
540	4.11	75	3.04%	11.52%
544	2.05	72	2.31%	11.16%
554	3.73	73	1.63%	10.82%
555	5.12	73	2.16%	11.08%
565	5.54	72	1.77%	10.89%
566	4.67	74	9.01%	14.50%
574	2.64	75	3.87%	11.94%
588	6.58	73	4.65%	12.88%
597	3.19	73	7.11%	13.56%
598	2.94	74	5.33%	12.66%
599	6.24	73	3.34%	11.67%
605	2.39	72	7.69%	13.84%
606	1.71	76	9.15%	14.57%
610	7.71	73	12.36%	19.71%

Table A-10 CN Number Summary – North Fork San Gabriel River (continued)

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
616	1.74	70	2.75%	11.37%
621	2.19	76	3.00%	11.50%
632	2.68	76	6.02%	13.01%
643	4.58	72	5.65%	12.82%
651	1.78	72	8.26%	14.13%
653	6.25	74	3.55%	11.80%
654	1.02	76	3.00%	11.49%
657	3.11	75	9.31%	13.78%
658	5.93	74	8.43%	14.22%
660	0.96	76	3.00%	11.50%
661	3.46	72	9.03%	14.41%
663	0.84	68	3.77%	11.88%
665	0.75	76	3.86%	11.93%
673	2.62	75	17.64%	18.82%
674	2.24	74	6.86%	13.43%
675	1.37	76	2.76%	10.60%
676	2.20	70	8.32%	14.16%
690	2.84	76	9.70%	15.39%
691	9.60	79	24.24%	25.46%
698	2.02	73	11.52%	15.76%
703	4.27	75	5.84%	12.72%
709	6.39	73	9.73%	12.81%
727	3.67	74	16.89%	19.32%
747	1.57	72	2.17%	7.43%
750	0.93	71	32.57%	35.30%

Table A-11 CN Number Summary – South Fork San Gabriel River

Watershed Name	Watershed Area (mi^2)	Existing Conditions Weighted Curve Number	Existing Conditions Impervious Cover	Future Developed Weighted Curve Number	Future Developed Impervious Cover
01	5.37	73.28	4.75%	73.83	12.48%
02	1.60	72.03	4.68%	72.79	12.66%
03	1.02	72.32	3.46%	73.22	11.73%
04	0.93	72.1	2.94%	73.12	11.47%
05	2.48	72.57	2.11%	73.69	11.06%
06	1.46	73.79	2.96%	74.16	11.48%
07	1.64	73.34	5.08%	73.87	12.54%
08	1.34	68.15	2.64%	69.83	11.32%
09	2.21	72.58	5.60%	72.96	13.53%
10	0.72	69.27	3.07%	69.27	11.54%
11	4.75	72.91	3.03%	73.57	11.52%
12	1.73	74.08	3.26%	74.14	11.63%
13	1.82	71.84	2.91%	71.88	11.45%
14	3.60	73.33	3.44%	73.71	11.76%
15	1.43	72.22	3.44%	72.39	11.72%
16	4.11	73.52	2.37%	74.35	11.27%
17	1.87	71.27	1.39%	73.23	10.70%
18	1.61	73.78	3.33%	74.18	11.66%
19	0.40	69.41	4.02%	69.42	12.01%
20	2.43	71.6	8.20%	72.17	16.25%
21	1.11	73.47	2.23%	74.46	11.22%
22	1.57	73.45	2.16%	73.85	11.08%
23	1.19	71.11	13.10%	71.41	20.22%
24	0.45	73.81	3.51%	73.81	11.75%
25	0.71	68.35	1.53%	68.35	12.52%
26	4.86	74.64	8.17%	74.79	14.66%
27	1.00	75.79	2.01%	75.79	11.01%
28	0.47	71.78	2.21%	71.78	11.10%
29	0.42	75.79	1.10%	75.79	10.55%
30	0.50	71.89	2.12%	71.89	11.06%
31	0.80	75.79	1.50%	75.79	10.91%
32	1.58	72.86	2.11%	72.56	11.63%
33	0.96	75.79	0.59%	75.79	10.56%
34	0.25	72.07	2.50%	70.65	12.03%
35	0.84	74.97	3.61%	75.51	12.37%

Table A-11 CN Number Summary – South Fork San Gabriel River (continued)

Watershed Name	Watershed Area (mi^2)	Existing Conditions Weighted Curve Number	Existing Conditions Impervious Cover	Future Developed Weighted Curve Number	Future Developed Impervious Cover
36	0.45	68.05	0.53%	67.9	10.43%
37	0.44	73.73	15.94%	73.9	21.33%
38	0.29	66.33	1.24%	68.34	10.62%
39	0.47	72.48	25.44%	72.71	30.32%
40	0.36	67.49	5.14%	68.5	12.57%
41	0.51	73.33	22.99%	73.33	28.56%
42	0.39	71.75	15.27%	71.75	18.08%
43	3.15	75.54	8.78%	75.68	15.27%
44	2.71	75.29	2.24%	75.37	11.12%
45	2.34	73.92	1.51%	74.72	10.75%
46	0.67	75.04	6.03%	74.94	13.41%
47	3.01	73.92	1.69%	74.8	10.84%
48	3.31	75.11	9.06%	75.15	14.82%
49	2.63	74.29	5.42%	75.02	12.71%
50	3.87	73.79	3.30%	74.09	11.67%
51	0.57	72.33	10.98%	72.33	17.33%
52	1.35	73.96	4.04%	74.24	12.06%
53	0.25	74.71	22.23%	74.71	23.26%
54	0.50	69.76	8.31%	69.76	15.74%
55	0.27	75.2	15.16%	75.2	19.98%
56	0.38	71.6	30.74%	71.6	36.30%
57	1.63	73.44	2.96%	73.44	11.48%
58	0.49	73.84	5.00%	73.84	12.69%
59	0.40	73.09	26.57%	73.09	32.01%
60	0.75	73.67	17.95%	73.67	23.21%
61	0.32	71.48	39.24%	71.48	45.06%
62	0.73	73.16	8.86%	73.16	15.78%
63	2.31	72.95	4.46%	72.91	12.91%
64	1.94	75.28	6.85%	75.54	13.43%
65	2.11	74.7	4.14%	75.25	12.07%
66	2.21	75	11.41%	75.16	15.90%
67	1.18	69.11	6.32%	70.21	13.20%
68	2.07	73.65	11.98%	74.17	16.90%
69	0.89	74.58	11.39%	74.64	19.03%
70	1.53	74.32	17.46%	74.3	25.75%

Table A-11 CN Number Summary – South Fork San Gabriel River (continued)

Watershed Name	Watershed Area (mi^2)	Existing Conditions Weighted Curve Number	Existing Conditions Impervious Cover	Future Developed Weighted Curve Number	Future Developed Impervious Cover
71	0.69	63.75	38.89%	64.15	44.56%
72	0.33	72.9	17.64%	73.38	23.72%
73	0.89	73.89	10.80%	74.22	19.32%
74	1.08	68.5	7.00%	68.43	17.80%
75	1.24	71.92	2.72%	73.22	11.57%
76	1.56	71.25	13.30%	71.98	20.64%
77	1.32	67.43	8.43%	68.27	16.46%
78	1.28	70.7	29.07%	70.97	35.72%
79	0.85	73.29	10.12%	73.75	15.14%
80	4.18	70.68	5.14%	70.68	17.30%
81	2.09	74.57	3.34%	74.78	13.45%
82	0.37	70.33	4.05%	70.91	18.08%
83	1.14	72.39	1.42%	75.23	17.02%
84	2.63	75.3	2.97%	74.12	19.63%
85	1.20	76.9	8.78%	74.65	23.63%
86	1.51	71.17	31.61%	70.29	45.77%
87	0.58	70.63	52.41%	70.41	58.47%
88	0.50	69.92	56.49%	69.67	63.10%
89	0.36	65.83	60.22%	65.57	66.18%
90	0.26	74.76	17.81%	72.3	47.42%
91	2.04	71.24	11.48%	71.66	19.09%
92	2.13	66.35	4.53%	68.92	13.58%
93	0.43	72.12	30.88%	72.12	35.67%
94	0.18	72	48.73%	71.4	59.00%

Table A-12 CN Number Summary – San Gabriel River

Watershed Name	Watershed Area (mi^2)	Weighted Curve Number	Existing Impervious Cover	Future Developed Impervious Cover
36	1.32	74	3.00%	11.50%
37	1.22	74	3.00%	11.50%
38	2.44	73	3.44%	11.72%
39	1.11	72	5.87%	12.93%
40	0.46	69	3.00%	11.50%
41	1.32	66	1.89%	7.25%
42	1.33	70	3.00%	11.48%
43	0.32	61	1.42%	5.45%
44	0.25	65	1.79%	6.87%
45	0.51	65	1.84%	7.04%
48	0.36	72	3.00%	11.50%
49	0.91	71	3.05%	11.50%
50	0.31	71	3.07%	11.56%
52	0.16	63	22.53%	25.45%
53	0.46	68	2.35%	8.98%
54	0.25	71	2.83%	10.85%
56	0.75	73	31.63%	35.14%
57	1.18	68	2.59%	9.30%
58	0.76	67	13.32%	19.12%
59	0.52	63	22.49%	23.88%
64	0.37	73	2.83%	10.56%
67	0.55	65	3.42%	11.71%
68	1.44	69	4.81%	12.41%

Table A-13 Lag Time Summary – Berry Creek

Watershed	Length	SHEET				SHALLOW				CHANNEL			Total Lag Time		
		Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
72	17609	200	0.3	0.009	0.66	7621	0.009	1.52	1.39	9788	2.90	0.94	1.79	107.44	85.95
73	15812	200	0.3	0.011	0.61	4062	0.015	1.96	0.58	11550	2.24	1.43	1.57	94.38	75.51
74	20804	200	0.3	0.007	0.73	3887	0.013	1.84	0.59	16717	2.40	1.93	1.95	116.87	93.50
75	24837	200	0.3	0.011	0.61	4379	0.010	1.62	0.75	20258	3.72	1.51	1.73	103.66	82.93
76	27515	200	0.3	0.021	0.47	5955	0.015	1.96	0.85	21360	3.06	1.94	1.95	117.28	93.83
80	34857	200	0.3	0.009	0.67	1313	0.037	3.12	0.12	33344	4.61	0.81	1.69	101.17	80.93
81	22630	200	0.3	0.010	0.64	2303	0.013	1.83	0.35	20127	2.88	1.94	1.76	105.66	84.53
82	16875	200	0.3	0.016	0.52	5382	0.010	1.63	0.92	11293	2.77	1.13	1.54	92.63	74.11
84	13939	200	0.3	0.006	0.77	2949	0.028	2.68	0.31	10790	2.07	1.44	1.51	90.86	72.69
87	11582	200	0.3	0.016	0.52	2799	0.013	1.86	0.42	8583	3.93	0.61	0.93	55.66	44.52
89	25323	200	0.3	0.013	0.57	1105	0.024	2.48	0.12	24018	4.06	1.65	1.40	84.24	67.39
90	18221	200	0.3	0.034	0.39	5067	0.014	1.91	0.74	12954	3.00	1.20	1.39	83.67	66.93
91	18979	200	0.3	0.010	0.64	1665	0.038	3.16	0.15	17114	3.29	1.45	1.34	80.39	64.32
92	21899	200	0.3	0.029	0.41	7766	0.012	1.78	1.21	13933	4.83	0.31	1.49	89.50	71.60
93	8223	200	0.3	0.013	0.56	3392	0.020	2.26	0.42	4631	4.35	0.30	0.77	45.93	36.74
98	15271	200	0.3	0.017	0.51	2437	0.019	2.25	0.30	12634	2.98	1.18	1.19	71.69	57.35
101	19839	200	0.3	0.002	1.20	1387	0.034	2.96	0.13	18252	5.02	1.01	1.40	84.15	67.32
102	20411	200	0.3	0.012	0.60	2139	0.013	1.87	0.32	18072	3.27	1.53	1.47	88.18	70.54
103	15030	200	0.3	0.014	0.55	5369	0.016	2.04	0.73	9461	5.24	0.50	1.07	64.20	51.36
106	16030	200	0.3	0.015	0.54	6688	0.016	2.05	0.90	9142	3.24	0.78	1.34	80.28	64.22
107	15150	200	0.3	0.016	0.52	6478	0.014	1.91	0.94	8472	2.20	1.07	1.52	91.14	72.91
110	15328	200	0.3	0.010	0.63	9709	0.017	2.09	1.29	5419	4.21	0.36	1.37	82.03	65.63
111	10482	200	0.3	0.025	0.44	3352	0.002	0.69	1.34	6930	5.20	0.37	1.29	77.38	61.90
112	12291	200	0.3	0.025	0.44	1822	0.022	2.39	0.21	10269	3.40	0.84	0.90	53.95	43.16
113	19803	200	0.3	0.009	0.67	3836	0.016	2.02	0.53	15767	2.90	1.52	1.63	97.64	78.12
114	19797	200	0.3	0.010	0.64	4854	0.016	2.06	0.66	14743	2.10	1.95	1.95	116.95	93.56
116	12658	200	0.3	0.021	0.47	5731	0.009	1.54	1.03	6727	5.24	0.36	1.12	66.93	53.55
119	26970	200	0.3	0.018	0.51	5476	0.013	1.87	0.81	21294	6.80	0.93	1.35	80.91	64.73
120	15951	200	0.3	0.017	0.51	711	0.021	2.34	0.08	15040	3.61	1.17	1.06	63.35	50.68
123	20356	200	0.3	0.019	0.49	6915	0.010	1.65	1.16	13241	3.30	1.12	1.66	99.86	79.88
124	12521	200	0.3	0.021	0.47	2462	0.024	2.48	0.28	9859	2.21	1.24	1.19	71.66	57.33
125	9607	200	0.3	0.001	1.40	2338	0.016	2.02	0.32	7069	3.56	0.55	1.36	81.82	65.46
126	4759	100	0.2	0.007	0.31	3816	0.023	2.45	0.43	843	2.88	0.08	0.49	29.56	23.65

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-13 Lag Time Summary – Berry Creek (continued)

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
127	18841	200	0.3	0.014	0.56	4486	0.017	2.07	0.60	14155	3.13	1.26	1.45	87.12	69.70
128	11701	200	0.3	0.020	0.48	4112	0.014	1.92	0.59	7389	5.04	0.41	0.89	53.35	42.68
129	30791	200	0.3	0.011	0.61	5707	0.015	1.98	0.80	24884	4.65	1.49	1.74	104.21	83.37
130	5305	200	0.3	0.020	0.48	4422	0.013	1.81	0.68	683	4.98	0.04	0.72	42.98	34.39
131	10309	200	0.3	0.029	0.41	5164	0.014	1.92	0.75	4945	3.87	0.35	0.91	54.49	43.59
133	11224	200	0.3	0.011	0.61	3339	0.017	2.08	0.45	7685	5.04	0.42	0.89	53.36	42.68
134	20791	200	0.3	0.013	0.57	9832	0.013	1.83	1.49	10759	2.54	1.18	1.94	116.45	93.16
135	16034	100	0.3	0.003	0.58	3989	0.024	2.12	0.53	11945	7.10	0.50	0.97	58.04	46.43
136	25430	200	0.3	0.027	0.42	4633	0.019	2.22	0.58	20597	4.63	1.23	1.34	80.58	64.46
138	6459	200	0.3	0.008	0.68	3338	0.012	1.73	0.54	2921	7.86	0.10	0.79	47.60	38.08
142	16887	200	0.3	0.023	0.45	3262	0.014	1.89	0.48	13425	3.42	1.27	1.32	79.45	63.56
149	10262	80	0.15	0.035	0.09	5537	0.015	1.98	0.90	4645	3.86	0.33	0.79	47.53	38.03
154	7875	200	0.3	0.025	0.44	4049	0.008	1.48	0.76	3626	2.75	0.37	0.94	56.36	45.09
159	5034	200	0.3	0.003	1.10	3334	0.014	1.94	0.48	1500	5.29	0.08	0.99	59.61	47.69
164	6442	200	0.3	0.021	0.47	5718	0.018	2.17	0.73	524	1.33	0.11	0.79	47.23	37.78
179	5698	200	0.3	0.014	0.56	429	0.017	2.14	0.06	5069	6.64	0.51	0.68	40.63	32.51
184	14212	200	0.3	0.033	0.39	9250	0.010	1.61	1.59	4762	11.57	0.11	1.26	75.56	60.45
189	9803	100	0.3	0.015	0.31	4125	0.018	2.17	0.53	5578	5.22	0.30	0.68	40.77	32.62
190	13144	200	0.3	0.008	0.69	4455	0.019	2.24	0.55	8489	3.73	0.63	1.13	67.51	54.01
195	10927	200	0.3	0.010	0.63	6741	0.013	1.85	1.01	3986	7.10	0.16	1.08	64.87	51.89
204	14458	200	0.3	0.014	0.55	1070	0.008	1.46	0.20	13188	2.80	1.31	1.24	74.35	59.48
212	9853	200	0.3	0.019	0.49	3731	0.016	2.07	0.50	5922	4.58	0.36	0.81	48.66	38.93

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-14 Lag Time Summary – Mankins Branch

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
34	4184	200	0.3	0.004	0.89	3704	0.016	2.02	0.51	280	4.71	0.02	0.85	50.99	40.80
39	9880	200	0.3	0.011	0.60	1282	0.007	1.36	0.26	8398	1.85	1.26	1.28	76.56	61.24
40	8070	200	0.3	0.051	0.33	450	0.013	1.89	0.07	7420	4.94	0.53	0.56	33.36	26.69
41	6047	200	0.3	0.035	0.38	779	0.025	2.55	0.08	5068	6.75	0.23	0.42	25.13	20.11
42	13662	200	0.3	0.020	0.48	3293	0.017	2.10	0.44	10169	2.57	1.11	1.22	72.95	58.36
43	12954	200	0.3	0.008	0.70	2045	0.011	1.69	0.34	10709	2.32	0.40	0.86	51.54	41.23
49	14916	200	0.3	0.007	0.73	2226	0.011	1.69	0.37	12490	3.21	1.36	1.47	88.41	70.73
50	12378	200	0.3	0.009	0.66	1427	0.023	2.47	0.16	10751	5.25	0.57	0.83	49.83	39.87
52	26119	200	0.3	0.009	0.65	10232	0.013	1.87	0.15	15687	6.49	0.89	1.02	60.91	48.73
53	10795	200	0.3	0.004	0.93	3093	0.019	2.21	0.39	7502	5.09	0.63	1.17	70.17	56.13
54	6369	200	0.3	0.027	0.43	2357	0.025	2.53	0.26	3812	5.17	0.20	0.53	32.10	25.68
55	8739	200	0.3	0.037	0.37	896	0.032	2.87	0.09	7643	4.52	0.47	0.56	33.65	26.92
56	9603	200	0.3	0.012	0.58	632	0.019	2.24	0.08	8771	2.33	1.10	1.06	63.50	50.80
57	7588	200	0.3	0.002	1.25	4565	0.019	2.23	0.57	2823	4.63	0.17	1.19	71.47	57.18
60	10017	200	0.3	0.035	0.38	2111	0.024	2.48	0.24	7706	2.98	0.72	0.80	48.17	38.53
66	10790	200	0.3	0.011	0.61	920	0.028	2.55	0.03	9670	2.72	1.05	1.01	60.82	48.66

Table A-15 Lag Time Summary – Pecan Branch

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
01	6169	200	0.2	0.010	0.46	2699	0.011	1.7	0.44	3270.66	4.61	0.20	1.10	39.65	31.72
02	6365	100	0.02	0.012	0.04	143	0.011	2.2	0.02	6122.30	2.86	0.59	0.65	23.47	18.77
03	7362	200	0.2	0.014	0.40	3577	0.015	1.9	0.52	3585.12	3.54	0.28	1.20	43.36	34.69
04	7202	100	0.2	0.014	0.23	2160	0.018	2.2	0.28	4941.87	3.52	0.39	0.90	32.31	25.85
05	5712	100	0.02	0.010	0.04	3311	0.018	2.7	0.34	2300.71	3.96	0.16	0.54	19.56	15.65
06	9235	100	0.02	0.033	0.03	2983	0.014	2.4	0.35	6151.86	4.75	0.36	0.73	26.31	21.05
07	6411	100	0.02	0.017	0.03	2949	0.021	3.0	0.28	3361.31	3.98	0.23	0.55	19.64	15.71
08	5291	200	0.2	0.015	0.39	3474	0.008	1.4	0.69	1616.84	6.74	0.07	1.15	41.31	33.05
09	9903	200	0.2	0.009	0.47	3628	0.013	1.8	0.56	6075.63	3.21	0.53	1.56	56.03	44.82
10	5274	100	0.02	0.012	0.04	488	0.017	2.7	0.05	4685.89	5.47	0.24	0.33	11.76	9.41
11	5549	200	0.2	0.005	0.61	2489	0.006	1.2	0.60	2859.78	2.86	0.28	1.49	53.5	42.8
12	6651	200	0.2	0.017	0.37	725	0.013	1.8	0.11	5725.49	3.02	0.53	1.01	36.33	29.06
13	6289	200	0.2	0.008	0.50	3512	0.011	1.7	0.57	2577.80	4.15	0.17	1.24	44.77	35.82
14	4904	200	0.2	0.037	0.27	1652	0.023	2.4	0.19	3051.88	3.55	0.24	0.70	25.15	20.12
15	11550	200	0.2	0.016	0.38	1698	0.009	1.5	0.31	9651.24	5.35	0.50	1.19	42.95	34.36
16	5756	200	0.2	0.005	0.61	1689	0.026	2.6	0.18	3867.07	3.97	0.27	1.06	38.06	30.45
17	13466	200	0.2	0.020	0.34	2119	0.022	2.4	0.25	11147.05	4.63	0.67	1.26	45.23	36.19

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-16 Lag Time Summary – Smith Branch

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length (ft)	Length (ft)	N-value	Slope (ft/ft)	T (hr)	Length (ft)	Slope	Velocity (ft/s)	T (hr)	Length (ft)	Velocity (ft/s)	T (hr)	T_{lag} (hr)	Existing T_{lag} (min)	Future T_{lag} (min)
01	7705	200	0.2	0.011	0.44	3978	0.016	2.1	0.54	3527	6.92	0.14	1.12	40.18	32.1
02	9230	200	0.2	0.021	0.34	6761	0.010	1.6	1.17	2269	17.00	0.04	1.55	55.82	44.7
03	10966	200	0.2	0.031	0.29	3108	0.034	3.0	0.29	7658	2.13	1.00	1.58	56.76	45.4
04	6159	200	0.2	0.013	0.41	4352	0.011	1.7	0.71	1607	2.46	0.18	1.30	46.92	37.5
05	12120	100	0.2	0.019	0.20	531	0.014	1.9	0.08	11488	5.02	0.64	0.92	33.05	26.4
06	6391	200	0.2	0.023	0.33	2033	0.048	3.6	0.16	4157	1.52	0.76	1.25	44.87	35.9
07	5644	200	0.2	0.019	0.35	258	0.047	3.6	0.02	5186	3.72	0.39	0.76	27.22	21.8
08	7966	200	0.2	0.036	0.27	1506	0.034	3.0	0.14	6260	6.65	0.26	0.67	24.22	19.4
09	6058	200	0.2	0.008	0.49	733	0.036	3.1	0.07	5125	4.78	0.30	0.86	30.89	24.7
10	3780	200	0.2	0.006	0.56	2255	0.014	1.9	0.33	1325	4.27	0.09	0.98	35.12	28.1
11	3909	200	0.2	0.016	0.37	3662	0.011	1.7	0.60	47	29.47	0.00	0.97	35.04	28
12	6484	200	0.2	0.020	0.35	1508	0.051	3.6	0.12	4776	4.88	0.27	0.73	26.43	21.1
13	5468	53.95	0.2	0.023	0.11	659	0.003	1.0	0.18	4755	3.02	0.44	0.73	26.44	21.2
14	7307	200	0.2	0.012	0.42	1947	0.039	3.2	0.17	5160	7.72	0.19	0.77	27.84	22.3
15	8898	200	0.2	0.014	0.40	4397	0.020	2.3	0.53	4300	7.48	0.16	1.09	39.19	31.4
16	8182	82.97	0.2	0.010	0.22	2686	0.008	1.2	0.62	5413	5.81	0.26	1.10	39.71	31.8
17	6477	200	0.2	0.019	0.35	2627	0.028	2.7	0.27	3650	3.97	0.26	0.88	31.58	25.3
18	7010	100	0.02	0.014	0.04	1488	0.016	2.6	0.16	5422	5.77	0.26	0.46	16.42	13.1
19	4887	100	0.02	0.022	0.03	1953	0.034	3.8	0.14	2834	6.59	0.12	0.29	10.53	8.4
20	4798	200	0.2	0.013	0.41	1832	0.022	2.4	0.21	2767	9.36	0.08	0.70	25.3	20.2
21	6213	200	0.2	0.026	0.31	1777	0.013	1.8	0.27	4236	7.25	0.16	0.75	26.93	21.5
22	8110	100	0.02	0.020	0.03	2235	0.009	1.95	0.32	5775	6.85	0.23	0.58	21.03	16.8
23	8140	200	0.2	0.061	0.22	4461	0.023	2.45	0.51	3479	6.55	0.15	0.87	31.46	25.2

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-17 Lag Time Summary – Middle Fork San Gabriel River

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
53	6345	200	0.3	0.005	0.82	4064	0.013	1.85	0.61	2081	3.19	0.18	0.97	58.00	46.40
55	9702	200	0.3	0.011	0.61	2500	0.038	3.13	0.22	7002	1.97	0.99	1.09	65.47	52.38
56	15716	200	0.3	0.002	1.18	3335	0.010	1.63	0.57	12181	3.40	1.05	1.67	100.45	80.36
57	12018	200	0.3	0.015	0.54	4339	0.021	2.34	0.51	7479	2.23	0.98	1.22	73.22	58.57
58	6332	200	0.3	0.035	0.38	850	0.060	3.94	0.06	5282	3.51	0.42	0.52	30.97	24.78
59	8075	200	0.3	0.017	0.51	3512	0.013	1.83	0.53	4363	1.59	0.76	1.08	65.02	52.01
62	10661	200	0.3	0.012	0.34	811	0.040	3.22	0.07	9650	4.24	0.63	0.63	37.64	30.12
64	13428	200	0.3	0.013	0.57	709	0.010	1.61	0.12	12519	3.15	1.17	1.12	67.18	53.74
65	8924	200	0.3	0.008	0.71	1522	0.029	2.73	0.15	7202	4.41	0.45	0.79	47.40	37.92
66	8907	200	0.3	0.003	1.03	2940	0.036	3.05	0.27	5767	2.74	0.65	1.17	70.29	56.23
68	9742	200	0.3	0.010	0.63	3717	0.030	2.82	0.37	5825	1.24	1.31	1.38	83.07	66.46
69	4513	200	0.3	0.002	1.30	3991	0.034	2.96	0.37	322	3.41	0.03	1.02	61.05	48.84
73	6939	200	0.3	0.028	0.42	1044	0.032	2.86	0.10	5695	3.72	0.44	0.57	34.42	27.53
74	5469	200	0.3	0.028	0.42	1283	0.039	3.17	0.11	3986	1.45	2.58	1.87	111.98	89.59
75	19274	200	0.3	0.003	1.01	6652	0.008	1.46	1.27	12422	2.53	1.40	2.20	132.28	105.82
76	11161	200	0.3	0.008	0.70	2943	0.031	2.77	0.32	8018	2.48	1.30	1.39	83.37	66.69
79	5761	200	0.3	0.039	0.37	513	0.049	3.58	0.04	5048	2.60	1.85	1.35	81.15	64.92
81	7373	200	0.3	0.001	1.36	5207	0.010	1.65	0.88	1966	2.16	0.25	1.50	89.72	71.78
82	5374	200	0.3	0.060	0.31	1840	0.024	2.51	0.20	3334	5.03	0.18	0.42	25.11	20.09
83	13322	200	0.3	0.004	0.94	1392	0.005	1.18	0.33	11730	2.63	1.24	1.50	90.01	72.01
88	5788	200	0.3	0.010	0.63	1979	0.008	1.44	0.38	3609	6.53	1.07	0.71	42.42	33.94
89	5516	200	0.3	0.006	0.80	643	0.014	1.91	0.09	4673	9.05	0.36	0.62	37.32	29.86
90	7396	200	0.3	0.018	0.50	4738	0.010	1.62	0.81	2458	3.38	0.20	0.91	54.64	43.71
92	9126	200	0.3	0.012	0.58	1548	0.025	2.54	0.17	7378	3.32	0.62	0.82	49.40	39.52
95	6047	200	0.3	0.016	0.53	758	0.040	3.21	0.07	5089	3.85	0.37	0.58	34.61	27.68

Table A-18 Lag Time Summary – North Fork San Gabriel River

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
379	33574	200	0.3	0.017	0.51	2378	0.020	2.28	0.29	30996	2.88	2.99	2.28	136.55	109.24
390	35693	200	0.3	0.010	0.63	2956	0.015	2.01	0.41	32537	4.43	2.04	1.85	110.79	88.63
399	26625	200	0.3	0.007	0.75	5038	0.010	1.63	0.86	21387	2.76	2.15	2.26	135.56	108.45
400	27499	200	0.3	0.020	0.48	7556	0.008	1.48	1.42	19743	4.39	1.25	1.89	113.19	90.55
401	33255	200	0.3	0.018	0.50	3109	0.018	2.16	0.40	29946	3.15	2.64	2.12	127.41	101.92
412	31215	200	0.3	0.009	0.66	5347	0.014	1.90	0.78	25668	3.01	2.38	2.29	137.54	110.03
417	23837	200	0.3	0.004	0.91	1113	0.013	1.85	0.17	22524	4.77	1.31	1.43	85.87	68.70
423	35636	200	0.3	0.002	1.24	7900	0.009	1.49	1.47	27536	3.50	2.19	2.94	176.48	141.19
443	23945	200	0.3	0.001	1.39	2638	0.021	2.33	0.31	21107	5.64	1.22	1.75	105.17	84.14
445	24613	200	0.3	0.011	0.61	2719	0.018	2.15	0.35	21694	2.66	2.37	2.00	119.99	95.99
454	14418	200	0.3	0.017	0.51	2264	0.020	2.27	0.28	11954	5.04	0.66	0.87	51.97	41.58
455	32113	200	0.3	0.006	0.77	2197	0.019	2.25	0.27	29716	4.56	1.82	1.71	102.90	82.32
467	20631	200	0.3	0.015	0.54	1912	0.016	2.04	0.26	18519	2.75	1.87	1.61	96.40	77.12
475	34200	200	0.3	0.006	0.80	4485	0.009	1.51	0.82	29515	3.97	2.15	2.26	135.88	108.70
477	28673	200	0.3	0.007	0.73	3629	0.015	2.00	0.50	24844	2.62	2.64	2.32	139.38	111.50
478	26395	200	0.3	0.016	0.52	3581	0.015	2.00	0.50	22614	3.05	2.07	1.86	111.41	89.13
489	27152	200	0.3	0.028	0.42	3024	0.020	2.27	0.37	23928	3.51	2.07	1.72	103.04	82.44
497	18489	200	0.3	0.011	0.60	4315	0.016	2.05	0.58	13974	3.18	1.22	1.44	86.57	69.26
498	20293	200	0.3	0.006	0.76	1375	0.021	2.35	0.16	18718	2.89	1.80	1.63	98.01	78.41
508	29176	200	0.3	0.012	0.59	1816	0.028	2.68	0.19	27160	4.31	1.94	1.63	97.93	78.34
522	31695	200	0.3	0.002	1.17	1816	0.033	2.95	0.17	29679	3.58	2.30	2.19	131.29	105.03
532	28917	200	0.3	0.010	0.64	4491	0.024	2.51	0.50	24226	3.20	2.10	1.94	116.62	93.30
533	31995	200	0.3	0.011	0.61	8276	0.009	1.54	1.49	23519	4.98	1.31	2.05	122.86	98.29
540	25732	200	0.3	0.005	0.83	6725	0.015	2.00	0.94	18807	2.45	2.13	2.34	140.41	112.33
544	19664	200	0.3	0.005	0.83	4755	0.011	1.72	0.77	14709	5.31	0.77	0.93	55.54	44.43
554	28237	200	0.3	0.014	0.55	3100	0.011	1.71	0.50	24937	4.20	1.65	1.62	97.37	77.89
555	28624	200	0.3	0.022	0.46	3284	0.020	2.26	0.40	25140	5.88	1.19	1.23	73.82	59.05
565	29758	200	0.3	0.017	0.51	1348	0.033	2.93	0.13	28210	5.61	1.40	1.22	73.46	58.77
566	23181	200	0.3	0.008	0.70	2412	0.023	2.43	0.28	20569	5.43	1.05	1.22	73.05	58.44
574	26715	200	0.3	0.009	0.65	5459	0.015	1.98	0.77	21056	3.61	1.62	1.82	109.35	87.48
588	30561	200	0.3	0.011	0.62	6641	0.011	1.71	1.08	23720	3.97	1.66	2.02	121.13	96.91
597	23140	200	0.3	0.031	0.40	2707	0.026	2.60	0.29	20233	4.17	1.35	1.23	73.53	58.82
598	23385	200	0.2	0.016	0.52	2802	0.013	1.81	0.43	20383	4.13	1.37	1.39	83.61	66.89
599	27968	200	0.3	0.021	0.47	2659	0.018	2.16	0.34	25109	4.56	1.53	1.41	84.44	67.56
605	22191	200	0.3	0.013	0.56	5178	0.022	2.39	0.60	16813	4.20	1.21	1.42	85.45	68.36

Table A-18 Lag Time Summary – North Fork San Gabriel River (continued)

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
606	20221	200	0.3	0.010	0.65	5117	0.014	1.90	0.75	14904	3.58	1.23	1.57	94.40	75.52
610	27326	200	0.3	0.013	0.56	2375	0.013	1.84	0.36	24751	3.33	2.08	1.80	107.96	86.37
616	15856	200	0.3	0.019	0.49	2600	0.067	4.19	0.17	13056	3.87	0.96	0.97	58.49	46.79
621	16315	200	0.3	0.029	0.42	4136	0.016	2.06	0.56	11979	2.64	1.26	1.34	80.43	64.34
632	19374	200	0.3	0.013	0.57	2849	0.020	2.27	0.35	16325	4.55	1.00	1.15	68.84	55.07
643	24538	200	0.3	0.010	0.64	7173	0.014	1.89	1.05	17165	4.74	1.03	1.63	97.98	78.38
651	20415	200	0.3	0.911	0.60	2548	0.017	2.08	0.34	17667	3.41	1.47	1.45	86.77	69.41
653	28561	200	0.3	0.003	0.98	2668	0.013	1.86	0.40	25693	4.62	1.57	1.77	106.39	85.11
654	15575	200	0.3	0.007	0.72	3474	0.010	1.60	0.60	11901	5.31	0.65	1.18	71.08	56.86
657	27756	200	0.3	0.011	0.60	2016	0.028	2.72	0.21	25540	4.21	1.76	1.54	92.38	73.90
658	32995	200	0.3	0.002	1.14	3803	0.010	1.65	0.64	28992	4.76	1.69	2.09	125.13	100.10
660	11981	200	0.3	0.006	0.80	3057	0.011	1.65	0.51	8724	3.79	0.64	1.17	70.49	56.39
661	31434	200	0.3	0.011	0.61	3234	0.014	2.42	0.37	28000	4.92	1.64	1.58	94.63	75.71
663	10784	200	0.3	0.036	0.38	3177	0.021	2.34	0.38	7407	5.33	0.39	0.69	41.29	33.03
665	13150	200	0.3	0.014	0.55	1923	0.020	2.30	0.23	11027	5.17	0.59	0.82	49.48	39.58
673	20697	200	0.3	0.008	0.69	1632	0.020	2.29	0.20	18865	4.19	1.25	1.28	77.06	61.65
674	18119	200	0.3	0.005	0.83	2039	0.025	2.56	0.22	15880	4.24	1.04	1.25	75.27	60.22
675	14734	200	0.3	0.026	0.43	1660	0.025	2.54	0.18	12874	3.73	0.99	0.96	57.84	46.28
676	15420	200	0.3	0.018	0.50	3411	0.022	2.42	0.39	11809	4.18	0.90	1.08	64.61	51.68
690	22453	200	0.3	0.006	0.76	1930	0.019	2.23	0.24	20323	5.91	0.96	1.18	70.59	56.47
691	27288	200	0.3	0.011	0.62	2336	0.026	3.27	0.20	24752	7.03	1.01	1.10	65.83	52.66
698	15249	200	0.3	0.008	0.70	2967	0.036	3.04	0.27	12082	4.16	0.86	1.10	65.94	52.75
703	22033	200	0.3	0.026	0.43	5388	0.012	1.74	0.86	16445	4.13	1.16	1.47	88.01	70.41
709	26197	200	0.3	0.030	0.41	7814	0.032	1.58	1.78	18183	3.92	1.71	2.34	140.46	112.37
727	22596	200	0.3	0.006	0.80	4200	0.023	2.43	0.48	18196	3.89	1.42	1.62	97.21	77.77
747	11675	200	0.3	0.008	0.69	1039	0.032	2.90	0.10	10436	4.59	0.82	0.97	57.96	46.37
750	5429	200	0.3	0.018	0.50	746	0.013	1.78	0.12	4483	6.63	0.41	0.62	37.04	29.63

Table A-19 Lag Time Summary – South Fork San Gabriel River

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
01	25841	200	0.41	0.43	68.47	2405	2.06	2.32	17.25	23236	3.88	99.76	3.09	111.3	89
02	23458	200	0.41	0.67	57.26	3739	2.07	2.33	26.73	19519	3.49	93.19	2.95	106.3	85
03	14858	200	0.24	1.47	27.28	368	2.57	2.60	2.36	14290	2.70	88.24	1.96	70.7	56.6
04	11526	200	0.41	1.52	41.30	999	3.51	3.04	5.49	10327	2.39	72.05	1.98	71.3	57
05	17489	200	0.41	1.33	43.52	2505	1.50	1.99	21.02	14784	4.31	57.15	2.03	73	58.4
06	14152	200	0.41	1.21	45.24	2123	2.64	2.63	13.44	11829	5.99	32.93	1.53	55	44
07	19170	200	0.24	1.18	29.79	1879	1.97	2.27	13.77	17091	4.53	62.89	1.77	63.9	51.1
08	13342	200	0.24	0.47	42.98	4215	1.57	2.03	34.65	8927	3.97	37.46	1.92	69.1	55.2
09	17953	200	0.41	0.90	50.93	1279	2.13	2.36	9.03	16474	4.12	66.70	2.11	76	60.8
10	8895	200	0.24	1.81	25.06	1645	1.23	1.80	15.26	7051	6.01	19.57	1.00	35.9	28.7
11	22343	200	0.24	1.42	27.64	1695	2.27	2.44	11.56	20449	4.20	81.09	2.01	72.2	57.7
12	16944	200	0.41	1.76	38.92	3362	3.03	2.82	19.88	13383	3.54	63.06	2.03	73.1	58.5
13	14486	200	0.24	1.64	26.10	1203	1.69	2.10	9.53	13083	3.97	54.87	1.51	54.3	43.4
14	22920	200	0.41	1.26	44.51	5608	1.30	1.85	50.52	17111	6.70	42.58	2.29	82.6	66.1
15	13574	200	0.24	1.82	25.05	919	3.59	3.07	4.99	12455	6.10	34.05	1.07	38.5	30.8
16	20527	200	0.24	0.96	32.35	3747	1.83	2.19	28.53	16580	6.41	43.09	1.73	62.4	49.9
17	17347	200	0.41	0.50	64.59	4127	1.50	1.99	34.65	13020	7.68	28.26	2.12	76.5	61.2
18	13962	200	0.41	0.83	52.61	1403	2.73	2.67	8.74	12359	4.18	49.24	1.84	66.4	53.1
19	4908	200	0.41	0.75	54.83	906	5.06	3.64	4.15	3802	6.88	9.22	1.14	40.9	32.7
20	27191	100	0.24	0.60	22.43	229	1.06	2.12	1.80	26862	3.29	135.90	2.67	96.1	76.9
21	11012	200	0.41	1.55	41.02	1102	1.87	2.22	8.28	9710	4.98	32.51	1.36	49.1	39.3
22	13444	200	0.24	0.98	32.02	2793	1.76	2.15	21.67	10452	3.13	55.68	1.82	65.6	52.5
23	11871	200	0.41	0.97	49.45	2309	1.75	2.14	17.98	9362	4.85	32.16	1.66	59.8	47.8
24	5717	200	0.41	1.82	38.44	779	3.82	3.16	4.10	4738	3.31	23.83	1.11	39.8	31.9
25	10998	200	0.41	2.29	35.07	2598	2.14	2.37	18.28	8200	5.87	23.29	1.28	46	36.8
26	25662	200	0.41	2.99	31.48	4158	1.97	2.27	30.46	21305	4.54	78.13	2.33	84	67.2
27	9135	200	0.41	2.29	35.04	1072	1.55	2.02	8.84	7863	3.35	39.13	1.38	49.8	39.8
28	6190	200	0.24	1.21	29.43	2484	2.57	2.60	15.93	3505	3.72	15.72	1.02	36.6	29.3
29	6164	200	0.24	1.26	29.03	3021	1.74	2.14	23.53	2943	4.37	11.22	1.06	38.3	30.6
30	6787	200	0.24	5.00	16.70	307	1.75	2.14	2.39	6280	4.91	21.30	0.67	24.2	19.4
31	9134	200	0.41	0.51	63.98	1215	2.15	2.38	8.52	7719	4.17	30.84	1.72	62	49.6
32	13291	200	0.41	1.93	37.55	1367	3.85	3.18	7.17	11725	5.56	35.15	1.33	47.9	38.3
33	9237	200	0.41	0.29	79.66	1476	1.75	2.15	11.46	7561	2.78	45.34	2.27	81.9	65.5
34	7295	200	0.41	2.21	35.52	391	2.40	2.51	2.60	6704	3.54	31.54	1.16	41.8	33.4

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-19 Lag Time Summary – South Fork San Gabriel River (continued)

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
35	8292	200	0.24	1.65	26.05	1307	1.11	1.71	12.77	6785	3.79	29.81	1.14	41.2	32.9
36	6622	200	0.24	3.46	19.35	1253	2.35	2.49	8.40	5169	4.55	18.95	0.78	28	22.4
37	6882	200	0.41	1.43	42.34	1307	1.16	1.74	12.49	5375	6.97	12.85	1.13	40.6	32.5
38	3848	200	0.24	2.43	22.31	236	3.76	3.14	1.25	3412	5.89	9.66	0.55	19.9	15.9
39	7666	200	0.41	1.13	46.51	1221	1.22	1.79	11.40	6245	3.09	33.73	1.53	55	44
40	4112	200	0.24	1.80	25.12	371	2.32	2.47	2.51	3541	6.34	9.31	0.62	22.2	17.7
41	5688	200	0.41	0.26	83.90	1091	2.12	2.36	7.70	4397	3.70	19.82	1.86	66.9	53.5
42	4824	200	0.24	0.97	32.14	1467	1.14	2.20	11.12	3157	4.83	10.89	0.90	32.5	26
43	29898	200	0.41	1.01	48.58	3917	0.98	1.60	40.73	25781	3.90	110.15	3.32	119.7	95.7
44	19531	200	0.41	1.59	40.55	3152	2.58	2.60	20.17	16179	4.39	61.38	2.04	73.3	58.6
45	16885	200	0.41	1.23	45.00	2187	3.01	2.81	12.97	14498	4.12	58.71	1.94	70	56
46	8740	200	0.41	1.21	45.21	1435	1.36	1.89	12.68	7106	5.30	22.34	1.34	48.1	38.5
47	18340	200	0.41	5.01	25.62	2082	3.11	2.86	12.15	16059	5.71	46.86	1.41	50.8	40.6
48	17061	200	0.41	1.27	44.43	1917	2.42	2.52	12.68	14943	5.48	45.47	1.71	61.5	49.2
49	19702	200	0.24	1.99	24.13	2129	2.55	2.58	13.73	17373	4.72	61.33	1.65	59.5	47.6
50	23711	200	0.41	2.33	34.78	2267	2.04	2.31	16.33	21244	5.77	61.34	1.87	67.5	54
51	6333	200	0.24	2.10	23.64	1803	1.92	2.25	13.37	4330	5.79	12.47	0.82	29.7	23.8
52	11847	200	0.41	0.81	53.20	2907	2.28	2.45	19.82	8739	4.82	30.21	1.72	61.9	49.6
53	3615	200	0.24	0.64	38.02	536	1.25	2.30	3.88	2878	3.95	12.15	0.90	32.4	25.9
54	4961	200	0.15	1.23	20.07	295	2.40	2.51	1.95	4467	3.94	18.91	0.68	24.6	19.6
55	3916	200	0.41	1.44	42.22	1239	1.18	1.76	11.72	2477	3.23	12.78	1.11	40	32
56	7824	100	0.15	1.89	9.72	1416	2.02	2.93	8.05	6309	5.02	20.94	0.65	23.2	18.6
57	10636	200	0.41	1.52	41.34	1278	2.78	2.70	7.89	9158	4.76	32.03	1.35	48.8	39
58	7002	200	0.41	6.93	22.50	1034	4.12	3.29	5.24	5768	5.62	17.12	0.75	26.9	21.5
59	5103	200	0.41	0.56	61.61	1472	1.65	2.08	11.78	3432	4.33	13.22	1.44	52	41.6
60	9506	100	0.15	2.35	8.91	1354	1.80	2.18	10.38	8051	5.59	24.00	0.72	26	20.8
61	2844	200	0.15	1.49	18.60	1516	2.24	3.08	8.20	1128	4.56	4.13	0.52	18.6	14.8
62	6115	200	0.41	1.09	47.16	3217	1.52	1.99	26.88	2698	5.69	7.91	1.37	49.2	39.3
63	18503	100	0.24	1.11	17.54	1622	1.50	1.98	13.62	16780	4.18	66.95	1.64	58.9	47.1
64	17740	200	0.41	0.47	65.91	2316	1.04	1.65	23.35	15225	4.81	52.79	2.37	85.2	68.2
65	13693	200	0.24	1.24	29.22	922	2.45	2.53	6.07	12570	3.87	54.10	1.49	53.6	42.9
66	15337	200	0.41	0.11	119.20	1294	2.17	2.39	9.03	13843	4.97	46.44	2.91	104.8	83.8
67	8477	200	0.41	1.52	41.26	1843	2.63	2.63	11.69	6435	6.54	16.39	1.16	41.6	33.3
68	16416	200	0.24	0.73	36.04	661	1.98	2.28	4.83	15555	4.15	62.42	1.72	62	49.6
69	8613	200	0.41	0.67	57.33	2103	1.47	1.96	17.85	6310	2.35	44.80	2.00	72	57.6

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-19 Lag Time Summary – South Fork San Gabriel River (continued)

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length (ft)	Length (ft)	N-value	Slope (ft/ft)	T (hr)	Length (ft)	Slope	Velocity (ft/s)	T (hr)	Length (ft)	Velocity (ft/s)	T (hr)	T_{lag} (hr)	Existing T_{lag} (min)	Future T_{lag} (min)
70	16024	200	0.24	1.00	31.78	3643	1.89	2.23	27.24	12181	5.48	37.03	1.60	57.6	46.1
71	9063	100	0.41	0.54	35.95	31	2.71	3.39	0.15	8932	6.32	23.54	0.99	35.8	28.6
72	3432	200	0.41	0.95	49.90	1541	1.52	2.00	12.87	1691	4.95	5.69	1.14	41.1	32.9
73	11531	200	0.41	3.17	30.78	306	11.84	5.57	0.91	11026	4.87	37.75	1.16	41.7	33.3
74	11686	200	0.24	1.84	24.94	98	3.80	3.16	0.52	11388	7.15	26.55	0.87	31.2	25
75	13199	200	0.24	0.70	36.61	601	3.17	2.89	3.47	12398	4.16	49.65	1.50	53.8	43.1
76	10626	200	0.41	2.95	31.68	617	6.67	4.18	2.46	9809	4.94	33.08	1.12	40.3	32.3
77	12645	200	0.41	1.90	37.75	281	11.35	5.46	0.86	12206	5.10	39.92	1.31	47.1	37.7
78	10319	200	0.41	0.95	49.74	1030	3.69	3.11	5.51	9089	6.39	23.70	1.32	47.4	37.9
79	7536	200	0.24	0.95	32.41	1134	7.69	4.49	4.20	6202	6.85	15.09	0.86	31	24.8
80	22717	200	0.24	1.28	28.83	628	5.76	3.89	2.69	21889	6.50	56.14	1.46	52.6	42.1
81	20298	200	0.41	1.47	41.81	905	4.21	3.33	4.54	19193	4.91	65.12	1.86	66.9	53.5
82	7448	200	0.41	0.81	53.04	3703	4.73	3.52	17.52	3544	5.60	10.55	1.35	48.7	38.9
83	13247	200	0.41	1.69	39.56	957	4.11	3.28	4.86	12090	4.03	49.97	1.57	56.6	45.3
84	12652	200	0.41	1.04	48.01	777	5.50	3.80	3.41	11675	6.81	28.55	1.33	48	38.4
85	13067	200	0.41	3.24	30.49	2358	1.19	1.76	22.28	10509	5.38	32.54	1.42	51.2	40.9
86	10202	200	0.41	1.49	41.56	495	3.02	2.81	2.93	9507	5.89	26.89	1.19	42.8	34.3
87	6548	100	0.24	1.53	15.40	124	1.91	2.24	0.92	6324	5.04	20.92	0.62	22.3	17.9
88	6778	100	0.15	0.33	19.63	53	0.56	1.54	0.57	6625	6.54	16.89	0.62	22.3	17.8
89	5959	100	0.15	0.31	20.13	82	2.35	2.48	0.55	5776	7.84	12.29	0.55	19.8	15.8
90	3460	200	0.24	1.66	25.99	1101	1.41	1.92	9.53	2159	8.69	4.14	0.66	23.8	19
91	16498	100	0.41	1.05	27.54	292	1.64	2.07	2.35	16106	3.85	69.81	1.66	59.8	47.9
92	14668	200	0.24	0.89	33.40	339	8.68	4.77	1.18	14129	5.35	43.99	1.31	47.1	37.7
93	5025	100	0.24	2.83	12.06	1365	2.76	2.69	8.45	3560	4.24	14.01	0.58	20.7	16.6
94	4558	200	0.24	0.81	34.55	1156	1.11	1.71	11.28	3202	2.54	21.03	1.11	40.1	32.1

*For flowpaths with multiple segments per flow type (sheet, shallow concentrated, channel), average velocities were calculated.

Table A-20 Lag Time Summary – San Gabriel River

Watershed		SHEET				SHALLOW				CHANNEL			Total Lag Time		
	Length	Length	N-value	Slope	T	Length	Slope	Velocity	T	Length	Velocity	T	T_{lag}	Existing T_{lag}	Future T_{lag}
	(ft)	(ft)		(ft/ft)	(hr)	(ft)		(ft/s)	(hr)	(ft)	(ft/s)	(hr)	(hr)	(min)	(min)
36	14886	200	0.3	0.024	0.44	2262	0.017	2.13	0.30	12424	4.93	0.70	0.86	51.79	41.43
37	14453	200	0.3	0.009	0.66	2080	0.026	2.58	0.22	12173	5.20	0.65	0.92	55.24	44.19
38	24242	200	0.3	0.060	0.31	1643	0.043	3.33	0.14	22399	6.16	1.01	0.87	52.48	41.98
39	11782	200	0.3	0.025	0.44	1605	0.019	2.23	0.20	9977	3.89	0.71	0.81	48.58	38.87
40	7533	200	0.3	0.011	0.60	929	0.024	2.51	0.10	6404	4.21	0.42	0.68	40.55	32.44
41	13964	200	0.3	0.019	0.49	3672	0.014	1.93	0.53	10092	7.00	0.40	0.85	51.17	40.93
42	17095	200	0.3	0.007	0.72	1541	0.010	1.65	0.26	15354	4.82	0.89	1.12	66.96	53.57
43	6574	200	0.3	0.008	0.68	2016	0.031	2.85	0.20	4358	7.00	0.17	0.63	37.87	30.30
44	7456	200	0.3	0.043	0.35	2122	0.021	2.36	0.25	5134	3.23	0.44	0.63	37.60	30.08
45	5266	200	0.3	0.021	0.47	864	0.004	1.00	0.24	4202	5.59	0.21	0.55	33.17	26.53
48	6090	200	0.3	0.016	0.52	1656	0.014	1.89	0.24	4234	3.77	0.31	0.65	38.89	31.11
49	12623	200	0.3	0.019	0.49	1609	0.020	2.29	0.20	10814	4.62	0.66	0.81	48.48	38.79
50	6302	200	0.3	0.015	0.54	1690	0.025	2.54	0.18	4412	3.10	0.40	0.67	40.20	32.16
52	2644	200	0.3	0.027	0.43	875	0.065	4.10	0.06	1569	7.00	0.06	0.33	19.78	15.82
53	6049	200	0.3	0.014	0.56	556	0.004	0.98	0.16	5293	4.65	0.37	0.65	39.09	31.27
54	6140	200	0.3	0.020	0.48	773	0.046	3.46	0.06	5167	4.48	0.32	0.52	30.91	24.73
56	8439	200	0.3	0.011	0.61	1821	0.008	1.45	0.35	6418	4.40	0.40	0.82	49.05	39.24
57	10121	200	0.3	0.025	0.44	2547	0.024	2.51	0.28	7374	6.99	0.29	0.61	36.58	29.27
58	6858	200	0.3	0.016	0.52	470	0.009	1.54	0.08	6188	5.40	0.33	0.56	33.68	26.94
59	5952	200	0.3	0.013	0.57	942	0.030	2.81	0.09	4810	7.00	0.19	0.51	30.67	24.54
64	5668	200	0.3	0.011	0.61	1422	0.032	2.87	0.14	4046	4.00	0.28	0.62	37.16	29.73
67	7717	200	0.3	0.009	0.66	1452	0.005	1.13	0.36	6065	6.44	0.27	0.77	46.29	37.03
68	13322	200	0.3	0.019	0.49	1194	0.023	2.45	0.14	11928	6.00	0.55	0.71	42.34	33.87

Table A-21 Modified Puls Routing Inputs – Berry Creek

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach -5	Junction-4	Junction-5	46.5	1000	1
			99.5	2500	
			215.3	5000	
			530.4	1000	
			1166.2	25000	
			1970.8	50000	
			2639.6	75000	
			3233.9	100000	
			3777	125000	
			4275.9	150000	
Reach-6	Junction-6	Junction-7	13.1	1000	3
			30.9	2500	
			83.2	5000	
			169.8	10000	
			357.9	25000	
			602.9	50000	
			805.5	75000	
			984.8	100000	
			1141.3	125000	
			1284.7	150000	
Reach-7	Junction-7	Junction-8	87.8	1000	7
			198.6	2500	
			471.6	5000	
			1027.2	10000	
			2299.7	25000	
			3980.1	50000	
			5348.3	75000	
			6544.0	10000	
			7626.9	125000	
			8653.1	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-8	Junction-9	Junction-10	47.2	1000	4
			93.4	2500	
			191.4	5000	
			397.5	10000	
			1061.9	25000	
			2037.1	50000	
			2808.9	75000	
			3441.1	100000	
			4073.5	125000	
			4617.7	150000	
Reach-9	Junction-11	Junction-12	80.2	1000	1
			149.3	2500	
			264.9	5000	
			489.8	10000	
			1177.2	25000	
			2256.6	50000	
			3223.7	75000	
			3971.5	100000	
			4682.8	125000	
			5314.6	150000	
Reach-10	Junction-14	Junction-15	28.1	1000	1
			61.3	2500	
			116	5000	
			255.5	10000	
			309.2	12773	
			515.9	17291	
			922.4	24128	
			1076.2	32273	
			1183	39584	
			1314.5	50000	
			1418.2	58903	
			1579.5	75000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-11	Junction-36	Junction-37	105.9	1000	11
			232.5	2500	
			430.6	5000	
			793.1	10000	
			1801.2	25000	
			3170.1	50000	
			4307.5	75000	
			5315.6	100000	
			6242.1	125000	
			7110.2	150000	
Reach-12	Junction-35	Junction-36	12.9	1000	2
			28.8	2500	
			56.8	5000	
			111.2	10000	
			246	25000	
			411.8	50000	
			547.7	75000	
			669.6	100000	
			782.9	125000	
			889	150000	
Reach-13a	Junction-15	DelWebb	58	1000	1
			105	2500	
			176.9	5000	
			300	10000	
			653.7	25000	
			1278.3	50000	
			1756.1	75000	
			2149.6	100000	
			2527.4	125000	
			2911.8	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-13b	DelWebb	Junction-16	103.7	1000	8
			185.4	2500	
			304.9	5000	
			536.1	10000	
			1190.8	25000	
			2333.9	50000	
			3409.8	75000	
			4374.5	100000	
			5244.8	125000	
			6053.4	150000	
Reach-14	Junction-17	Junction-18	54.7	1000	5
			99.5	2500	
			169.5	5000	
			305.8	10000	
			646.2	25000	
			1233	50000	
			1703.9	75000	
			2143.1	100000	
			2532.8	125000	
			2889.9	150000	
Reach-15	Junction-18	Junction-19	7.9	1000	1
			13.7	2500	
			22	5000	
			39	10000	
			105.5	25000	
			202.7	50000	
			286.2	75000	
			353.9	100000	
			410.9	125000	
			465.4	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-16	Junction-20	Junction-21	59.2	1000	3
			94	2500	
			144	5000	
			240.3	10000	
			536.7	25000	
			1087.4	50000	
			1730.8	75000	
			2007.5	100000	
			2302.9	125000	
			2774	150000	
Reach-17	Junction-22	Junction-23	25.3	1000	2
			49.9	2500	
			85.9	5000	
			150.9	10000	
			349.5	25000	
			916.4	50000	
			1715.3	75000	
			2168.7	100000	
			2628.7	125000	
			3652	150000	
Reach-18	Junction-23	Junction-24	10	1000	1
			20	2500	
			36.1	5000	
			64.7	10000	
			192.7	25000	
			640.5	50000	
			1155.6	75000	
			1372.2	100000	
			1594.8	125000	
			2099.2	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-19	Junction-24	Junction-25	8.6	1000	1
			15.9	2500	
			26.9	5000	
			45.5	10000	
			127.5	25000	
			287.4	50000	
			460.6	75000	
			558.7	100000	
			661.4	125000	
			897.6	150000	
Reach-20	Junction-25	Junction-26	28.9	1000	3
			58.9	2500	
			100.3	5000	
			188.6	10000	
			486.2	25000	
			1064.6	50000	
			1474.1	75000	
			1853.6	100000	
			2187.2	125000	
			2502.8	150000	
Reach-21	Junction-27	Junction-28	28.3	1000	3
			55.2	2500	
			96.1	5000	
			179.7	10000	
			401.8	25000	
			846.7	50000	
			1379.8	75000	
			1761.1	100000	
			2101.4	125000	
			2425.3	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-22	Junction-29	Junction-30	63.9	1000	5
			125.7	2500	
			222.8	5000	
			418	10000	
			1223.6	25000	
			2273.9	50000	
			3103.3	75000	
			3856	100000	
			4602.9	125000	
			5296.6	150000	
Reach-23	Junction-39	Junction-40	107.4	1000	8
			215.1	2500	
			394.4	5000	
			697.4	10000	
			1451	25000	
			2427.8	50000	
			3198.6	75000	
			3886	100000	
			4482.9	125000	
			5039.1	150000	
Reach-24	Junction-41	Junction-42	8.9	1000	1
			19.8	2500	
			33.7	5000	
			61	10000	
			128.4	25000	
			221.1	50000	
			295.5	75000	
			358.3	100000	
			414.8	125000	
			466.6	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-26	Junction-42	Junction-43	36.8	1000	5
			98.8	2500	
			194.1	5000	
			349.6	10000	
			688.7	25000	
			1148.9	50000	
			1543.5	75000	
			1893.7	100000	
			2207.9	125000	
			2495.8	150000	
Reach-27	Junction-43	Junction-44	35.2	1000	5
			76	2500	
			152.3	5000	
			310.6	10000	
			742.6	25000	
			1316.7	50000	
			1799.7	75000	
			2209.5	100000	
			2572.3	125000	
			2903.1	150000	
Reach-28	Junction-45	Junction-46	38.6	1000	5
			81.6	2500	
			146.4	5000	
			260	10000	
			897.7	25000	
			1414.9	50000	
			1735	75000	
			2233.4	100000	
			2510.5	125000	
			2758.5	150000	

Table A-21 Modified Puls Routing Inputs – Berry Creek (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-29	Junction-47	Junction-48	51.4	1000	7
			103.7	2500	
			195.7	5000	
			384	10000	
			965.6	25000	
			1851.6	50000	
			2464.1	75000	
			3090.6	100000	
			3633.1	125000	
			4141.6	150000	
Reach-30	Junction-49	Junction-50	16.3	1000	2
			32.6	2500	
			59.7	5000	
			117.9	10000	
			304.2	25000	
			737.7	50000	
			1042.2	75000	
			1323.7	100000	
			1579.2	125000	
			1819.6	150000	

Table A-22 Modified Puls Routing Inputs – Mankins Branch

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-1	Junction-7	Junction-8	4.48	500	3
			7.73	1000	
			34.17	5000	
			54.4	7500	
			72.31	10000	
			105.42	15000	
Reach-2	Junction-8	Junction-9	9.76	500	2
			16.43	1000	
			56.89	5000	
			77.67	7500	
			97.11	10000	
			134.48	15000	
Reach-3	Junction-9	Junction-10	10.61	500	4
			17.84	1000	
			71.05	5000	
			113.65	7500	
			156.9	10000	
			232.89	15000	
Reach-4	Junction-1	Junction-2	23.1	500	8
			41.5	1000	
			192	5000	
			279.4	7500	
			352.7	10000	
			490.9	15000	
			619.9	20000	
			751.4	25000	
			869.5	30000	

Table A-22 Modified Puls Routing Inputs – Mankins Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-5	Junction-3	Junction-4	38.5	500	9
			61.4	1000	
			199.2	5000	
			310.7	7500	
			436.2	10000	
			673.6	15000	
			893.9	20000	
			1118	25000	
			1318.6	30000	
Reach-9	Junction-5	Junction-6	5.1	500	1
			8.1	1000	
			23.6	5000	
			30.4	7500	
			36.5	10000	
			47.2	15000	
			59.6	20000	
			77.6	25000	
			155.8	30000	

Table A-23 Modified Puls Routing Inputs – Pecan Branch

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-1	01	Junction-1A	1.1	10	9
			5.55	100	
			21.46	500	
			37.91	1000	
			63.3	2000	
			124.95	5000	
			208.99	10000	
			301.56	16000	
			357.67	20000	
			438.64	26000	
Reach-2	Junction-1	Junction-2	0.97	10	7
			4.82	100	
			15.14	500	
			27.24	1000	
			49.21	2000	
			106.65	5000	
			184.93	10000	
			269.84	16000	
			315.64	20000	
			386.99	26000	
Reach-3	Junction-2	Junction-3	0.48	10	4
			2.31	100	
			6.78	500	
			10.99	1000	
			18.88	2000	
			44.01	5000	
			81.58	10000	
			127.26	16000	
			155.44	20000	
			197.01	26000	

Table A-23 Modified Puls Routing Inputs – Pecan Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-4	Junction-3	Junction-4	1.51	10	7
			9.23	100	
			27.59	500	
			44.24	1000	
			64.58	2000	
			117.45	5000	
			198.98	10000	
			285.11	16000	
			341.93	20000	
			422.55	26000	
Reach-5	Junction-4	Junction-5	0.34	10	3
			1.67	100	
			5.02	500	
			8.39	1000	
			14.37	2000	
			30.52	5000	
			56.59	10000	
			82.78	16000	
			98.54	20000	
			122.15	26000	
Reach-7	Junction-5	Junction-6	0.72	10	6
			3.82	100	
			14.8	500	
			23.22	1000	
			35.28	2000	
			64.84	5000	
			115.11	10000	
			169.75	16000	
			202.67	20000	
			250.48	26000	

Table A-23 Modified Puls Routing Inputs – Pecan Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-8	Junction-6	Junction-7	1.87 6.22 18.92 29.62 47.95 112.9 187.55 272.58 315.8 373.92	10 100 500 1000 2000 5000 10000 16000 20000 26000	9
Reach-9	Junction-7	Junction-8	2.9 7.22 21.48 32.11 59.55 235.68 331.31 438.17 473.4 520.77	10 100 500 1000 2000 5000 10000 16000 20000 26000	4
Reach-11	Junction-8	Junction-9	0.69 2.37 8.35 19.91 74.18 254.19 351.04 470.46 509.52 561.53	10 100 500 1000 2000 5000 10000 16000 20000 26000	4

Table A-23 Modified Puls Routing Inputs – Pecan Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-12	Junction-9	Junction-10	3.99 14.97 36.24 55.63 88.52 179.77 283.31 389 452.78 541.36	10 100 500 1000 2000 5000 10000 16000 20000 26000	12
Reach-13	Junction-10	Junction-11A	1.21 7.78 23.1 39.41 71.1 146.65 241.77 343.28 405.21 494.81	10 100 500 1000 2000 5000 10000 16000 20000 26000	10
Reach-14	Junction-11	Junction-12A	2.51 16.12 38.67 61.06 99.83 178.97 260.77 340.77 388.64 455.26	10 100 500 1000 2000 5000 10000 16000 20000 26000	13

Table A-23 Modified Puls Routing Inputs – Pecan Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-15	Junction-12	Junction-13	3.31	10	32
			17.88	100	
			59.6	500	
			101.03	1000	
			172.2	2000	
			368.42	5000	
			662.98	10000	
			932.07	16000	
			1088.99	20000	
			1313.59	26000	

Table A-24 Modified Puls Routing Inputs – Smith Branch

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-03	03	Junction-1	0.74	10	2
			3.12	100	
			9.63	500	
			16.23	1000	
			27.98	2000	
			60.9	5000	
			111.29	10000	
			157.4	16000	
			185.75	20000	
			226.86	26000	
Reach-02	Junction-1	Junction-2a	1.8	10	3
			4.61	100	
			13.45	500	
			27.25	1000	
			120.64	2000	
			262.25	5000	
			327.13	10000	
			597.82	16000	
			742.09	20000	
			951.55	26000	
Reach-04	Junction-2	Junction-16	0.7	10	1
			5.03	100	
			23.23	500	
			35.49	1000	
			61.71	2000	
			84.72	5000	
			104.65	10000	
			120.02	16000	
			138.92	20000	
			158.26	26000	

Table A-24 Modified Puls Routing Inputs – Smith Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-05	Junction-16	Junction-3a	0.97 3.03 11.25 18.47 31.11 58.22 102.09 140.33 162.82 193.43	10 100 500 1000 2000 5000 10000 16000 20000 26000	1
Reach-07	Junction-3	Junction-4	1.35 3.89 11.77 19.1 29.06 70.66 121.89 162.35 184.76 216.95	10 100 500 1000 2000 5000 10000 16000 20000 26000	1
Reach-08	Junction-4	Junction-5	0.98 9.02 18.85 31.13 53.62 122.97 230.34 312.49 359.37 424.05	10 100 500 1000 2000 5000 10000 16000 20000 26000	1

Table A-24 Modified Puls Routing Inputs – Smith Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-09	Junction-5	Junction-6a	0.92	10	1
			5.02	100	
			14.93	500	
			25.91	1000	
			44.45	2000	
			88.12	5000	
			146.86	10000	
			209.83	16000	
			249.79	20000	
			308.05	26000	
Reach-10	Junction-6	Junction-8	0.39	10	1
			1.79	100	
			4.85	500	
			7.52	1000	
			11.97	2000	
			22.44	5000	
			35.01	10000	
			52.45	16000	
			66.08	20000	
			82.49	26000	
Reach-12	Junction-8	Junction-9a	1.28	10	3
			6.04	100	
			20.03	500	
			31.6	1000	
			52.01	2000	
			115.05	5000	
			218.2	10000	
			307.79	16000	
			357.98	20000	
			438.68	26000	

Table A-24 Modified Puls Routing Inputs – Smith Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-13	Junction-9	Junction-11a	1.06	10	3
			5.18	100	
			15.83	500	
			26.54	1000	
			52.08	2000	
			132.52	5000	
			250.53	10000	
			356.93	16000	
			410.67	20000	
			492.49	26000	
Reach-16	Junction-11	OUTFALL	0.75	10	2
			3.75	100	
			11.64	500	
			19.28	1000	
			32.82	2000	
			67.14	5000	
			119.94	10000	
			181.46	16000	
			224.87	20000	
			283	26000	
Reach-18	Junction-17	Junction-12a	1.07	10	4
			6.9	100	
			23.62	500	
			42.23	1000	
			70.36	2000	
			137.94	5000	
			234.15	10000	
			321.45	16000	
			373.99	20000	
			448.74	26000	

Table A-24 Modified Puls Routing Inputs – Smith Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
Reach-19	Junction-12	Junction-13	0.26 1.57 13.21 20.01 25.96 64.63 107.95 143.93 165.44 195.02	10 100 500 1000 2000 5000 10000 16000 20000 26000	1
Reach-20	Junction-13	Junction-14a	1.05 4.66 20.65 34.53 62.4 200.71 519.3 674.27 751.31 855.62	10 100 500 1000 2000 5000 10000 16000 20000 26000	2
Reach-21	Junction-14	Junction-15	0.55 3.03 16.2 30.13 45.58 87.58 139.23 197.92 237.11 294.54	10 100 500 1000 2000 5000 10000 16000 20000 26000	2

Table A-24 Modified Puls Routing Inputs – Smith Branch (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-22	Junction-15	Junction-6	0.21	10	1
			1.3	100	
			4.77	500	
			7.71	1000	
			14.38	2000	
			33.25	5000	
			61.46	10000	
			93.5	16000	
			114.38	20000	
			144.41	26000	

Table A-25 Modified Puls Routing Inputs – Middle Fork San Gabriel River

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-2	Junction-2	Junction-3	0	0	7
			50.9	1000	
			93	2000	
			167.9	4000	
			290.4	7500	
			372.4	10000	
			536.6	15000	
			685.7	20000	
Reach-7	Junction-4	Junction-5	0	0	6
			66.6	1000	
			109.3	2000	
			190.3	4000	
			328.4	7500	
			430.7	10000	
			614.9	15000	
			815.4	20000	
Reach-8	Junction-6	Junction-7	0	0	3
			33.3	1000	
			53.9	2000	
			91.3	4000	
			152.2	7500	
			194.2	10000	
			276.4	15000	
			353.9	20000	
Reach-6	Junction-7	Junction-8	0	0	4
			34.1	1000	
			55.9	2000	
			95.1	4000	
			165	7500	
			216.5	10000	
			312.5	15000	
			409.5	20000	

Table A-25 Modified Puls Routing Inputs – Middle Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-10	Junction-9	Junction-10	0	0	7
			67.8	1000	
			109.3	2000	
			178.1	4000	
			287.6	7500	
			357.7	10000	
			508.1	15000	
			669.4	20000	
Reach-11	Junction-11	Junction-12	0	0	6
			61.7	1000	
			95.7	2000	
			156.3	4000	
			253.7	7500	
			314.8	10000	
			423.7	15000	
			524	20000	
Reach-12	Junction-12	Junction-13	0	0	3
			29.2	1000	
			46.4	2000	
			74.3	4000	
			116.8	7500	
			146.7	10000	
			202.2	15000	
			254.6	20000	
Reach-14	Junction-14	Junction-15	0	0	3
			37.6	1000	
			57.5	2000	
			89.6	4000	
			139.3	7500	
			172.4	10000	
			235.3	15000	
			294.8	20000	

Table A-25 Modified Puls Routing Inputs – Middle Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
Reach-3	Junction-15	Junction-16	0	0	4
			27.3	1000	
			46	2000	
			80.2	4000	
			131.1	7500	
			166.9	10000	
			249.2	15000	
			353.2	20000	
Reach-15	Junction-17	Junction-18	0	0	5
			31.7	1000	
			50.6	2000	
			80.7	4000	
			126.1	7500	
			156.9	10000	
			221.2	15000	
			288.4	20000	
Reach-16	Junction-19	Junction-20	0	0	6
			59.5	1000	
			89	2000	
			137.3	4000	
			209.1	7500	
			256.3	10000	
			348.1	15000	
			440.8	20000	
R230	J907	J1	0	0	19
			153.6	1000	
			597.1	5000	
			1189.7	10000	
			2638.9	25000	
			4463.9	50000	
			6031.5	75000	
			7392.2	100000	
			8634.1	125000	
			9804.1	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
R460	J784	J826	0	0	11
			90.9	1000	
			329.3	5000	
			632.5	10000	
			1785.2	25000	
			2475.7	50000	
			3316.6	75000	
			4077.1	100000	
			4772.6	125000	
			5424.1	150000	
R720	J826	J2	0	0	21
			168.7	1000	
			629.5	5000	
			1242.4	10000	
			2924.7	25000	
			5118	50000	
			6985.4	75000	
			8678.6	100000	
			10233	125000	
			11690	150000	
R860	J807	J3	0	0	10
			80.8	1000	
			290.6	5000	
			563.1	10000	
			1437.6	25000	
			2432	50000	
			3238.9	75000	
			3948.6	100000	
			4600.5	125000	
			5224.3	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R970	J774	J932	0	0	5
			53.8	1000	
			168.7	5000	
			302.5	10000	
			890.7	25000	
			1596.1	50000	
			2217.2	75000	
			2733.7	100000	
			3206.2	125000	
			3640.3	150000	
R1060	J932	J935	0	0	7
			64.7	1000	
			201.5	5000	
			363.3	10000	
			1019.2	25000	
			1881.5	50000	
			2628	75000	
			3283.6	100000	
			3881.9	125000	
			4437	150000	
R7680	J935	J810	0	0	4
			43	1000	
			131.2	5000	
			233.3	10000	
			640.5	25000	
			1197.4	50000	
			1641.6	75000	
			2031.2	100000	
			2390.9	125000	
			2724.4	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
R1140	J810	J4	0	0	9
			81.4	1000	
			261.6	5000	
			504.1	10000	
			1342.1	25000	
			2408.2	50000	
			3228.5	75000	
			3959.8	100000	
			4650	125000	
			5278.2	150000	
R1300	J857	J783	0	0	1
			7.3	1000	
			22	5000	
			45.4	10000	
			134.8	25000	
			225.2	50000	
			300.4	75000	
			366.2	100000	
			436.2	125000	
			508.2	150000	
R1650	J783	J5	0	0	9
			80.9	1000	
			269.3	5000	
			490.6	10000	
			1168.6	25000	
			1980.6	50000	
			2684.4	75000	
			3201.9	100000	
			3738.5	125000	
			4233.1	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R1960	J840	J913	0	0	11
			113.5	1000	
			386	5000	
			658.6	10000	
			1573.5	25000	
			3465.5	50000	
			4973.9	75000	
			6002.7	100000	
			7251.1	125000	
			8480.8	150000	
R2400	J913	J877	0	0	2
			24.3	1000	
			82.4	5000	
			140.6	10000	
			298.1	25000	
			663.2	50000	
			951.6	75000	
			1212.3	100000	
			1450.4	125000	
			1680.2	150000	
R2430	J877	J6	0	0	5
			42.2	1000	
			129.1	5000	
			227.4	10000	
			463.7	25000	
			992.8	50000	
			1419.3	75000	
			1804.3	100000	
			2154.5	125000	
			2481.7	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R2710	J849	J7	0	0	5
			50.4	1000	
			158.5	5000	
			282.6	10000	
			602.7	25000	
			1424.2	50000	
			2118.8	75000	
			2712.1	100000	
			3226.9	125000	
			3719	150000	
R2920	J804	J829	0	0	2
			35.5	1000	
			110.6	5000	
			192.9	10000	
			383.7	25000	
			849.9	50000	
			1542.8	75000	
			1833.9	100000	
			2250.2	125000	
			2677.6	150000	
R2940	J829	J8	0	0	1
			10.4	1000	
			33.8	5000	
			54.9	10000	
			107.2	25000	
			205.9	50000	
			303.1	75000	
			407.5	100000	
			496.2	125000	
			583.8	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R2990	J777	J795	0	0	3
			28.8	1000	
			88.9	5000	
			150.3	10000	
			292.7	25000	
			536.3	50000	
			827.9	75000	
			1102.5	100000	
			1335	125000	
			1625.7	150000	
R3020	J795	J9	0	0	5
			47.4	1000	
			148.8	5000	
			262.7	10000	
			551.2	25000	
			1110.4	50000	
			1826.6	75000	
			2611.5	100000	
			3406.9	125000	
			4280.3	150000	
R3150	J789	J924	0	0	3
			29.4	1000	
			89.3	5000	
			154.8	10000	
			345	25000	
			682.8	50000	
			1080.7	75000	
			1544.8	100000	
			2042.7	125000	
			2448.1	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
R7700	J924	J780	0	0	8
			75.3	1000	
			215.7	5000	
			388.2	10000	
			768.6	25000	
			1475.7	50000	
			2455.5	75000	
			3478.9	100000	
			4428.2	125000	
			5281.1	150000	
R7550	J780	J882	0	0	2
			13.9	1000	
			42	5000	
			77.1	10000	
			166.8	25000	
			367.5	50000	
			621.1	75000	
			827.5	100000	
			998.9	125000	
			1150.4	150000	
R7720	J882	J1113	0	0	1
			3.7	1000	
			12	5000	
			21.5	10000	
			46.6	25000	
			109.5	50000	
			180.8	75000	
			229	100000	
			267.3	125000	
			299.9	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R7560	J1113	J10	0	0	2
			15.5	1000	
			43.2	5000	
			72.8	10000	
			146.6	25000	
			275.6	50000	
			465.7	75000	
			644.5	100000	
			795.7	125000	
			932.5	150000	
R7570	J792	J846	0	0	8
			75.5	1000	
			210.6	5000	
			340.8	10000	
			657.4	25000	
			1161.8	50000	
			1601	75000	
			2089.4	100000	
			2568.6	125000	
			3029.3	150000	
R7600	J846	J910	0	0	26
			63.6	1000	
			213.9	5000	
			360.5	10000	
			734.3	25000	
			2170.8	50000	
			3010.3	75000	
			3804.1	100000	
			4533.1	125000	
			5221.1	150000	

Table A-26 Modified Puls Routing Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R3640	Lake Georgetown	J860	0	0	7
			11997	1000	
			12480	5000	
			12940	10000	
			14083	25000	
			15732	50000	
			17302	75000	
			18720	100000	
			20081	125000	
			21432	150000	
R4000	J860	J900	0	0	10
			86.6	1000	
			274	5000	
			461.8	10000	
			914.9	25000	
			1522.5	50000	
			2112.6	75000	
			2728.4	100000	
			3434.6	125000	
			4102	150000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R001	001	J001	1.22	10	8
			4.96	100	
			41.8	1000	
			162.63	5000	
			264.71	10000	
			499.91	25000	
			804.39	50000	
			1047.21	75000	
			1256.6	100000	
			1955.69	200000	
R002.1	J001	J003	0.35	10	3
			1.85	100	
			12.49	1000	
			54.12	5000	
			105.31	10000	
			206.08	25000	
			307.89	50000	
			390.57	75000	
			462.88	100000	
			700.3	200000	
R005	J003	J004	0.38	10	4
			1.98	100	
			12.5	1000	
			50.27	5000	
			96.22	10000	
			199.27	25000	
			327.45	50000	
			429.57	75000	
			520.06	100000	
			840.03	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R006	J004	J006	0.12	10	1
			0.61	100	
			3.11	1000	
			14.8	5000	
			32.37	10000	
			62.9	25000	
			103.62	50000	
			140.14	75000	
			173.09	100000	
			276.66	200000	
R008	J006	J007	3.62	10	8
			11.05	100	
			47.07	1000	
			168.27	5000	
			287.3	10000	
			631.04	25000	
			1075.09	50000	
			1408.65	75000	
			1726.57	100000	
			2815.07	200000	
R009	J008	J009	4.05	10	8
			10.99	100	
			45.26	1000	
			152.6	5000	
			267.55	10000	
			619.1	25000	
			1077.44	50000	
			1435.58	75000	
			1742.77	100000	
			2823.88	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R010	J009	J010	0.95	10	5
			4.41	100	
			23.37	1000	
			74.72	5000	
			129.73	10000	
			296.02	25000	
			491.79	50000	
			655.86	75000	
			799.65	100000	
			1271.56	200000	
R011	J010	J011	1.53	10	10
			9.5	100	
			50.77	1000	
			183.45	5000	
			314.79	10000	
			658.65	25000	
			1100.49	50000	
			1461.83	75000	
			1785.08	100000	
			2840.16	200000	
R016	J011.2	J015	0.45	10	1
			2.25	100	
			9.2	1000	
			34.58	5000	
			59.44	10000	
			132.7	25000	
			247.37	50000	
			354.9	75000	
			448.44	100000	
			837.9	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R017	J015	J016	1.56	10	4
			6.05	100	
			28.26	1000	
			93.64	5000	
			168.62	10000	
			360.53	25000	
			671.02	50000	
			910.53	75000	
			1125.9	100000	
			1831.61	200000	
R018	J016.2	J017	0.63	10	2
			2.87	100	
			13.47	1000	
			44.17	5000	
			77.95	10000	
			184.57	25000	
			317.3	50000	
			493.57	75000	
			649.38	100000	
			1153.57	200000	
R019	J017	J018	3.07	10	2
			5.54	100	
			19.41	1000	
			57.68	5000	
			95.53	10000	
			225.31	25000	
			365.85	50000	
			601.97	75000	
			792.43	100000	
			1346.18	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River(continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
R020	J018	J020	0.92	10	2
			2.59	100	
			13.84	1000	
			44.19	5000	
			81.76	10000	
			220.58	25000	
			358.73	50000	
			459.66	75000	
			553.33	100000	
			927.32	200000	
R022	J020	J021	6.59	10	6
			10.93	100	
			37.38	1000	
			115.66	5000	
			200.1	10000	
			455.82	25000	
			807.88	50000	
			1168.41	75000	
			1487.03	100000	
			2562.93	200000	
R024	J023	J024	11.94	10	2
			14.08	100	
			23.63	1000	
			49.32	5000	
			83.59	10000	
			188.16	25000	
			334.63	50000	
			456.33	75000	
			596.56	100000	
			1038.58	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R026	J026	J027	2.78 4.29 14.18 40.04 66.26 155.79 319.22 451.46 548.63 858.7	10 100 1000 5000 10000 25000 50000 75000 100000 200000	2
R027	J027.2	J029	8.01 16.42 54.81 147.42 241.98 520.57 1108.26 1601.65 2031.91 3385.25	10 100 1000 5000 10000 25000 50000 75000 100000 200000	6
R029	J029.2	J031	1.81 2.92 7.21 21.13 38.5 93.32 159.89 206.41 248.37 426.14	10 100 1000 5000 10000 25000 50000 75000 100000 200000	1

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R031	J031	J032	0.37	10	1
			1.85	100	
			10.49	1000	
			31.53	5000	
			62.7	10000	
			155.15	25000	
			316.63	50000	
			447.25	75000	
			560.43	100000	
			1000.42	200000	
R032	J032	J034	0.51	10	2
			2.68	100	
			14.51	1000	
			46.61	5000	
			78.67	10000	
			163.29	25000	
			317.25	50000	
			452.03	75000	
			571.68	100000	
			1001.07	200000	
R034	J034	J036	0.47	10	2
			2.67	100	
			14.61	1000	
			52.79	5000	
			89.91	10000	
			195.73	25000	
			348.29	50000	
			510.44	75000	
			664.22	100000	
			1172.82	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R036	J036	J038	0.53	10	2
			2.48	100	
			12.01	1000	
			40.58	5000	
			73.06	10000	
			172.58	25000	
			330.2	50000	
			459.46	75000	
			573.17	100000	
			941.62	200000	
R038	J038	J045	0.73	10	4
			4.38	100	
			21.65	1000	
			67.67	5000	
			119.26	10000	
			268.5	25000	
			612.44	50000	
			854.94	75000	
			1038.61	100000	
			1619.06	200000	
R045	J045.2	J046	0.41	10	2
			2.41	100	
			13.54	1000	
			43.89	5000	
			72.05	10000	
			147.89	25000	
			261.37	50000	
			378.37	75000	
			466.06	100000	
			781.62	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R046	J046	J048	1.53 7.6 32.81 100.85 169.78 377.06 643.71 875.16 1082.28 1764.72	10 100 1000 5000 10000 25000 50000 75000 100000 200000	4
R048	J048	J050	0.32 1.71 6.66 23.01 41.82 95.73 207.23 304.27 390.13 665.37	10 100 1000 5000 10000 25000 50000 75000 100000 200000	1
R050	J050	J051	0.92 4.07 19.53 68.72 118.09 236.28 489.52 714.88 920.2 1597.59	10 100 1000 5000 10000 25000 50000 75000 100000 200000	2

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R051	J051	J052	1.22	10	3
			7.12	100	
			27.27	1000	
			79.05	5000	
			130.22	10000	
			284.77	25000	
			491.3	50000	
			671.47	75000	
			802.67	100000	
			1244.55	200000	
R052	J052	J054	0.12	10	1
			0.84	100	
			3.96	1000	
			12.81	5000	
			21.84	10000	
			44.77	25000	
			83.32	50000	
			119.89	75000	
			139.73	100000	
			226.91	200000	
R054	J054	J056	0.79	10	3
			4.65	100	
			22.42	1000	
			68.85	5000	
			113.38	10000	
			235.16	25000	
			451.58	50000	
			658.69	75000	
			794.62	100000	
			1247.02	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R056	J056	J058	2.28 14.21 71.49 231.2 413.62 877.86 1512.28 2137.97 2776.79 5041.53	10 100 1000 5000 10000 25000 50000 75000 100000 200000	8
R058	J058.2	J059	2.12 10.48 45.23 133.05 226.97 458.56 814.1 1189.71 1583.29 2772.99	10 100 1000 5000 10000 25000 50000 75000 100000 200000	5
R059	J059.2	J063	1.58 6.91 30.5 95.2 154.28 310.63 542.28 789.06 1232.3 2169.3	10 100 1000 5000 10000 25000 50000 75000 100000 200000	4

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R063	J063.2	J064	5.82 11.66 37.07 100.4 157.64 313.13 580.05 881.97 1284.07 2617.59	10 100 1000 5000 10000 25000 50000 75000 100000 200000	3
R064	J064.2	J092	0.98 5.89 27.25 85.89 141.71 288.04 516.8 825.95 1172.89 2320.15	10 100 1000 5000 10000 25000 50000 75000 100000 200000	3
R064.1	J092	J065	2.1 10.36 44.48 134.15 224.69 469.88 830.01 1220.78 1820.11 3449.83	10 100 1000 5000 10000 25000 50000 75000 100000 200000	5

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R065	J065	J066	2.86 13.69 71.13 204.52 329.93 637.09 1054.23 1477.81 2015.8 4069.09	10 100 1000 5000 10000 25000 50000 75000 100000 200000	7
R066	J066.2	J067	0.24 1.1 5.89 18.78 31.61 65.55 115.72 168.57 232.37 515.67	10 100 1000 5000 10000 25000 50000 75000 100000 200000	1
R067	J067	J068	4.93 26.45 119.66 360.59 597.75 1267.4 2296.19 3506.13 4697.36 8594.57	10 100 1000 5000 10000 25000 50000 75000 100000 200000	13

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R068	J068.2	J069	1.15 5.52 25.2 73.25 119.77 285.25 594.04 897.18 1207.22 2311.85	10 100 1000 5000 10000 25000 50000 75000 100000 200000	3
R069	J069.2	J070	3.25 16.7 77.53 233.82 388.88 788.06 1522.36 2354.26 3047.93 6106.95	10 100 1000 5000 10000 25000 50000 75000 100000 200000	8
R070	J070.2	J071	2.14 12.77 62.55 187.89 310.4 634.72 1180.74 1849.73 2480.54 5321.89	10 100 1000 5000 10000 25000 50000 75000 100000 200000	8

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R071	J071	J072	0.88	10	3
			5.29	100	
			25.9	1000	
			78.78	5000	
			134.92	10000	
			280.4	25000	
			479.73	50000	
			658.65	75000	
			828.4	100000	
			1744.14	200000	
R072	J072	J090	0.58	10	2
			3	100	
			14.23	1000	
			43.91	5000	
			71.79	10000	
			150.09	25000	
			250.44	50000	
			339.26	75000	
			433.45	100000	
			808.85	200000	
R072.1	J090	J094	0.67	10	2
			3.92	100	
			21.53	1000	
			62.82	5000	
			100.74	10000	
			186.64	25000	
			297.34	50000	
			402.04	75000	
			504.36	100000	
			1000.51	200000	

Table A-27 Modified Puls Routing Inputs – South Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R072.2	J094	J073	2.89	10	1
			4.48	100	
			11.53	1000	
			33.51	5000	
			58.17	10000	
			119.5	25000	
			193.77	50000	
			297.25	75000	
			356.98	100000	
			579.79	200000	
R073	J073	OUTFALL	0.42	10	1
			2.14	100	
			8.19	1000	
			32.19	5000	
			64.6	10000	
			135.21	25000	
			207.51	50000	
			282.41	75000	
			364.32	100000	
			651.66	200000	

Table A-28 Modified Puls Routing Inputs – San Gabriel River

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R290	SF-SG	SGJ199	73.6	1000	3
			159.6	5000	
			251.4	10000	
			472.5	25000	
			832.1	50000	
			1234.8	75000	
			1711	100000	
			2290.1	125000	
			3188.9	150000	
R180	SGJ199	SGJ202	24.1	1000	2
			68.7	5000	
			114.8	10000	
			229.6	25000	
			376.7	50000	
			506	75000	
			654.7	100000	
			838.9	125000	
			1089.9	150000	
R220	SGJ202	S-SG	38.1	1000	4
			128.5	5000	
			227.4	10000	
			490.6	25000	
			928.1	50000	
			1419.1	75000	
			1949.7	100000	
			2502.9	125000	
			3153.7	150000	

Table A-28 Modified Puls Routing Inputs – San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R170	S-SG	SGJ10	19.1	1000	2
			89.1	5000	
			184.3	10000	
			371.7	25000	
			650.7	50000	
			944.9	75000	
			1197.2	100000	
			1410.1	125000	
			1665.9	150000	
R110	SGJ10	B-SG	122.5	1000	9
			382	5000	
			684.7	10000	
			1538.9	25000	
			2873.7	50000	
			4214.2	75000	
			5418	100000	
			6578.5	125000	
			7597.7	150000	
R70	B-SG	SGJ228	49.7	1000	4
			158.2	5000	
			261.1	10000	
			544.1	25000	
			991.1	50000	
			1462.3	75000	
			2181.6	100000	
			2893.3	125000	
			3572.3	150000	
			4051.1	175000	
			4500	195153	

Table A-28 Modified Puls Routing Inputs – San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function		Subreaches
			Ac-Ft	CFS	
R80	SGJ228	SGJ225	2	1000	1
			6.8	5000	
			10.4	10000	
			21.1	25000	
			37.6	50000	
			58.9	75000	
			79	100000	
			100.3	125000	
			127.8	150000	
			167.17	175000	
			200	226721	
R150	SGJ225	SGJ256	14.7	1000	2
			49.9	5000	
			87.1	10000	
			190	25000	
			361.3	50000	
			566.2	75000	
			827.9	100000	
			1114.5	125000	
			1512	150000	
			1998.7	175000	
			2500	239128	
R240	SGJ256	SGJ205	38.9	1000	1
			115.1	5000	
			188.5	10000	
			378.6	25000	
			735.1	50000	
			1095.6	75000	
			1521.6	100000	
			2045.1	125000	
			2743	150000	
			3542.5	175000	
			4000	215044	

Table A-28 Modified Puls Routing Inputs – San Gabriel River (continued)

Reach Name	From Element	To Element	Storage-Discharge Function Ac-Ft	Storage-Discharge Function CFS	Subreaches
R310	SGJ205	SGJ193	42.1	1000	4
			126.9	5000	
			198.6	10000	
			398.3	25000	
			766.5	50000	
			1143.9	75000	
			1590.3	100000	
			2225.7	125000	
			2900.4	150000	
			3522.7	175000	
			4000	209780	
R360	SGJ193	SGJ267	5.4	10000	1
			16.9	50000	
			27.3	100000	
			52.3	250000	
			96.1	500000	
			144.6	750000	
			196.5	1000000	
			246.9	1250000	
			311.1	1500000	
			364.2	1750000	
			450	2213078	
R330	SGJ267	SGJ188	26.5	1000	2
			71.9	5000	
			133.1	10000	
			283.9	25000	
			548.5	50000	
			783.3	75000	
			1002.5	100000	
			1231.9	125000	
			1511.5	150000	
			1773	175000	
			2500	250159	

Table A-29 Muskingum-Cunge Inputs – Berry Creek

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Trapezoid		Eight Point	
							Bottom Width (ft)	Side Slope (xH:1V)	X	Y
Reach-31	204	Junction-1	13024	0.0034	0.045	Trapezoid	13	3	N/A	N/A
Reach-1	Junction-1	Junction-2	9873	0.0033	0.04	Trapezoid	30	7	N/A	N/A
Reach-32	Junction-2	Junction-3	13619	0.0032	0.04	Trapezoid	29	5	N/A	N/A
Reach-2	Junction-3	Junction-4	18199	0.0034	0.04	Trapezoid	43	2.75	N/A	N/A
Reach-3	Junction-32	Junction-33	16932	0.0048	0.045	Trapezoid	27	5.5	N/A	N/A
Reach-4	Junction-33	Junction-4	5781	0.0042	0.04	Trapezoid	33	3	N/A	N/A
Reach-25	Junction-51	Junction-52	11588	0.0060	0.04	Trapezoid	58	3	N/A	N/A
Reach-33	136	Junction-31	985	0.0004	0.04	Trapezoid	12	1	N/A	N/A

Table A-30 Muskingum-Cunge Inputs – Mankins Branch

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Trapezoid		Eight Point	
							Bottom Width (ft)	Side Slope (xH:1V)	X	Y
Reach-7	Junction-12	Junction-13	3917	0.0106	0.04	Trapezoid	19	3	N/A	N/A
Reach-6	Junction-11	Junction-13	8028	0.0087	0.04	Trapezoid	19	2.6	N/A	N/A
Reach-8	Junction-13	Junction-5	6785	0.0068	0.04	Trapezoid	17	2.5	N/A	N/A

Table A-31 Muskingum-Cunge Inputs – Pecan Branch

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Trapezoid		Eight Point	
							Bottom Width (ft)	Side Slope (xH:1V)	X	Y
Reach-6	06	Junction-5	132	0.1187	0.04	Trapezoid	20	3	N/A	N/A
Reach-10	10	Junction-8	1761	0.0651	0.04	Trapezoid	10	10	N/A	N/A

Table A-32 Muskingum-Cunge Inputs – Smith Branch

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Trapezoid		Eight Point	
							Bottom Width (ft)	Side Slope (xH:1V)	X	Y
Reach-01	01	Junction-02	1823	0.0077	0.04	Trapezoid	20	10	N/A	N/A
Reach-17	07	Junction-12	4040	0.0472	0.04	Trapezoid	25	10	N/A	N/A

Table A-33 Muskingum-Cunge Inputs – Middle Fork San Gabriel River

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Trapezoid		Eight Point	
							Bottom Width (ft)	Side Slope (xH:1V)	X	Y
Reach-1	Junction-1	Junction-2	7989	0.0033	0.045	Trapezoid	30	4	N/A	N/A
Reach-5	81	Junction-21	11174	0.0050	0.045	Trapezoid	26	3	N/A	N/A
Reach-4	Junction-21	Junction-4	10009	0.0033	0.04	Trapezoid	31	6	N/A	N/A

Table A-34 Muskingum-Cunge Inputs – North Fork San Gabriel River

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Manning's n		Eight Point	
							L.B. Manning's n	R.B. Manning's n	X	Y
R540	J894	J832	13444	0.0057	0.045	Eight Point	0.24	0.24	0.0 293.77 306.79 338.37 352.28 368.66 384.25 568.88	1293.9 1292.0 1288.3 1283.9 1283.9 1288.4 1291.4 1299.1
R620	J832	J874	16063	0.0046	0.045	Eight Point	0.24	0.2	0.0 172.53 289.62 305.68 320.02 330.40 348.23 600.47	1228.8 1222.5 1217.4 1213.8 1213.8 1217.9 1227.5 1228.9
R1500	J871	J798	19352	0.0042	0.045	Eight Point	0.24	0.24	0.0 296.17 318.41 327.41 346.42 373.98 394.53 828.71	1271.1 1265.8 1262.3 1261.9 1261.9 1264.4 1268.4 1279.0

Table A-34 Muskingum-Cunge Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Manning's n		Eight Point	
							L.B. Manning's n	R.B. Manning's n	X	Y
R1890	J798	J801	14211	0.0036	0.045	Eight Point	0.3	0.4	0.0 204.61 234.46 241.80 250.74 263.55 275.00 571.64	1246.9 1241.9 1235.1 1233.9 1234.1 1236.6 1240.1 1252.8
R1820	J801	J818	6013	0.0029	0.045	Eight Point	0.24	0.2	0.0 66.060 122.18 127.62 149.38 154.05 246.92 450.10	1195.2 1183.3 1175.4 1173.9 1174.1 1176.0 1187.2 1189.4
R1790	J818	J904	12421	0.0028	0.045	Eight Point	0.4	0.3	0.0 102.22 181.79 201.76 231.18 260.48 333.33 434.12	1162.3 1160.6 1155.5 1147.5 1147.7 1155.0 1160.6 1162.3
R1450	J904	J852	18767	0.0026	0.045	Eight Point	0.4	0.4	0.0 235.12 250.13 262.55 285.12 298.04 420.01 468.70	1113.5 1106.7 1101.1 1094.8 1094.6 1102.3 1110.9 1121.8

Table A-34 Muskingum-Cunge Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Manning's n		Eight Point	
							L.B. Manning's n	R.B. Manning's n	X	Y
R1520	J852	J774	20934	0.0030	0.045	Eight Point	0.4	0.35	0.0 70.320 219.69 236.10 270.30 284.81 291.04 400.56	1064.7 1055.9 1052.7 1045.6 1045.6 1053.2 1059.3 1065.7
R2390	J843	J877	18173	0.0060	0.045	Eight Point	0.4	0.4	0.0 212.17 304.56 320.40 329.39 353.96 511.08 956.67	1003.4 994.75 983.43 978.90 978.90 981.14 986.35 991.99
R2310	J929	J885	17958	0.0047	0.045	Eight Point	0.24	0.24	0.0 12.000 25.510 38.360 66.400 77.530 172.65 353.69	1067.3 1062.7 1048.4 1040.2 1039.6 1046.4 1047.9 1054.3
R2530	J885	J837	16695	0.0039	0.045	Eight Point	0.4	0.4	0.0 222.37 238.73 252.34 268.42 324.98 336.47 393.15	1020.9 1019.1 1014.7 1010.1 1010.2 1014.5 1025.8 1032.1

Table A-34 Muskingum-Cunge Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Manning's n		Eight Point	
							L.B. Manning's n	R.B. Manning's n	X	Y
R2580	J837	J849	19311	0.0043	0.045	Eight Point	0.24	0.24	0.0 159.29 297.21 304.83 333.25 345.22 622.87 797.95	947.97 940.68 927.17 924.51 923.56 931.04 842.36 946.56
R3130	J863	J1113	19584	0.0060	0.045	Eight Point	0.4	0.24	0.0 75.290 95.900 106.52 113.70 145.60 276.71 694.18	854.90 841.83 823.54 819.22 818.76 824.37 831.82 835.44
R2900	J868	J813	11421	0.0058	0.045	Eight Point	0.4	0.4	0.0 56.890 291.78 301.06 307.17 313.34 370.00 704.42	875.41 686.01 852.41 848.02 848.09 832.25 854.35 865.06
R3000	J813	J1103	1586	0.0074	0.045	Eight Point	0.2	0.4	0.0 288.00 445.65 453.84 467.08 471.89 587.87 852.93	842.02 839.26 836.44 831.76 831.12 832.57 837.46 851.06

Table A-34 Muskingum-Cunge Inputs – North Fork San Gabriel River (continued)

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Manning's n		Eight Point	
							L.B. Manning's n	R.B. Manning's n	X	Y
R3010	J823	J1103	9566	0.0076	0.045	Eight Point	0.3	0.4	0.0 133.00 146.00 153.00 161.00 170.00 287.00 509.00	887.19 875.77 868.94 866.71 866.82 867.46 877.22 881.02
R3140	J1103	J792	3735	0.0096	0.045	Eight Point	0.24	0.24	0.0 138.16 174.59 208.80 229.49 257.97 285.71 599.23	830.09 822.44 816.93 807.82 807.99 816.03 821.49 832.87

Table A-35 Muskingum-Cunge Inputs – South Fork San Gabriel River

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Trapezoid		Eight Point	
							Bottom Width (ft)	Side Slope (xH:1V)	X	Y
R012	J012.1	J012.2	8918	0.0074	0.08	Trapezoid	5	5.3	N/A	N/A
R013	J012.2	J014	10835	0.0054	0.08	Trapezoid	14.5	2.89	N/A	N/A
R014	J013	J014	10058	0.0057	0.08	Trapezoid	10	5.61	N/A	N/A
R015	J014	J011.2	2884	0.0054	0.08	Trapezoid	14.5	3.9	N/A	N/A
R004	J002	J003	643	0.0241	0.08	Trapezoid	7.5	10.8	N/A	N/A
R007	J005	J006	907	0.0166	0.08	Trapezoid	0.5	4.4	N/A	N/A
R091	J091	J091B	5749	0.0080	0.065	Trapezoid	20	6	N/A	N/A
R021	J019	J020	3165	0.0225	0.08	Trapezoid	3.5	3.1	N/A	N/A
R023	J022	J023	3081	0.0162	0.08	Trapezoid	6.5	1.92	N/A	N/A
R025	J025	J026	3525	0.0171	0.08	Trapezoid	3.5	5.6	N/A	N/A
R089	031	J027.2	2733	0.0120	0.07	Trapezoid	2	5	N/A	N/A
R028	J028	J029.2	6257	0.0108	0.08	Trapezoid	4	5.2	N/A	N/A
R030	J030	J031	3654	0.0120	0.08	Trapezoid	5	7.4	N/A	N/A
R033	J033	J034	3894	0.0186	0.08	Trapezoid	5.5	2.15	N/A	N/A
R035	J035	J036	3359	0.0217	0.08	Trapezoid	3.5	2.39	N/A	N/A
R037	J037	J038	4378	0.0178	0.08	Trapezoid	4	10.2	N/A	N/A
R039	J039	J040	3696	0.0081	0.08	Trapezoid	4.5	2.3	N/A	N/A
R040	J040	J041	12017	0.0030	0.08	Trapezoid	8.5	2.06	N/A	N/A
R041	J041	J042	1272	0.0252	0.08	Trapezoid	4	4.01	N/A	N/A
R042	J042	J043	17968	0.0043	0.08	Trapezoid	8	2.8	N/A	N/A
R043	J043	J044	634	0.0026	0.08	Trapezoid	13	1.96	N/A	N/A
R044	J044	J045.2	1915	0.0063	0.08	Trapezoid	13.5	1.26	N/A	N/A
R047	J047	J047.1	4724	0.0148	0.08	Trapezoid	3.5	6.8	N/A	N/A
R047.1	J047.1	J048	3706	0.0148	0.08	Trapezoid	3.5	6.8	N/A	N/A
R049	J049	J050	7170	0.0164	0.08	Trapezoid	6	6.4	N/A	N/A
R053	J053	J054	7492	0.0155	0.08	Trapezoid	8.5	3.1	N/A	N/A
R055	J055	J056	5528	0.0182	0.08	Trapezoid	8	3.2	N/A	N/A
R057	J057	J058.2	10000	0.0085	0.08	Trapezoid	5	2.43	N/A	N/A
R060	J060	J062	13501	0.0078	0.08	Trapezoid	5	5.7	N/A	N/A
R061	J061	J062	10660	0.0099	0.08	Trapezoid	8	6.3	N/A	N/A
R062	J062	J063.2	1474	0.0209	0.08	Trapezoid	8.5	4.2	N/A	N/A
R090	090	J090	1313	0.0256	0.08	Trapezoid	15	2.5	N/A	N/A
R094	094	J094	1333	0.0511	0.08	Trapezoid	15	2.5	N/A	N/A

Table A-36 Muskingum-Cunge Inputs – San Gabriel River

Reach Name	From Element	To Element	Length (ft)	Slope (ft/ft)	Channel Manning's n	Shape	Manning's n		Eight Point	
							L.B. Manning's n	R.B. Manning's n	X	Y
R40	SGJ245	SGJ241	9801	0.0069	0.045	Eight Point	0.24	0.2	0.00	638.63
									205.73	633.85
									256.80	630.38
									273.57	623.93
									280.33	622.97
									287.13	623.40
									339.24	634.10
									586.39	642.40
R90	SGJ241	SGJ225	3915	0.0050	0.045	Eight Point	0.4	0.25	0.00	622.15
									186.41	625.24
									199.97	602.28
									209.69	601.83
									224.31	601.79
									250.28	613.25
									309.74	616.94
									438.02	619.68
R140	SGJ217	SGJ256	8359	0.0098	0.045	Eight Point	0.2	0.24	0.00	637.78
									95.47	623.86
									104.21	618.92
									113.49	618.69
									117.67	618.33
									134.29	625.60
									169.84	630.96
									323.28	635.18

Table A-37 Estimation of Rainfall Depth by Annual Exceedance Probability

Return Frequency	Total Rainfall Depth (inches) in 24 hours
5	4.7
10	5.5
25	6.7
50	8
100	9.1
500	12

Table A-38 HEC-HMS Results – Berry Creek

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Junction-1	8.04	8286.5	9916.5	11916.5
Junction-10	54.38	36319	40301.8	54419.3
Junction-11	55.41	36593.2	40570.7	54857.2
Junction-12	57.20	34487.5	37951.6	51573.4
Junction-13	58.20	34723.8	38187.3	51933.5
Junction-14	58.75	34800.6	38272.1	52047.7
Junction-15	69.35	36850.5	40393.9	55818.3
Junction-16	74.43	36299.4	39597.8	56031.9
Junction-17	76.27	36526.1	39839.7	56380.4
Junction-18	77.33	36530	39825.4	56475.4
Junction-19	77.83	36564.6	39860.9	56537.8
Junction-2	12.39	12294.5	14506.6	17734.1
Junction-20	78.60	36656.2	39960.9	56684.1
Junction-21	79.60	36580.7	39849.2	56470.8
Junction-22	80.50	36468.3	39733.7	56420.2
Junction-23	80.70	36220.8	39419.6	55689.7
Junction-24	82.41	36083.8	39216.3	55412.1
Junction-25	82.92	36090.6	39218.5	55418.6
Junction-26	83.36	35972.4	39062.9	55366.2
Junction-27	83.58	35990.8	39084.5	55394.3
Junction-28	83.99	35935.4	39008.3	55269.2
Junction-29	120.92	50068.2	54817	69694.4
Junction-3	20.76	19279.5	22507.2	27889.2
Junction-30	122.27	49980.3	54887.1	69832.6
Junction-31	125.44	50696	55605	70987.2
Junction-32	4.08	4557.9	5432.9	6517.2
Junction-33	11.41	12422.2	14608.9	17832.9
Junction-34	3.54	4888.4	6002.6	6948.8
Junction-35	5.34	7258.2	8885.4	10329.9
Junction-36	6.73	8921.8	10858.8	12726
Junction-37	10.60	11790.1	13318.1	16963.6
Junction-38	5.48	5179.8	6214.6	7443.4
Junction-39	12.67	12090.7	14491.1	17338.3
Junction-4	39.10	33678.2	38655.1	49149.4
Junction-40	14.28	12708.5	14967.9	18247.8

*Results are after applying Areal Reduction Factors

Table A-38 HEC-HMS Results – Berry Creek (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Junction-41	18.01	15837	18618.2	22762.5
Junction-42	24.25	20799.4	24382.4	30116.9
Junction-43	27.78	23377.9	27310.9	34248
Junction-44	28.67	23476.9	27452.2	34552.9
Junction-45	30.30	24173.3	28290.3	35815.5
Junction-46	30.97	23917.2	28267.4	35895.4
Junction-47	33.44	25004.6	29592.1	37925.6
Junction-48	34.74	25063.3	29289.3	38019.4
Junction-49	36.53	25908.2	30239.4	39562
Junction-5	42.71	33285	37725.4	49090.9
Junction-50	36.93	25849	29891.7	39313.3
Junction-51	4.52	5195.8	6267.2	7421.1
Junction-52	6.24	7101.7	8618	10167.5
Junction-6	44.62	34517.1	39035.4	50997.2
Junction-7	47.06	35915.3	40501.7	53220.1
Junction-8	49.69	35801.3	40017.7	53382.4
Junction-9	52.41	36372.8	40543	54324.1
Outlet1	125.44	50696	55605	70987.2
Reach-1	8.04	8232.9	9816.8	11842.8
Reach-10	58.75	34401.2	37876	51814.6
Reach-11	6.73	8327.7	9854.7	11943.8
Reach-12	5.34	7188	8757.2	10250.4
Reach-13a	69.35	35901.1	39314.9	55114.6
Reach-13b	69.35	35583.8	38935.6	54737.4
Reach-14	76.27	36401	39685.6	56265.6
Reach-15	77.33	36513.2	39804.4	56457.6
Reach-16	78.60	36478	39739.5	56312.6
Reach-17	80.50	36204.1	39400.6	55663.7
Reach-18	80.70	35923	39044.9	55171.5
Reach-19	82.41	36048	39171.1	55354.7
Reach-2	20.76	19110.1	22216.2	27655
Reach-20	82.92	35937.9	39025.1	55313.9
Reach-21	83.58	35903.9	38974.6	55221.4
Reach-22	120.92	49702.9	54606.4	69382.9
Reach-23	12.67	11835.4	14035.7	16988.4
Reach-24	18.01	15815.9	18585	22738

*Results are after applying Areal Reduction Factors

Table A-38 HEC-HMS Results – Berry Creek (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Reach-25	4.52	5182.1	6241.7	7400.9
Reach-26	24.25	20654.3	24169.3	30010.4
Reach-27	27.78	23158.8	27086.2	34038.3
Reach-28	30.30	23766.1	28073.5	35634.5
Reach-29	33.44	24781.1	28965.3	37531.1
Reach-3	4.08	4515	5357.8	6458.2
Reach-30	36.53	25773.6	29806.9	39186.7
Reach-31	3.57	4239.4	5009.4	6085.9
Reach-32	12.39	12185.7	14310.1	17584.9
Reach-33	3.18	3380.8	4028.8	4918.5
Reach-4	11.41	12388.1	14548	17785.3
Reach-5	39.10	31506.9	35855	46276
Reach-6	44.62	34462.8	38959.8	50944.7
Reach-7	47.06	34836.8	39072.1	51847.1
Reach-8	52.41	35762.4	39757.8	53525.4
Reach-9	55.41	34186	37624.2	51117.1
101	2.63	2976.1	3546	4248.5
102	2.43	2661.2	3226.3	3800.3
103	1.61	2106.4	2501.9	3034.6
106	1.72	1964.6	2465.4	2818.4
107	2.09	2229	2723	3184
110	1.97	2224	2669.3	3190.6
111	1.02	1199.6	1442.3	1720.9
112	1.80	2728.4	3401.7	3880.6
113	3.53	3462.7	4403.7	4999.6
114	3.73	3277.3	3945.1	4711.9
116	1.80	2377.2	2891.5	3391.2
119	3.87	4761.4	5641.2	6658.1
120	3.54	4888.4	6002.6	6948.8
123	1.63	1529.3	1980.6	2224.6
124	1.38	1733.8	2103.7	2475.6
125	1.00	1213	1495.4	1700
126	0.55	1214.2	1381.4	1707
127	2.47	2577.1	3154	3736
128	1.83	2976.1	3581.7	4156
129	5.08	5206.8	6272.2	7307.5

*Results are after applying Areal Reduction Factors

Table A-38 HEC-HMS Results – Berry Creek (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
130	0.67	1025	1402.1	1511.8
131	0.89	1287.2	1687.4	1852.4
133	1.29	1722.8	2113.9	2547.7
134	1.80	1521.7	1837.5	2211.1
135	1.71	2549	3088.3	3592.6
136	3.18	3482.7	4176.9	5052.3
138	0.40	548.9	655.2	821.9
142	1.34	1430	1727.3	2096.3
149	0.44	666.4	856.1	966
154	0.41	518.4	658.1	771.6
159	0.22	291.7	420.7	422
164	0.51	793.6	1050.9	1146.1
179	0.20	317.6	412.7	468.9
184	0.90	1132.2	1422.6	1597.8
189	0.49	918.6	1108.4	1293
190	1.07	1352.1	1792.7	1947.8
195	0.77	1035.8	1369.3	1477.4
204	3.57	4307.6	5130.9	6179.4
212	1.00	1717.8	2010.2	2395.5
72	4.47	4090.4	4920.7	5909.1
73	4.35	4535.7	5418.8	6480.3
74	4.08	3658.5	4385.9	5232.2
75	4.29	4187.4	5011	5985.5
76	6.35	5680.9	6809.6	8123.8
80	7.19	7139.8	8541.1	10203
81	5.48	5179.8	6214.6	7443.4
82	2.51	2647.4	3162.6	3782.2
84	1.91	2041.4	2437.1	2916
87	1.57	2334.8	2747	3327.6
89	4.62	5215	6214.6	7445
90	2.71	3073.8	3662.3	4388.1
91	2.72	3171	3775.4	4526.6
92	3.61	3835.4	4586.6	5505.7
93	0.59	987.7	1151.3	1405.9
98	2.44	3069.4	3658.9	4378.2
DelWebb	69.35	35901.1	39314.9	55114.6

*Results are after applying Areal Reduction Factors

Table A-39 HEC-HMS Results – Mankins Branch

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Junction-1	1.35	1683.1	2093.1	2434.6
Junction-10	4.06	4303.4	5479.1	6147.8
Junction-11	1.45	1977.8	2398.9	2841.4
Junction-12	1.46	2319.8	2725.5	3371.9
Junction-13	3.94	5141.1	6182.8	7472.1
Junction-2	2.43	2668.1	3277.6	3889
Junction-3	6.49	6970.9	8756.7	10035.9
Junction-4	8.00	8154.3	9805.7	11634.7
Junction-5	13.10	13909.1	16618	19830.3
Junction-6	13.23	14011.8	16729.9	19985.9
Junction-7	1.92	2397.9	3235.6	3479.2
Junction-8	2.74	3381.7	4429.7	4864
Junction-9	3.42	3949.3	5109.9	5684.7
Outlet1	13.23	14011.8	16729.9	19985.9
Reach-1	1.92	2392.3	3224	3470.8
Reach-2	2.74	3356.2	4379.4	4826.9
Reach-3	3.42	3930.8	5063.5	5641.8
Reach-4	1.35	1639.5	2012.9	2371.3
Reach-5	6.49	6851.6	8534.8	9838.8
Reach-6	1.45	1973.9	2392.2	2835.9
Reach-7	1.46	2316.9	2720.8	3367.9
Reach-8	3.94	5129.4	6162.3	7455.4
Reach-9	13.10	13903.6	16604	19820.8
34	0.13	142.7	174.5	222.5
39	0.82	1011.2	1231.1	1425.6
40	0.68	1312.3	1624.6	1889.1
41	0.64	1357.7	1618.3	1978.9
42	1.05	1265.5	1682.2	1819.5
43	0.87	1228	1673.1	1796.6
49	1.17	1155.1	1403.2	1695.1
50	1.08	1550.5	2085	2274.7
52	1.51	1836.6	2263.2	2722.2
53	0.74	871.1	1081.9	1269

Table A-39 HEC-HMS Results – Mankins Branch (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
54	0.29	561.7	649.3	815.9
55	0.56	1022.1	1187.1	1493.5
56	0.78	990.5	1253.7	1443.3
57	0.56	699.8	848.5	1001.5
60	0.90	1385.1	1630.2	2004.7
66	1.45	1977.8	2398.9	2841.4

Table A-40 HEC-HMS Results – Pecan Branch

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
BERRY	0.00	1478.8	1573.1	4118.8
Diversion-1	7.35	4656.1	4833.7	7763.7
Diversion-2	7.35	4131.3	4263.5	5298.5
Junction-1	1.34	2087.5	2352.8	2963.9
Junction-1A	0.88	1483.4	1660.8	2133.8
Junction-10	5.55	5324.0	5574.0	9167.0
Junction-11	6.21	5472.4	5707.6	9391.8
Junction-11A	5.83	5355.2	5585.4	9142.8
Junction-12	6.83	5616.4	5851.4	9644.2
Junction-12A	6.47	5520.0	5750.6	9451.2
Junction-13	7.35	5610.1	5836.6	9417.3
Junction-2	1.80	2885.1	3201.4	4069.3
Junction-3	2.19	3339.5	3660.2	4697.2
Junction-4	2.46	3528.4	3836.0	4962.7
Junction-5	3.22	4569.1	4888.1	6516.4
Junction-6	3.50	5067.5	5452.6	7214.8
Junction-7	4.18	6059.2	6635.0	8631.2
Junction-8	4.5081	5796.8	6273.9	8576.5
Junction-9	5.0691	5213.7	5543.6	8959.5
OUTFALL	7.3492	4131.3	4263.5	5298.5
Reach-1	0.4198	754.7	875.5	1073.9
Reach-10	0.3268	1064.3	1202.3	1501.8
Reach-11	4.5081	4901.7	5191.9	8223.4
Reach-12	5.0691	5173.8	5415.2	8849.2
Reach-13	5.5484	5286.4	5511.9	9022.1
Reach-14	6.2124	5453.5	5682.8	9323.2
Reach-15	6.8258	5505.7	5731.4	9221.5
Reach-2	1.3437	2049.6	2306.7	2939.0
Reach-3	1.7996	2870.1	3172.5	4046.8
Reach-4	2.1919	3300.1	3611.7	4644.0
Reach-5	2.4618	3521.1	3826.8	4953.4
Reach-6	0.7585	1820.4	2066.1	2533.5
Reach-7	3.2203	4559.4	4876.3	6496.0
Reach-8	3.5003	5033.2	5426.4	7178.2
Reach-9	4.1813	5677.4	6145.0	8398.4

Table A-40 HEC-HMS Results – Pecan Branch (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
1	0.4198	789.1	929.3	1110.8
2	0.4596	1141.6	1293.9	1604.1
3	0.4643	835.7	955.4	1174.6
4	0.4559	973.7	1091.5	1366.7
5	0.3923	1062.4	1192.4	1490.8
6	0.7585	1820.6	2066.4	2533.6
7	0.2699	710.4	807.7	1007.1
8	0.28	520.5	604.2	728.8
9	0.681	1029.3	1223.3	1453.0
10	0.3268	1065.3	1204.7	1504.0
11	0.561	859.5	1052.8	1218.9
12	0.4793	913.9	1077.4	1299.5
13	0.3845	609.1	763.8	881.8
14	0.2795	647.3	745.5	919.9
15	0.3543	578.7	741.5	838.8
16	0.2591	466.6	545.6	669.5
17	0.5234	767.1	874.9	1136.4

Table A-41 HEC-HMS Results – Smith Branch

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Junction-01	1.24	1749.5	2141.4	2412.4
Junction-02	2.13	3067.5	3673.0	4273.6
Junction-02a	1.59	2203.2	2648.8	3057.8
Junction-03	2.94	3660.5	4427.4	5494.7
Junction-03a	2.40	3144.7	3791.1	4590.6
Junction-04	2.94	3548.8	4218.0	5263.0
Junction-05	3.38	3575.2	4147.6	5245.7
Junction-06	7.42	8203.4	9208.8	11684.2
Junction-06a	3.75	3763.7	4312.2	5536.7
Junction-08	7.75	8506.9	9573.3	12073.7
Junction-09	8.32	8633.6	9691.6	12331.0
Junction-09a	8.05	8521.5	9565.9	12167.1
Junction-11	8.83	8711.5	9737.8	12560.2
Junction-11a	8.58	8619.6	9642.2	12417.5
Junction-12	1.72	3109.8	3645.0	4530.1
Junction-12a	1.01	1787.4	2058.1	2630.6
Junction-13	1.99	3368.9	3913.0	4932.7
Junction-14	3.0451	4086.4	4547.9	5576.9
Junction-14a	2.4881	3308.5	3609.9	4508.7
Junction-15	3.6661	4863.3	5496.5	6797.4
Junction-16	2.1339	2949.2	3612.2	4247.1
Junction-17	0.6815	1467.9	1753.4	2102.2
OUTFALL	9.1964	8838.1	9862.1	12783.3
Reach-01	0.5399	1023.7	1204.7	1430.4
Reach-02	1.2442	1730.1	2103.2	2373.5
Reach-03	0.5655	793.8	983.3	1044.3
Reach-04	2.1339	2949.2	3612.2	4247.1
Reach-05	2.1339	2893.5	3488.8	4162.5
Reach-07	2.9374	3548.8	4218.0	5263.0
Reach-08	2.9374	3363.6	3923.5	4916.5
Reach-09	3.3842	3523.1	4069.7	5156.1
Reach-10	7.4205	8202.1	9206.9	11679.9
Reach-12	7.754	8413.3	9446.4	12014.1
Reach-13	8.3153	8514.0	9534.4	12247.3
Reach-16	8.8307	8680.6	9702.0	12526.0
Reach-17	0.3577	775.4	958.5	1113.6

Table A-41 HEC-HMS Results – Smith Branch (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Reach-18	0.6815	1283.1	1497.5	1871.4
Reach-19	1.7228	2923.3	3413.3	4278.6
Reach-20	1.9865	2917.9	3224.6	3999.2
Reach-21	3.0451	4050.6	4497.4	5545.8
Reach-22	3.6661	4830.5	5447.4	6753.5
1	0.5399	1025.2	1207.1	1432.5
2	0.6787	1030.1	1282.4	1455.5
3	0.5655	833.5	1055.2	1186.4
4	0.3498	602.2	724.7	844.0
5	0.5325	1111.3	1327.9	1560.1
6	0.3564	625.1	735.1	876.3
7	0.3577	775.6	959.1	1114.1
8	0.411	932.5	1113.9	1340.7
9	0.2705	554.2	660.8	788.4
10	0.271	546.0	626.1	767.7
11	0.2637	509.8	594.5	726.6
12	0.3272	741.3	880.3	1054.6
13	0.4468	1064.7	1197.0	1485.0
14	0.5016	1102.3	1320.6	1571.1
15	0.557	994.4	1229.7	1425.2
16	0.3702	709.2	813.3	989.6
17	0.621	1291.7	1522.5	1833.4
18	0.264	756.2	835.2	1066.2
19	0.2973	970.9	1053.4	1383.1
20	0.3335	784.5	904.2	1104.7
21	0.2601	519.9	604.9	764.0
22	0.2553	606.0	697.5	873.3
23	0.3657	704.6	852.1	1024.3

Table A-42 HEC-HMS Results – Middle Fork San Gabriel River

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Junction-1	2.11	2210.6	2630.9	2210.6
Junction-10	11.43	8955	9840.6	9840.6
Junction-11	12.19	9186.4	10061.5	10061.5
Junction-12	13.21	9426.6	10281.4	10281.4
Junction-13	13.57	9484.7	10339.7	10339.7
Junction-14	13.83	9563.7	10417.3	10417.3
Junction-15	14.39	9749.7	10588.6	10588.6
Junction-16	14.87	9958.4	10766.6	10766.6
Junction-17	15.27	10037.7	10851.5	10851.5
Junction-18	15.74	10161.3	10958	10958
Junction-19	16.03	10220.3	11018.4	11018.4
Junction-2	3.34	3670.6	4295.5	3670.6
Junction-20	16.94	10369	11165.2	11165.2
Junction-21	1.95	1979.5	2310.4	1979.5
Junction-3	4.11	4360.8	4997.5	4360.8
Junction-4	7.08	7093.4	8238.1	7093.4
Junction-5	8.74	7999.4	9019.9	7999.4
Junction-6	9.08	8144.6	9162.5	8144.6
Junction-7	9.61	8251.8	9253.2	8251.8
Junction-8	10.33	8503.6	9446.1	9446.1
Junction-9	10.61	8575.1	9521.6	9521.6
Outlet1	16.94	10369	11165.2	11165.2
Reach-1	2.11	2192.5	2599.4	2192.5
Reach-10	10.61	8523.7	9450.3	9450.3
Reach-11	12.19	9144.5	10006	10006
Reach-12	13.21	9407.2	10257.4	10257.4
Reach-14	13.83	9540.4	10388.7	10388.7
Reach-15	15.27	10025.7	10835.2	10835.2
Reach-16	16.03	10200.9	10992.5	10992.5
Reach-2	3.34	3587.2	4161.7	3587.2
Reach-3	14.39	9730.1	10553.8	10553.8
Reach-4	1.95	1968.5	2291.2	1968.5

*Results are after applying Areal Reduction Factors

Table A-42 HEC-HMS Results – Middle Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
Reach-5	0.65	699.9	832	699.9
Reach-6	9.61	8198.3	9179.8	8198.3
Reach-7	7.08	6939.1	7983.4	6939.1
Reach-8	9.08	8095	9093.5	8095
53	0.74	1080.3	1264	1080.3
55	0.85	1136.9	1345.3	1136.9
56	1.37	1374.4	1640.9	1374.4
57	0.76	952.8	1136.9	952.8
58	0.52	1132.2	1280.2	1132.2
59	0.39	527	623.2	527
62	0.91	1698.8	2034.7	1698.8
64	1.66	2178.7	2589	2178.7
65	0.76	1297.8	1491.5	1297.8
66	0.47	606.1	718.7	606.1
68	0.72	854.8	1013.9	854.8
69	0.26	360	473.4	360
73	0.39	772.2	996	772.2
74	0.48	428.4	550.8	428.4
75	1.02	847.5	1011.5	847.5
76	0.82	962.7	1131.5	962.7
79	0.56	633.2	842.7	633.2
81	0.65	703.2	838	703.2
82	0.28	678.8	791.2	678.8
83	0.86	927.7	1107.2	927.7
88	0.35	624.4	723.8	624.4
89	0.29	575.5	680.6	575.5
90	0.44	691.8	806.3	691.8
92	1.03	1674.2	2021.5	1674.2
95	0.35	693	861.1	693

*Results are after applying Areal Reduction Factors

Table A-43 HEC-HMS Results – North Fork San Gabriel River

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
J1	19.26	13583.7	16092.3	20461
J10	222.51	54922.8	57709.3	88767.4
J11	246.37	56128.9	59779.4	90631.9
J1103	4.92	3458.4	4020.3	5217.2
J1113	219.41	54838.7	57576.5	88680.4
J2	47.60	26772.8	29832.7	40645.1
J3	55.18	28125.6	31034.4	43415.7
J4	128.45	48104.3	51538.4	75433.1
J5	135.80	48595.7	51975.7	76405
J6	155.58	49712.5	52946.6	78461.1
J7	185.42	53233.6	56437.3	86644.2
J774	107.33	45494.5	49368.8	70210.5
J777	198.00	53860.9	56778.4	87859.5
J780	210.75	54334	57078.3	87892.3
J783	133.75	48536.6	51960.3	76264.7
J789	205.28	54210.3	57053.1	88095.9
J792	228.80	55341.8	58483	89465.6
J795	200.24	53980.9	56882.7	88004.6
J798	20.10	11328.1	13286.8	16257.9
J8	195.38	53690.6	56603.9	87576.8
J801	25.64	12156.5	13385.1	17966.4
J804	188.61	53441.1	56654	86987.8
J807	51.10	27347	30407.6	41881.1
J810	121.35	46901.7	50495.8	73016.3
J813	3.96	2539.8	2993.7	3757
J818	34.49	15576.8	18064.4	23087.4
J823	0.96	1227.7	1457	1751.8
J826	42.26	25970.6	30072.5	39102.2
J829	194.54	53651	56568.9	87539.3
J832	12.12	8829.4	10092.1	11841.9
J837	23.49	15171.6	16876.6	22298.9
J840	138.47	48818.6	52210.3	76827.3
J843	6.75	5477.5	6593.8	7882.5
J846	230.38	55321.2	58485.7	89357.6

*Results are after applying Areal Reduction Factors

Table A-43 HEC-HMS Results – North Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
J849	183.65	53193	56552.7	86757.3
J852	46.84	18572.2	19819	28387.4
J857	131.18	48284.1	51712.5	75786.9
J860	250.04	3362.9	3957.1	4815.5
J863	4.38	5148.6	6090.2	7325.3
J868	2.19	2551.3	3038.8	3642.7
J871	9.22	7367.6	8860.9	10632.3
J874	36.62	24447	27815.1	35440.6
J877	153.84	49658.8	52916.4	78437.1
J882	215.02	54563.2	57298	88238
J885	14.29	10389.7	11587.9	14938.6
J894	5.89	4568	5516	6608.3
J9	202.43	54036.5	56874.4	87816
J900	250.97	3616.2	4186.7	5167.4
J904	38.86	17845.4	19983.5	26750.4
J907	13.05	10338.8	12488.7	15042.2
J910	236.77	55702.8	59134	89989.6
J913	144.71	48762.5	52053.8	76597.2
J924	207.29	54292.8	57108.6	88076
J929	6.58	5458.6	6587.4	7917.2
J932	111.36	45837.3	49583	70917.4
J935	117.89	46874.2	50486.3	72929
Lake Georgetown	246.37	4470.5	4495.7	4705.7
Outlet1	250.97	3616.2	4186.7	5167.4
R1060	111.36	45670.7	49310.9	70615.6
R1140	121.35	46730.4	50224.6	72738.6
R1300	131.18	48273.9	51692.3	75770.6
R1450	38.8619	16171.2	17461.6	24632
R1500	9.2204	7022.7	8232.5	10136.9
R1520	46.8396	18140.4	19261.5	27728.3
R1650	133.7502	48446	51816.1	76146.3
R1790	34.4869	14688.3	16532.3	21985.4
R1820	25.6385	11991	13106.9	17687.7

*Results are after applying Areal Reduction Factors

Table A-43 HEC-HMS Results – North Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
R1890	20.098	10430.6	11573.1	15290.4
R1960	138.47	48464.4	51744	76083.6
R230	13.0504	10002.5	12036.8	14717.6
R2310	6.5837	5330.5	6332.8	7698.3
R2390	6.7476	5259.8	6151.7	7478.3
R2400	144.7085	48697.6	51953.1	76341.6
R2430	153.8418	49604.5	52830.8	78281.7
R2530	14.2894	10201.6	11399.2	14697.9
R2580	23.4874	14661.6	16113.8	21219.4
R2710	183.648	53114.3	56313.8	86441.1
R2900	2.1923	1881.5	2055.5	2723.5
R2920	188.6127	53271.2	56223.5	86822.8
R2940	194.5422	53644.1	56555	87500.7
R2990	197.9986	53840.8	56738	87772.3
R3000	3.9574	2532.3	2937.4	3745.8
R3010	0.9644	1210.6	1423.9	1722.9
R3020	200.2356	53910.8	56744.5	87611.7
R3130	4.382	5036.6	5873.7	7041.3
R3140	4.9218	3457.4	4018.8	5216.8
R3150	205.2752	54175.4	56987.6	87888.1
R3640	246.3707	696.5	810.5	4127.4
R4000	250.0394	3309.5	3861.3	4739.4
R460	36.6196	24085.3	27651.1	35338
R540	5.8898	4503.4	5350.4	6491.4
R620	12.1184	8473.1	9522.5	11542.3
R720	42.2588	25673.2	28599.7	38544.6
R7550	210.7519	54314	57043.7	87838.5
R7560	219.4052	54827.4	57557.4	88640.3
R7570	228.8043	55327	58468.8	89392.7
R7600	230.3785	55304.8	58470.2	89299.7
R7680	117.8855	46759.1	50336.9	72741
R7700	207.2916	54215.1	56970.4	87724.9
R7720	215.0232	54559.9	57292.6	88231.9
R860	51.103	27159.5	30012.5	41579.4

*Results are after applying Areal Reduction Factors

Table A-43 HEC-HMS Results – North Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
R970	107.3345	45335.7	49071.9	69914
379	6.4602	4903.2	5923.3	7122.1
390	6.5902	5808.4	6994.5	8427.5
399	5.8898	4568	5516	6608.3
400	3.5023	3092.9	3722.7	4468.5
401	6.2095	4965	5984.9	7203.6
412	5.2413	3924.9	4762.9	5717.1
417	2.7316	3020.3	3613.8	4322.8
423	7.0947	4530.2	5500.3	6570.2
443	6.2286	5519.8	6694.7	8079.3
445	5.6392	4715.2	5673.2	6834.8
454	3.4651	5188.6	6114.4	7472.5
455	5.3419	4731.4	5734.9	6950.9
467	2.5733	2640.5	3157.4	3774.1
475	4.0797	3059.3	3694.6	4460.1
477	6.5207	4977	6000	7191.6
478	4.0303	3450.6	4175.2	5041.3
489	5.3122	4777.7	5741.7	6980.8
497	2.6678	2715.3	3277.5	3968
498	4.375	4336.2	5209.8	6239.3
508	3.6636	3358.7	4068.4	4934
522	9.2204	7367.6	8860.9	10632.3
532	6.2125	5262.1	6352.7	7645.3
533	4.3141	3661.5	4404.8	5266.4
540	4.1079	3171.1	3820.5	4563.1
544	2.052	2822	3355.7	4113.7
554	3.7283	3566	4305.7	5187
555	5.1201	5944.2	7124.8	8628.8
565	5.5405	6310.6	7588.3	9217.1
566	4.6651	5695.1	6725.9	8157.6
574	2.6397	2440.8	2926.3	3504.9
588	6.5837	5458.6	6587.4	7917.2
597	3.1893	3780	4487.6	5453.4
598	2.9445	3237.3	3860.5	4659.2

*Results are after applying Areal Reduction Factors

Table A-43 HEC-HMS Results – North Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
599	6.2385	6631.9	7957.2	9619
605	2.3857	2506.9	2989.2	3635.1
606	1.7053	1809	2141.4	2569.1
610	7.7057	7134.9	8556.4	10244.7
616	1.7409	2221	2658.9	3273.8
621	2.1923	2551.3	3038.8	3642.7
632	2.6767	3492.5	4123.3	4968.3
643	4.5779	4337.7	5207.8	6310.8
651	1.7754	1850.1	2204.3	2680.9
653	6.2535	5775.3	6941.7	8338.6
654	1.0196	1290.7	1532.3	1841.8
657	3.1063	3289.1	3886.5	4691.8
658	5.9295	4967.1	5929.8	7135.8
660	0.9644	1227.7	1457	1751.8
661	3.4603	3405.1	4055	4931
663	0.8407	1281.9	1514.6	1906.1
665	0.7455	1198.2	1401.1	1705.9
673	2.6157	3218.4	3749.1	4548.2
674	2.237	2656.8	3151.7	3815.1
675	1.371	1988.6	2339.4	2835.8
676	2.1953	2687.9	3188.5	3930.4
690	2.8443	3687	4339.2	5227.1
691	9.604	14113.1	16339.8	19526.8
698	2.0164	2612.6	3066.6	3747.5
703	4.2713	4625.9	5503.3	6621.7
709	6.3882	4859.8	5760.4	7007.7
727	3.6687	3778.5	4440.3	5371
747	1.5742	2104.6	2473.9	3068.7
750	0.9263	1793.2	2041.9	2525.3

*Results are after applying Areal Reduction Factors

Table A-44 HEC-HMS Results – South Fork San Gabriel River

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
J001	6.97	6068.4	7414.0	8872.8
J002	1.02	1203.5	1462.1	1750.3
J003	7.98	6715.5	8207.4	9892.9
J004	8.91	7298.3	8885.2	10821.5
J005	2.48	2879.5	3524.3	4190.1
J006	11.40	9051.8	10720.6	13604.1
J007	12.86	9835.8	11432.8	14601.3
J008	14.50	11038.1	12761.6	16142.4
J009	15.84	11915.2	13753.3	17349.0
J010	20.08	15250.7	17480.7	22504.8
J011	20.80	15441.7	17658.1	22818.8
J011.2	41.73	35489.6	41247.6	52252.1
J012.1	6.48	7682.3	9266.2	11124.1
J012.2	11.91	13079.9	15623.4	19060.9
J013	5.98	7347.6	8969.8	10674.2
J014	20.93	21901.8	25934.0	32110.7
J015	42.13	35620.4	41367.0	52364.0
J016	44.57	37477.2	43536.4	55300.9
J016.2	45.67	38033.2	44133.1	56151.1
J017	47.24	39033.5	45110.3	57511.6
J018	48.42	39615.0	45690.9	58335.6
J019	0.45	786.1	913.2	1131.2
J020	48.87	39813.6	45840.8	58569.8
J021	49.58	39941.8	45910.5	58827.7
J021.2	54.44	43034.4	48898.0	63463.5
J022	1.00	1579.8	1854.4	2255.3
J023	55.44	43519.0	49356.6	64166.7
J024	55.91	43591.7	49446.6	64347.2
J025	0.42	770.9	894.7	1100.2
J026	56.33	43751.8	49604.7	64580.0
J027	56.82	43814.7	49651.9	64709.1
J027.2	57.62	44259.8	50076.9	65373.0
J028	0.96	1089.0	1304.3	1560.5
J029	59.45	44431.8	50250.6	65990.5
J029.2	60.41	44763.2	50579.8	66677.2

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
J030	0.84	1473.2	1730.9	2106.8
J031	61.24	45009.4	50832.4	67072.0
J032	61.69	44977.5	50788.9	67096.0
J033	0.44	795.2	918.3	1129.3
J034	62.42	45107.4	50889.9	67313.8
J035	0.47	709.3	830.3	1002.7
J036	63.25	45284.5	51031.5	67575.4
J037	0.51	684.2	805.7	967.5
J038	64.15	45546.3	51272.6	68001.0
J039	5.05	6167.4	7413.5	8874.0
J040	8.73	10966.5	13101.2	15847.3
J041	12.04	13887.7	15937.8	20231.4
J042	14.67	16960.7	19426.4	24766.4
J043	18.55	19525.3	21815.5	28834.4
J044	21.70	21820.1	24638.2	32086.5
J045	64.72	45538.9	51263.2	68089.0
J045.2	86.42	57829.7	63998.0	88104.5
J046	87.77	58221.3	64372.4	88757.5
J047	0.25	533.1	599.6	749.0
J047.1	0.68	1332.3	1457.7	1914.3
J048	88.96	58393.1	64554.8	89022.5
J049	0.27	494.0	567.0	697.9
J050	89.60	58483.0	64648.4	89171.8
J051	91.22	58496.9	64632.0	88744.5
J052	91.72	58524.6	64656.2	88823.5
J053	0.40	639.2	745.0	900.4
J054	92.87	58775.9	64913.0	89214.1
J055	0.32	907.4	1018.5	1265.6
J056	93.92	58923.7	65041.6	89508.4
J057	4.06	4982.8	5943.0	7140.4
J058	96.23	59168.0	65230.8	89919.8
J058.2	102.50	60929.8	66863.9	93402.2
J059	103.68	60984.5	66894.8	93542.6
J059.2	105.76	61424.1	67326.9	94268.9
J060	0.89	1112.4	1321.4	1584.7

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
J061	0.33	588.1	684.8	836.6
J062	1.22	1489.6	1758.3	2129.0
J063	106.45	61460.6	67350.1	93287.3
J063.2	110.09	61506.9	67376.4	93435.6
J064	111.17	61538.1	67369.1	93364.9
J064.2	112.41	61748.1	67585.1	93676.2
J065	116.10	62015.0	67774.1	93696.3
J066	117.42	62087.8	67827.0	93706.5
J066.2	118.69	62264.4	68008.7	93948.7
J067	119.54	62356.8	68103.4	94067.7
J068	123.72	62100.9	67754.3	93876.1
J068.2	125.81	62380.1	68030.0	94291.9
J069	126.18	61485.4	66766.4	91996.6
J069.2	127.31	61607.6	66893.1	92174.5
J070	129.94	61708.9	66958.8	92097.2
J070.2	131.14	61410.2	66603.9	91443.9
J071	132.65	61430.6	66588.1	91359.7
J072	133.24	61456.5	66610.0	91379.4
J073	134.17	61506.5	66656.0	91399.7
J090	133.49	61469.0	66622.2	91386.3
J091	2.21	2527.3	3042.1	3661.5
J091B	4.25	4919.0	5848.1	7161.8
J092	113.97	61848.6	67627.4	93768.8
J094	133.67	61475.1	66626.3	91379.6
OUTFALL	134.53	61526.4	66671.6	91409.3
R001	5.37	4723.8	5747.7	6862.4
R002.1	6.97	6057.3	7390.4	8856.4
R004	1.02	1203.4	1461.8	1750.2
R005	7.98	6709.3	8189.6	9883.2
R006	8.91	7294.8	8872.7	10819.6
R007	2.48	2878.8	3522.9	4189.0
R008	11.40	9025.8	10675.7	13498.5
R009	14.50	11018.0	12724.9	16111.7
R010	15.84	11903.1	13730.9	17342.2
R011	20.08	15198.9	17402.6	22439.1

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
R012	6.48	7626.6	9167.0	11048.7
R013	11.91	12912.2	15328.2	18822.0
R014	5.98	7232.1	8765.5	10512.5
R015	20.93	21826.2	25810.8	32007.4
R016	41.73	35436.3	41173.3	52096.0
R017	42.13	35413.5	41158.9	52228.2
R018	45.67	38003.4	44034.9	55988.0
R019	47.24	38943.8	45007.9	57362.5
R020	48.42	39624.7	45652.0	58308.5
R021	0.45	785.1	911.7	1129.9
R022	48.87	39689.7	45664.0	58466.8
R023	1.00	1577.5	1850.8	2252.2
R024	55.44	43448.3	49301.4	64134.4
R025	0.42	769.0	892.0	1097.9
R026	56.33	43693.0	49524.0	64533.5
R027	57.62	43880.0	49706.9	65140.6
R028	0.96	1086.3	1299.5	1556.8
R029	60.41	44745.0	50564.6	66665.0
R030	0.84	1467.1	1721.6	2098.9
R031	61.24	44883.3	50689.1	66954.5
R032	61.69	44924.8	50702.3	67036.0
R033	0.44	793.5	915.8	1127.1
R034	62.42	45053.0	50800.5	67218.5
R035	0.47	708.7	829.4	1002.0
R036	63.25	45234.7	50969.0	67519.5
R037	0.51	683.4	804.3	966.4
R038	64.15	45420.6	51139.3	67912.9
R039	5.05	6151.4	7385.5	8852.9
R040	8.73	10303.5	12022.4	14922.1
R041	12.04	13886.3	15935.0	20228.2
R042	14.67	16291.6	18467.6	23813.5
R043	18.55	19461.2	21732.3	28737.7
R044	21.70	21783.2	24587.3	32030.6
R045	86.42	57791.9	63957.7	88052.5
R046	87.77	58138.8	64287.2	88639.1

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
R047	0.25	530.3	595.3	745.0
R047.1	0.68	1328.2	1451.5	1908.1
R048	88.96	58333.5	64493.1	88942.4
R049	0.27	491.7	563.2	694.5
R050	89.60	58331.5	64475.6	88932.6
R051	91.22	58433.1	64558.9	88685.3
R052	91.72	58518.2	64648.0	88815.7
R053	0.40	637.0	741.3	897.4
R054	92.87	58703.0	64816.6	89162.5
R055	0.32	899.6	1004.7	1254.9
R056	93.92	58672.6	64741.1	89116.3
R057	4.06	4948.0	5881.1	7091.8
R058	102.50	60791.7	66689.7	93232.7
R059	105.76	61354.5	67236.5	93130.2
R060	0.89	1098.5	1296.8	1566.0
R061	0.33	577.5	668.0	822.1
R062	1.22	1489.2	1757.8	2128.5
R063	110.09	61391.5	67211.2	93147.2
R064	112.41	61622.9	67389.2	93438.4
R064.1	113.97	61731.8	67469.8	93288.9
R065	116.10	61918.6	67650.4	93468.9
R066	118.69	62253.2	67995.7	93925.9
R067	119.54	61957.4	67615.0	93770.0
R068	125.81	61448.0	66727.9	91942.2
R069	127.31	61455.1	66701.4	91733.7
R070	131.14	61299.4	66454.9	91176.0
R071	132.65	61410.1	66562.6	91315.8
R072	133.24	61448.8	66601.4	91358.4
R072.1	133.49	61460.0	66611.1	91358.9
R072.2	133.67	61467.0	66615.7	91346.1
R073	134.17	61498.9	66643.5	91371.9
R089	0.80	1095.3	1297.7	1566.1
R090	0.26	628.7	737.7	886.2
R091	2.21	2519.9	3029.2	3651.6
R094	0.18	346.9	403.5	478.9

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
1	5.37	4754.7	5773.8	6882.6
2	1.60	1427.3	1745.9	2079.8
3	1.02	1203.5	1462.1	1750.3
4	0.93	1084.8	1324.5	1580.7
5	2.48	2879.5	3524.3	4190.1
6	1.46	2106.7	2505.9	3038.1
7	1.64	2130.6	2549.7	3074.0
8	1.34	1462.7	1834.8	2182.4
9	2.21	2527.3	3042.1	3661.5
10	0.72	1214.9	1423.1	1793.5
11	4.75	5604.8	6787.0	8130.4
12	1.73	2077.8	2480.2	2994.4
13	1.82	2542.2	3021.2	3705.2
14	3.60	3912.4	4718.6	5663.1
15	1.43	2491.6	2912.7	3616.9
16	4.11	5397.8	6519.6	7805.4
17	1.87	2037.0	2550.4	2990.0
18	1.61	2052.5	2459.4	2961.2
19	0.40	637.4	749.6	939.4
20	2.43	2343.6	2850.8	3404.6
21	1.11	1695.9	2032.8	2450.9
22	1.57	1986.7	2385.7	2875.2
23	1.19	1593.0	1898.4	2300.3
24	0.45	786.1	913.2	1131.2
25	0.71	1007.5	1212.5	1501.3
26	4.86	5442.8	6479.3	7783.6
27	1.00	1579.8	1854.4	2255.3
28	0.47	835.3	974.0	1217.2
29	0.42	770.9	894.7	1100.2
30	0.50	1090.5	1247.9	1586.5
31	0.80	1096.7	1299.9	1568.0
32	1.58	2428.4	2854.6	3521.1
33	0.96	1089.0	1304.3	1560.5
34	0.25	408.3	468.2	594.0
35	0.84	1473.2	1730.9	2106.8

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
36	0.45	833.6	971.5	1243.9
37	0.44	795.2	918.3	1129.3
38	0.29	618.7	748.2	932.0
39	0.47	709.3	830.3	1002.7
40	0.36	756.0	886.0	1123.4
41	0.51	684.2	805.7	967.5
42	0.39	768.0	870.1	1100.2
43	3.15	2806.3	3355.9	3999.8
44	2.71	3311.8	3953.0	4747.8
45	2.34	2859.7	3465.6	4132.5
46	0.67	1090.4	1270.4	1556.0
47	3.01	4539.6	5440.4	6548.6
48	3.31	4622.6	5427.6	6580.5
49	2.63	3664.4	4374.0	5257.3
50	3.87	4873.9	5832.5	7032.0
51	0.57	1182.8	1349.3	1698.3
52	1.35	1815.8	2159.7	2614.1
53	0.25	533.1	599.6	749.0
54	0.50	1061.3	1216.3	1548.3
55	0.27	494.0	567.0	697.9
56	0.38	926.0	1042.9	1302.8
57	1.63	2509.9	2954.7	3624.0
58	0.49	1076.7	1227.7	1544.5
59	0.40	639.2	745.0	900.4
60	0.75	1725.4	1948.1	2442.8
61	0.32	907.4	1018.5	1265.6
62	0.73	1134.8	1329.7	1629.9
63	2.31	3140.3	3726.2	4542.1
64	1.94	2169.9	2585.8	3098.0
65	2.12	3154.9	3742.1	4521.0
66	2.21	2155.6	2559.0	3069.8
67	1.18	1865.7	2230.5	2744.6
68	2.07	2833.5	3350.4	4049.1
69	0.89	1112.4	1321.4	1584.7
70	1.53	2266.3	2671.9	3209.1

Table A-44 HEC-HMS Results – South Fork San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
71	0.69	1276.5	1489.4	1821.4
72	0.33	588.1	684.8	836.6
73	0.89	1552.8	1820.2	2216.5
74	1.08	1980.0	2324.5	2916.5
75	1.24	1742.7	2116.6	2539.7
76	1.56	2692.8	3169.7	3879.2
77	1.32	1877.5	2267.9	2780.1
78	1.28	2104.0	2469.6	2979.7
79	0.85	1734.8	1988.3	2482.9
80	4.18	5854.3	7056.5	8561.8
81	2.09	2679.7	3212.3	3849.8
82	0.37	538.1	659.4	789.5
83	1.14	1551.3	1975.9	2259.1
84	2.63	4246.6	4998.2	6070.9
85	1.20	1935.0	2231.8	2730.6
86	1.51	2689.4	3177.0	3790.6
87	0.58	1563.4	1757.4	2155.2
88	0.50	1356.4	1531.9	1864.2
89	0.36	1001.7	1130.1	1379.6
90	0.26	629.2	739.1	887.2
91	2.04	2726.6	3257.9	3943.2
92	2.13	2889.5	3651.9	4336.7
93	0.43	1131.9	1265.9	1589.7
94	0.18	347.1	403.5	479.0

Table A-45 HEC-HMS Results – San Gabriel River

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
B-SG	549.46	109413	113066.8	161929.3
R110	414.90	67128.9	69018.5	98199.9
R140	0.67	1113.4	1113.4	1625.6
R150	556.12	109691.4	112840.4	162237.9
R170	414.19	67192	70526.1	98384.9
R180	403.71	66224.3	70907.7	97284
R220	403.86	66191.8	70659.6	97165.7
R240	558.21	109656.6	112666.5	161742.4
R290	402.43	66133.2	70827.7	97181.5
R310	559.38	109598.2	112356.3	161629.6
R330	574.50	111359.5	114125.1	163668.5
R360	573.17	111306.7	114093.5	163621.5
R40	2.54	3572	3572	5023.1
R70	549.46	109268	112442.4	161818.5
R80	550.03	109301	112491.3	161864.9
R90	6.09	7929.3	7929.3	10715.3
San Gabriel	575.94	111446.2	114216	163790.7
SF-SG	402.43	66179.6	71004.6	97356.6
SGJ10	414.90	67241.1	70575.5	98452.5
SGJ188	575.94	111446.2	114216	163790.7
SGJ193	573.17	111310.1	114096.5	163627.9
SGJ199	403.71	66233.7	70932.3	97317.4
SGJ202	403.86	66234.8	70918.4	97298.6
SGJ205	559.38	109728.2	112741	161844
SGJ217	0.67	1121.5	1121.5	1635.2
SGJ225	556.12	109748.3	112961.4	162513.7
SGJ228	550.03	109301.4	112492.4	161868.3
SGJ241	6.09	7986.9	7986.9	10913.5
SGJ245	2.54	3730.6	3730.6	5372.8
SGJ256	558.21	109827.4	112981.6	162432.7
SGJ267	574.50	111393.3	114184.6	163743.5
S-SG	414.19	67218	70631.9	98441.2
36	1.32	1978.3	1978.3	2848.5

*Results are after applying Areal Reduction Factors

**HMS model for San Gabriel includes all other study areas; however, results shown here exclude the other study area results because they are already shown in Tables A-38 to A-44

Table A-45 HEC-HMS Results – San Gabriel River (continued)

Element Name	Area (mi^2)	Existing 100-Year Peak Discharge (cfs)	Future Developed 100-Year Peak Discharge (cfs)	Existing 500-Year Peak Discharge (cfs)
37	1.22	1757.7	1757.7	2531.7
38	2.44	3572.5	3572.5	5169.3
39	1.11	1681.8	1681.8	2438.5
40	0.46	715.4	715.4	1058.5
41	1.32	1659.6	1659.6	2510.8
42	1.33	1549.9	1549.9	2285.1
43	0.32	420.7	172.6	659.6
44	0.25	366.8	366.8	558
45	0.51	815.9	815.9	1240.2
48	0.36	611.6	611.6	889.2
49	0.91	1338.2	1338.2	1958.4
50	0.31	510.4	510.4	746.5
52	0.16	345.5	348.5	509
53	0.46	714.4	837.9	1064.8
54	0.25	474.3	474.3	693.1
56	0.75	1265.5	1275.3	1773.6
57	1.18	1914.3	1914.3	2850.5
58	0.76	1340.4	1563.9	1970.5
59	0.52	938.5	946.1	1382.7
64	0.37	664.6	764.6	960.8
67	0.55	727.5	727.5	1104
68	1.44	2230.1	2230.1	3291.1

*Results are after applying Areal Reduction Factors

**HMS model for San Gabriel includes all other study areas; however, results shown here exclude the other study area results because they are already shown in Tables A-38 to A-44

Table A-46 South Fork San Gabriel Hydrologic Calibration – Green & Ampt Loss Parameters

Basin No.	Initial Moisture Content		Saturated Content	Suction (IN)	Conductivity (IN/HR)
	TS Hermine	June 2007			
001	0.150	0.370	0.462	21.651	0.146
002	0.150	0.370	0.460	20.243	0.207
003	0.150	0.370	0.461	21.165	0.167
004	0.150	0.370	0.461	21.190	0.166
005	0.150	0.370	0.462	22.251	0.119
006	0.150	0.370	0.462	21.821	0.138
007	0.150	0.370	0.462	21.606	0.148
008	0.150	0.370	0.457	17.007	0.349
009	0.150	0.370	0.460	20.173	0.210
010	0.150	0.370	0.454	15.221	0.693
011	0.150	0.370	0.461	21.330	0.160
012	0.150	0.370	0.461	21.300	0.161
013	0.150	0.370	0.458	18.085	0.367
014	0.150	0.370	0.461	21.034	0.173
015	0.150	0.370	0.459	18.678	0.276
016	0.150	0.370	0.462	21.554	0.150
017	0.150	0.370	0.463	22.854	0.093
018	0.150	0.370	0.462	21.896	0.136
019	0.150	0.370	0.454	17.031	0.853
020	0.150	0.370	0.460	20.303	0.268
021	0.150	0.370	0.463	23.169	0.079
022	0.150	0.370	0.461	21.380	0.161
023	0.150	0.370	0.459	20.506	0.462
024	0.150	0.370	0.461	20.668	0.189
025	0.150	0.370	0.453	15.994	0.999
026	0.150	0.370	0.463	22.878	0.116
027	0.150	0.370	0.464	23.811	0.051
028	0.150	0.370	0.458	19.737	0.578
029	0.150	0.370	0.464	23.811	0.051
030	0.150	0.370	0.458	19.855	0.562
031	0.150	0.370	0.464	23.811	0.051
032	0.150	0.370	0.459	20.837	0.435
033	0.150	0.370	0.464	23.811	0.051
034	0.150	0.370	0.458	20.040	0.538
035	0.150	0.370	0.464	23.811	0.051
036	0.150	0.370	0.456	18.576	0.728
037	0.150	0.370	0.464	23.811	0.051

Basin No.	Initial Moisture Content		Saturated Content	Suction (IN)	Conductivity (IN/HR)
	TS Hermine	June 2007			
038	0.150	0.370	0.456	18.283	0.765
039	0.150	0.370	0.463	23.482	0.094
040	0.150	0.370	0.454	17.444	0.874
041	0.150	0.370	0.464	23.811	0.051
042	0.150	0.370	0.458	19.946	0.551
043	0.150	0.370	0.464	23.800	0.053
044	0.150	0.370	0.463	23.289	0.074
045	0.150	0.370	0.463	23.519	0.086
046	0.150	0.370	0.463	23.044	0.150
047	0.150	0.370	0.464	23.699	0.066
048	0.150	0.370	0.463	23.244	0.124
049	0.150	0.370	0.464	23.775	0.056
050	0.150	0.370	0.462	22.382	0.236
051	0.150	0.370	0.459	20.851	0.434
052	0.150	0.370	0.462	22.531	0.217
053	0.150	0.370	0.464	23.811	0.051
054	0.150	0.370	0.455	18.147	0.783
055	0.150	0.370	0.464	23.811	0.051
056	0.150	0.370	0.463	22.974	0.159
057	0.150	0.370	0.460	21.432	0.359
058	0.150	0.370	0.461	21.828	0.307
059	0.150	0.370	0.464	23.811	0.051
060	0.150	0.370	0.463	23.557	0.084
061	0.150	0.370	0.464	23.811	0.051
062	0.150	0.370	0.461	21.755	0.317
063	0.150	0.370	0.460	20.893	0.428
064	0.150	0.370	0.464	23.811	0.051
065	0.150	0.370	0.464	23.811	0.051
066	0.150	0.370	0.463	23.338	0.112
067	0.150	0.370	0.457	19.269	0.638
068	0.150	0.370	0.463	22.955	0.162
069	0.150	0.370	0.464	23.811	0.051
070	0.150	0.370	0.464	23.693	0.066
071	0.150	0.370	0.454	16.814	0.955
072	0.150	0.370	0.464	23.811	0.051
073	0.150	0.370	0.463	23.148	0.137
074	0.150	0.370	0.454	17.102	0.918
075	0.150	0.370	0.462	22.541	0.215
076	0.150	0.370	0.461	21.944	0.292
077	0.150	0.370	0.455	17.784	0.830

Basin No.	Initial Moisture Content		Saturated Content	Suction (IN)	Conductivity (IN/HR)
	TS Hermine	June 2007			
078	0.150	0.370	0.461	21.996	0.286
079	0.150	0.370	0.461	22.024	0.282
080	0.150	0.370	0.456	18.741	0.706
081	0.150	0.370	0.462	22.888	0.170
082	0.150	0.370	0.457	19.176	0.650
083	0.150	0.370	0.463	23.100	0.143
084	0.150	0.370	0.461	21.850	0.305
085	0.150	0.370	0.462	22.768	0.186
086	0.150	0.370	0.461	21.776	0.314
087	0.150	0.370	0.462	22.763	0.187
088	0.150	0.370	0.461	21.773	0.315
089	0.150	0.370	0.456	18.379	0.753
090	0.150	0.370	0.464	23.811	0.051
091	0.150	0.370	0.459	19.150	0.255
092	0.150	0.370	0.458	19.797	0.570
093	0.150	0.370	0.464	23.811	0.051
094	0.150	0.370	0.464	23.811	0.051

Table A-47 South Fork San Gabriel Hydrologic Calibration – TS Hermine Summary

Hydrograph Peak 1	
Observed (cfs)	24,500
Computed (cfs)	25,224
Difference (cfs)	724
Difference (%)	2.9%
Hydrograph Peak 2	
Observed (cfs)	4,480
Computed (cfs)	8,760
Difference (cfs)	4280
Difference (%)	64.7%
Storm Volume	
Observed (ac-ft)	216.40
Computed (ac-ft)	224.33
Difference (ac-ft)	7.94
Difference (%)	3.6%
Hydrograph Peak 1 Volume	
Observed (ac-ft)	187.96
Computed (ac-ft)	178.76
Difference (ac-ft)	-9.20
Difference (%)	-5.0%

Table A-48 South Fork San Gabriel Hydrologic Calibration – June 2007 Event Summary

Hydrograph Peak	
Observed (cfs)	57,500
Computed (cfs)	57,314
Difference (cfs)	-186
Difference (%)	-0.3%
Storm Volume	
Observed (ac-ft)	646.55
Computed (ac-ft)	450.56
Difference (ac-ft)	-195.99
Difference (%)	-35.7%

Table A-49 Estimation of Green-Ampt Infiltration Parameters (www.water-research.net/Waterlibrary/Stormwater/greenamp.pdf)

USDA Soil Texture Classification	SUCT Avg. Capillary Suction		HYDCON Saturated Hydraulic Conductivity		SMDMAX Initial Moisture Deficit for Soil (Vol. of Air / Vol. of Voids, expressed as a fraction)	
	(in)	(mm)	(in/hr)	(mm/hr)	Moist Soil Climates (Eastern US)	Dry Soil Climates (Western US)
Sand	**1.95**	**49.5**	**9.27**	**235.6**	**.346**	**.404**
Loamy Sand	**2.41**	**61.3**	**2.35**	**59.8**	**.312**	**.382**
Sandy Loam	**4.33**	**110.1**	**0.86**	**21.8**	**.246**	**.358**
Loam	**3.50**	**88.9**	**0.52**	**13.2**	**.193**	**.346**
Silt Loam	**6.57**	**166.8**	**0.27**	**6.8**	**.171**	**.368**
Sandy Clay Loam	**8.60**	**218.5**	**0.12**	**3.0**	**.143**	**.250**
Clay Loam	**8.22**	**208.8**	**0.08**	**2.0**	**.146**	**.267**
Silty Clay Loam	**10.75**	**273.0**	**0.08**	**2.0**	**.105**	**.263**
Sandy Clay	**9.41**	**239.0**	**0.05**	**1.2**	**.091**	**.191**
Silty Clay	**11.50**	**292.2**	**0.04**	**1.0**	**.092**	**.229**
Clay	**12.45**	**316.3**	**0.02**	**0.6**	**.079**	**.203**

Notes:

1. These values are provisional, and are offered as reasonable parameters estimates for SWMM applications where more detailed soils information is not available. There is significant variance in these values; laboratory and field testing, sensitivity analysis, and calibration may be employed to improve upon these estimates.
2. Typically use USDA SCS (now NRCS) Soil Survey to determine Soil Texture. In these surveys, Saturated Hydraulic Conductivity is reported as Permeability . Use the values reported in the soil survey for permeability for **HYDCON**, rather than the **HYDCON** values listed in the table above. In the absence of a soil survey or more reliable information, the values listed above may be used.
3. Synthesized from *Handbook of Hydrology*, D.R. Maidment, Editor in Chief, McGraw-Hill, Inc., 1993, pp 5.1-5.39.

FIGURES

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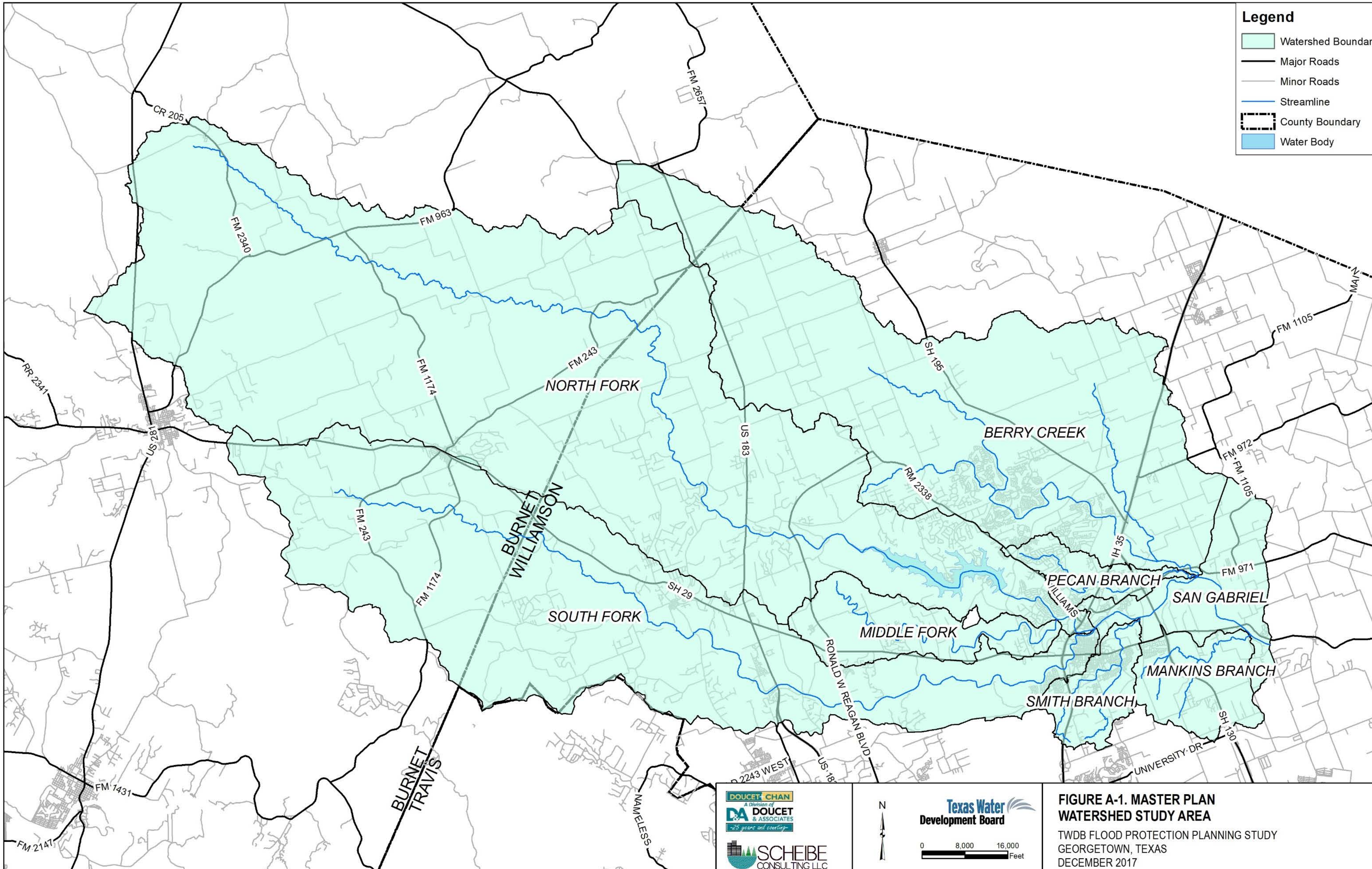


FIGURE A-1. MASTER PLAN WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

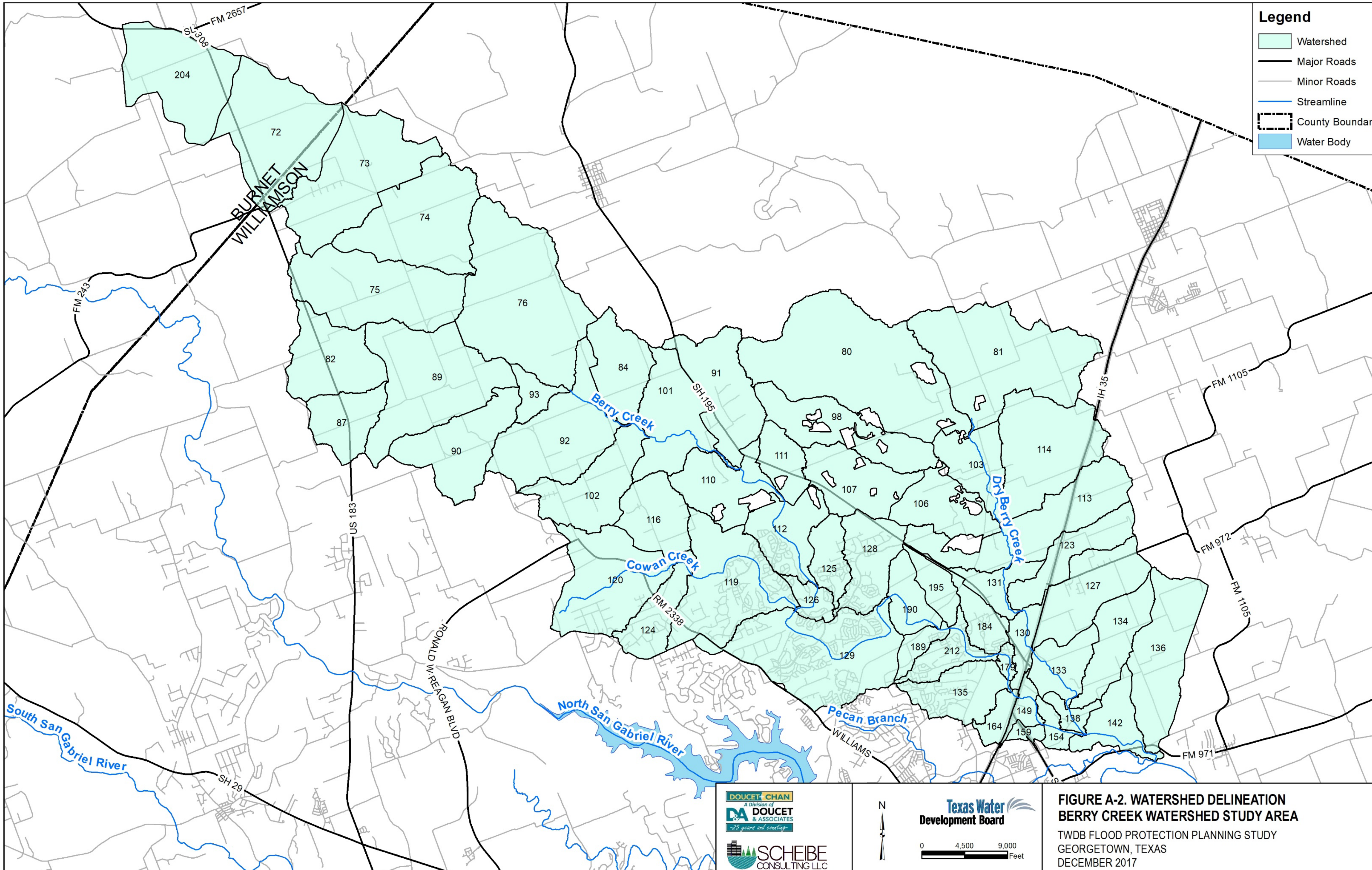


FIGURE A-2. WATERSHED DELINEATION
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

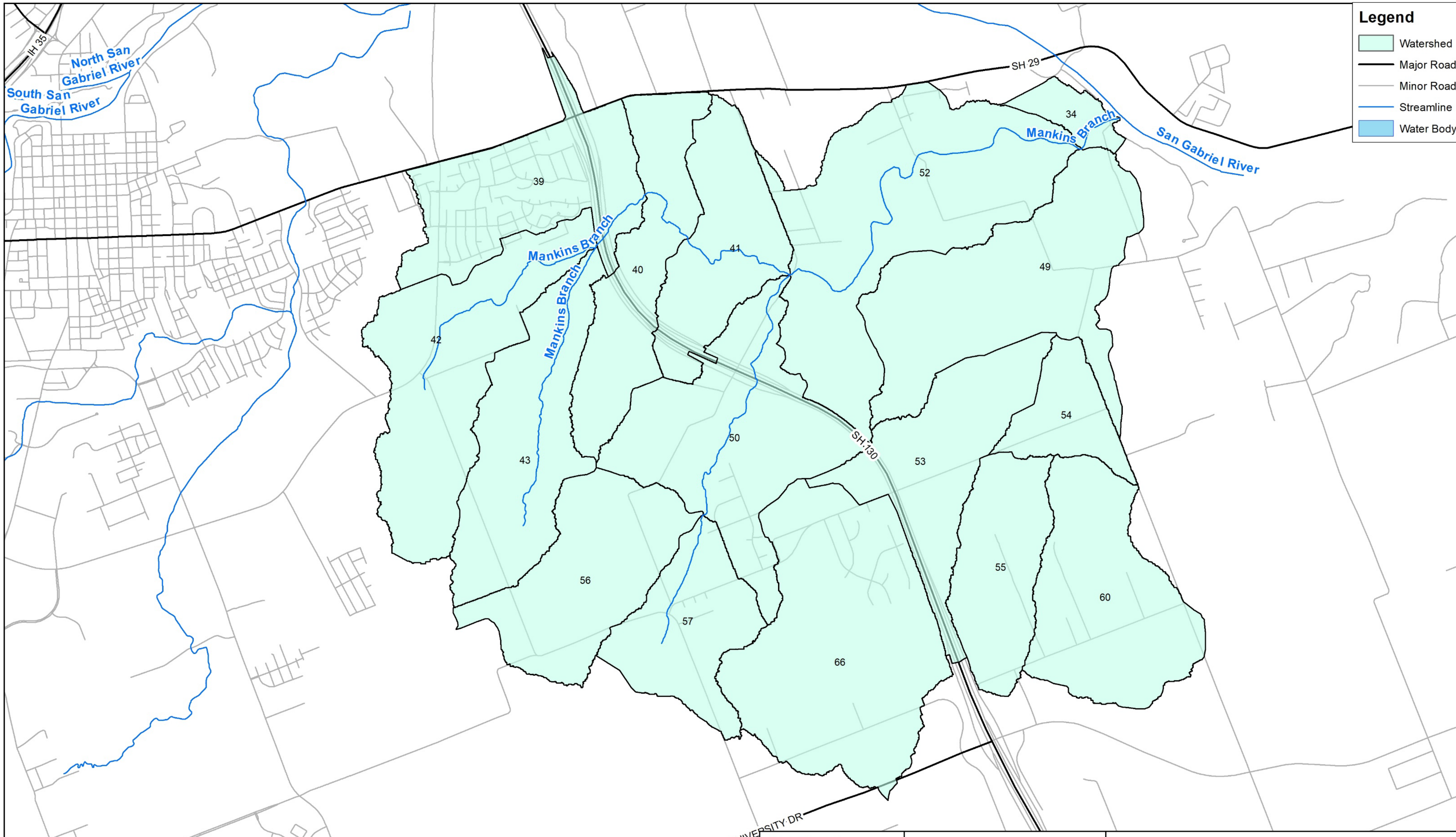
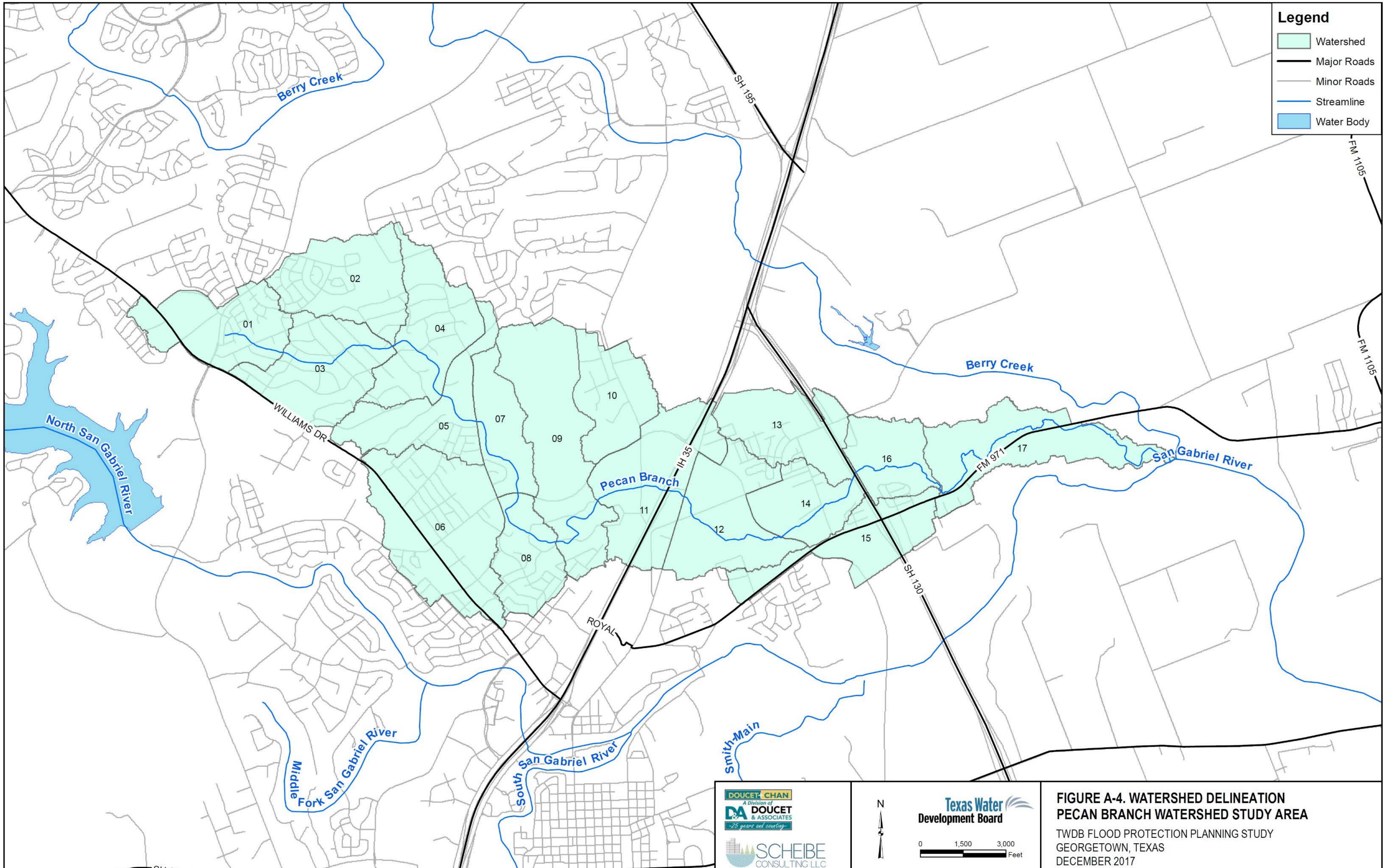
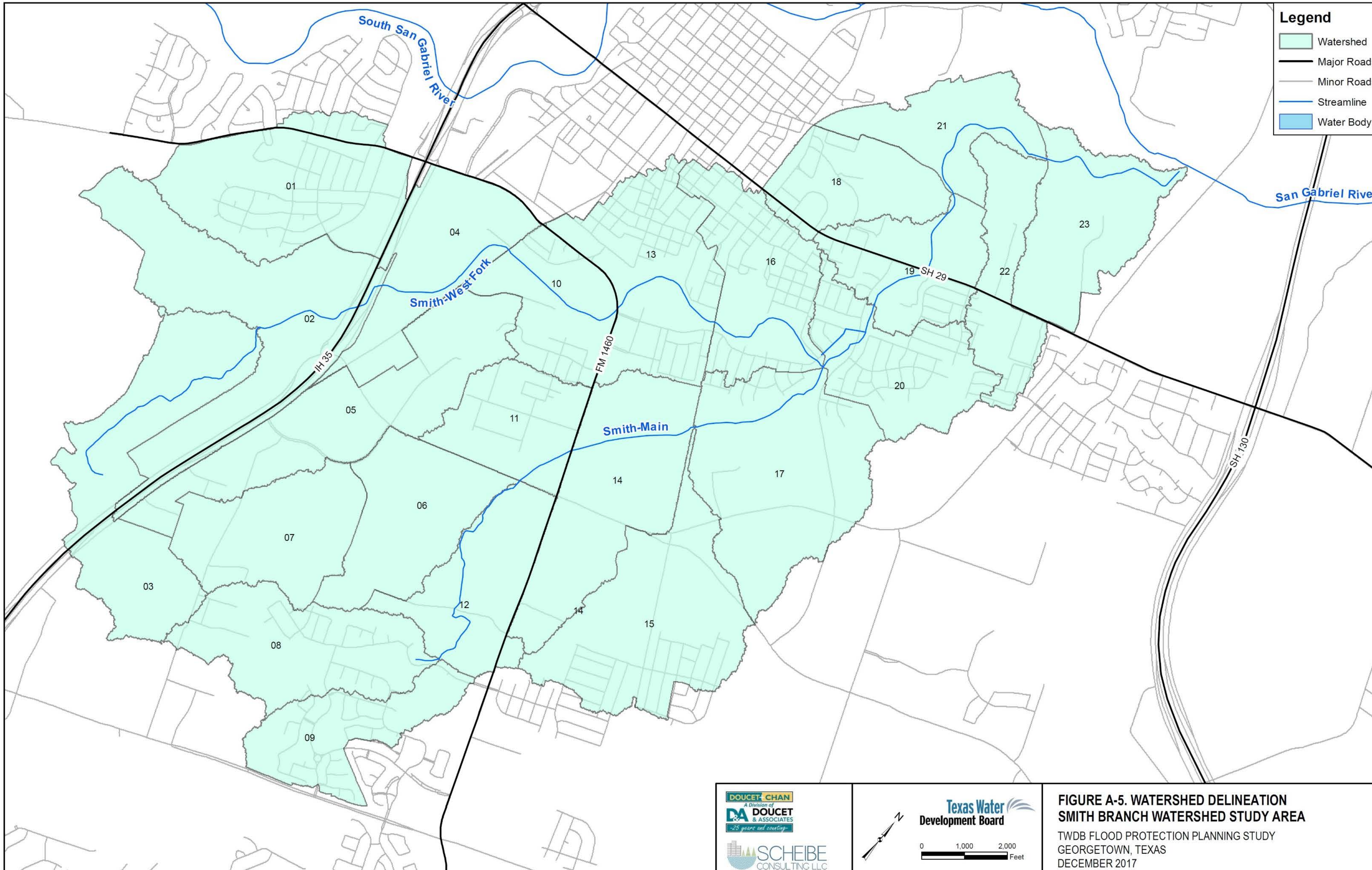


FIGURE A-3. WATERSHED DELINEATION
MANKINS BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Berry Creek
SH 195
FM 1105
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
North San Gabriel River
WILLIAMS DR
IH 35
Pecan Branch
SH 130
FM 971
San Gabriel River
ROYAL
Middle Fork San Gabriel River
South San Gabriel River
Smith-Main
SH 29
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
1,500
3,000
Feet
FIGURE A-4. WATERSHED DELINEATION
PECAN BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
South San Gabriel River
San Gabriel River
Smith-West Fork
Smith-Main
IH 35
FM 1460
SH 29
SH 130
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
25 years and counting
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
1,000
2,000
Feet
FIGURE A-5. WATERSHED DELINEATION
SMITH BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

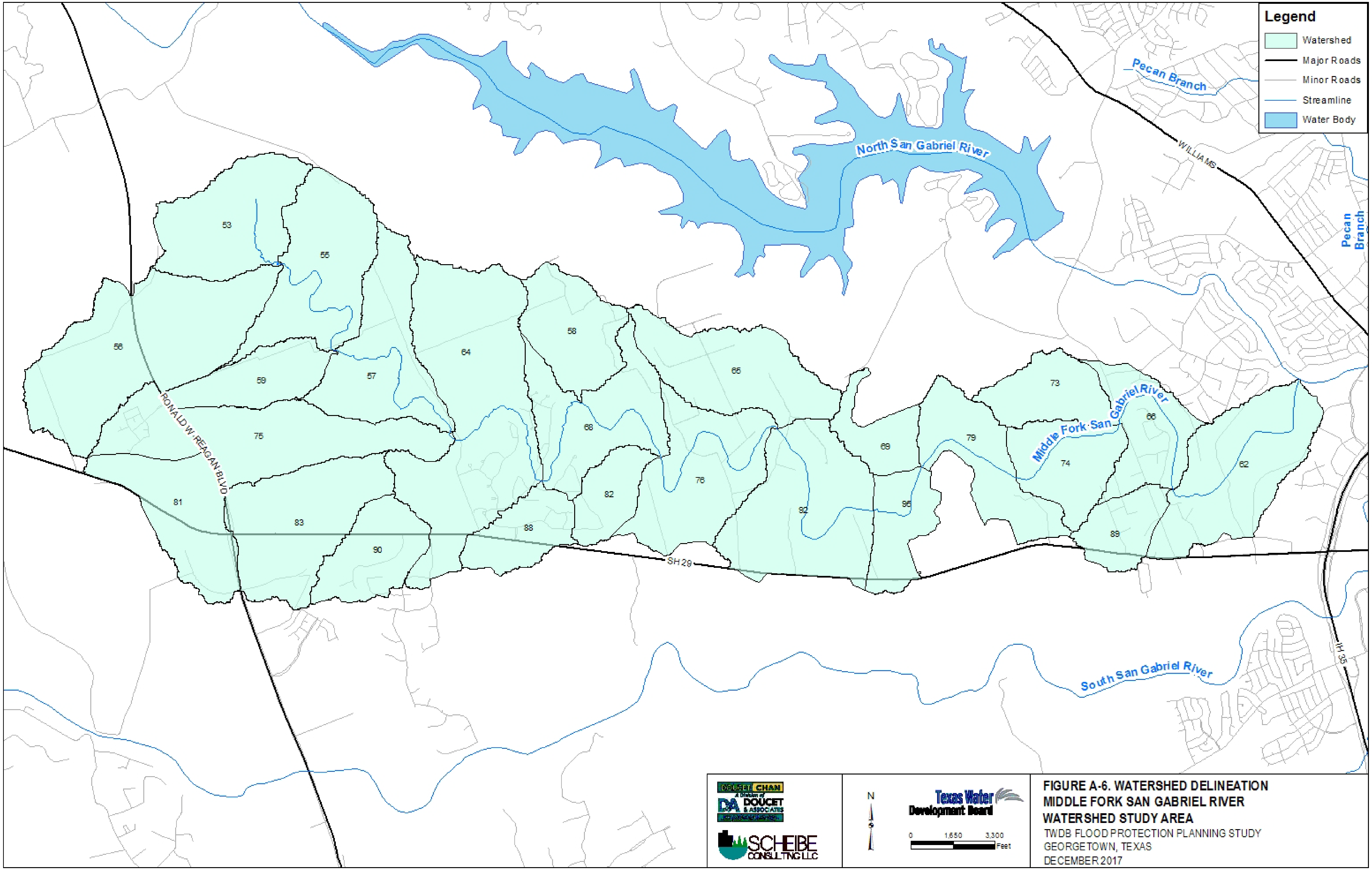
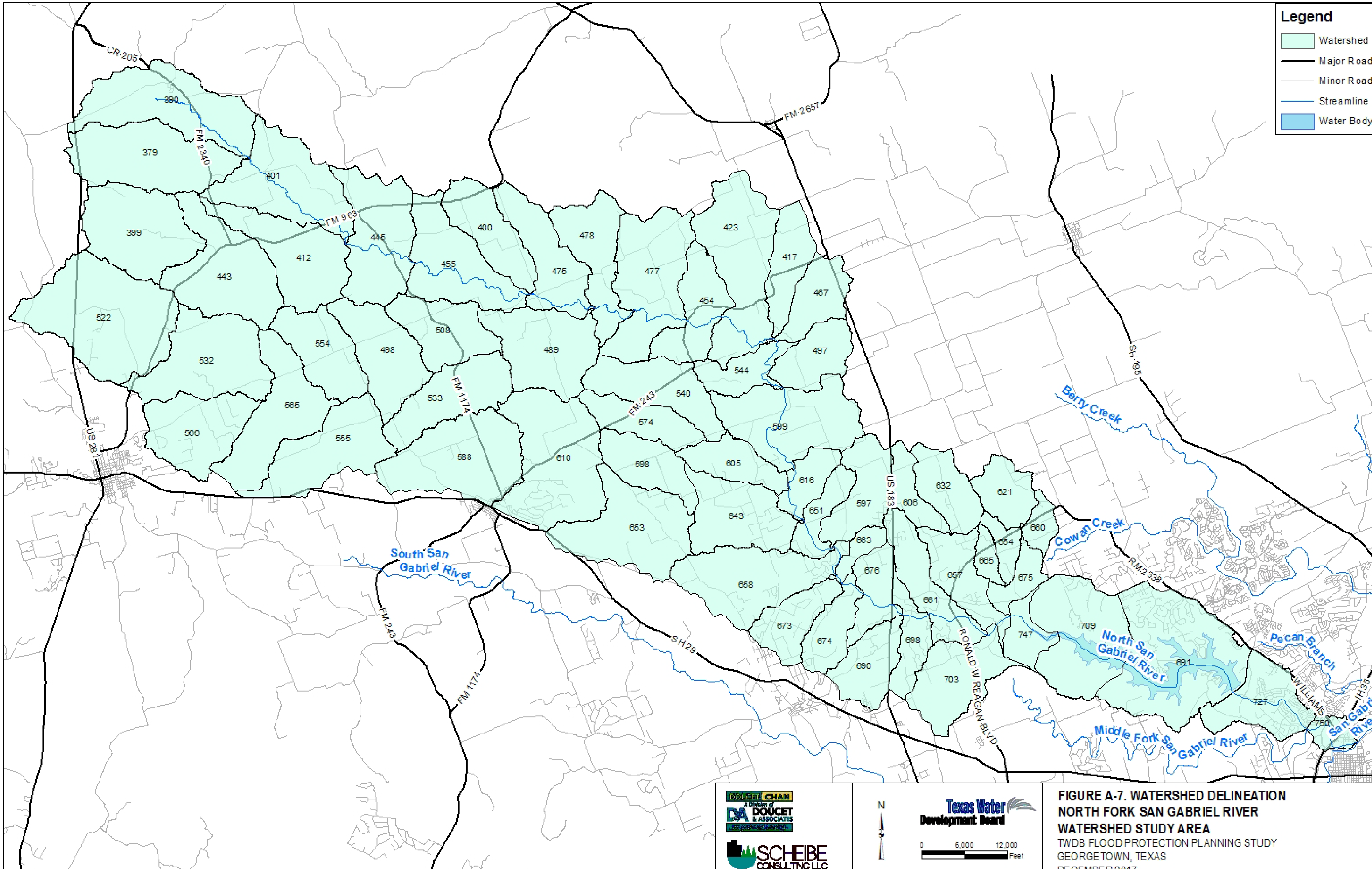
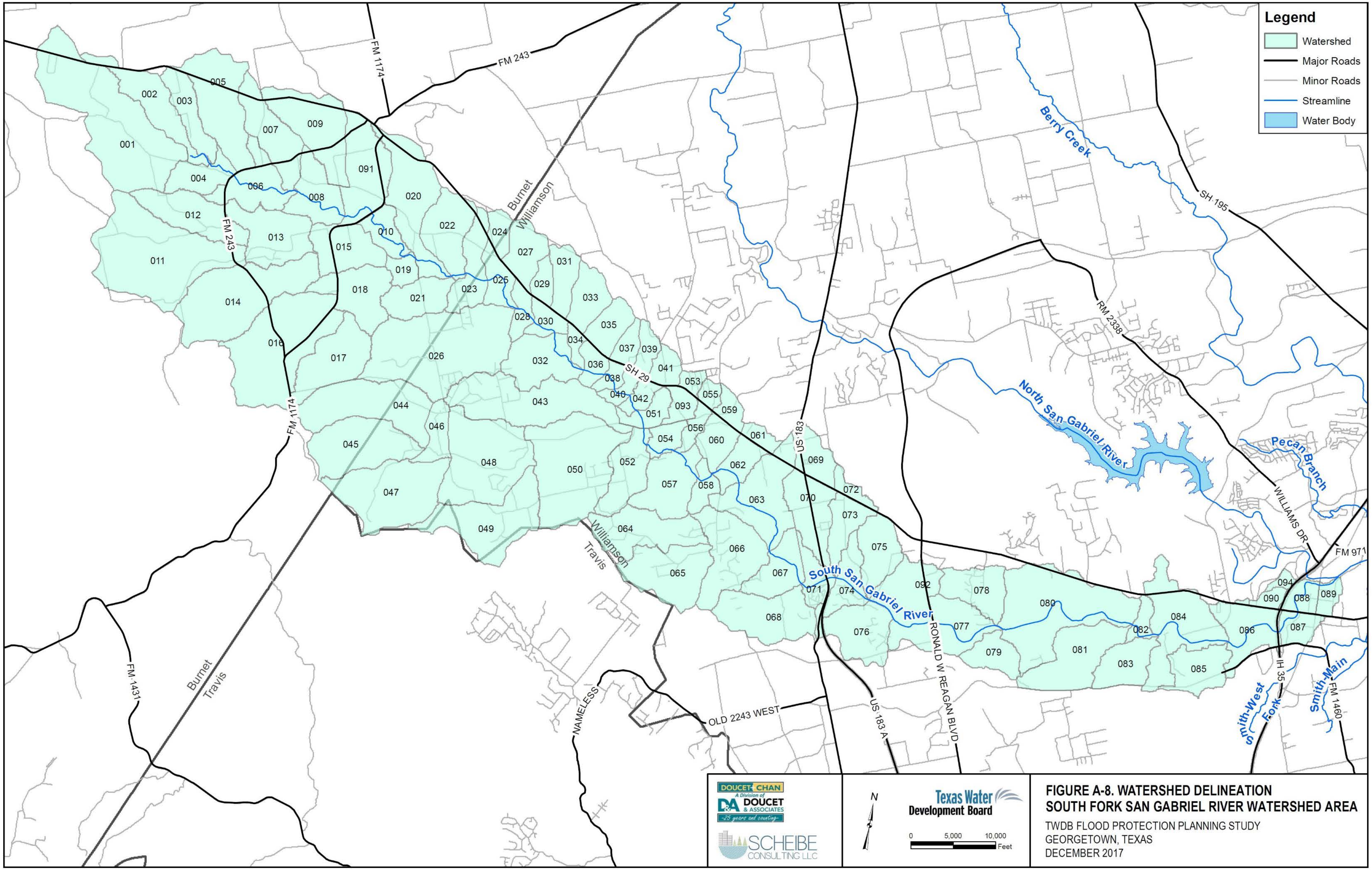


FIGURE A-6. WATERSHED DELINEATION
MIDDLE FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
FIGURE A-7. WATERSHED DELINEATION
NORTH FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
South San Gabriel River
North San Gabriel River
Middle Fork San Gabriel River
San Gabriel River
Berry Creek
Cowan Creek
Pecan Branch
0 6,000 12,000 Feet


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
FIGURE A-8. WATERSHED DELINEATION
SOUTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
Texas Water Development Board
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
25 years and counting
SCHEIBE CONSULTING LLC
N
0
5,000
10,000
Feet
South San Gabriel River
North San Gabriel River
Berry Creek
Pecan Branch
Smith-West Fork
Smith-Main
FM 243
FM 1174
SH 29
US 183
US 183 A
RONALD W REAGAN BLVD
RM 2338
SH 195
WILLIAMS DR
FM 971
IH 35
FM 1460
FM 1431
OLD 2243 WEST
NAMELESS
Burnet
Williamson
Travis

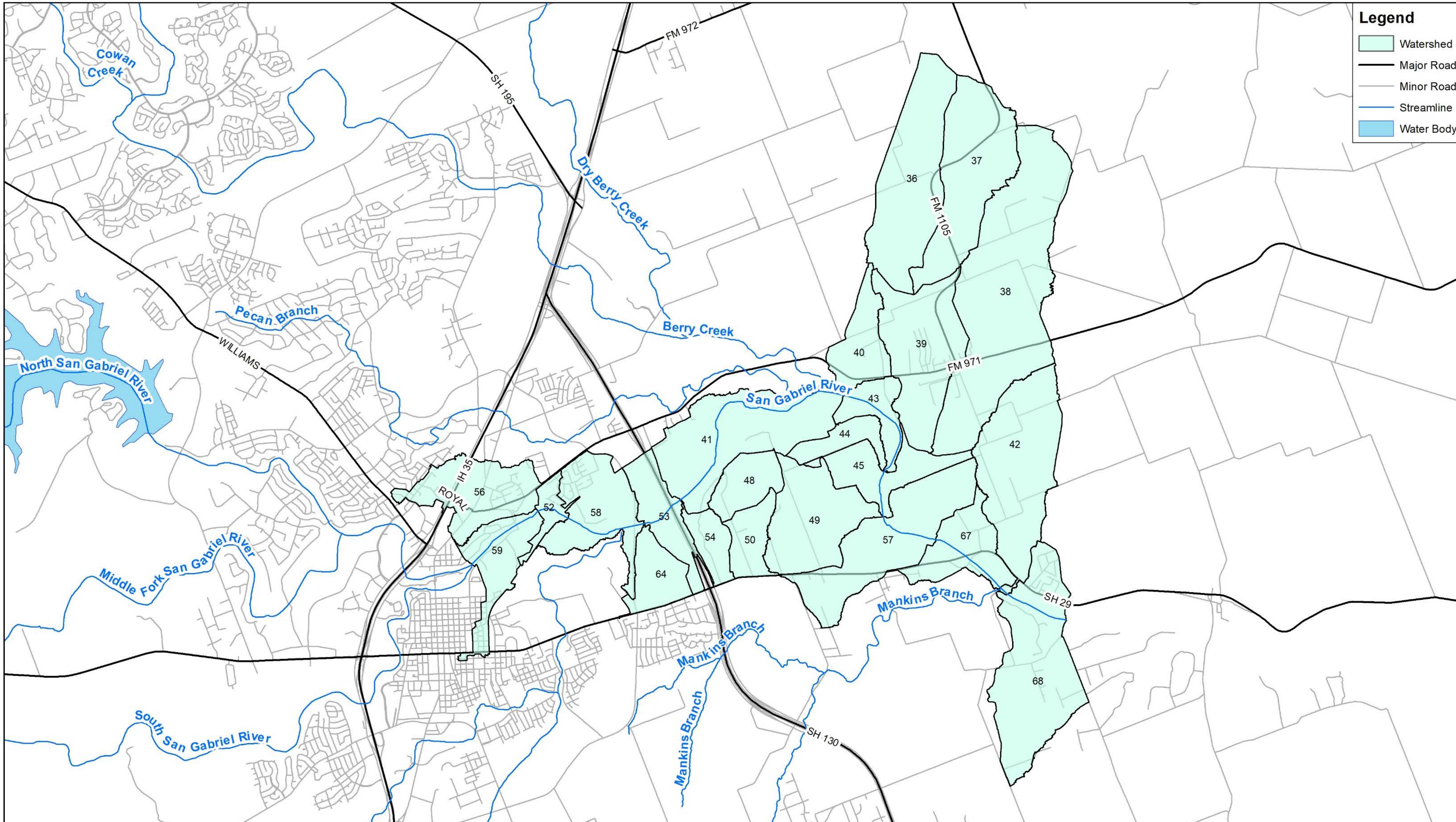


FIGURE A-9. WATERSHED DELINEATION
SAN GARIEL RIVER WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

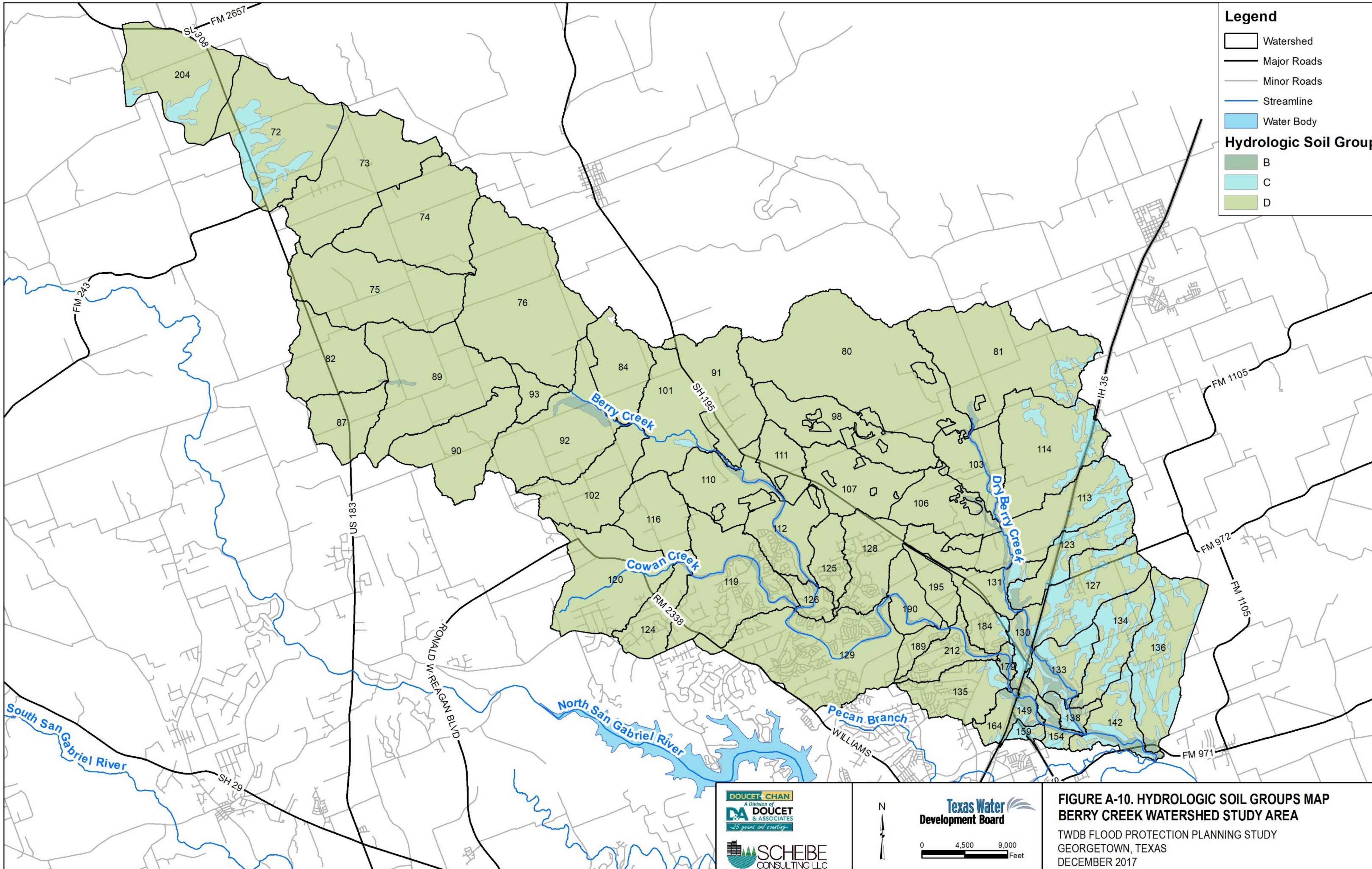
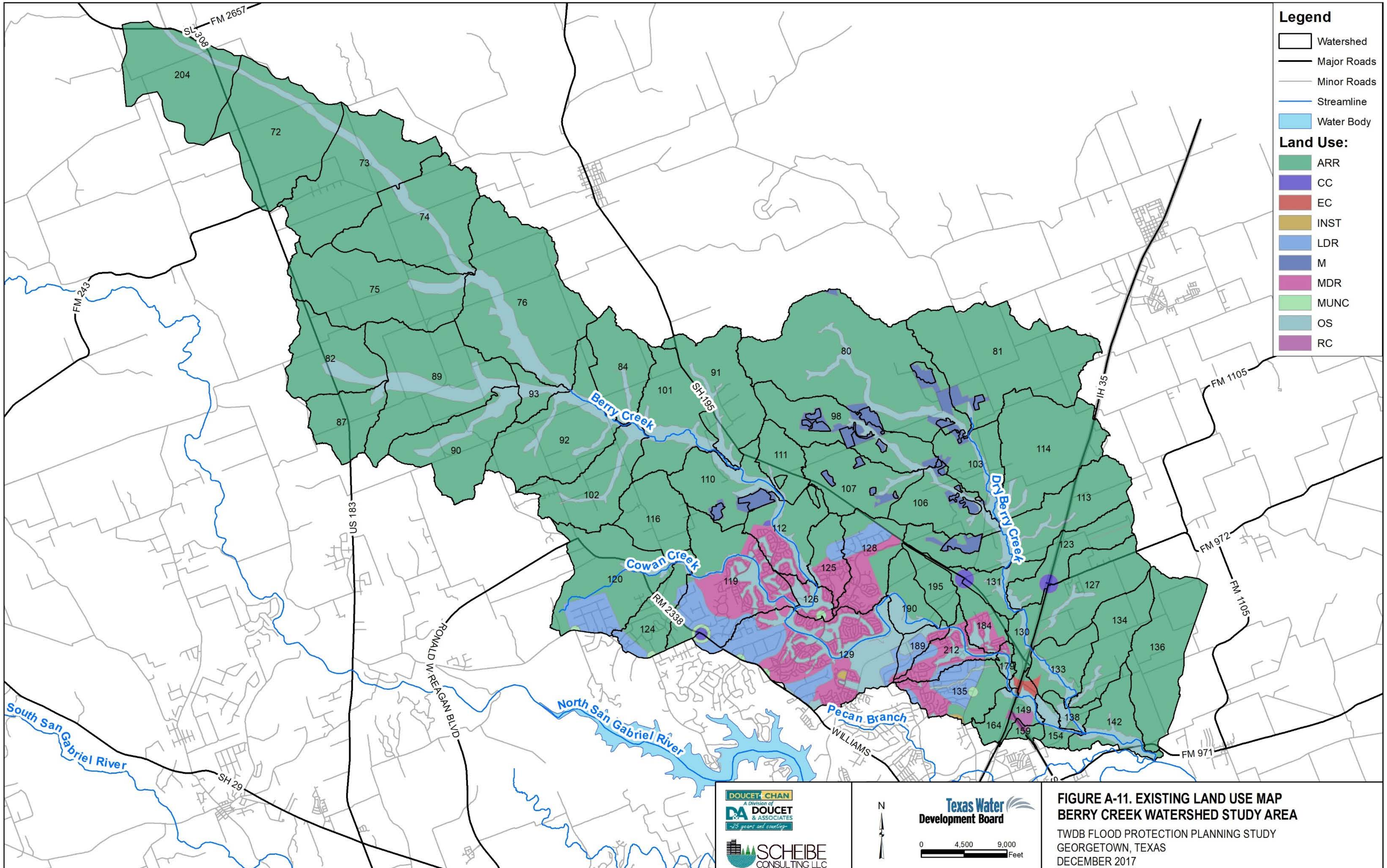
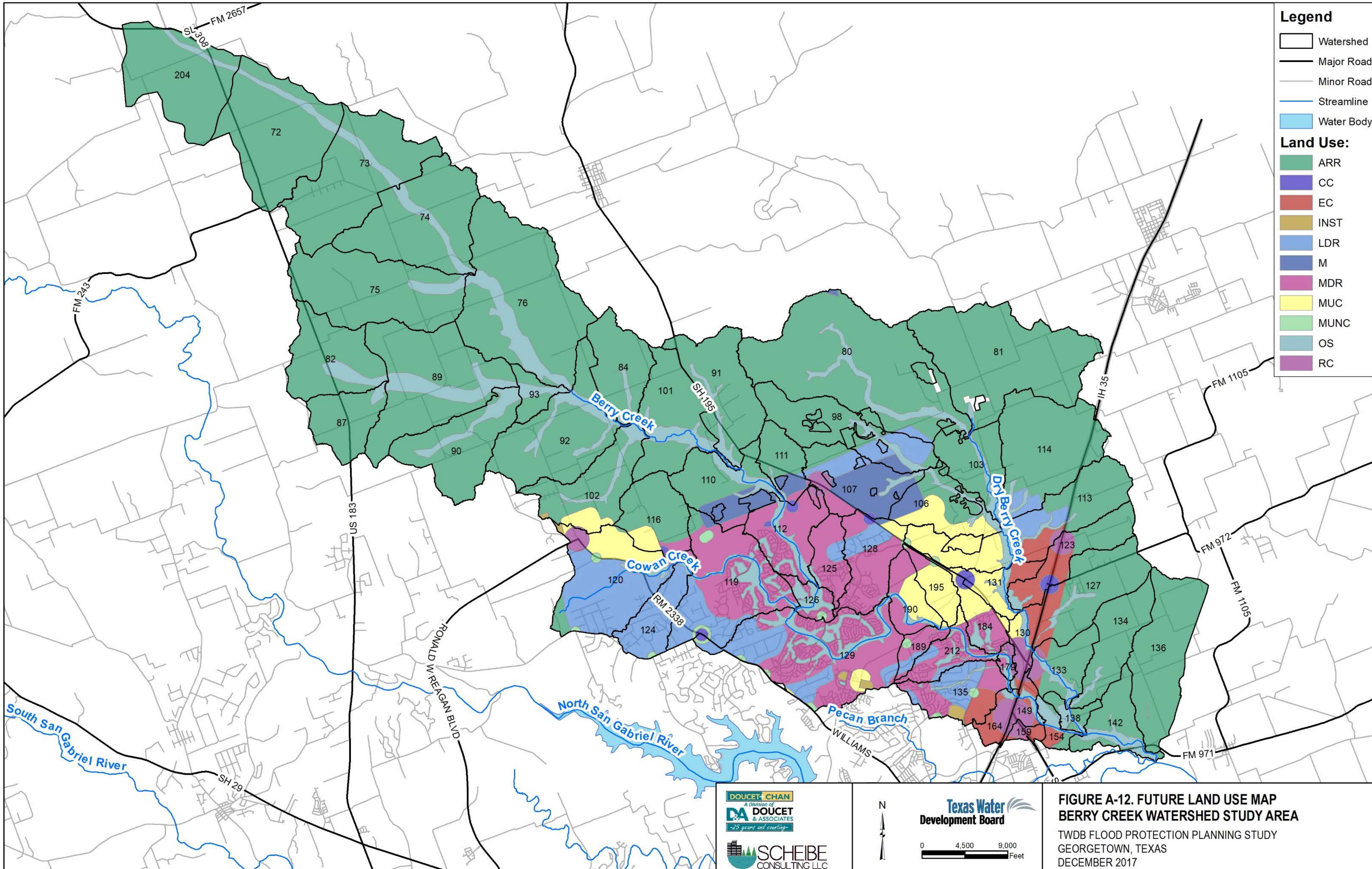
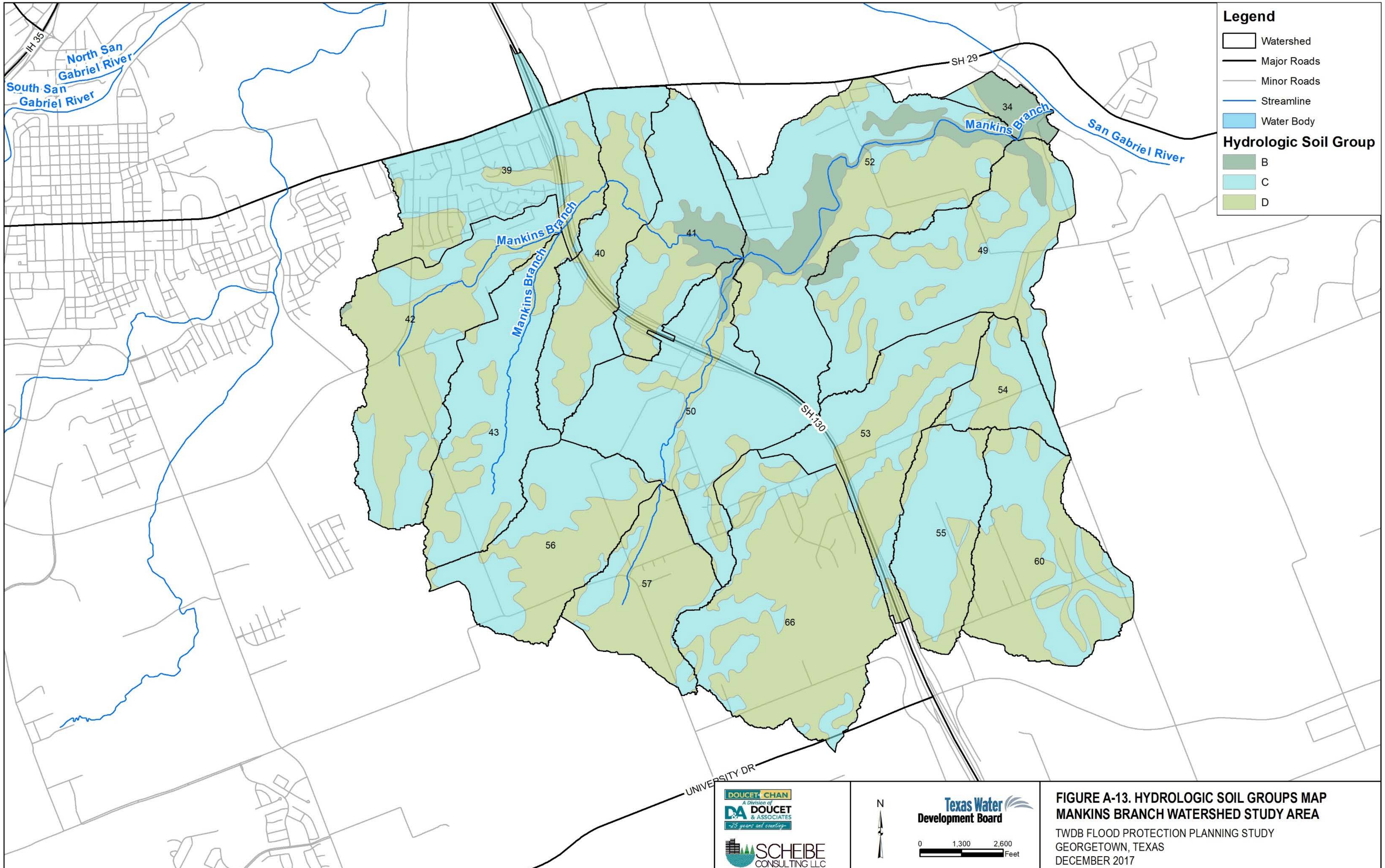


FIGURE A-10. HYDROLOGIC SOIL GROUPS MAP
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Land Use:
ARR
CC
EC
INST
LDR
M
MDR
MUNC
OS
RC
Berry Creek
Dry Berry Creek
Cowan Creek
Pecan Branch
North San Gabriel River
South San Gabriel River
FM 2657
SL 308
FM 243
US 183
SH 195
RM 2338
RONALD W. REAGAN BLVD
SH 29
WILLIAMS
IH 35
FM 1105
FM 972
FM 971
DOUCET - CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0 4,500 9,000 Feet
FIGURE A-11. EXISTING LAND USE MAP
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Land Use:
ARR
CC
EC
INST
LDR
M
MDR
MUC
MUNC
OS
RC
Berry Creek
Dry Berry Creek
Cowan Creek
Pecan Branch
North San Gabriel River
South San Gabriel River
FM 2657
SL 308
FM 243
US 183
SH 195
RM 2338
RONALD W. REAGAN BLVD
SH 29
WILLIAMS
IH 35
FM 1105
FM 972
FM 971
DOUCET-CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0
4,500
9,000
Feet
FIGURE A-12. FUTURE LAND USE MAP
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Hydrologic Soil Group
B
C
D
IH 35
North San Gabriel River
South San Gabriel River
SH 29
San Gabriel River
Mankins Branch
SH 130
UNIVERSITY DR
39
40
41
42
43
49
50
52
53
54
55
56
57
60
66
34
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
1,300
2,600
Feet
FIGURE A-13. HYDROLOGIC SOIL GROUPS MAP
MANKINS BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

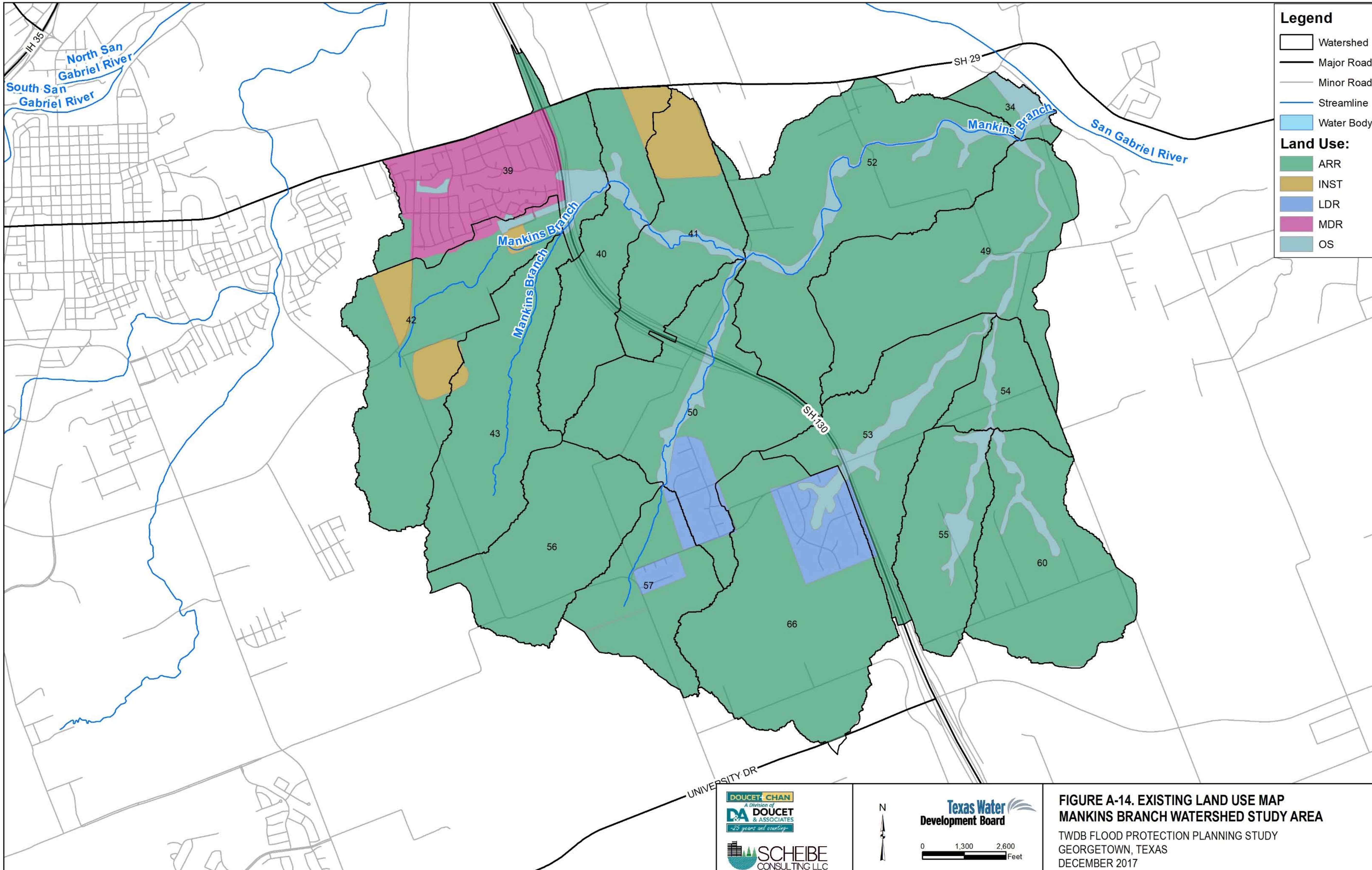


FIGURE A-14. EXISTING LAND USE MAP
MANKINS BRANCH WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

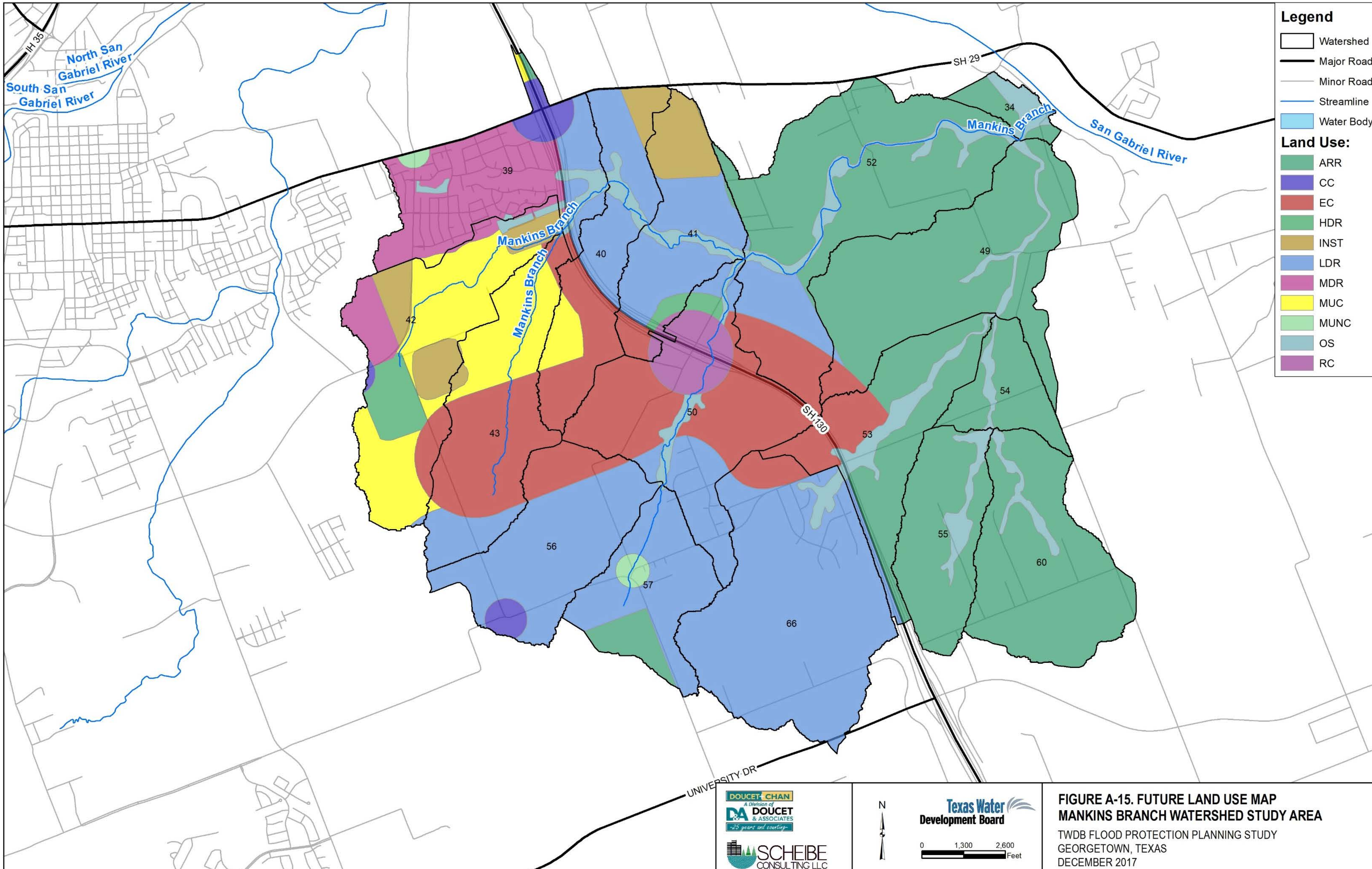


FIGURE A-15. FUTURE LAND USE MAP
MANKINS BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

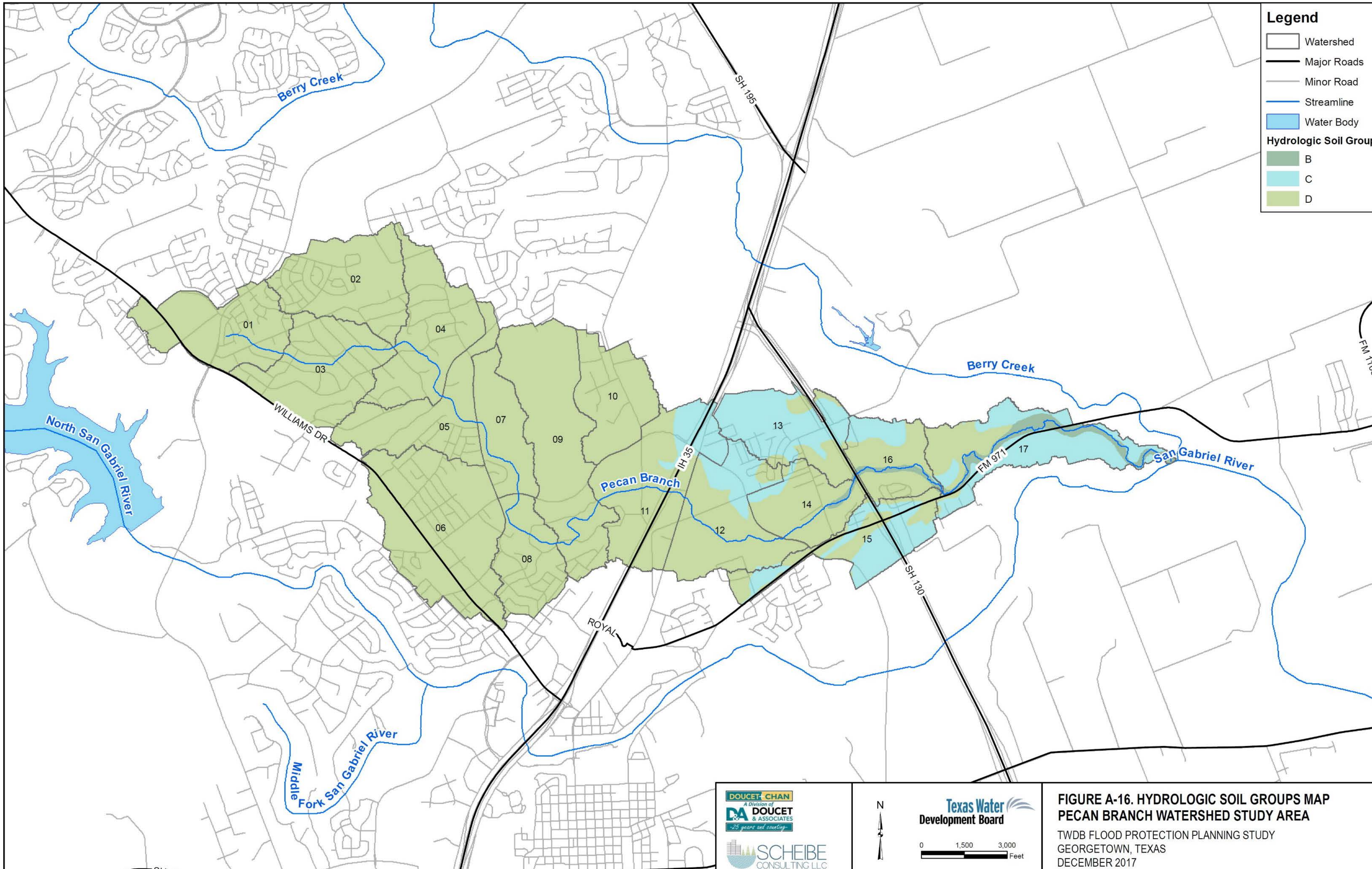
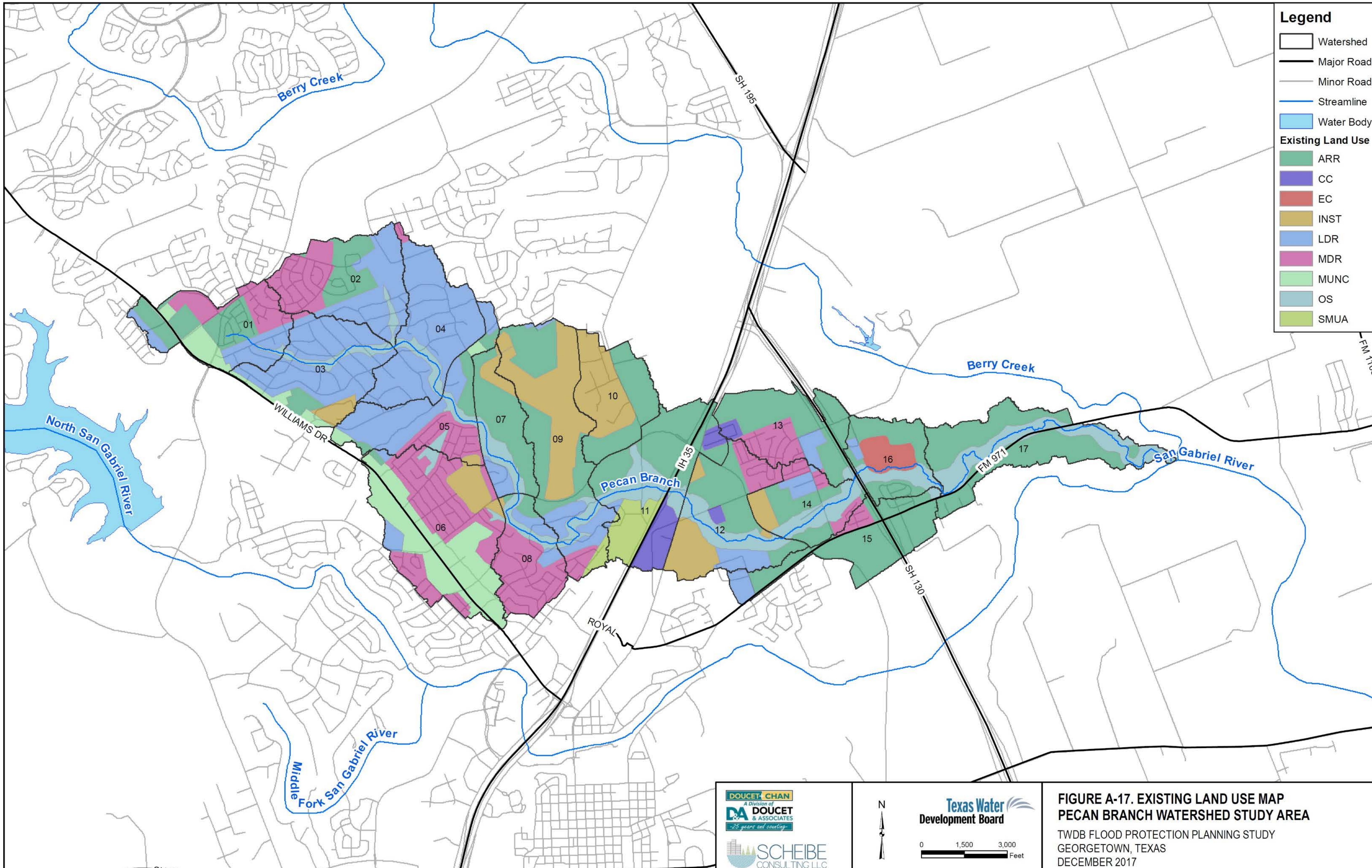
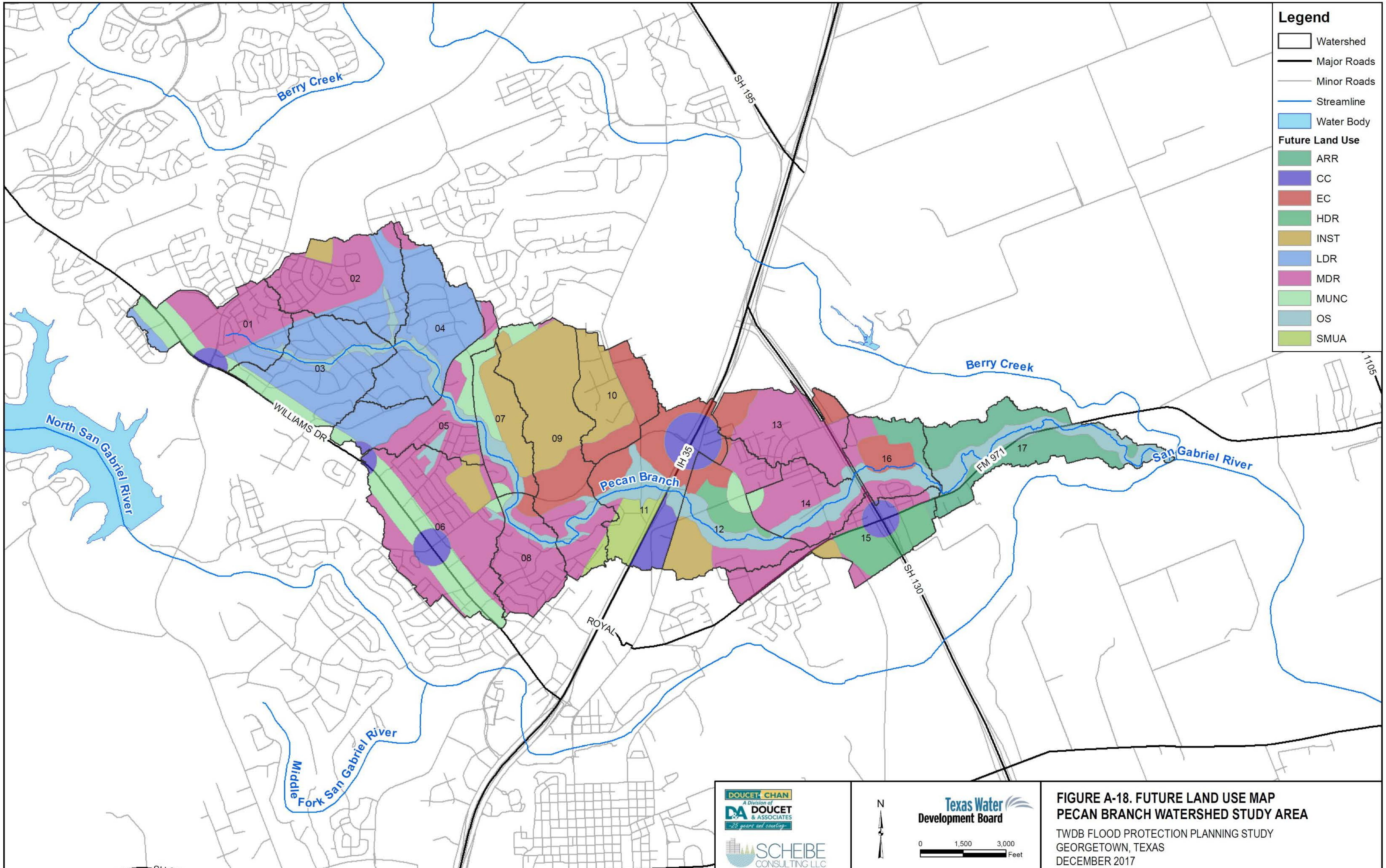
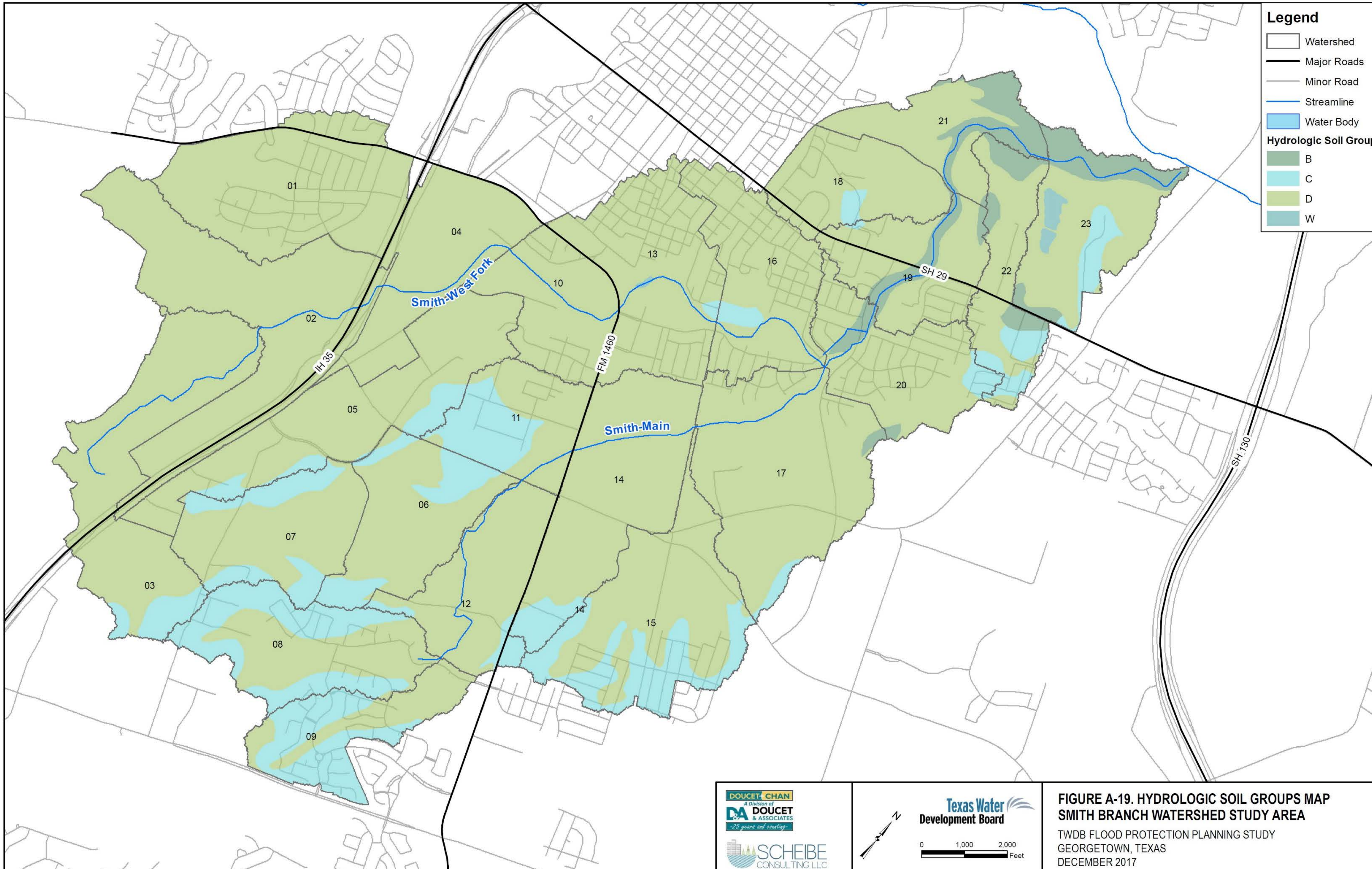
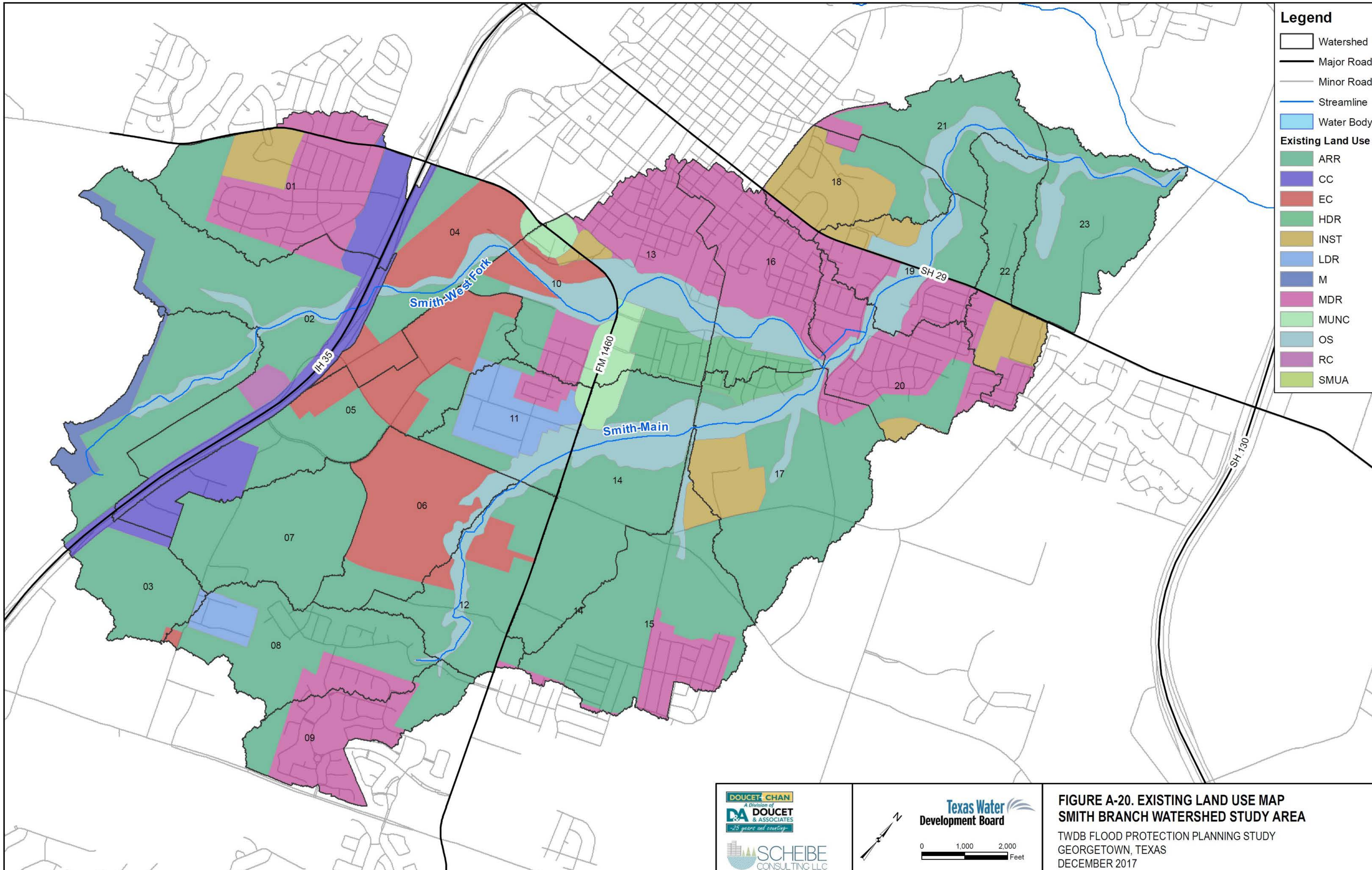


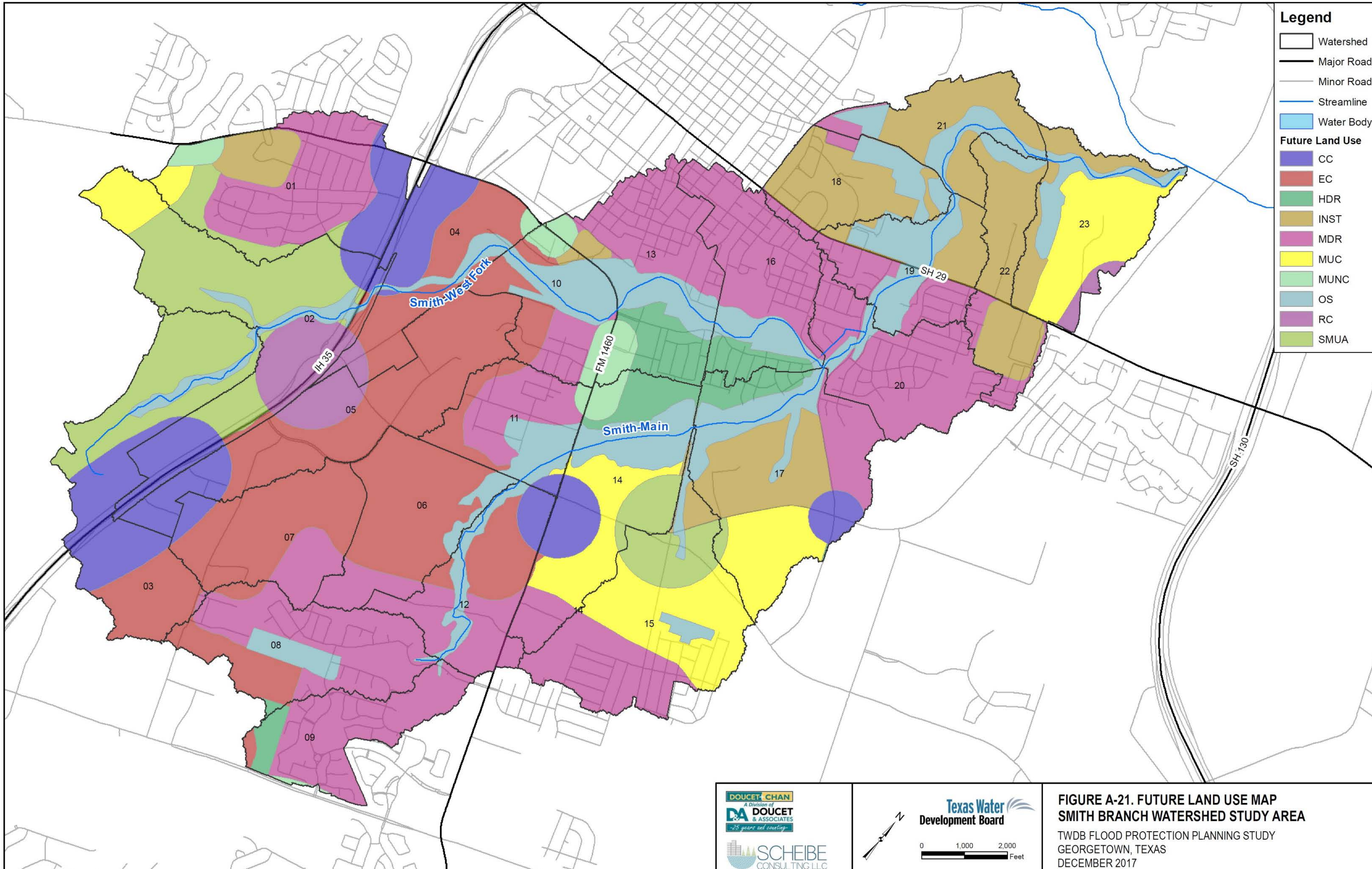
FIGURE A-16. HYDROLOGIC SOIL GROUPS MAP
PECAN BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

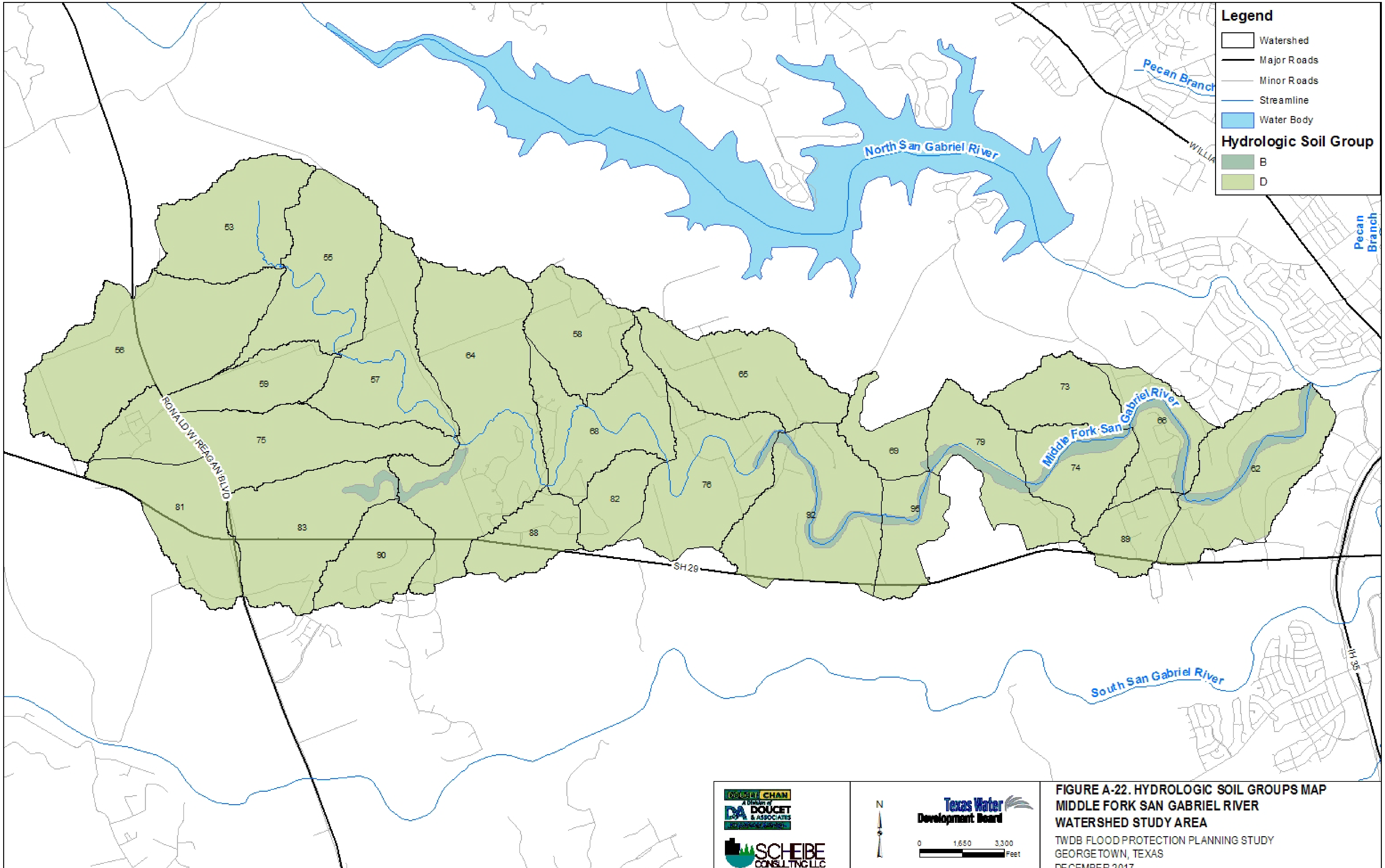

Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Existing Land Use
ARR
CC
EC
INST
LDR
MDR
MUNC
OS
SMUA
Berry Creek
San Gabriel River
North San Gabriel River
Middle Fork San Gabriel River
Pecan Branch
SH 195
IH 35
SH 130
FM 971
FM 1105
WILLIAMS DR
ROYAL
SH 29
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
1,500
3,000
Feet
FIGURE A-17. EXISTING LAND USE MAP
PECAN BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Future Land Use
ARR
CC
EC
HDR
INST
LDR
MDR
MUNC
OS
SMUA
Berry Creek
North San Gabriel River
San Gabriel River
Middle Fork San Gabriel River
Pecan Branch
SH 195
IH 35
SH 130
FM 971
WILLIAMS DR
ROYAL
SH 29
1105
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
DOUCET CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 1,500 3,000 Feet
FIGURE A-18. FUTURE LAND USE MAP
PECAN BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Road
Streamline
Water Body
Hydrologic Soil Group
B
C
D
W
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
Smith-West Fork
Smith-Main
IH 35
FM 1460
SH 29
SH 130
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 1,000 2,000 Feet
FIGURE A-19. HYDROLOGIC SOIL GROUPS MAP
SMITH BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Existing Land Use
ARR
CC
EC
HDR
INST
LDR
M
MDR
MUNC
OS
RC
SMUA
Smith-West Fork
Smith-Main
IH 35
FM 1460
SH 29
SH 130
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
~25 years and counting~
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
1,000
2,000
Feet
FIGURE A-20. EXISTING LAND USE MAP
SMITH BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Future Land Use
CC
EC
HDR
INST
MDR
MUC
MUNC
OS
RC
SMUA
Smith-West Fork
Smith-Main
IH 35
FM 1460
SH 29
SH 130
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
20
21
22
23
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
~25 years and counting~
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0
1,000
2,000
Feet
FIGURE A-21. FUTURE LAND USE MAP
SMITH BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Hydrologic Soil Group
B
D
North San Gabriel River
Pecan Branch
Middle Fork San Gabriel River
South San Gabriel River
RONALD W. REAGAN BLVD
SH 29
IH 35
53
55
56
59
57
64
58
65
75
68
81
83
90
88
82
76
92
95
69
79
73
74
66
62
89
Texas Water Development Board
DOUCET
SCHEIBE CONSULTING LLC
0 1,650 3,300 Feet
FIGURE A-22. HYDROLOGIC SOIL GROUPS MAP
MIDDLE FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

F

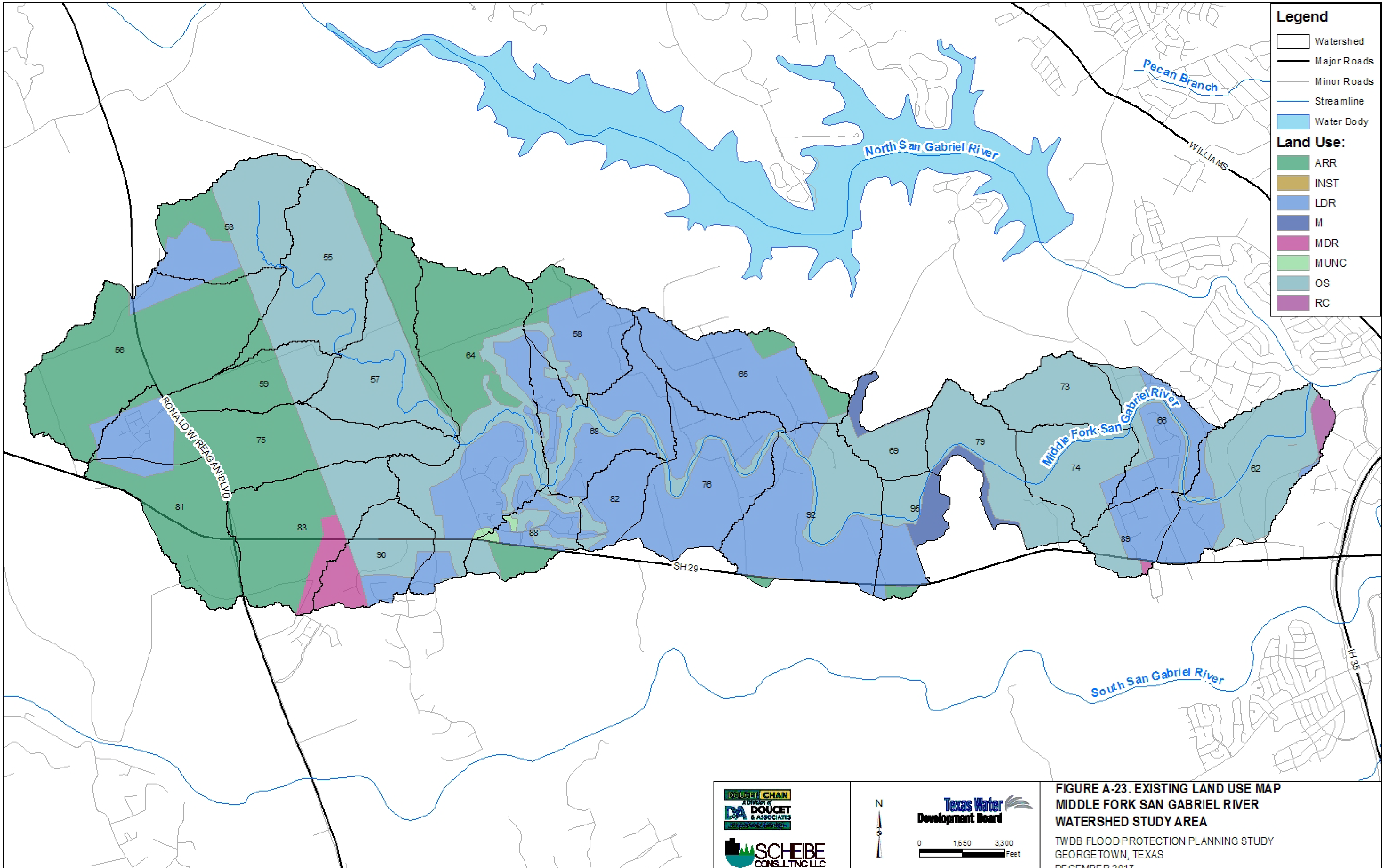


FIGURE A-23. EXISTING LAND USE MAP
MIDDLE FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

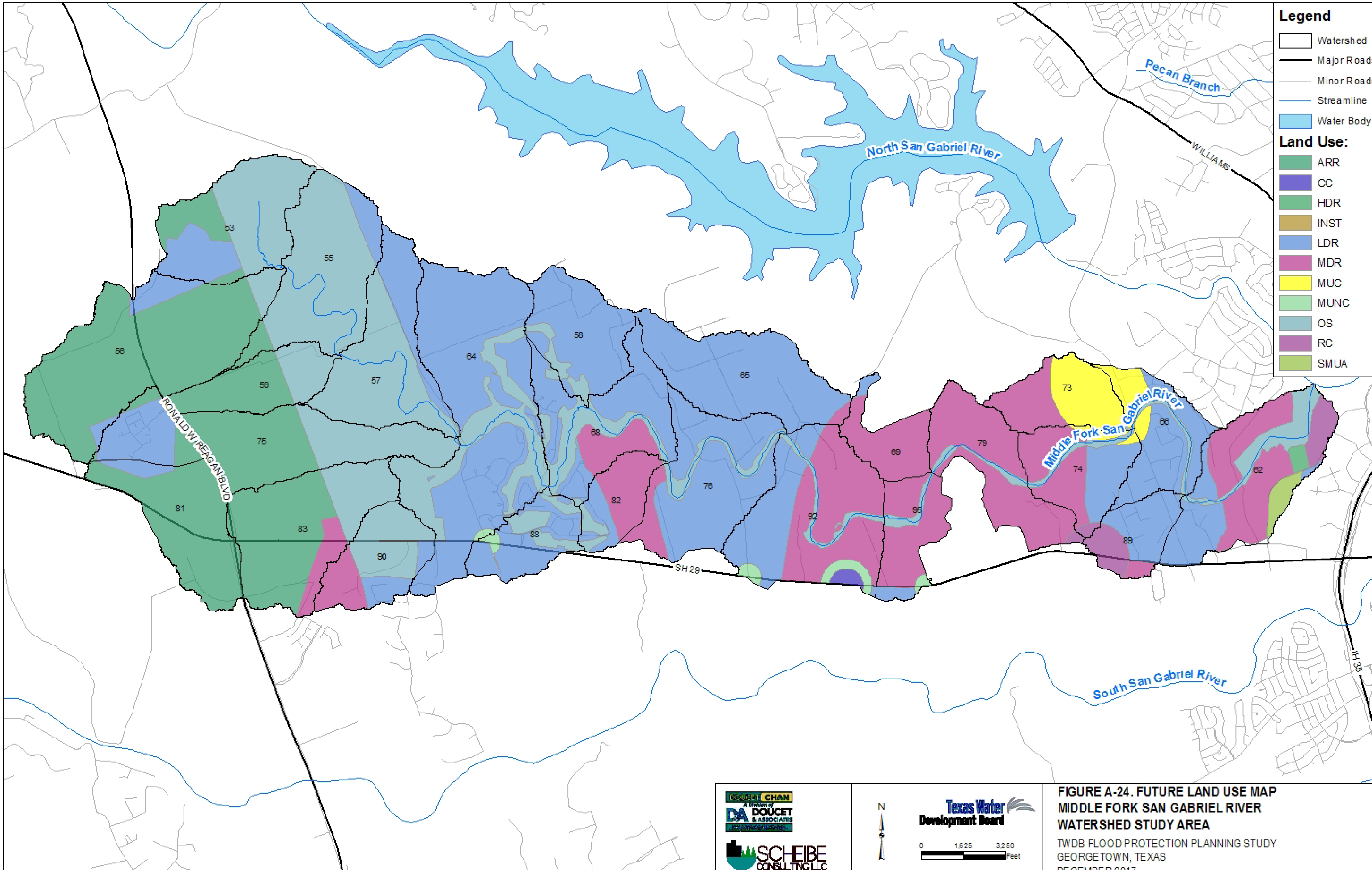
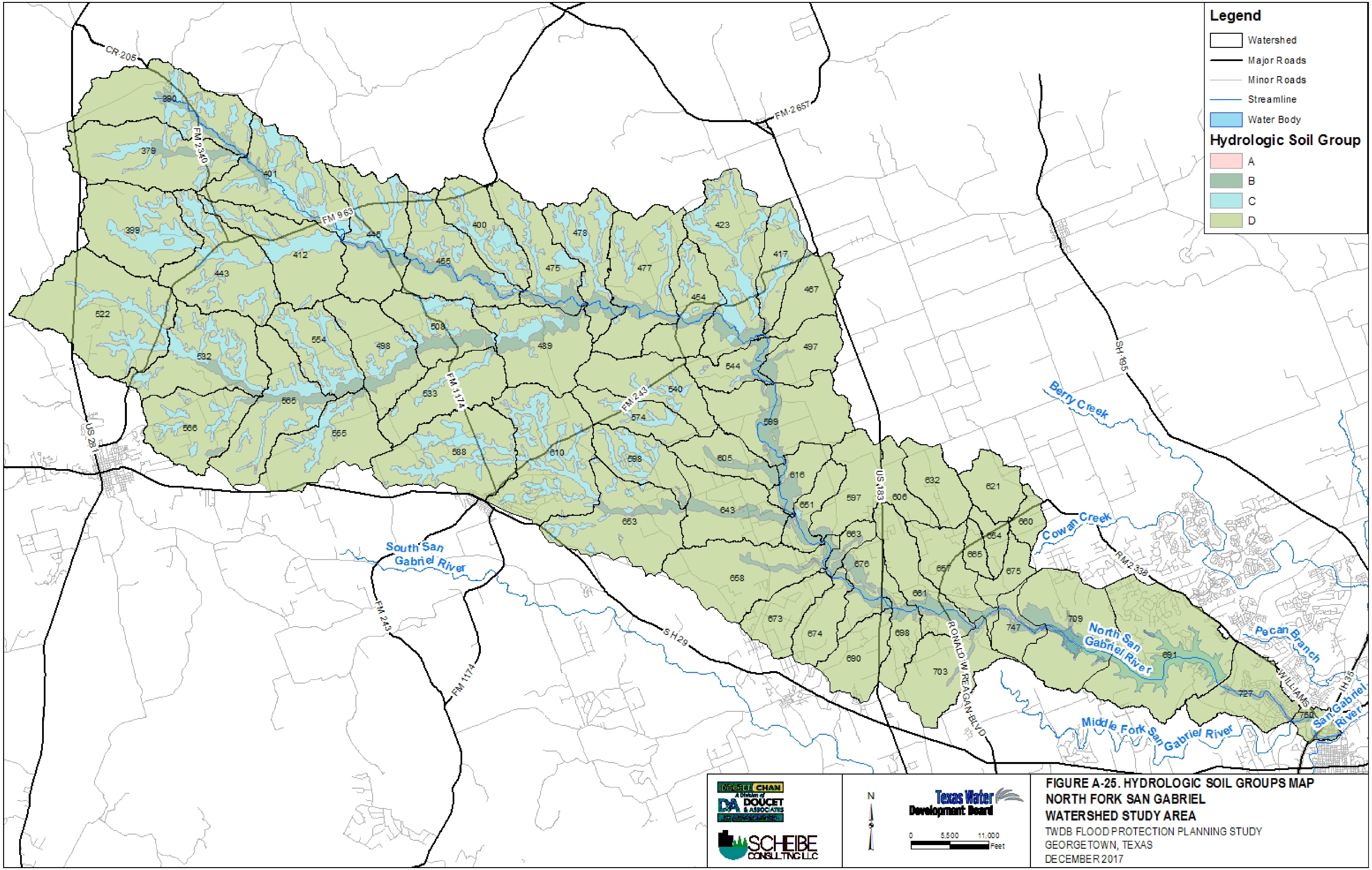


FIGURE A-24. FUTURE LAND USE MAP
MIDDLE FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Hydrologic Soil Group
A
B
C
D
North San Gabriel River
South San Gabriel River
Middle Fork San Gabriel River
San Gabriel River
Berry Creek
Cowan Creek
Pecan Branch
FIGURE A-25. HYDROLOGIC SOIL GROUPS MAP
NORTH FORK SAN GABRIEL
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

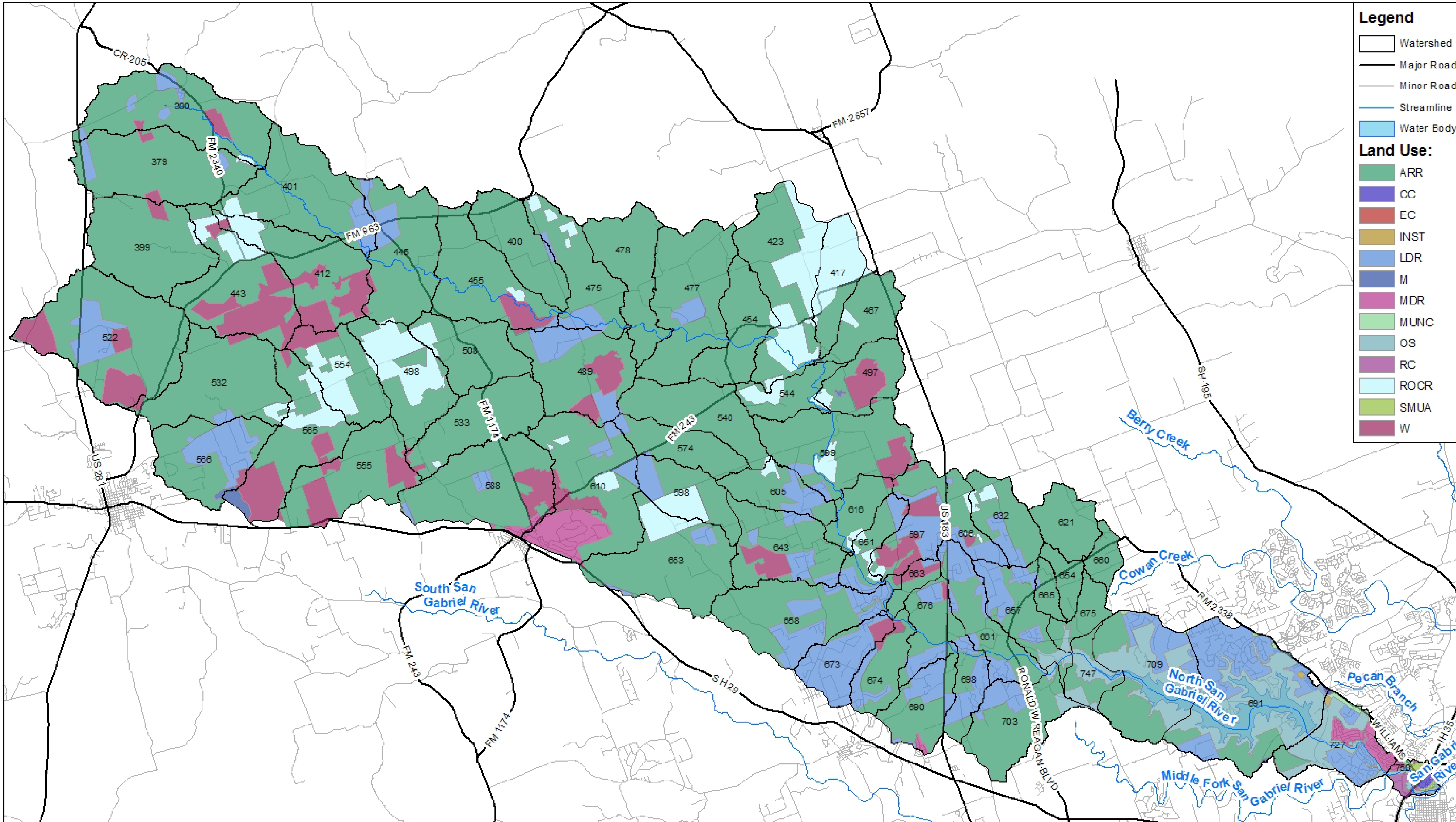
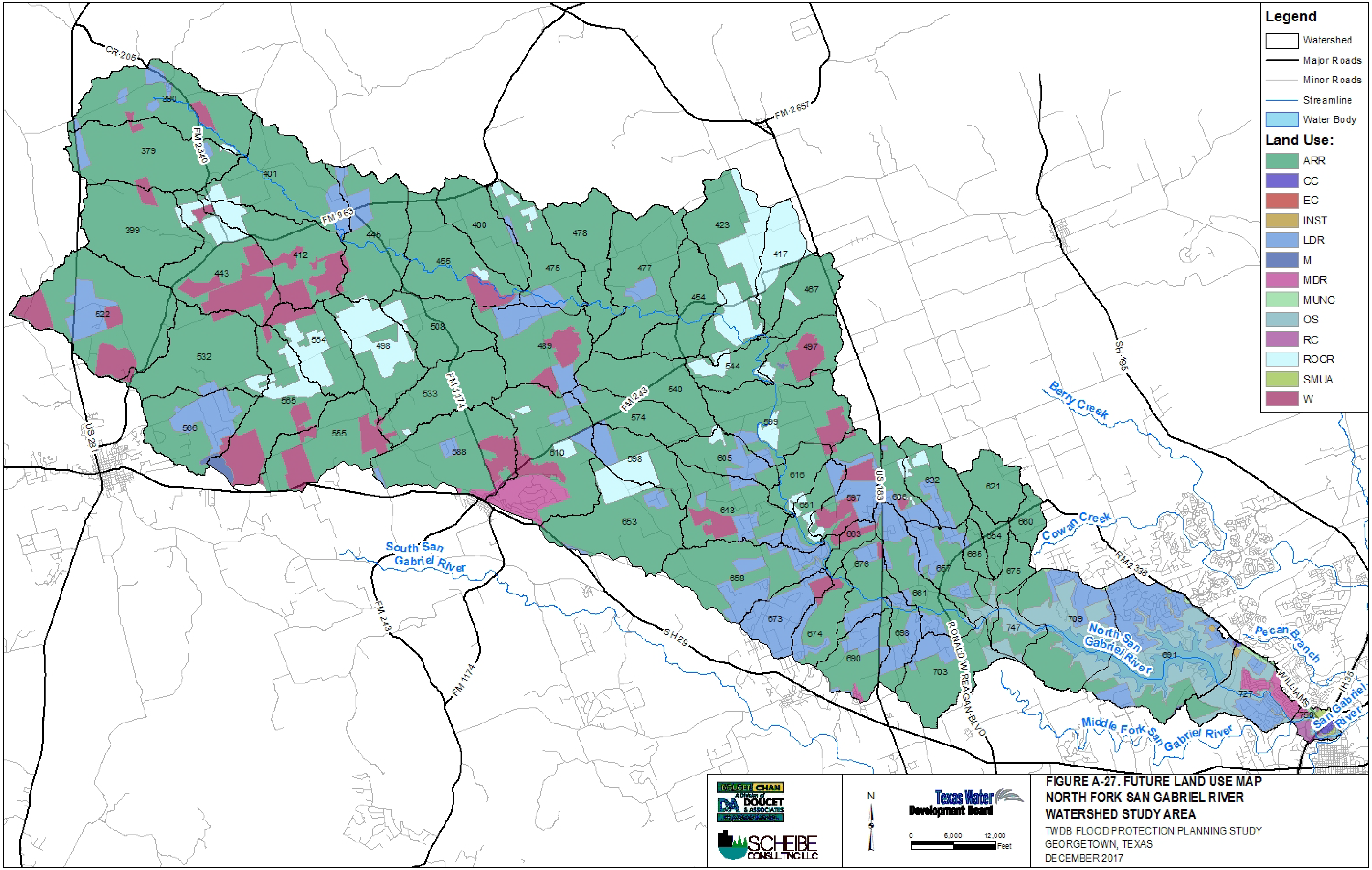
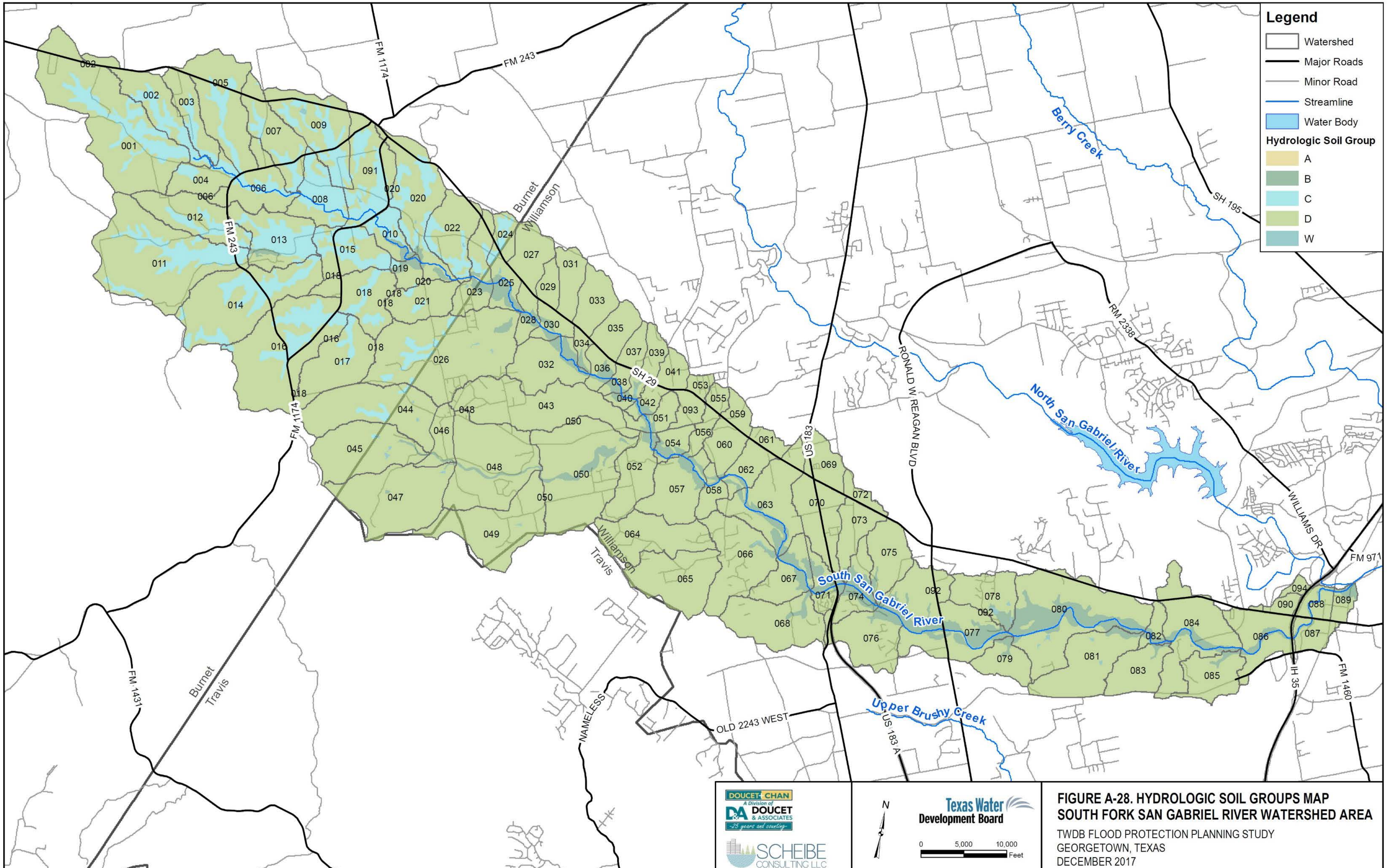


FIGURE A-26. EXISTING LAND USE MAP
NORTH FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Land Use:
ARR
CC
EC
INST
LDR
M
MDR
MUNC
OS
RC
ROCR
SMUA
W
Berry Creek
Cowan Creek
South San Gabriel River
North San Gabriel River
Middle Fork San Gabriel River
Pecan Branch
San Gabriel River
FIGURE A-27. FUTURE LAND USE MAP
NORTH FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
Texas Water Development Board
SCHEIBE CONSULTING LLC
0 6,000 12,000 Feet


Legend
Watershed
Major Roads
Minor Road
Streamline
Water Body
Hydrologic Soil Group
A
B
C
D
W
Berry Creek
North San Gabriel River
South San Gabriel River
Upper Brushy Creek
FM 243
FM 1174
SH 29
SH 195
RM 2338
RONALD W REAGAN BLVD
US 183
US 183 A
WILLIAMS DR
FM 971
IH 35
FM 1460
FM 1431
OLD 2243 WEST
NAMELESS
Burnet
Williamson
Travis
DOUCET CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0 5,000 10,000 Feet
FIGURE A-28. HYDROLOGIC SOIL GROUPS MAP
SOUTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

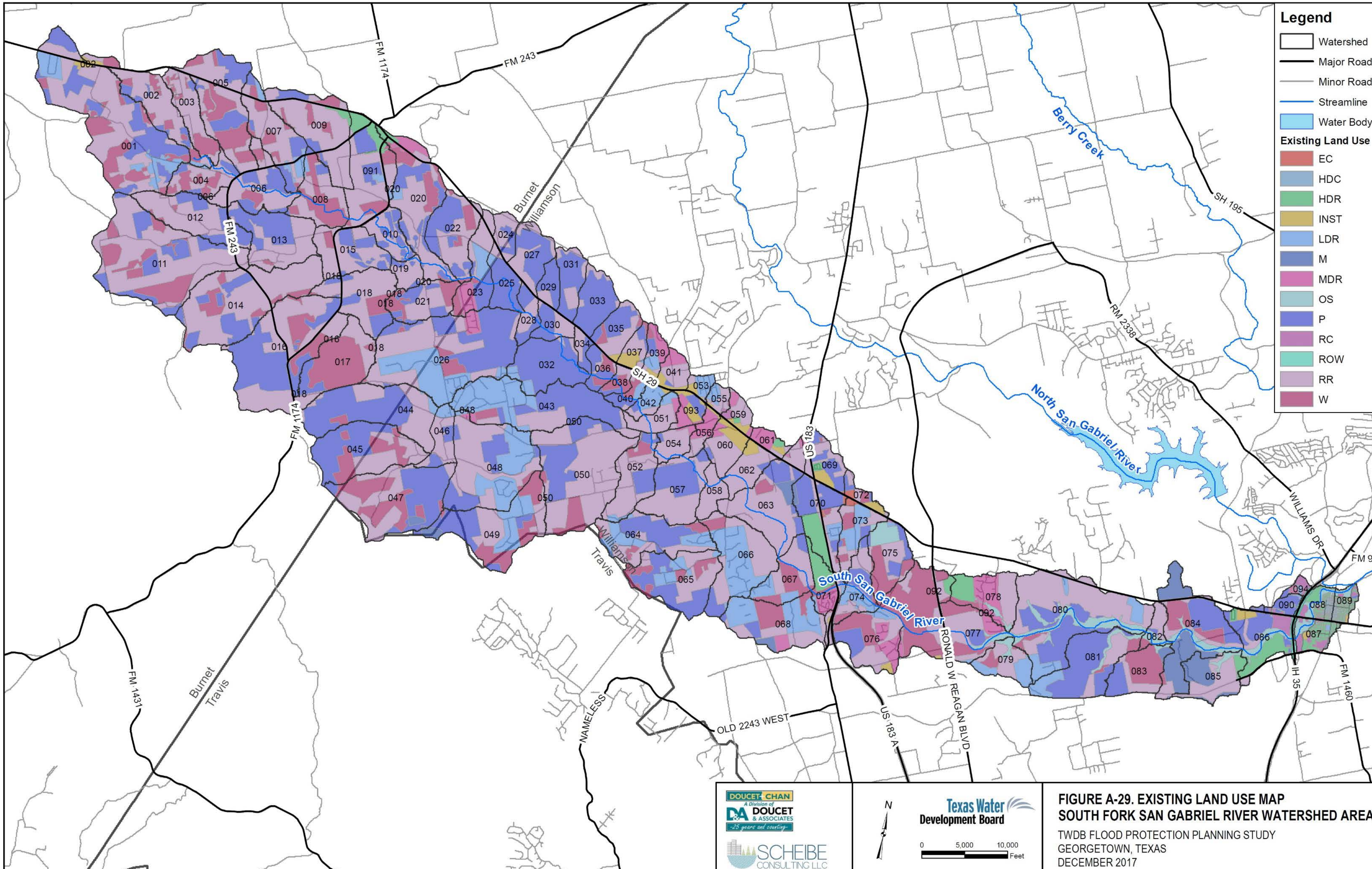
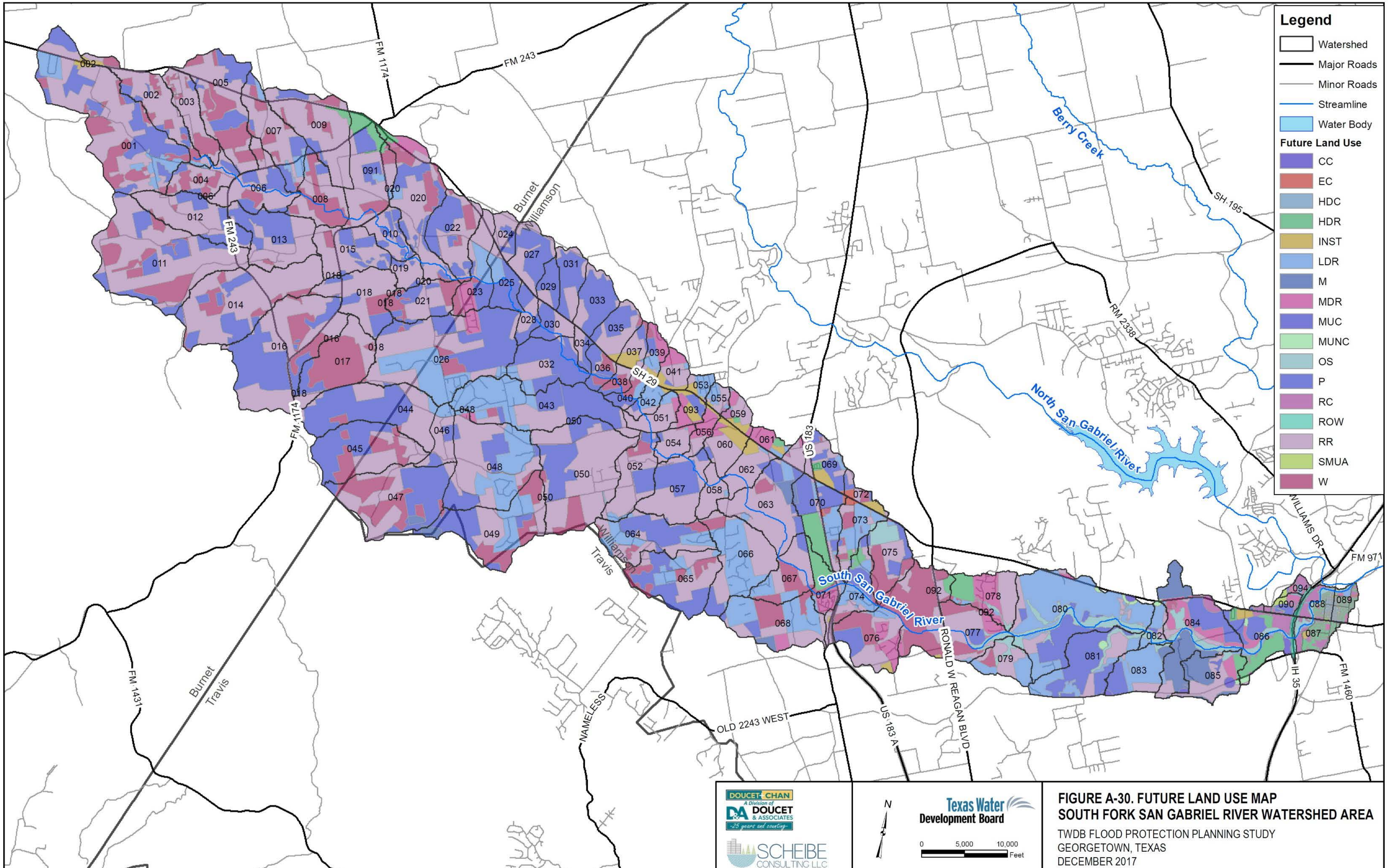


FIGURE A-29. EXISTING LAND USE MAP
SOUTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Future Land Use
CC
EC
HDC
HDR
INST
LDR
M
MDR
MUC
MUNC
OS
P
RC
ROW
RR
SMUA
W
FM 243
FM 1174
Burnet
Williamson
Travis
SH 29
US 183
US 183 A
SH 195
RM 2338
WILLIAMS DR
FM 971
IH 35
FM 1460
FM 1431
RONALD W REAGAN BLVD
OLD 2243 WEST
NAMELESS
Berry Creek
North San Gabriel River
South San Gabriel River
DOUCET CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0 5,000 10,000 Feet
FIGURE A-30. FUTURE LAND USE MAP
SOUTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

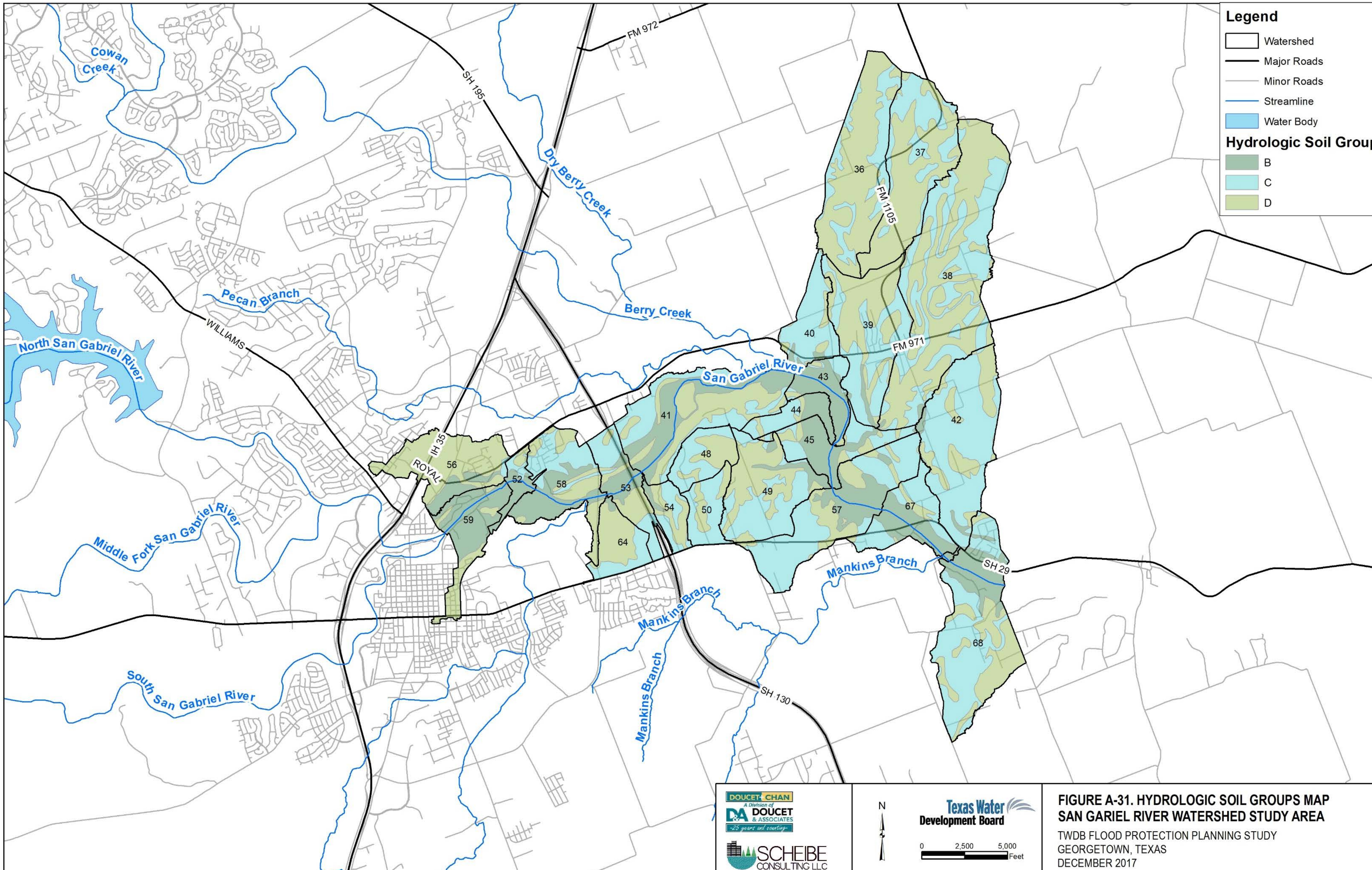


FIGURE A-31. HYDROLOGIC SOIL GROUPS MAP
SAN GARIEL RIVER WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

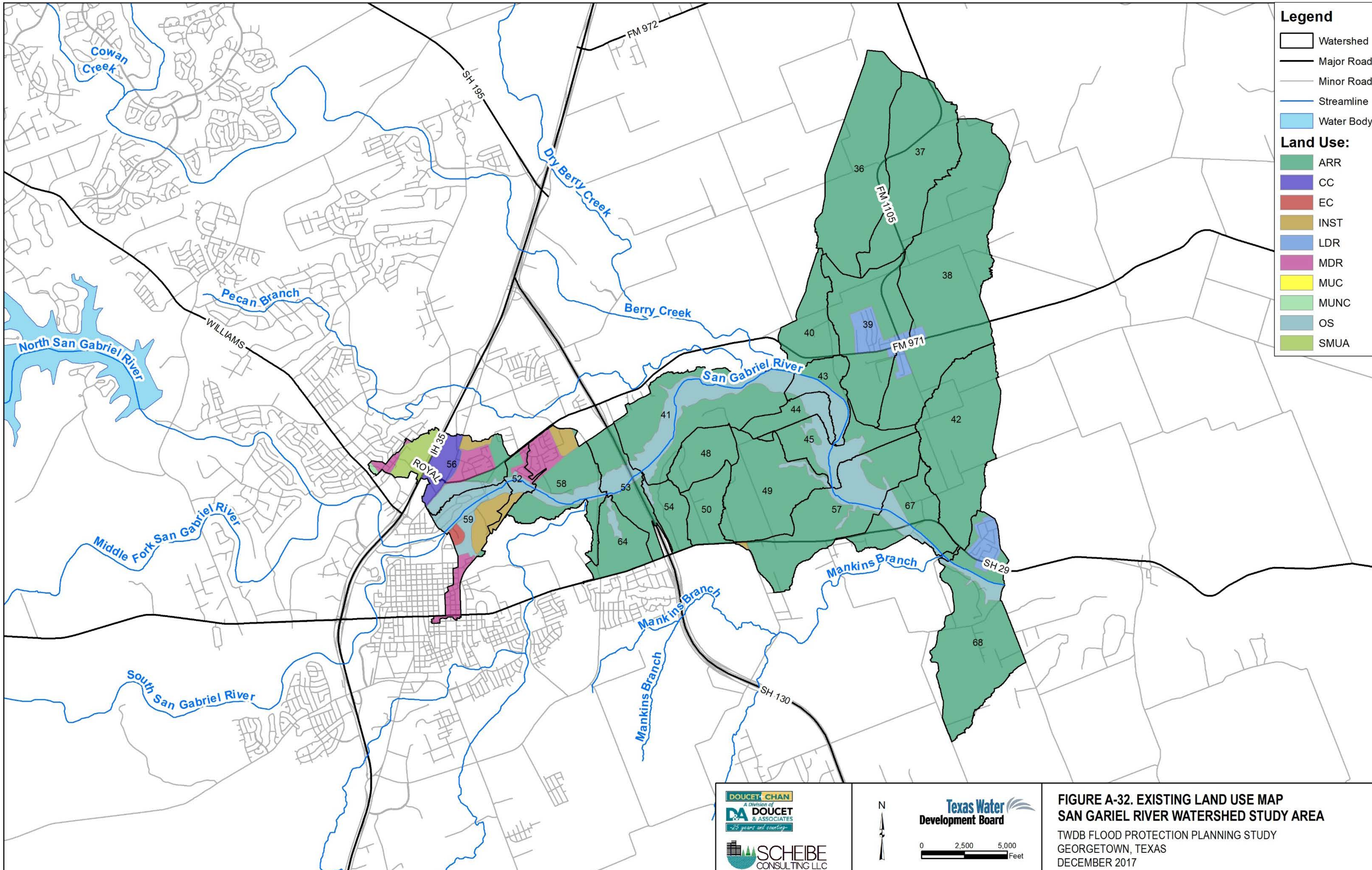
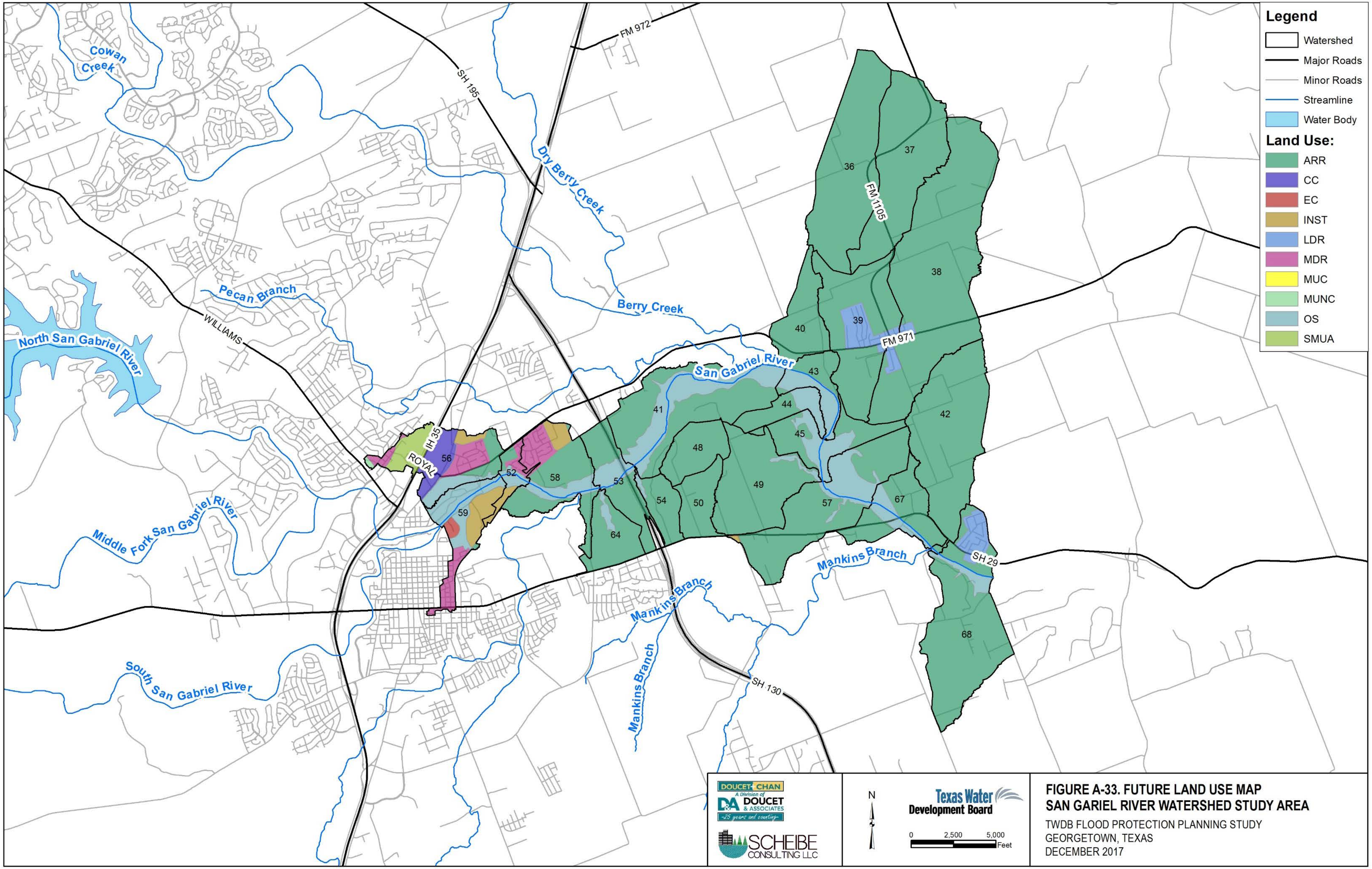


FIGURE A-32. EXISTING LAND USE MAP
SAN GARIEL RIVER WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Land Use:
ARR
CC
EC
INST
LDR
MDR
MUC
MUNC
OS
SMUA
Cowan Creek
SH 195
FM 972
Dry Berry Creek
Berry Creek
Pecan Branch
North San Gabriel River
WILLIAMS
San Gabriel River
FM 1105
FM 971
IH 35
ROYAL
Middle Fork San Gabriel River
South San Gabriel River
Mankins Branch
SH 29
SH 130
36
37
38
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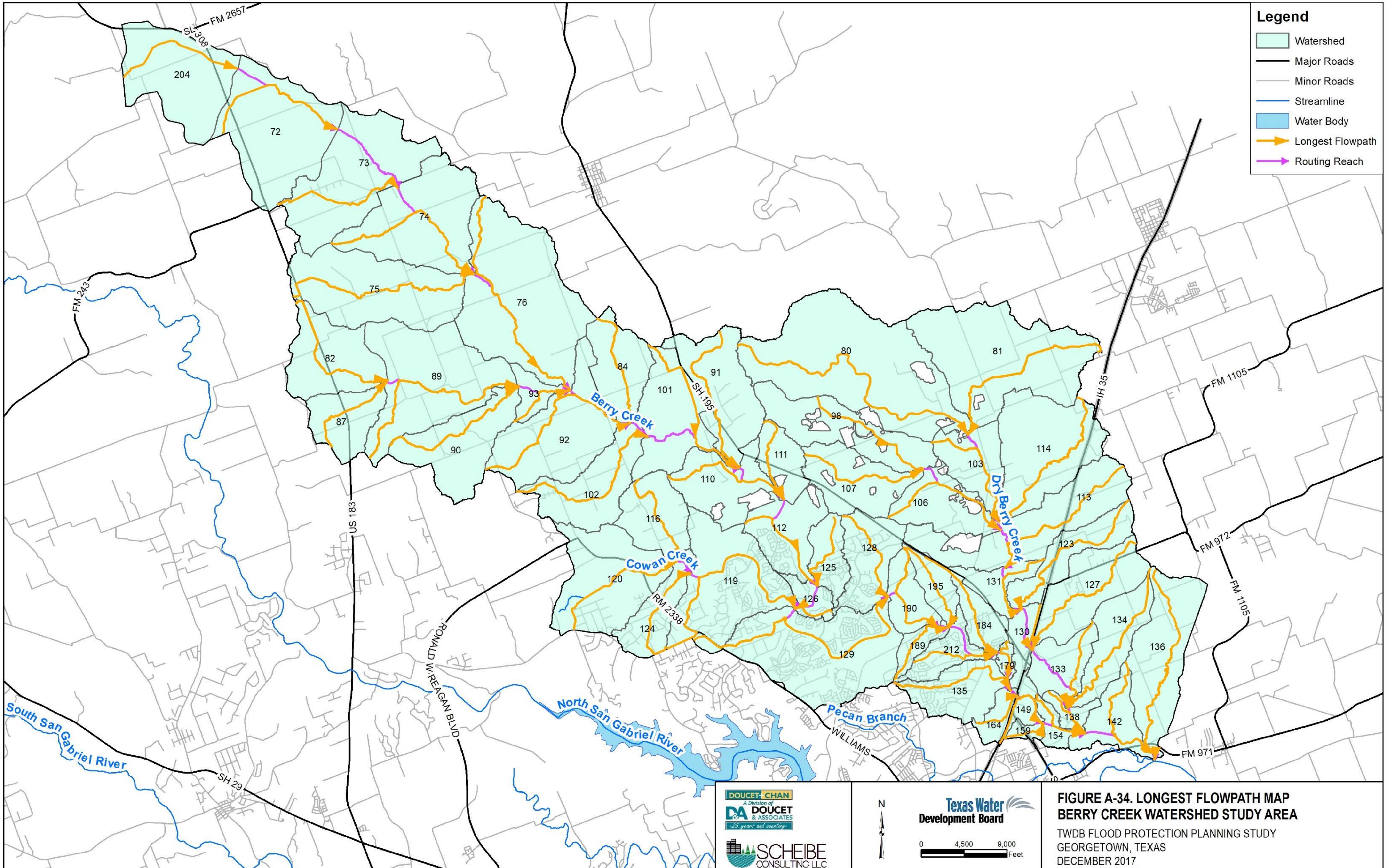
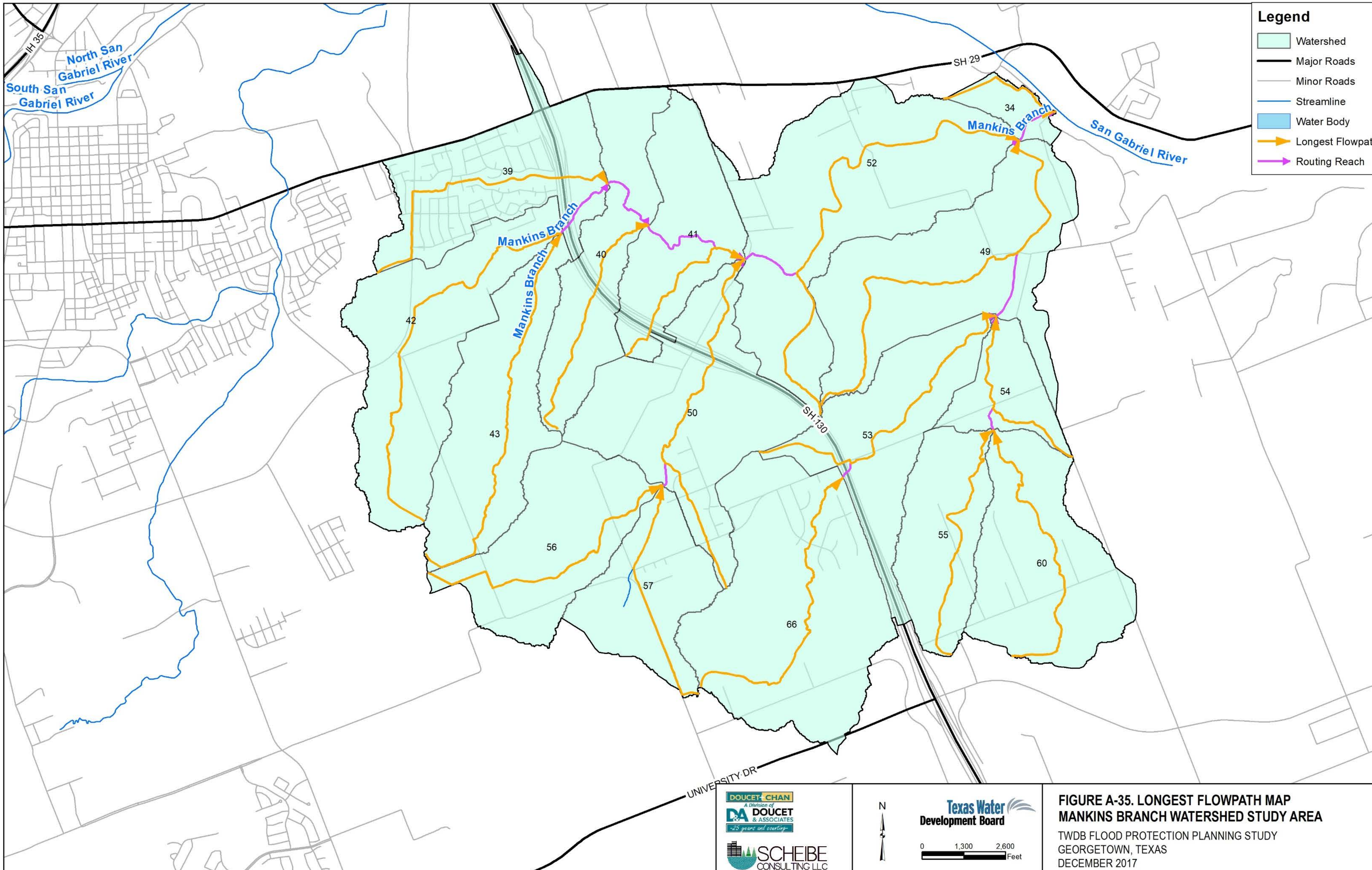
59
64
67
68
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
2,500
5,000
Feet
FIGURE A-33. FUTURE LAND USE MAP
SAN GARIEL RIVER WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Longest Flowpath
Routing Reach
Berry Creek
Dry Berry Creek
Cowan Creek
Pecan Branch
North San Gabriel River
South San Gabriel River
FM 2657
SL 308
FM 243
US 183
SH 195
RM 2338
RONALD W. REAGAN BLVD
SH 29
WILLIAMS
IH 35
FM 1105
FM 972
FM 971
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0 4,500 9,000 Feet
FIGURE A-34. LONGEST FLOWPATH MAP
BERRY CREEK WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


Legend
Watershed
Major Roads
Minor Roads
Streamline
Water Body
Longest Flowpath
Routing Reach
IH 35
North San Gabriel River
South San Gabriel River
San Gabriel River
SH 29
SH 130
UNIVERSITY DR
Mankins Branch
34
39
40
41
42
43
49
50
52
53
54
55
56
57
60
66
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 1,300 2,600 Feet
FIGURE A-35. LONGEST FLOWPATH MAP
MANKINS BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

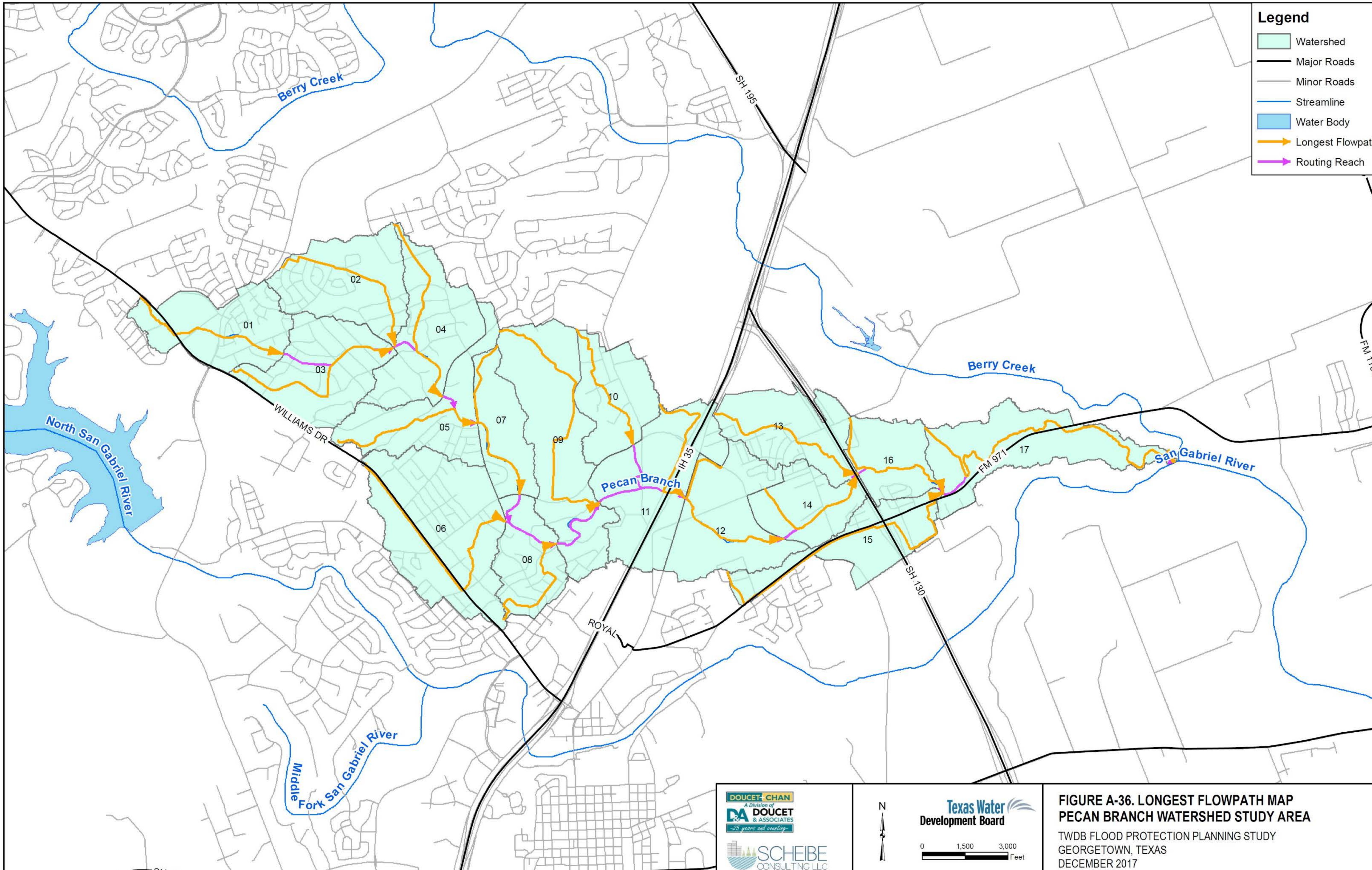


FIGURE A-36. LONGEST FLOWPATH MAP
PECAN BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

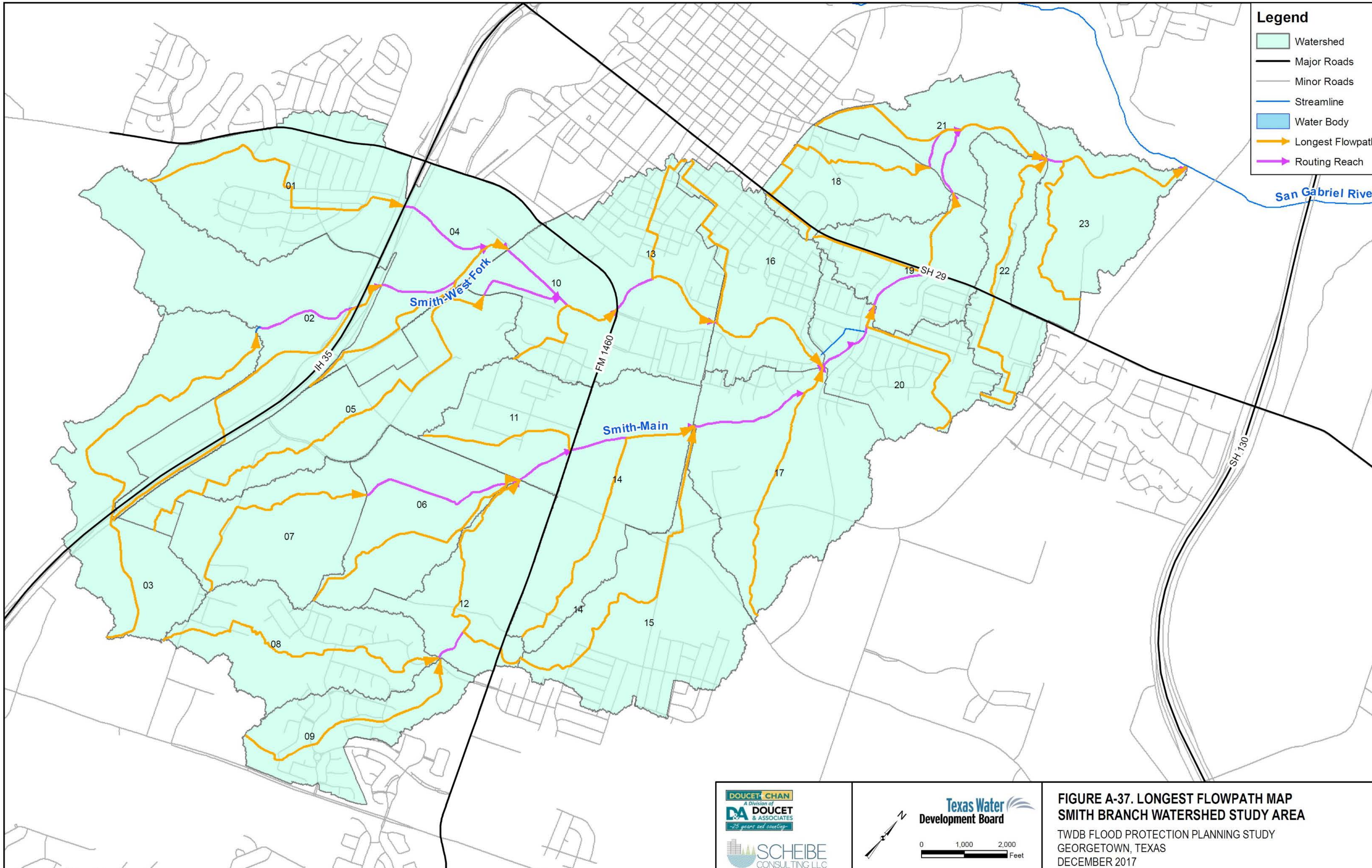


FIGURE A-37. LONGEST FLOWPATH MAP
SMITH BRANCH WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

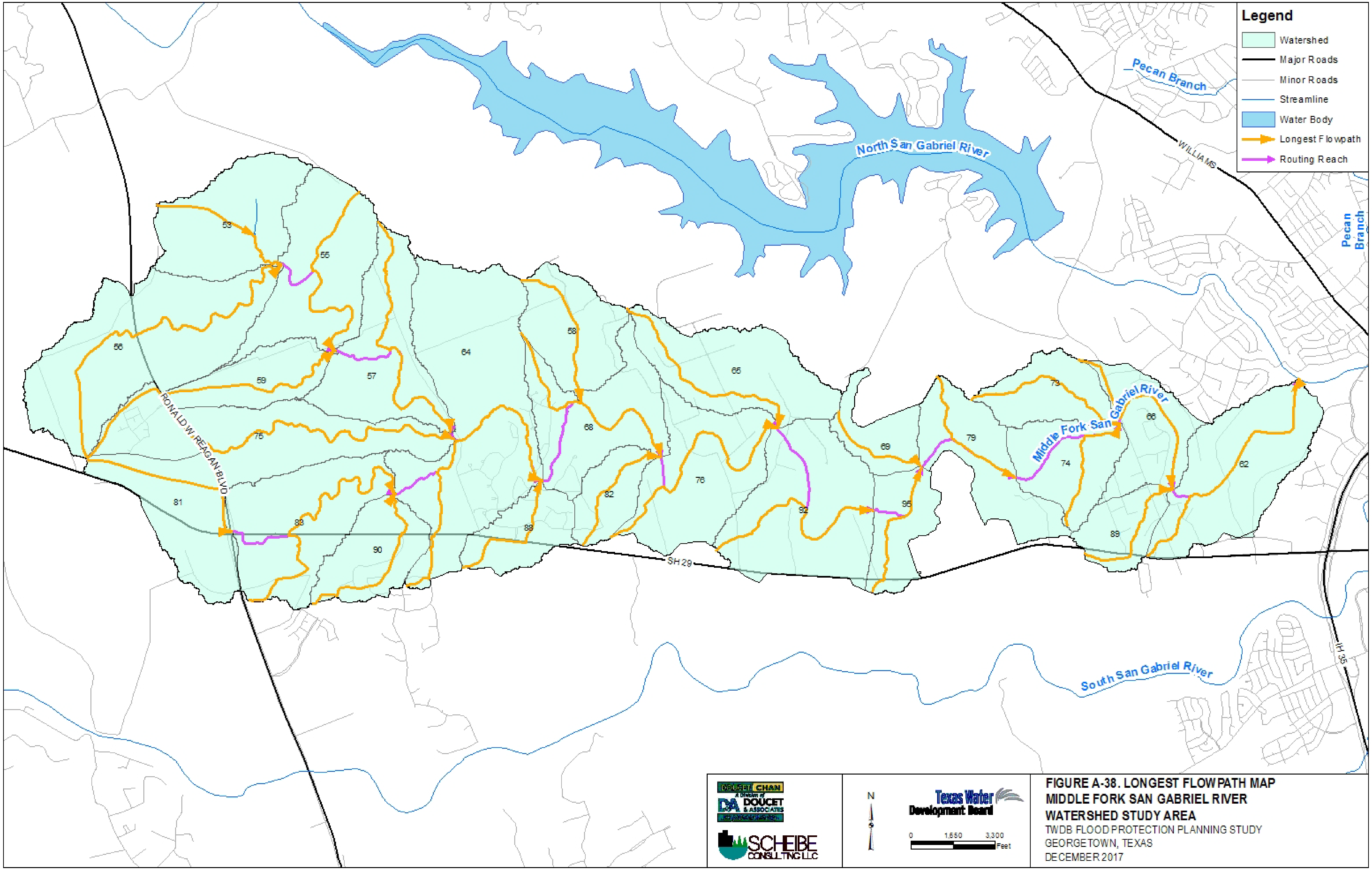


FIGURE A-38. LONGEST FLOWPATH MAP
MIDDLE FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

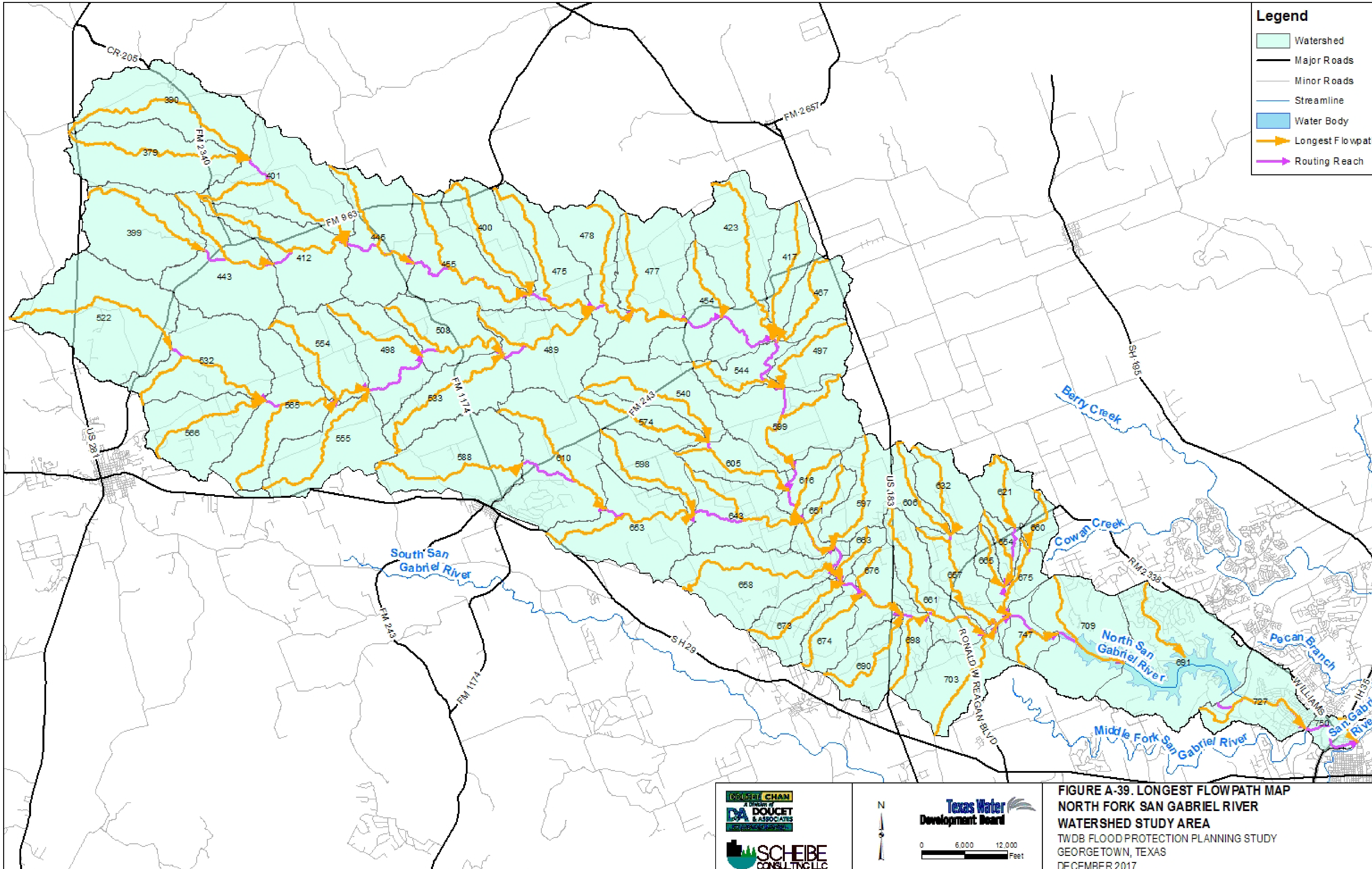


FIGURE A-39. LONGEST FLOWPATH MAP
NORTH FORK SAN GABRIEL RIVER
WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

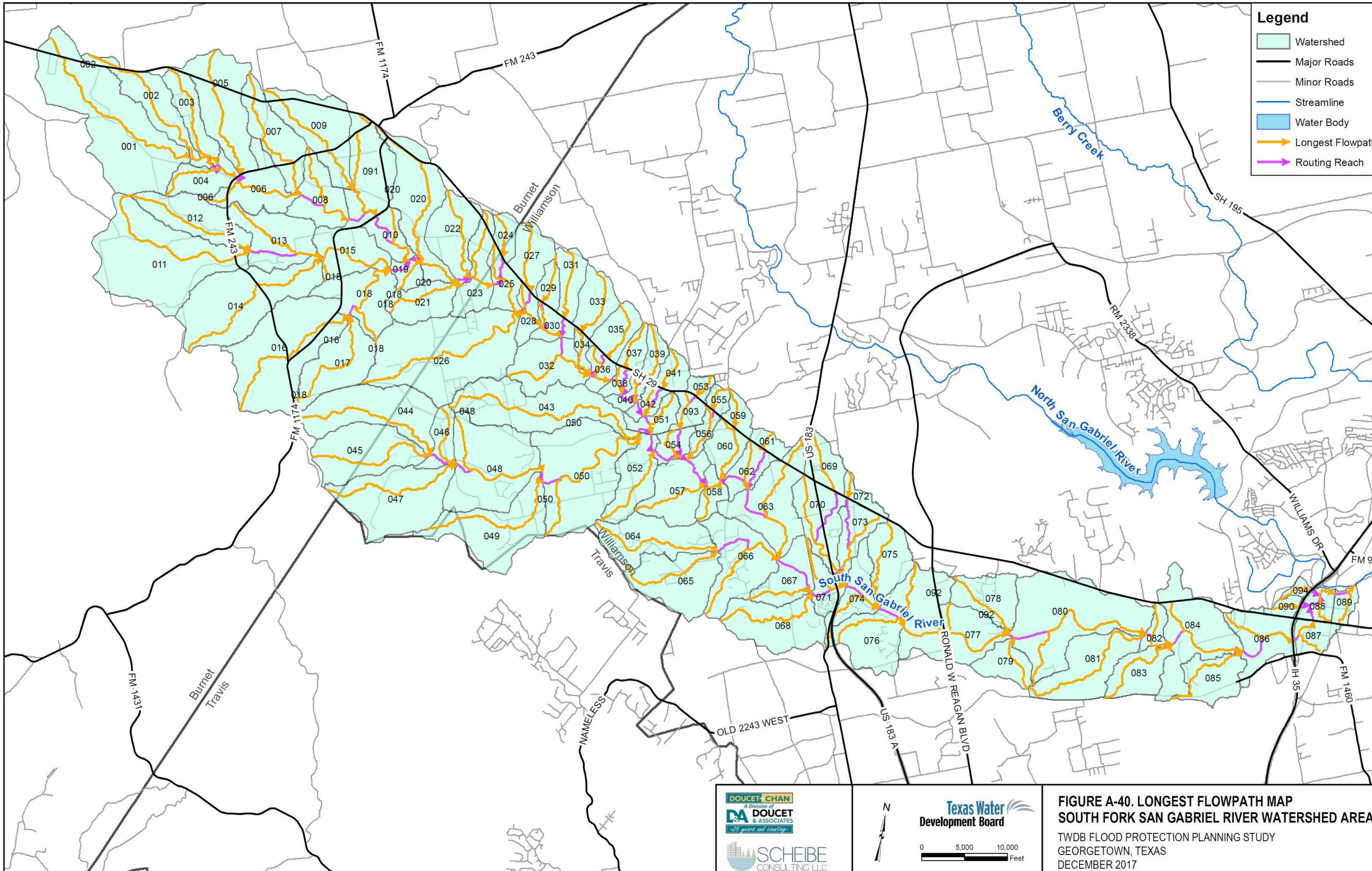


FIGURE A-40. LONGEST FLOWPATH MAP
SOUTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

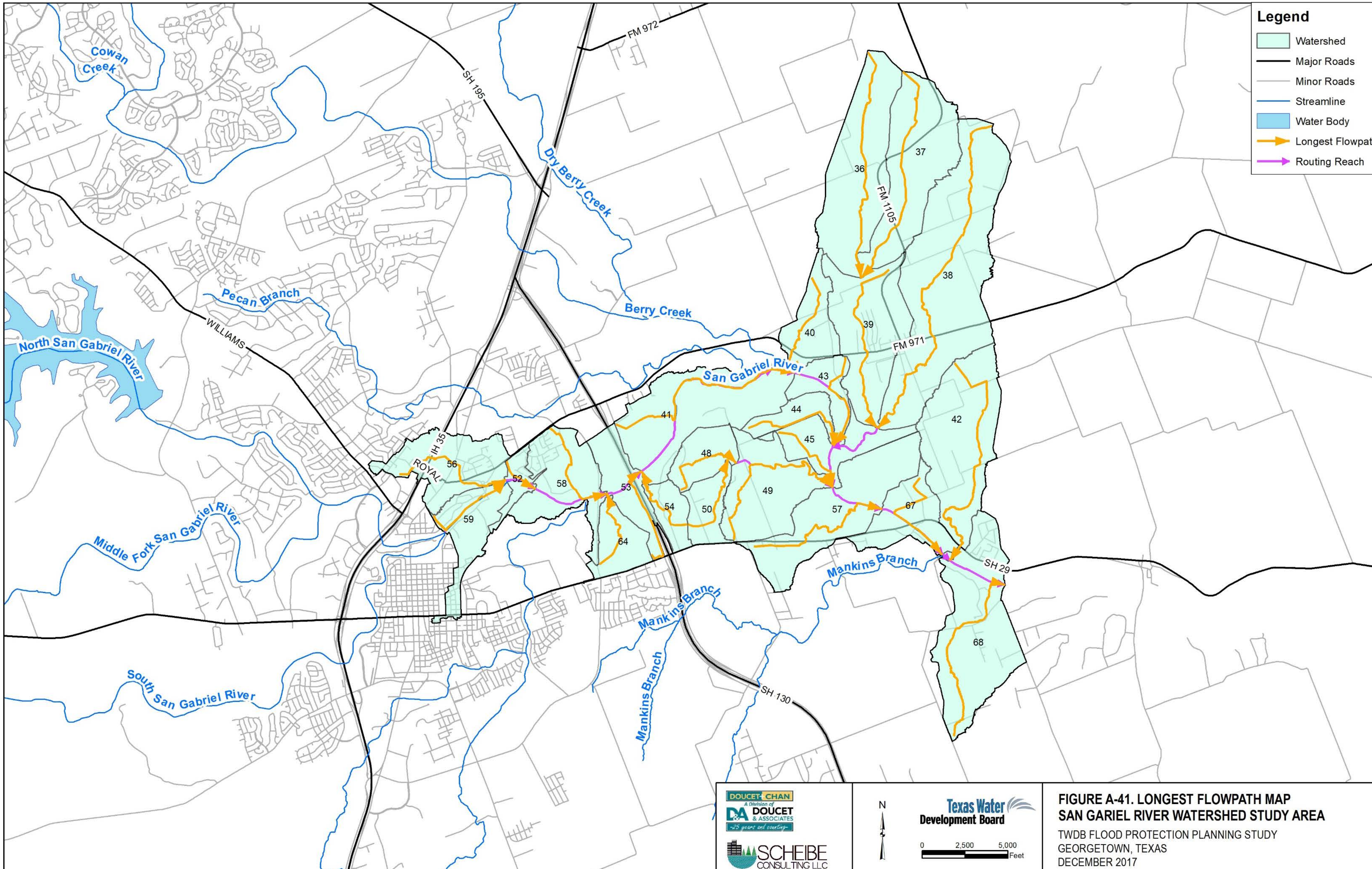


FIGURE A-41. LONGEST FLOWPATH MAP
SAN GARIEL RIVER WATERSHED STUDY AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

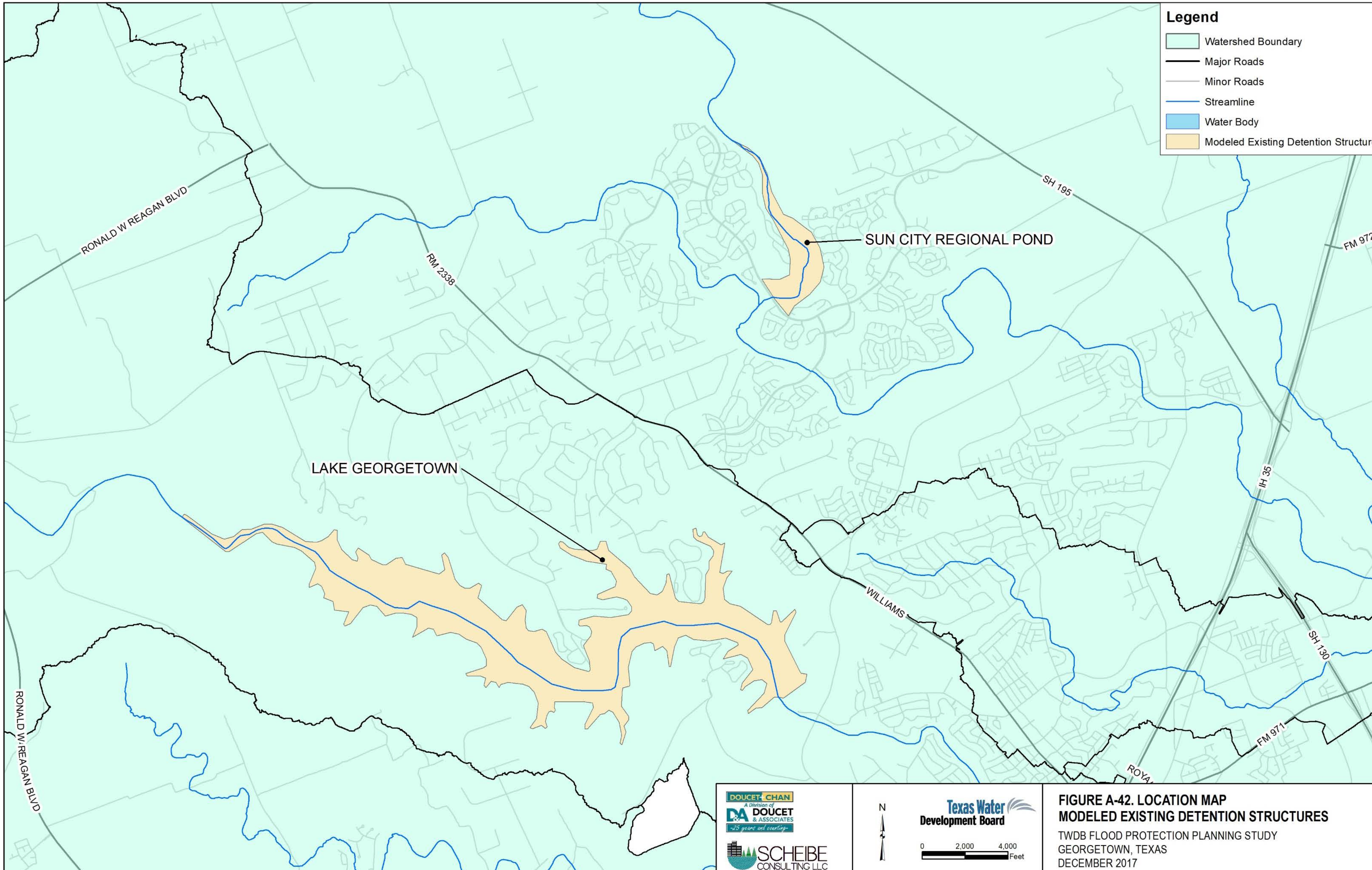

Legend
Watershed Boundary
Major Roads
Minor Roads
Streamline
Water Body
Modeled Existing Detention Structure
SUN CITY REGIONAL POND
LAKE GEORGETOWN
RONALD W REAGAN BLVD
RM 2338
SH 195
FM 972
IH 35
WILLIAMS
SH 130
FM 971
RONALD W REAGAN BLVD
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 2,000 4,000 Feet
FIGURE A-42. LOCATION MAP
MODELED EXISTING DETENTION STRUCTURES
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

Figure A-43 HEC-HMS Model Layout – Berry Creek Watershed Study Area

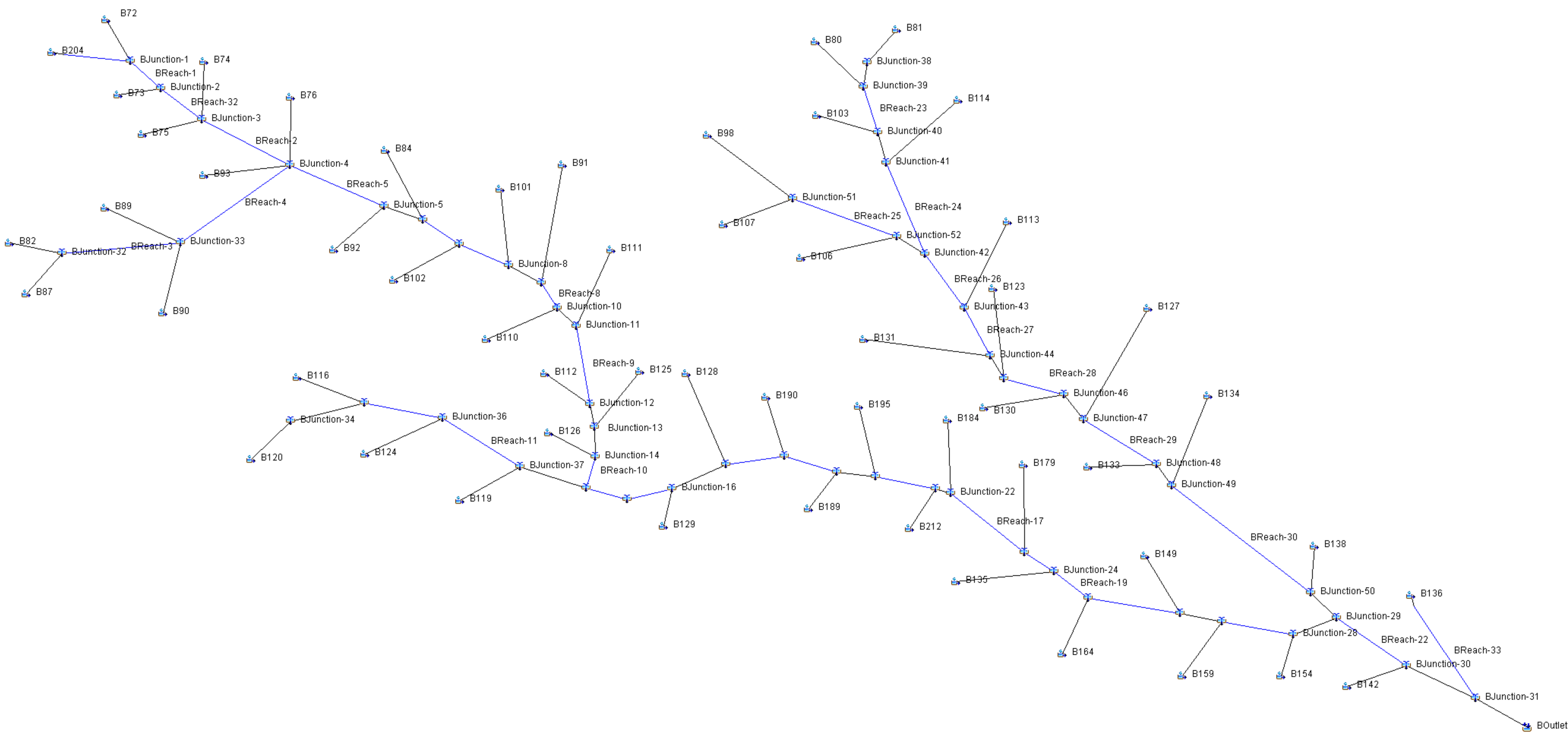


Figure A-44 HEC-HMS Model Layout – Mankins Branch Watershed Study Area

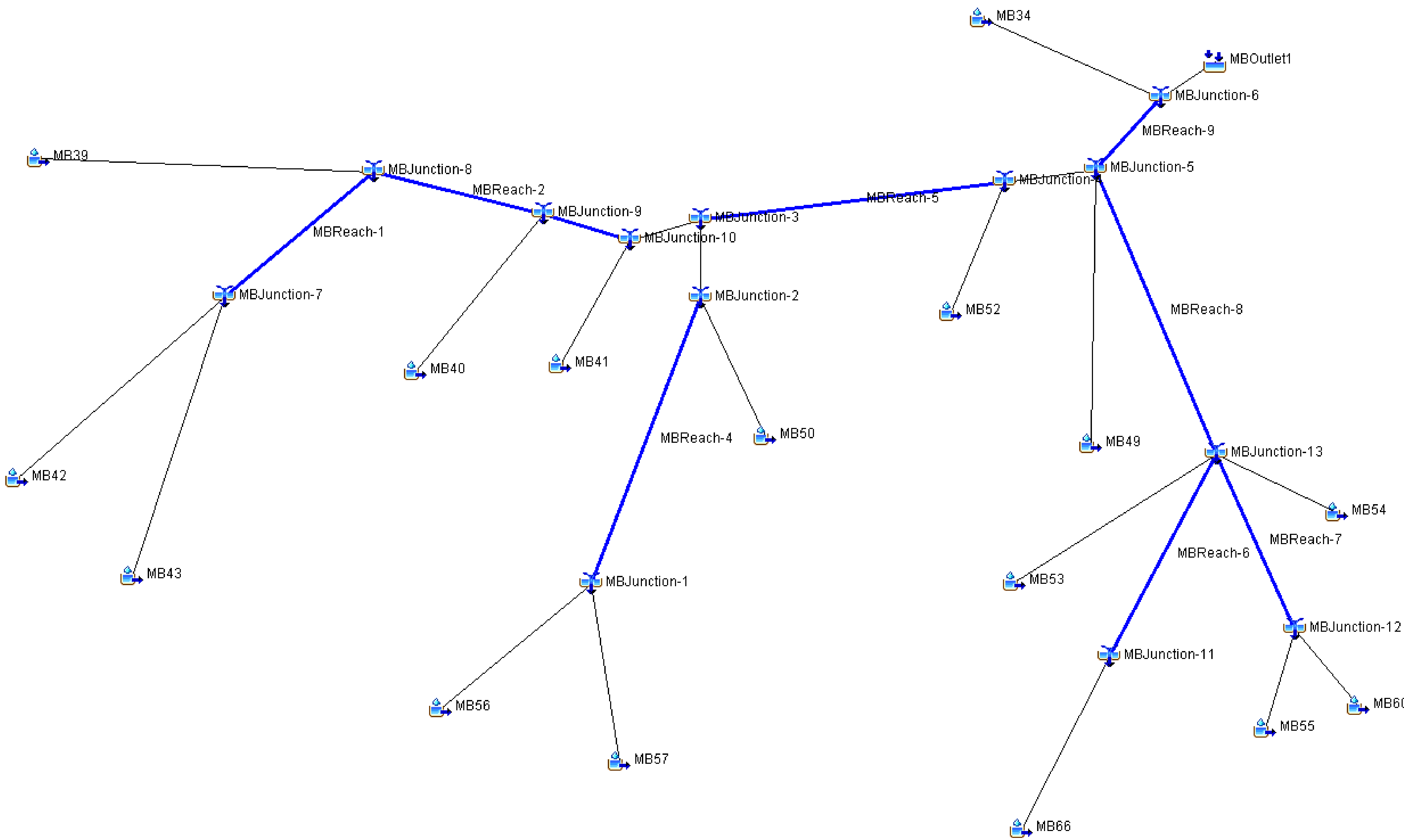


Figure A-45 HEC-HMS Model Layout – Pecan Branch Watershed Study Area

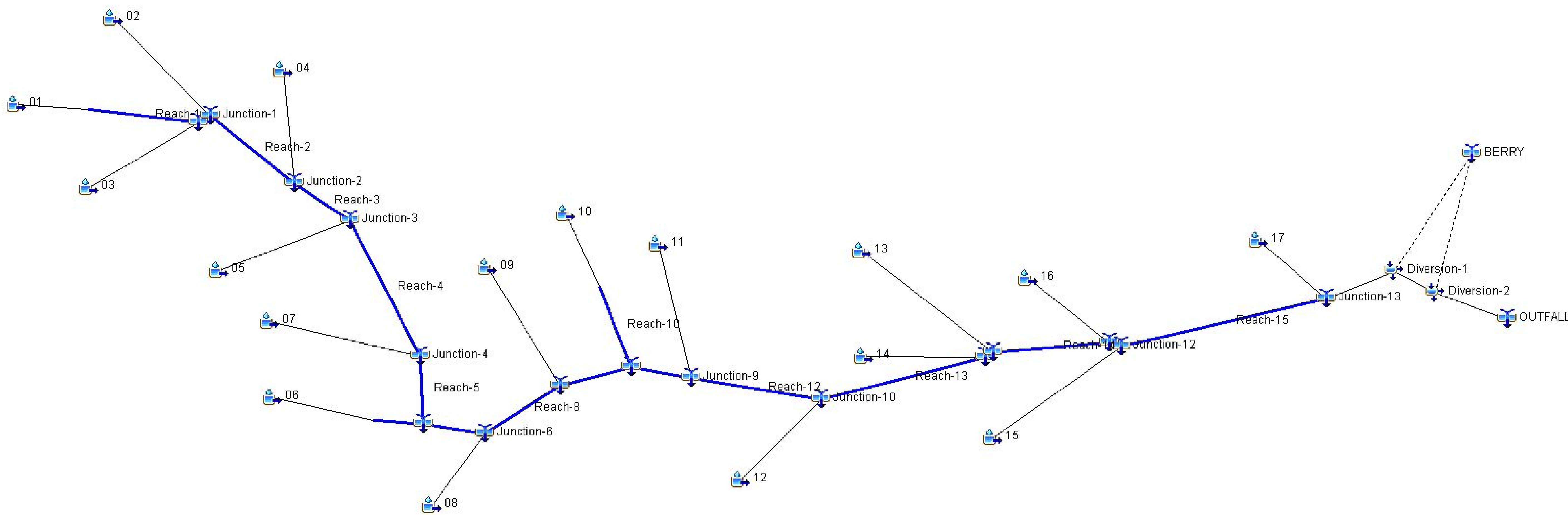


Figure A-46 HEC-HMS Model Layout – Smith Branch Watershed Study Area

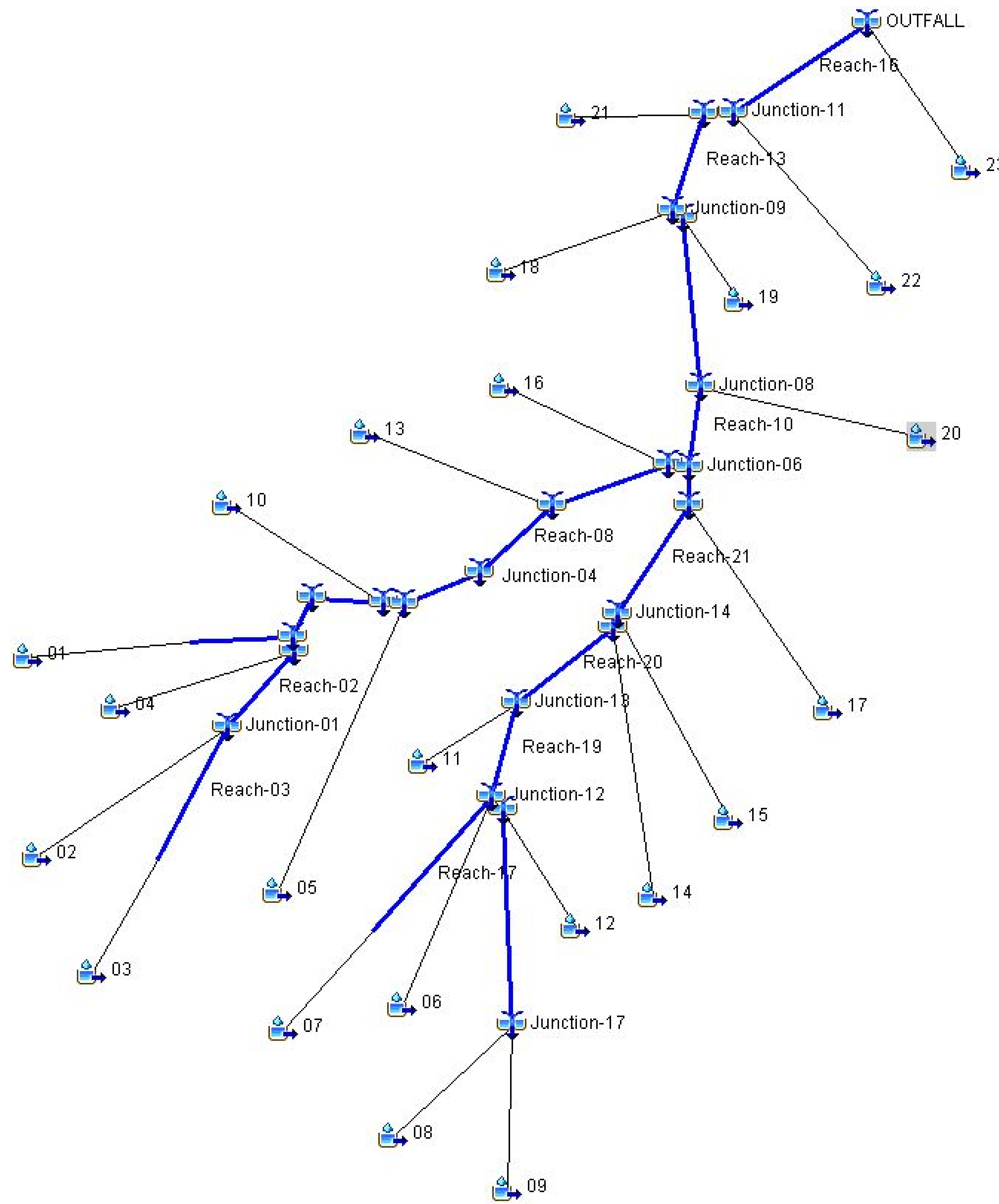


Figure A-47 HEC-HMS Model Layout – Middle Fork San Gabriel River Watershed Study Area

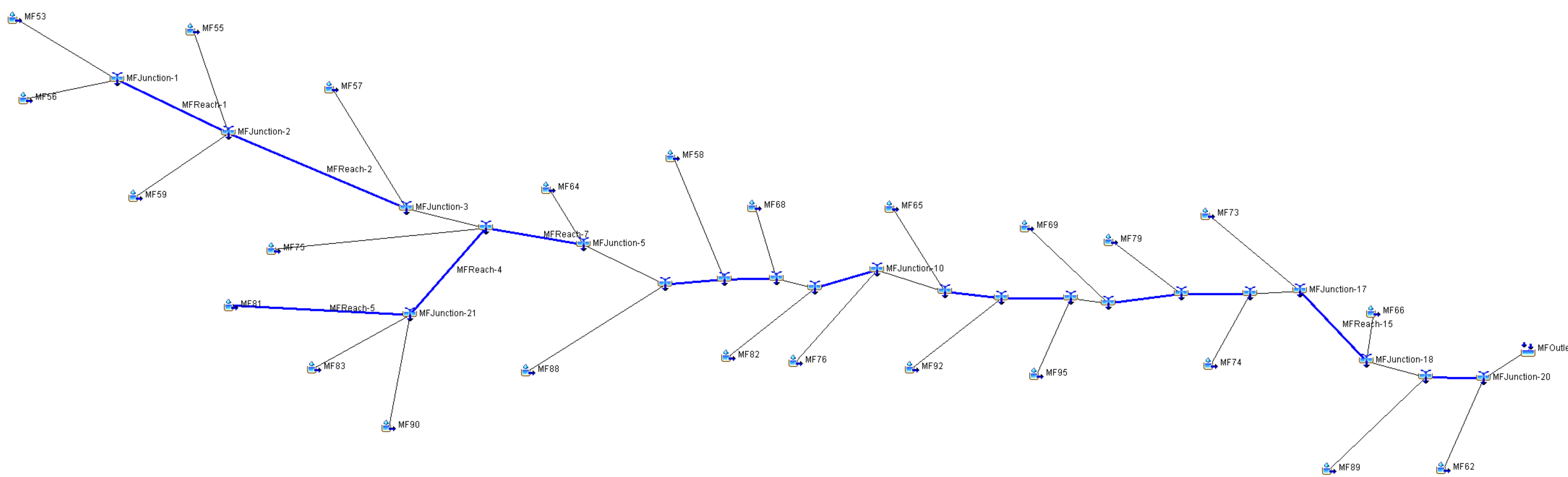


Figure A-48 HEC-HMS Model Layout – North Fork San Gabriel River Watershed Study Area

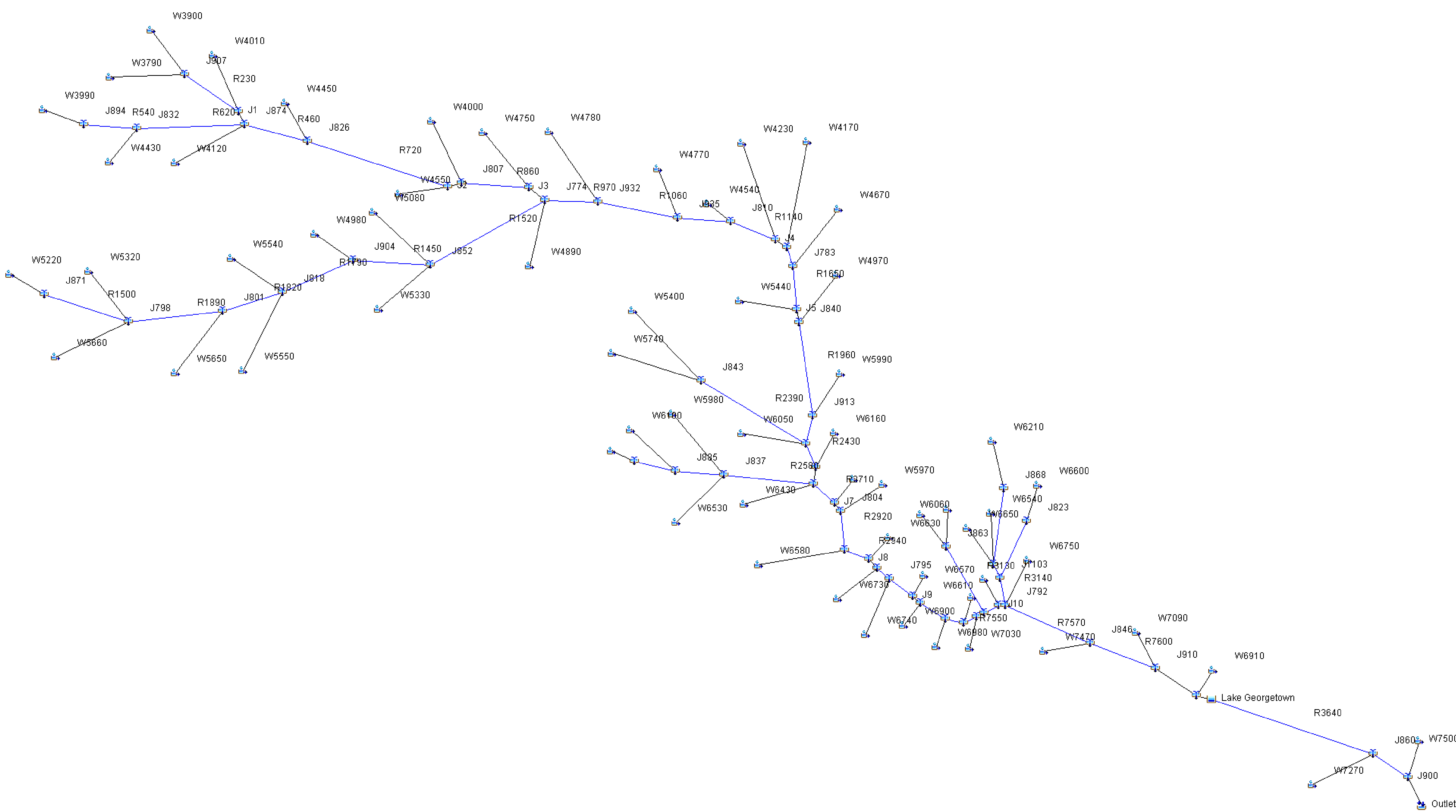


Figure A-49 HEC-HMS Model Layout – South Fork San Gabriel River Watershed Study Area

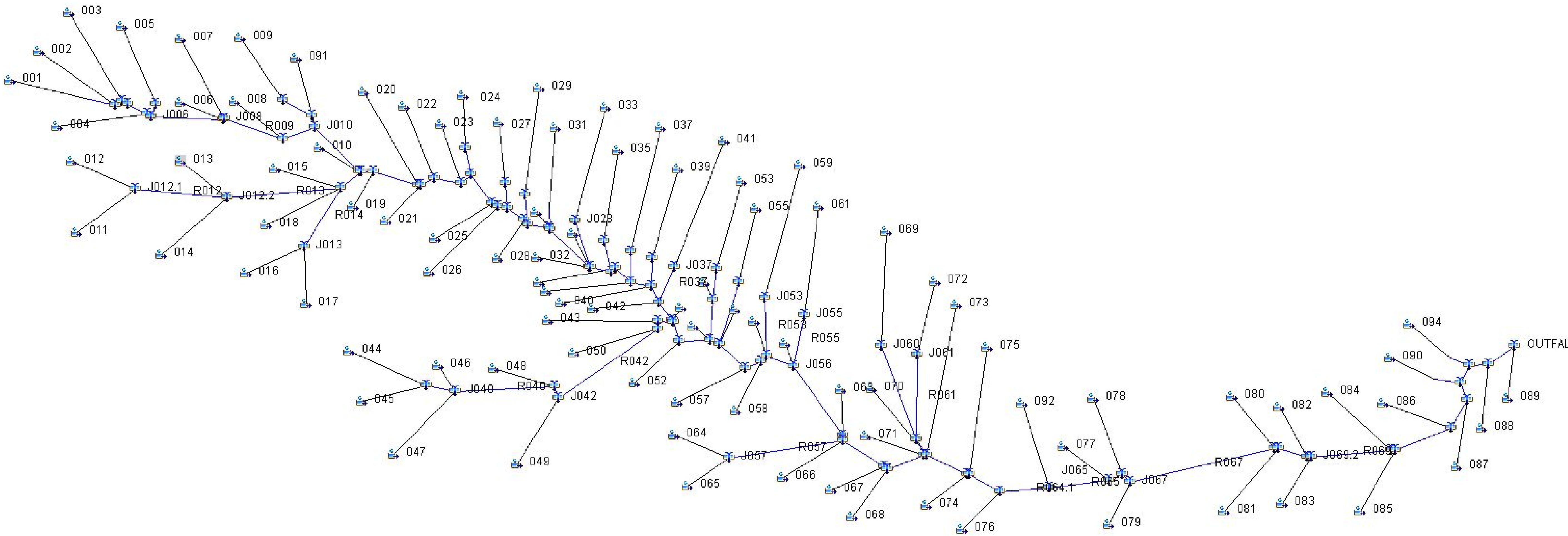


Figure A-50 HEC-HMS Model Layout – San Gabriel River Watershed Study Area

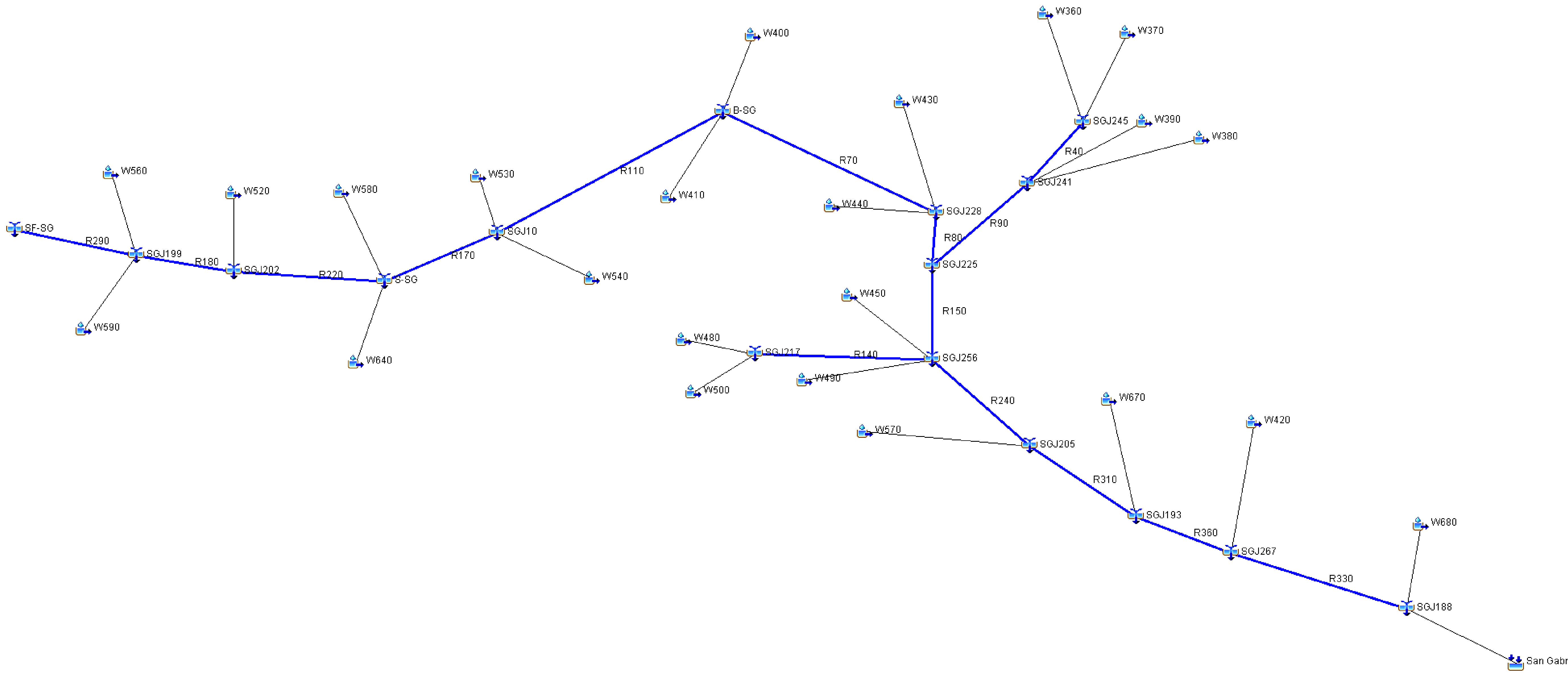


Figure A-51 South Fork San Gabriel Computed vs. Observed Hydrographs – TS Hermine

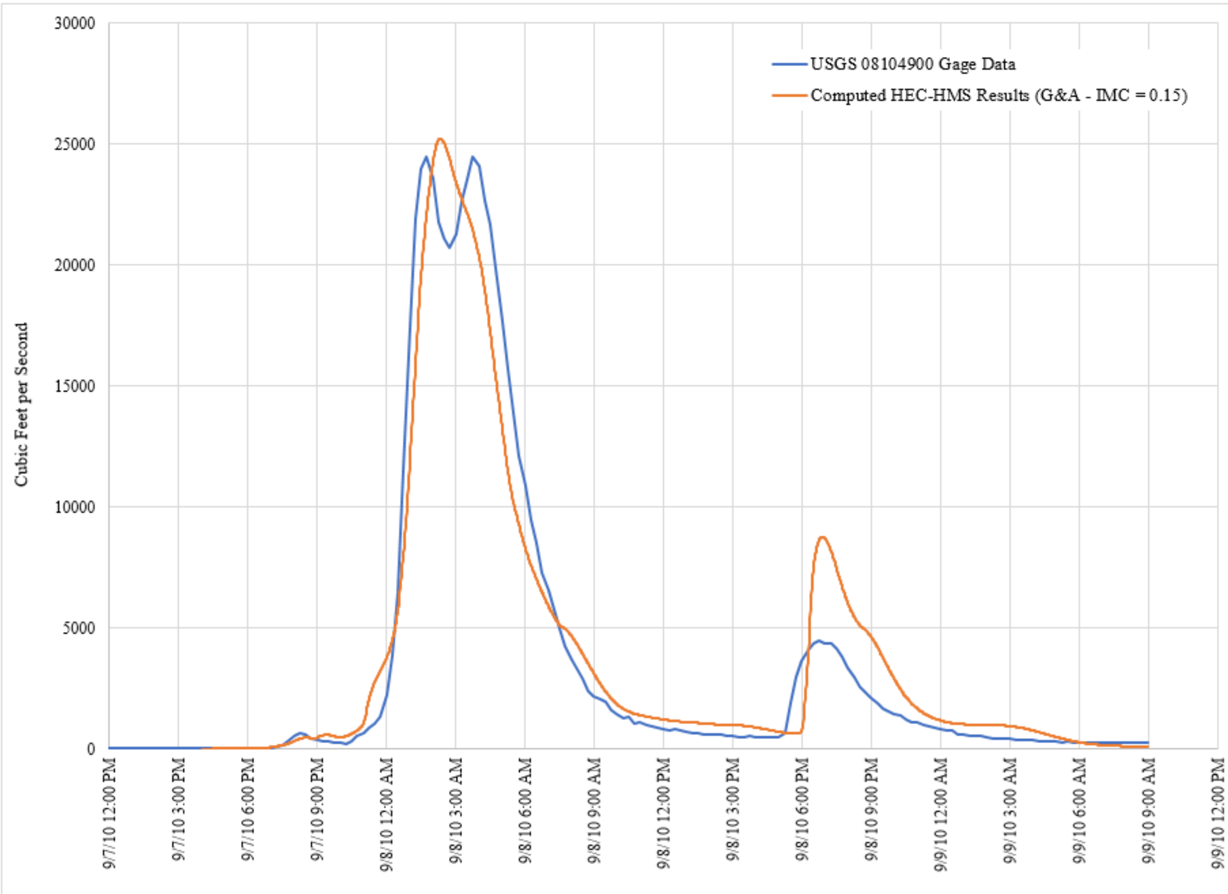


Figure A-52 South Fork San Gabriel Computed vs. Observed Hydrographs – June 2007 Event

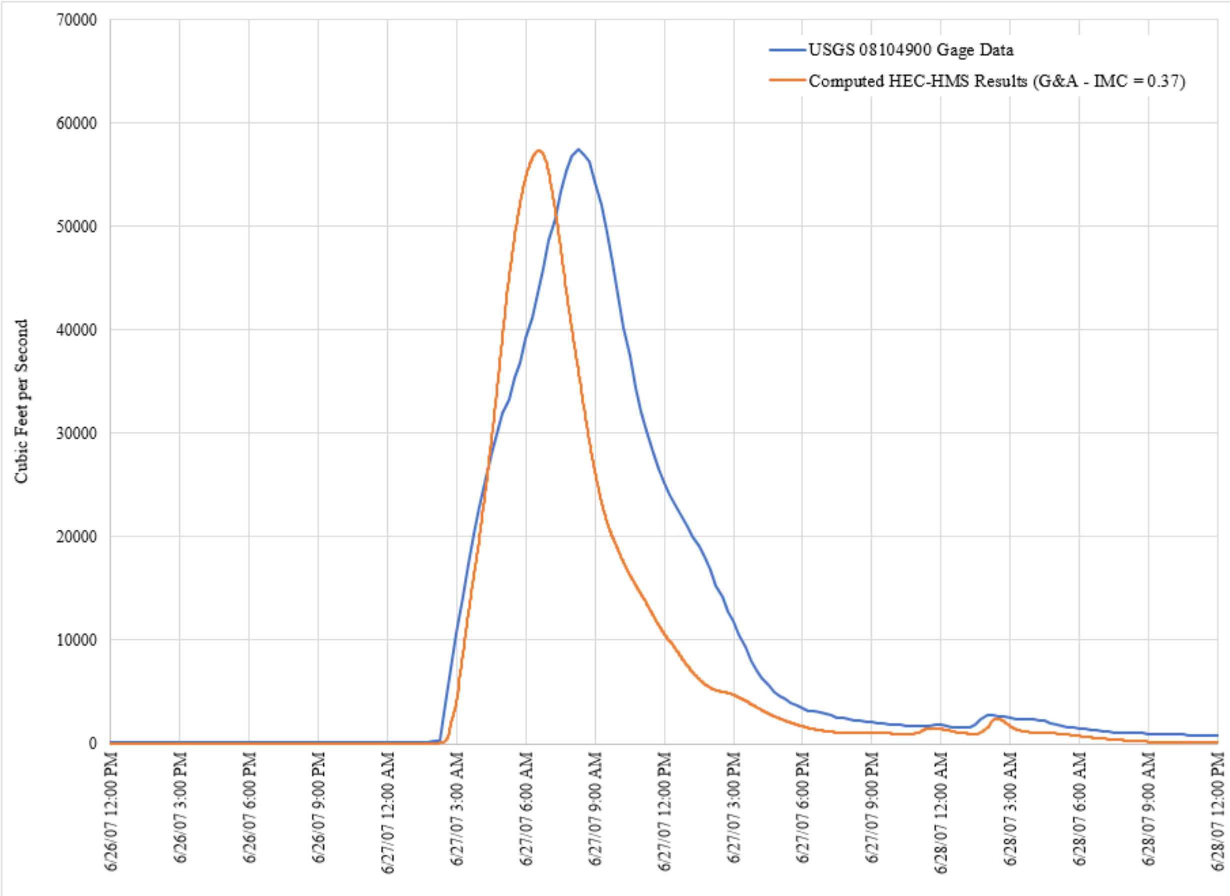
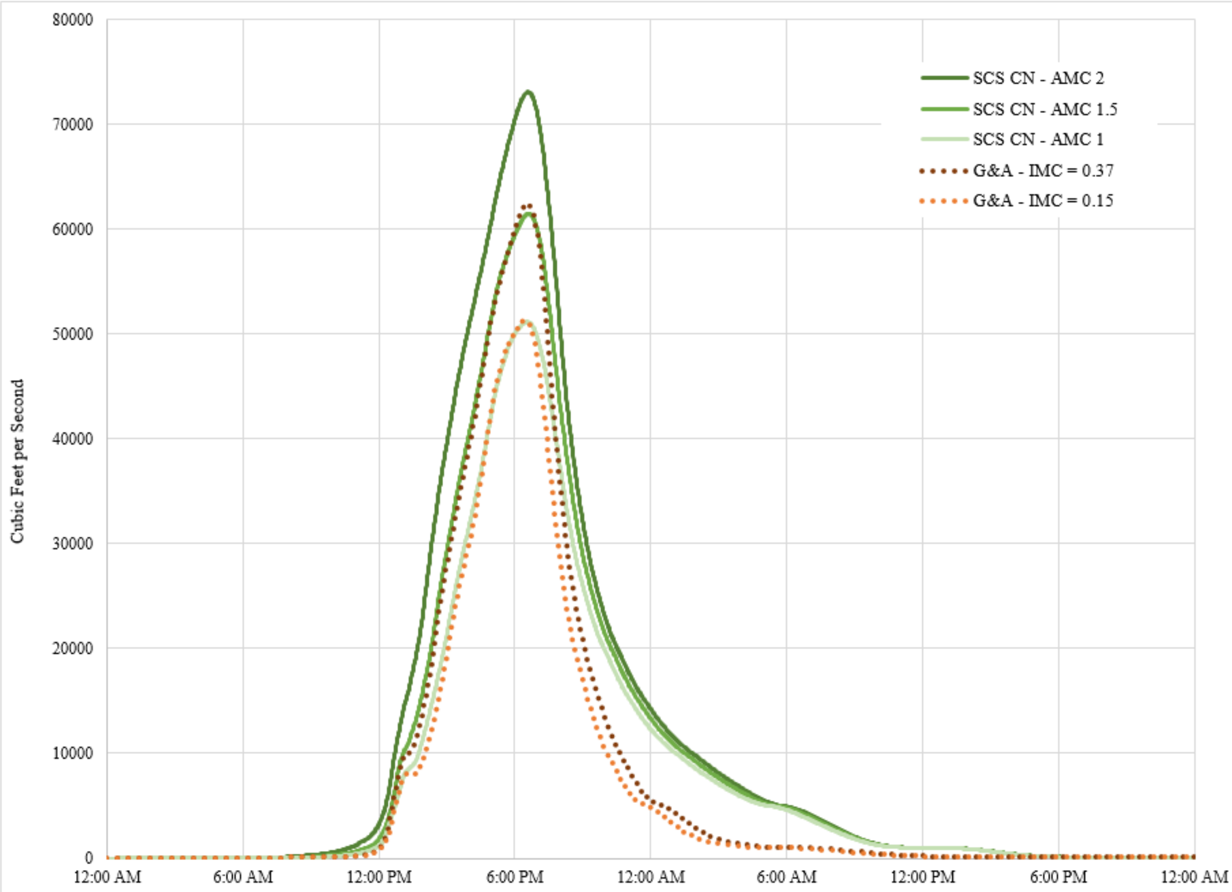


Figure A-53 South Fork San Gabriel SCS CN Loss Method vs Green & Ampt Loss Method



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APPENDIX B
HYDRAULICS

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B.1.0 Background

Hydraulic analyses were performed for study streams within the watershed study areas to estimate maximum water surface elevations that would occur for the 5-, 10-, 25-, 50-, 100-, and 500-year (20, 10, 4, 2, 1, and 0.2 percent annual chance exceedance) storm events for existing and future watershed conditions. The hydraulic analyses also include the delineation of the existing and future conditions 100-year floodplains. U.S. Army Corps of Engineers (USACE) Hydrologic Engineering Center River Analysis System (HEC-RAS) software version 5.0.1 is used for the hydraulic analysis. All modeling is one dimensional and steady state. Table B-1 lists stream study limits as well as the length and number of structures modeled, respectively.

The sections that follow describe the development of the hydraulic models both in general terms and specifics that apply to each stream.

B.2.0 Data Sources

Table B-2 lists the sources of data used in the hydraulic analyses. The most recently flown Light Detection and Ranging (LiDAR) data was utilized within each study reach for model geometry development. New on-the-ground topographic survey data were collected as part of this study including channel cross sections at one stream mile intervals and detailed survey of culvert crossings, bridge crossings, and regional detention facilities to supplement available as-built information. Field survey data sheets are included as Attachment 1. As-built information sources for culvert and bridge crossings within each study reach are listed in Section B.4 of this appendix. All topographic data were referenced to the North American Vertical Datum of 1988 (NAVD 88).

B.3.0 Model Development

B.3.1 Stream Centerlines and Cross Sections

Study stream centerlines and channel cross sections were developed based on best available LiDAR topographic data. A terrain surface was developed using ESRI ArcMap for each watershed study area. Cross sections were placed along the stream centerlines to capture natural cross sections and data for hydraulically significant structures including bridges, culverts, and roads. In general, cross section spacing was no more than 1,000 feet in undeveloped areas and no more than 500 ft in developed areas. Additional cross sections were placed at significant profile inflection points, areas of rapid expansion or contraction, and at significant changes in channel or overbank cross sectional geometry or roughness. Cross section locations for each study reach are shown on Figures B-2 through B-9.

USACE HEC-GeoRAS software was used in conjunction with ESRI ArcMap to develop station-elevation data for stream centerlines and cross sections based on LiDAR data. Crossing and hydraulic structures were then added to model geometry based on best available data including field survey data, as-built information, and field measurements. Channel cross sections were also refined based on field survey data where available.

B.3.2 Parameter Estimation

Hydraulic models require several estimated parameters, including Manning's 'n' roughness coefficients for channels and overbanks, contraction and expansion coefficients, ineffective flow area limits, and others as shown in the following tables.

Manning's 'n' is a measure of the roughness of channels and overbanks. The value of 'n' varies with flow depth, alignment, amount and type of vegetation, and flow observations. For this analysis, channel and overbank surfaces were evaluated using best available aerial imagery and field reconnaissance data and corresponding roughness coefficients were assigned based on Table B-3 using experience and engineering judgement.

Contraction and expansion coefficients were applied upstream and downstream, respectively, of culverts and bridges to model the contraction and expansion of flow. In this study, contraction and expansion coefficients of cross sections bounding bridges and culverts were 0.3 and 0.5, respectively. All other cross sections used the default contraction and expansion coefficients of 0.1 and 0.3. Additional hydraulic parameters are provided in Table B-4.

Ineffective flow limits were added to cross sections to accurately model any given section's inability to convey flow, such as cross sections that bound bridges and culverts. Blocked obstructions were added within off-channel local drainage features including detention ponds and channels, since these areas were assumed to be full and unable to convey flow. Storage in the main channel and overbanks were accounted for by using Modified Puls routing within the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) hydrologic models.

Downstream boundary conditions for each hydraulic model were based on normal depth. An energy slope was entered for each model based on the average bed slope in the vicinity of the downstream boundary. All hydraulic modeling assumed a subcritical flow regime for this study.

B.3.3 Peak Discharge Application Locations

Peak discharges within each study stream were computed by the HEC-HMS models for each watershed study area (See Appendix A). Peak flow rates computed at each hydrologic junction along the study stream were generally applied two-thirds of the distance to the next upstream junction. In cases where junctions were located at a significant tributary inflow point, the confluence peak flow was applied at the nearest cross section downstream of the confluence. Tables B-5 through B-12 provide a summary of peak existing and future conditions 100-year and existing conditions 500-year discharges and application locations for each study stream.

B.3.4 Road Crossings

Given the significant importance that road crossings play in a stream's hydraulic conditions, numerous crossings were field surveyed or measured. When available, as-built information on the road crossing was used. Topographic data sources are provided in Tables B-5 through B-12.

B.3.5 Special Modeling Considerations

The following sections provide details of calibration efforts and special modeling requirements and considerations for each study stream.

B.3.5.1 Hydraulic Model – Berry Creek Watershed Study Area

The Berry Creek Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations included simulation of Sun City inline detention pond and the in-line wet pond. The Sun City detention pond's control structure is modeled as bridge crossing since it is integrated with the Sun City Boulevard crossing of Berry Creek. The wet pond is modeled as an inline structure consisting of a flat-topped weir. The weir crest elevation was set to the apparent permanent pool elevation upstream of the structure based on best available LiDAR data. The channel invert at the structure was interpolated from the nearest downstream channel elevation.

Since no historical stage or discharge gage data were available for the Berry Creek hydraulic study reach, calibration efforts focused on site-specific flood complaint data collected during Tropical Storm Hermine in September 2010. Peak flows computed using the Berry Creek hydrologic model for Tropical Storm Hermine were applied to the hydraulic model. Resulting water surface elevations were compared to specific flood complaint locations and details. For Berry Creek, the Tropical Strom Hermine was run for the AMC II and AMC 1.5 land conditions. The flood elevation results were compared. The modeled water surface elevations for the AMC 1.5 conditions were closer to the flood complaint data than the AMC II conditions. Hydraulic parameters including Manning's n roughness coefficients and contraction/expansion coefficients were adjusted to agree with flood complaint data to the greatest extent possible. Special consideration was given to differentiate between flood complaints caused by local flooding sources (i.e., exceeded capacity of gutters, storm drains, channels, and other local drainage infrastructure) rather than riverine flooding sources.

B.3.5.2 Hydraulic Model – Mankins Branch Watershed Study Area

The Mankins Branch Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations included simulation of a small dam that is modeled as an inline structure consisting of a flat-topped weir. The weir crest elevation was set to the apparent permanent pool elevation upstream of the structure based on best available LiDAR data. The channel invert at the structure was interpolated from the nearest downstream channel elevation.

Since no historical stage or discharge gage data were available for the Mankins Branch hydraulic study reach, calibration efforts focused on site-specific flood complaint data collected during Tropical Storm Hermine in September 2010. Peak flows computed using the Mankins Branch hydrologic model for Tropical Storm Hermine were applied to the hydraulic model. Resulting water surface elevations were compared to specific flood complaint locations and details. Hydraulic parameters including Manning's n roughness coefficients and contraction/expansion coefficients were adjusted to agree with flood complaint data to the greatest extent possible. Special consideration was given to differentiate between flood complaints caused by local flooding sources (i.e., exceeded capacity of gutters, storm drains, channels, and other local drainage infrastructure) rather than riverine flooding sources.

B.3.5.3 Hydraulic Model – Pecan Branch Watershed Study Area

The Pecan Branch Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations included simulation of the overtopping of the left overbank into Berry Creek in the lower reach near FM 971. An auxiliary HEC-RAS model including laterals weirs along high ground between Pecan Branch and Berry Creek within the potential overflow area. The split flow optimization tool was used to compute diversion flow rates between the two systems assuming independent storm events within each watershed (i.e., no coincident peaks). An inflow-diversion rating curve was then developed based on the auxiliary model and added to the Pecan Branch HEC-HMS hydrologic model to adjust flow rates in the lower reach. Spillover from Pecan Branch into Berry Creek may occur in events as frequent as the 5-year event in the vicinity of FM 971; however, Berry Creek flows are generally conveyed within its banks up to the 100-year event and do not significantly influence flow rates in its lower reach.

Since no historical stage or discharge gage data were available for the Pecan Branch hydraulic study reach, calibration efforts focused on site-specific flood complaint data collected during Tropical Storm Hermine in September 2010. Peak flows computed using the Pecan Branch hydrologic model for Tropical Storm Hermine were applied to the hydraulic model. Resulting water surface elevations were compared to specific flood complaint locations and details. Hydraulic parameters including Manning's n roughness coefficients and contraction/expansion coefficients were adjusted to agree with flood complaint data to the greatest extent possible. Special consideration was given to differentiate between flood complaints caused by local flooding sources (i.e., exceeded capacity of gutters, storm drains, channels, and other local drainage infrastructure) rather than riverine flooding sources.

B.3.5.4 Hydraulic Model – Smith Branch Watershed Study Area

The Smith Branch Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations were limited to the West Fork of Smith Branch, and included simulation of the overtopping of the left overbank near Quail Valley Drive (including auxiliary unsteady-state and 2D modeling), simulation of overtopping of the right overbank along S. Austin Avenue (including auxiliary unsteady-state and 2D modeling), unsteady-state modeling in support of hydrologic routing calibration, and use of a levee along the railroad embankment between S. Austin Avenue and FM 1460.

Since no historical stage or discharge gage data were available for the Smith Branch hydraulic study reach, calibration efforts focused on site-specific flood complaint data collected during Tropical Storm Hermine in September 2010. Peak flows computed using the Smith Branch hydrologic model for Tropical Storm Hermine were applied to the hydraulic model. Resulting water surface elevations were compared to specific flood complaint locations and details. Hydraulic parameters including Manning's n roughness coefficients and contraction/expansion coefficients were adjusted to agree with flood complaint data to the greatest extent possible. Special consideration was given to differentiate between flood complaints caused by local flooding sources (i.e., exceeded capacity of gutters, storm drains, channels, and other local drainage infrastructure) rather than riverine flooding sources.

B.3.5.5 Hydraulic Model – Middle Fork San Gabriel River Watershed Study Area

The Middle Fork San Gabriel River Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations included simulation of several private inline check dams. They were modeled as inline structures consisting of flat-topped weirs. Weir crest elevations were set to the apparent permanent pool elevation upstream of each structure based on best available LiDAR data. Channel inverts at each structure were interpolated from the nearest upstream and downstream channel or structure field survey data.

Since no historical stage or discharge gage data were available for the Middle Fork San Gabriel River hydraulic study reach, calibration efforts focused on site-specific flood complaint data collected during Tropical Storm Hermine in September 2010. Peak flows computed using the Middle Fork San Gabriel River hydrologic model for Tropical Storm Hermine were applied to the hydraulic model. Resulting water surface elevations were compared to specific flood complaint locations and details. Hydraulic parameters including Manning's n roughness coefficients and contraction/expansion coefficients were adjusted to agree with flood complaint data to the greatest extent possible. Special consideration was given to differentiate between flood complaints caused by local flooding sources (i.e., exceeded capacity of gutters, storm drains, channels, and other local drainage infrastructure) rather than riverine flooding sources.

B.3.5.6 Hydraulic Model – North Fork San Gabriel River Watershed Study Area

The North Fork San Gabriel River Watershed Study Area HEC-RAS model consists of the stream identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations included considerations in and around Lake Georgetown. Lake Georgetown is a significant U.S. Army Corps of Engineers' reservoir located on the North Fork San Gabriel River in the northwest Georgetown area. The reservoir storage capacity, the dam, as well as its principal and emergency spillways influence flood considerations in the reservoir impoundment area as well as the downstream areas, including North Fork to the confluence with South Fork and the San Gabriel River downstream of the confluence. In developing existing and future developed watershed condition flood elevations, we developed separate approaches for three different areas of the Lake Georgetown floodplain; the impoundment area, downstream of the dam, and upstream of the lake.

For 100-year flood elevations within the Lake Georgetown impoundment area, the study compared the maximum historic lake elevation, the effective FEMA Zone A flood elevation, and the maximum flood elevation occurring when North Fork 100-year flood event flows route through the lake assuming pool elevation starts 10-feet above conservation pool elevation. Based upon Corps data, the historic maximum lake level did not occur during a significant flood event for the San Gabriel, but when the Corps impounded water in Lake Georgetown to provide flood protection in the lower Brazos River Basin. FEMA Zone A floodplains around the lake appear to indicate an elevation at or near the historic maximum lake level which is slightly higher than the emergency spillway elevation. Those levels were then compared to the runoff volume estimated to flow into the lake during a 100-year flood event and assuming the lake's water surface elevation is 10-feet above the conservation pool elevation. The study used the existing Zone A floodplain around the Lake Georgetown impoundment area since it exceeded the study's peak 100-year flood elevation and closely matched the maximum historic lake elevation.

Immediately downstream of Lake Georgetown, the flows reflected the runoff from the surrounding area and small releases from the dam.

Upstream of Lake Georgetown, the 100-year flood elevations are based upon Lake Georgetown's maximum impoundment flood elevation. The boundary condition for the most downstream cross-section just upstream of the lake was set at the top of the spillway's elevation.

Channel cross sections were also refined based on field survey data where available. In order to maintain a consistent bed slope between surveyed cross sections, channel inverts for cross sections based on LiDAR data alone were lowered to an interpolated channel invert based on the nearest upstream and downstream channel or structure field survey data. This was done by adjusting the lowest channel cross section point for each of these cross sections.

B.3.5.7 Hydraulic Model – South Fork San Gabriel River Watershed Study Area

The South Fork San Gabriel River Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1. Special modeling requirements and considerations included simulation of several private inline check dams generally west of Liberty Hill. Since no field survey data were obtained for these small dams, which were several feet below the 5-year computed water surface, they were modeled as inline structures consisting of flat-topped weirs. Weir crest elevations were set to the apparent permanent pool elevation upstream of each structure based on best available LiDAR data. Channel inverts at each structure were interpolated from the nearest upstream and downstream channel or structure field survey data.

Channel cross sections were also refined based on field survey data where available. In order to maintain a consistent bed slope between surveyed cross sections, channel inverts for cross sections based on LiDAR data alone were lowered to an interpolated channel invert based on the nearest upstream and downstream channel or structure field survey data. This was done by adjusting the lowest channel cross section point for each of these cross sections.

Historical stage and discharge data available at a USGS Station (USGS 08104900 S Fk San Gabriel Rv at Georgetown, TX) located on the South Fork San Gabriel River were used to calibrate the hydraulic model in concert with hydrologic calibration (Appendix A, Section A.10.0). Calibration events included Tropical Storm Hermine in September 2010 and the June 2007 storm event. Site-specific flood complaint data collected during Tropical Storm Hermine were also evaluated. Peak flows computed using the South Fork San Gabriel River hydrologic model for both storm events were applied to the hydraulic model. Resulting water surface elevations were compared to observed stages at the USGS gage and to specific flood complaint locations and details. Hydraulic parameters including Manning's n roughness coefficients and contraction/expansion coefficients were adjusted to agree with gage and flood complaint data to the greatest extent possible. Special consideration was given to differentiate between flood complaints caused by local flooding sources (i.e., exceeded capacity of gutters, storm drains, channels, and other local drainage infrastructure) rather than riverine flooding sources.

B.3.5.8 Hydraulic Model – San Gabriel River Watershed Study Area

The San Gabriel River Watershed Study Area HEC-RAS model consists of the streams identified in Table B-1 and shown on Figure B-1.

Channel cross sections were also refined based on field survey data where available. In order to maintain a consistent bed slope between surveyed cross sections, channel inverts for cross sections based on LiDAR data alone were lowered to an interpolated channel invert based on the nearest upstream and downstream channel or structure field survey data. This was done by adjusting the lowest channel cross section point for each of these cross sections.

B.4.0 Model Results and Floodplain Mapping

This section provides detailed model results including a tabulation of maximum water surface elevation profiles and floodplain figures. Existing and future conditions 100-year floodplain limits were determined by comparing maximum computed water surface elevation profiles to watershed terrain surfaces based on best available LiDAR ground surface elevations within each study stream. The RAS Mapper tool within HEC-RAS was used to auto-delineate floodplain limits for each event. Auto-delineated floodplain limits were then exported as shapefiles to ESRI ArcMap for post-processing, which included removal of "islands" within the floodplain and areas not hydraulically connected to the floodplain generally smaller than 0.5 acres.

Figures B-2 through B-9 provide cross section locations, effective FEMA 100-year floodplain limits, existing conditions 100-year floodplain limits, and future conditions 100-year floodplain limits for each of the study streams. Tables B-5 through B-12 provide tabulations of existing and future conditions 100- and 500-year maximum computed water surface elevations at cross sections within each study stream. These tables also provide the topographic data sources used at each cross section, bridge/culvert, and inline structure.

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TABLES

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Table B-1. Studied Streams Table

Stream	Limits of Study	Length (ft)	No. Structures
Berry Creek (Main Stem)	From confl. with San Gabriel River to 2,500 ft upstream of CR 241	108,095	19
Berry Creek (Dry Berry Creek)	From confl. with Berry Creek to 4,200 ft upstream of Ronald Reagan Blvd.	43,291	9
Berry Creek (Cowan Creek)	From confl. with Berry Creek to 550 ft downstream of Young Ranch Rd.	34,654	3
Mankins Branch (Main Stem)	From confl. with San Gabriel River to 950 ft upstream of Hutto Rd.	27,799	11
Mankins Branch (Trib 2)	From confl. with Main Stem to 1700 ft upstream of Sam Houston Ave.	17,838	2
Mankins Branch (Trib 2.1)	From confl. with Trib 2 to 400 ft upstream of Rockride Ln.	7865	1
Pecan Branch	From confl. with San Gabriel River to 1,000 ft upstream of W. Sequoia Spur	48,500	31
Smith Branch (Main Stem)	From confl. with San Gabriel River to 2,300 ft upstream of CR 166	27,400	7
Smith Branch (West Fork)	From confl. with Main Stem to D/S face railroad west of I.H. 35	22,400	10
Middle Fork San Gabriel	From confl. with San Gabriel River to 80 ft downstream of Cross Creek Ln.	69,217	10
North Fork San Gabriel	From confl. with San Gabriel River to 4600 ft upstream of FM 2340	264,538	23
South Fork San Gabriel	From confl. with San Gabriel River to 1,100 ft upstream of CR 330B	196,800	21
San Gabriel River	From 6650 ft downstream of SH 29 to confl. with South San Gabriel River	58,354	17

Table B-2. Data Sources

Source	Used For
Burnet County 2011 LiDAR topography	Cross Section Station-Elevation Data, Floodplain Mapping
CAPCOG 2006 LiDAR topography	Cross Section Station-Elevation Data, Floodplain Mapping
City of Georgetown 2015 LiDAR topography	Cross Section Station-Elevation Data, Floodplain Mapping
ESRI World Imagery	Channel & Overbank Roughness Coefficients
2015-2016 Topographic Field Survey Data	Cross Section Station-Elevation Data, Stream Invert, Bridge/Culvert Data
Various As-built Information (see Section B-5 through B-12 for sources)	Bridge/Culvert Data

Table B-3. Manning's n Roughness Coefficients for Open Channel Flow

Material	Typical Manning's n roughness coefficient	
	Minimum	**Maximum**
Channel		
Concrete	0.011	0.020
Natural stream channels	0.025	0.033
Clean, straight stream	0.033	0.045
Clean, winding stream	0.045	0.060
Winding with weeds & pools	0.070	0.150
With heavy brush and timber		
Overbanks		
Pasture	0.025	0.060
Cultivated Area	0.020	0.060
Light brush	0.035	0.080
Dense brush	0.045	0.160
Trees	0.080	0.200
Residential Areas	0.100	0.200

Table B-4. Miscellaneous Hydraulic Coefficients

Coefficient Type	Value or Range
Bridge pier drag coefficient for momentum equation application, Cd	1.2 to 2
Pressure and weir flow coefficient (submerged inlet and outlet), Cd	0.8
Expansion coefficients for bridge / culverts / in-line structures	0.3 to 0.5
Expansion coefficients for channels	0.3
Contraction coefficient for bridges / culverts / in-line structures	0.1 to 0.3
Contraction coefficients for channels	0.1
Weir coefficients (road deck)	2.6 to 3.0
Culvert entrance loss coefficient	0.4
Culvert exit loss coefficient	1

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Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	107605	915.26	915.84	918.76	LIDAR TOPO
Berry Creek	Berry Creek	107128	914.20	914.73	915.74	LIDAR TOPO
Berry Creek	Berry Creek	106636	913.33	913.86	914.87	LIDAR TOPO
Berry Creek	Berry Creek	106149	912.39	912.93	913.94	LIDAR TOPO
Berry Creek	Berry Creek	105690	911.57	912.12	913.15	LIDAR TOPO
Berry Creek	Berry Creek	105633	911.63	912.18	913.20	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	105550 COUNTY RD 241				2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	105480	911.19	911.86	912.92	LIDAR TOPO
Berry Creek	Berry Creek	105368	910.18	910.77	912.02	LIDAR TOPO
Berry Creek	Berry Creek	105006	908.88	909.48	910.60	LIDAR TOPO
Berry Creek	Berry Creek	104554	906.33	906.86	908.04	LIDAR TOPO
Berry Creek	Berry Creek	104065	905.45	905.91	906.94	LIDAR TOPO
Berry Creek	Berry Creek	103582	904.71	905.14	906.11	LIDAR TOPO
Berry Creek	Berry Creek	103058	903.86	904.27	905.17	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	103006 COUNTY RD 245				2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	102912	902.24	902.75	903.94	LIDAR TOPO
Berry Creek	Berry Creek	102793	902.09	902.60	903.79	LIDAR TOPO
Berry Creek	Berry Creek	102314	901.24	901.77	902.98	LIDAR TOPO
Berry Creek	Berry Creek	101863	899.91	900.39	901.51	LIDAR TOPO
Berry Creek	Berry Creek	101386	898.24	898.64	899.58	LIDAR TOPO
Berry Creek	Berry Creek	100905	896.12	896.59	897.75	LIDAR TOPO
Berry Creek	Berry Creek	100394	895.12	895.59	896.75	LIDAR TOPO
Berry Creek	Berry Creek	99933	894.23	894.69	895.83	LIDAR TOPO
Berry Creek	Berry Creek	99432	893.02	893.47	894.60	LIDAR TOPO
Berry Creek	Berry Creek	98959	891.48	892.00	893.25	LIDAR TOPO
Berry Creek	Berry Creek	98479	890.11	890.61	891.86	LIDAR TOPO
Berry Creek	Berry Creek	97979	889.11	889.64	890.96	LIDAR TOPO
Berry Creek	Berry Creek	97464	887.81	888.34	889.59	LIDAR TOPO
Berry Creek	Berry Creek	97058	887.22	887.74	888.98	LIDAR TOPO
Berry Creek	Berry Creek	96595	886.40	886.92	888.16	LIDAR TOPO
Berry Creek	Berry Creek	96137	885.69	886.22	887.48	LIDAR TOPO
Berry Creek	Berry Creek	95634	884.43	884.97	886.21	LIDAR TOPO
Berry Creek	Berry Creek	95019	882.00	882.42	883.51	LIDAR TOPO
Berry Creek	Berry Creek	94671	881.54	881.97	883.05	LIDAR TOPO
Berry Creek	Berry Creek	94118	879.74	880.23	881.45	LIDAR TOPO
Berry Creek	Berry Creek	93636	878.70	879.22	880.50	LIDAR TOPO
Berry Creek	Berry Creek	93179	877.76	878.29	879.59	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	92700	876.94	877.46	878.75	LIDAR TOPO
Berry Creek	Berry Creek	92219	876.33	876.84	878.10	LIDAR TOPO
Berry Creek	Berry Creek	91704	875.22	875.76	877.09	LIDAR TOPO
Berry Creek	Berry Creek	91199	873.82	874.34	875.69	LIDAR TOPO
Berry Creek	Berry Creek	90700	873.18	873.67	875.01	LIDAR TOPO
Berry Creek	Berry Creek	90298	872.21	872.66	873.97	LIDAR TOPO
Berry Creek	Berry Creek	89830	870.85	871.30	872.59	LIDAR TOPO
Berry Creek	Berry Creek	89346	869.34	869.79	871.12	LIDAR TOPO
Berry Creek	Berry Creek	88885	868.27	868.74	870.11	LIDAR TOPO
Berry Creek	Berry Creek	88760	868.08	868.56	869.94	LIDAR TOPO
Berry Creek	Berry Creek	88716 BEAVER LN				LIDAR TOPO
Berry Creek	Berry Creek	88681	867.74	868.17	869.48	LIDAR TOPO
Berry Creek	Berry Creek	88638	867.69	868.13	869.44	LIDAR TOPO
Berry Creek	Berry Creek	88408	866.83	867.30	868.69	LIDAR TOPO
Berry Creek	Berry Creek	87940	865.90	866.38	867.80	LIDAR TOPO
Berry Creek	Berry Creek	87446	863.70	864.19	865.76	LIDAR TOPO
Berry Creek	Berry Creek	86947	862.73	863.31	865.11	LIDAR TOPO
Berry Creek	Berry Creek	86482	861.98	862.62	864.58	LIDAR TOPO
Berry Creek	Berry Creek	85998	861.27	861.97	864.08	LIDAR TOPO
Berry Creek	Berry Creek	85551	860.94	861.67	863.84	LIDAR TOPO
Berry Creek	Berry Creek	85083	860.70	861.45	863.67	LIDAR TOPO
Berry Creek	Berry Creek	84626	860.46	861.24	863.49	LIDAR TOPO
Berry Creek	Berry Creek	84143	860.26	861.05	863.34	LIDAR TOPO
Berry Creek	Berry Creek	83684	859.96	860.76	863.07	LIDAR TOPO
Berry Creek	Berry Creek	83190	859.30	860.10	862.43	LIDAR TOPO
Berry Creek	Berry Creek	82689	857.60	858.40	860.56	LIDAR TOPO
Berry Creek	Berry Creek	82209	856.00	856.69	858.75	LIDAR TOPO
Berry Creek	Berry Creek	81764	855.20	855.87	857.98	LIDAR TOPO
Berry Creek	Berry Creek	81291	854.28	854.95	857.15	LIDAR TOPO
Berry Creek	Berry Creek	80881	853.79	854.49	856.74	LIDAR TOPO
Berry Creek	Berry Creek	80415	852.63	853.27	855.43	LIDAR TOPO
Berry Creek	Berry Creek	79933	851.78	852.46	854.72	LIDAR TOPO
Berry Creek	Berry Creek	79469	850.96	851.58	853.62	LIDAR TOPO
Berry Creek	Berry Creek	79174	849.92	850.48	852.34	LIDAR TOPO
Berry Creek	Berry Creek	78709	848.40	849.04	851.26	LIDAR TOPO
Berry Creek	Berry Creek	78249	848.10	848.93	851.14	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	77704	847.45	848.15	850.24	LIDAR TOPO
Berry Creek	Berry Creek	77347	847.12	847.86	850.05	LIDAR TOPO
Berry Creek	Berry Creek	76869	843.89	844.76	847.30	LIDAR TOPO
Berry Creek	Berry Creek	76407	843.21	844.08	846.57	LIDAR TOPO
Berry Creek	Berry Creek	75929	841.29	842.21	845.35	LIDAR TOPO
Berry Creek	Berry Creek	75464	840.98	841.93	844.95	LIDAR TOPO
Berry Creek	Berry Creek	75002	840.61	841.53	844.56	LIDAR TOPO
Berry Creek	Berry Creek	74905	839.90	840.77	844.32	LIDAR TOPO
Berry Creek	Berry Creek	74792 RONALD REAGAN BLVD				Ronald W. Reagan Boulevard North Phase III As-builts
Berry Creek	Berry Creek	74637	838.73	839.55	841.80	LIDAR TOPO
Berry Creek	Berry Creek	74512	838.07	839.01	841.54	LIDAR TOPO
Berry Creek	Berry Creek	74062	835.92	836.59	838.84	LIDAR TOPO
Berry Creek	Berry Creek	73599	834.66	835.40	837.92	LIDAR TOPO
Berry Creek	Berry Creek	73169	834.09	834.83	837.26	LIDAR TOPO
Berry Creek	Berry Creek	72687	831.61	832.33	834.54	LIDAR TOPO
Berry Creek	Berry Creek	72222	830.94	831.68	834.17	LIDAR TOPO
Berry Creek	Berry Creek	71803	830.09	830.82	833.19	LIDAR TOPO
Berry Creek	Berry Creek	71329	829.07	829.77	832.05	LIDAR TOPO
Berry Creek	Berry Creek	70900	828.06	828.67	830.75	LIDAR TOPO
Berry Creek	Berry Creek	70391	826.90	827.46	829.46	LIDAR TOPO
Berry Creek	Berry Creek	69914	825.80	826.38	828.42	LIDAR TOPO
Berry Creek	Berry Creek	69453	824.87	825.42	827.36	LIDAR TOPO
Berry Creek	Berry Creek	68973	824.01	824.55	826.48	LIDAR TOPO
Berry Creek	Berry Creek	68494	822.79	823.35	825.28	LIDAR TOPO
Berry Creek	Berry Creek	68026	820.64	821.48	823.19	LIDAR TOPO
Berry Creek	Berry Creek	67554	819.35	819.85	821.66	LIDAR TOPO
Berry Creek	Berry Creek	67056	818.65	819.19	821.01	LIDAR TOPO
Berry Creek	Berry Creek	66570	817.95	818.48	820.23	LIDAR TOPO
Berry Creek	Berry Creek	66065	817.39	817.91	819.59	LIDAR TOPO
Berry Creek	Berry Creek	65597	817.14	817.65	819.28	LIDAR TOPO
Berry Creek	Berry Creek	65141	816.97	817.46	819.03	LIDAR TOPO
Berry Creek	Berry Creek	64665	816.84	817.32	818.84	LIDAR TOPO
Berry Creek	Berry Creek	64247	816.68	817.14	818.58	LIDAR TOPO
Berry Creek	Berry Creek	63749	816.50	816.94	818.30	LIDAR TOPO
Berry Creek	Berry Creek	63563	816.45	816.88	818.21	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	63101	816.44	816.88	818.20	LIDAR TOPO
Berry Creek	Berry Creek	62999	816.46	816.90	818.23	LIDAR TOPO
Berry Creek	Berry Creek	62816 SUN CITY BLVD				Sun City Georgetown - Phase 2A - Sun City Boulevard Bridge/Detention Facility
Berry Creek	Berry Creek	62717	804.49	805.18	807.91	LIDAR TOPO
Berry Creek	Berry Creek	62634	804.28	804.98	807.73	LIDAR TOPO
Berry Creek	Berry Creek	62371	804.07	804.76	807.51	LIDAR TOPO
Berry Creek	Berry Creek	62248	803.59	804.26	807.04	LIDAR TOPO
Berry Creek	Berry Creek	62046	802.84	803.50	806.08	LIDAR TOPO
Berry Creek	Berry Creek	61776	802.22	802.86	805.42	LIDAR TOPO
Berry Creek	Berry Creek	61281	801.14	801.82	804.47	LIDAR TOPO
Berry Creek	Berry Creek	60851	801.02	801.70	804.37	LIDAR TOPO
Berry Creek	Berry Creek	60351	801.01	801.71	804.44	LIDAR TOPO
Berry Creek	Berry Creek	59882	799.66	800.35	803.09	LIDAR TOPO
Berry Creek	Berry Creek	59419	798.83	799.48	802.05	LIDAR TOPO
Berry Creek	Berry Creek	58952	797.92	798.55	801.13	LIDAR TOPO
Berry Creek	Berry Creek	58465	796.37	797.17	800.13	LIDAR TOPO
Berry Creek	Berry Creek	57967	795.40	796.29	799.43	LIDAR TOPO
Berry Creek	Berry Creek	57529	793.95	794.95	798.33	LIDAR TOPO
Berry Creek	Berry Creek	57049	793.22	794.29	797.74	LIDAR TOPO
Berry Creek	Berry Creek	56566	792.45	793.60	797.07	LIDAR TOPO
Berry Creek	Berry Creek	56519 DAM				LIDAR TOPO
Berry Creek	Berry Creek	56372	792.34	793.45	796.87	LIDAR TOPO
Berry Creek	Berry Creek	56272 DEL WEBB BLVD				Sun City Georgetown - Market Trail - Segment 1
Berry Creek	Berry Creek	56192	791.14	791.98	794.88	LIDAR TOPO
Berry Creek	Berry Creek	56085	791.04	791.88	794.78	LIDAR TOPO
Berry Creek	Berry Creek	55635	789.41	790.33	793.09	LIDAR TOPO
Berry Creek	Berry Creek	55147	787.22	788.15	791.37	LIDAR TOPO
Berry Creek	Berry Creek	54684	787.09	788.07	791.25	LIDAR TOPO
Berry Creek	Berry Creek	54210	785.54	786.38	789.78	LIDAR TOPO
Berry Creek	Berry Creek	53686	783.68	784.76	787.86	LIDAR TOPO
Berry Creek	Berry Creek	53221	782.06	783.27	786.09	LIDAR TOPO
Berry Creek	Berry Creek	52739	779.02	779.60	782.92	LIDAR TOPO
Berry Creek	Berry Creek	52255	778.01	778.81	781.96	LIDAR TOPO
Berry Creek	Berry Creek	51764	776.60	777.41	780.73	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	51373	776.33	777.17	780.48	LIDAR TOPO
Berry Creek	Berry Creek	51025	775.55	776.38	779.69	LIDAR TOPO
Berry Creek	Berry Creek	50617	774.90	775.74	778.93	LIDAR TOPO
Berry Creek	Berry Creek	50323	774.65	775.46	778.69	LIDAR TOPO
Berry Creek	Berry Creek	49841	772.72	773.38	776.20	LIDAR TOPO
Berry Creek	Berry Creek	49345	771.69	772.28	775.11	LIDAR TOPO
Berry Creek	Berry Creek	48887	770.69	771.24	773.87	LIDAR TOPO
Berry Creek	Berry Creek	48527	769.00	769.54	772.24	LIDAR TOPO
Berry Creek	Berry Creek	48187	768.32	768.90	771.78	LIDAR TOPO
Berry Creek	Berry Creek	47773	767.63	768.15	770.95	LIDAR TOPO
Berry Creek	Berry Creek	47383	767.07	767.59	770.53	LIDAR TOPO
Berry Creek	Berry Creek	46913	766.64	767.15	770.16	LIDAR TOPO
Berry Creek	Berry Creek	46421	762.94	763.92	768.28	LIDAR TOPO
Berry Creek	Berry Creek	45923	762.73	763.60	767.51	LIDAR TOPO
Berry Creek	Berry Creek	45448	758.97	759.53	761.95	LIDAR TOPO
Berry Creek	Berry Creek	44939	758.46	759.08	761.97	LIDAR TOPO
Berry Creek	Berry Creek	44477	758.04	758.75	761.97	LIDAR TOPO
Berry Creek	Berry Creek	43987	756.89	757.72	761.25	LIDAR TOPO
Berry Creek	Berry Creek	43467	754.14	754.91	758.33	LIDAR TOPO
Berry Creek	Berry Creek	43012	752.60	753.35	757.03	LIDAR TOPO
Berry Creek	Berry Creek	42532	751.66	752.52	756.23	LIDAR TOPO
Berry Creek	Berry Creek	42059	750.42	751.32	755.26	LIDAR TOPO
Berry Creek	Berry Creek	41572	748.92	749.81	753.67	LIDAR TOPO
Berry Creek	Berry Creek	41110	747.97	748.87	752.75	LIDAR TOPO
Berry Creek	Berry Creek	40655	745.75	746.60	750.00	LIDAR TOPO
Berry Creek	Berry Creek	40168	744.79	745.56	748.77	LIDAR TOPO
Berry Creek	Berry Creek	39686	743.23	743.88	747.13	LIDAR TOPO
Berry Creek	Berry Creek	39212	741.69	742.34	745.67	LIDAR TOPO
Berry Creek	Berry Creek	38734	740.36	741.00	744.52	LIDAR TOPO
Berry Creek	Berry Creek	38261	739.54	740.33	744.55	LIDAR TOPO
Berry Creek	Berry Creek	37773	738.77	739.59	743.91	LIDAR TOPO
Berry Creek	Berry Creek	37314	737.70	738.57	743.22	LIDAR TOPO
Berry Creek	Berry Creek	36857	735.96	736.79	741.63	LIDAR TOPO
Berry Creek	Berry Creek	36394	734.24	735.23	740.91	LIDAR TOPO
Berry Creek	Berry Creek	35898	734.29	735.32	741.05	LIDAR TOPO
Berry Creek	Berry Creek	35429	733.11	734.20	740.25	LIDAR TOPO
Berry Creek	Berry Creek	35152	730.67	731.60	739.53	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	35102 SHELL RD				Field Measurements
Berry Creek	Berry Creek	35053	729.24	730.02	733.32	LIDAR TOPO
Berry Creek	Berry Creek	34974	727.44	728.19	731.42	LIDAR TOPO
Berry Creek	Berry Creek	34491	726.35	727.05	730.97	LIDAR TOPO
Berry Creek	Berry Creek	34022	725.11	725.97	730.20	LIDAR TOPO
Berry Creek	Berry Creek	33544	723.33	724.25	728.65	LIDAR TOPO
Berry Creek	Berry Creek	33071	721.63	722.40	726.41	LIDAR TOPO
Berry Creek	Berry Creek	32604	721.08	721.93	726.32	LIDAR TOPO
Berry Creek	Berry Creek	32120	715.55	716.49	720.00	LIDAR TOPO
Berry Creek	Berry Creek	31657	713.29	713.93	719.33	LIDAR TOPO
Berry Creek	Berry Creek	31183	712.10	712.91	718.65	LIDAR TOPO
Berry Creek	Berry Creek	30713	710.37	711.16	717.81	LIDAR TOPO
Berry Creek	Berry Creek	30254	709.51	710.38	717.63	LIDAR TOPO
Berry Creek	Berry Creek	29744	707.98	708.77	716.92	LIDAR TOPO
Berry Creek	Berry Creek	29534	706.56	707.39	716.87	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	29483 OAK TREE DR				2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	29448	706.10	707.19	713.09	LIDAR TOPO
Berry Creek	Berry Creek	29311	705.82	706.87	712.63	LIDAR TOPO
Berry Creek	Berry Creek	29169	705.68	706.66	712.21	LIDAR TOPO
Berry Creek	Berry Creek	29117 CHAMPIONS DR				Field Measurements
Berry Creek	Berry Creek	29073	704.45	705.09	708.38	LIDAR TOPO
Berry Creek	Berry Creek	28840	704.15	704.77	707.98	LIDAR TOPO
Berry Creek	Berry Creek	28365	703.24	703.70	706.55	LIDAR TOPO
Berry Creek	Berry Creek	27897	702.60	702.99	705.62	LIDAR TOPO
Berry Creek	Berry Creek	27421	701.97	702.27	704.53	LIDAR TOPO
Berry Creek	Berry Creek	26968	701.56	701.81	703.85	LIDAR TOPO
Berry Creek	Berry Creek	26906	701.31	701.50	703.29	LIDAR TOPO
Berry Creek	Berry Creek	26856 COUNTY RD 190 / AIRPORT RD				Field Measurements
Berry Creek	Berry Creek	26794	698.48	699.03	700.28	LIDAR TOPO
Berry Creek	Berry Creek	26501	698.28	698.86	700.28	LIDAR TOPO
Berry Creek	Berry Creek	26019	698.32	698.98	700.71	LIDAR TOPO
Berry Creek	Berry Creek	25521	697.94	698.62	700.23	LIDAR TOPO
Berry Creek	Berry Creek	25035	694.96	695.77	697.95	LIDAR TOPO
Berry Creek	Berry Creek	24556	694.66	695.37	697.72	LIDAR TOPO
Berry Creek	Berry Creek	24079	693.47	693.94	696.90	LIDAR TOPO
Berry Creek	Berry Creek	23580	692.44	692.76	696.37	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	23130	689.41	690.19	695.93	LIDAR TOPO
Berry Creek	Berry Creek	22645	689.34	689.90	695.83	LIDAR TOPO
Berry Creek	Berry Creek	22183	688.43	689.05	695.67	LIDAR TOPO
Berry Creek	Berry Creek	21733	687.85	688.50	695.60	LIDAR TOPO
Berry Creek	Berry Creek	21239	687.51	688.22	695.54	LIDAR TOPO
Berry Creek	Berry Creek	20742	687.21	687.94	695.44	LIDAR TOPO
Berry Creek	Berry Creek	20304	686.70	687.46	695.34	LIDAR TOPO
Berry Creek	Berry Creek	19864	686.60	687.34	695.29	LIDAR TOPO
Berry Creek	Berry Creek	19765	686.23	686.94	695.25	LIDAR TOPO
Berry Creek	Berry Creek	19703 I.H. 35 SB FRONTAGE RD				TXDOT 0015-08-108 As-builts
Berry Creek	Berry Creek	19662	685.16	685.78	693.21	LIDAR TOPO
Berry Creek	Berry Creek	19621 SH 130 SB				TXDOT 0015-08-114
Berry Creek	Berry Creek	19549	684.46	685.03	692.74	LIDAR TOPO
Berry Creek	Berry Creek	19502 I.H. 35 MAIN LANE NB AND SB				TXDOT 0015-08-108
Berry Creek	Berry Creek	19392	683.62	684.11	689.82	LIDAR TOPO
Berry Creek	Berry Creek	19356 SH 130 NB				TXDOT 0015-08-114
Berry Creek	Berry Creek	19285	683.18	683.61	685.28	LIDAR TOPO
Berry Creek	Berry Creek	19216 I.H. 35 NB FRONTAGE RD				TXDOT 0015-08-108
Berry Creek	Berry Creek	19144	680.93	681.35	682.37	LIDAR TOPO
Berry Creek	Berry Creek	19055	681.50	682.05	683.76	LIDAR TOPO
Berry Creek	Berry Creek	18808	681.37	681.90	683.65	LIDAR TOPO
Berry Creek	Berry Creek	18366	681.00	681.55	683.13	LIDAR TOPO
Berry Creek	Berry Creek	18116	680.55	681.13	682.65	LIDAR TOPO
Berry Creek	Berry Creek	17640	677.54	677.86	680.04	LIDAR TOPO
Berry Creek	Berry Creek	17171	677.45	677.80	679.40	LIDAR TOPO
Berry Creek	Berry Creek	16705	676.37	676.81	678.67	LIDAR TOPO
Berry Creek	Berry Creek	16241	675.00	675.46	677.40	LIDAR TOPO
Berry Creek	Berry Creek	15796	673.63	674.07	675.56	LIDAR TOPO
Berry Creek	Berry Creek	15354	673.27	673.76	675.15	LIDAR TOPO
Berry Creek	Berry Creek	14873	671.65	671.99	674.16	LIDAR TOPO
Berry Creek	Berry Creek	14421	669.26	669.89	672.39	LIDAR TOPO
Berry Creek	Berry Creek	13950	668.18	668.83	671.29	LIDAR TOPO
Berry Creek	Berry Creek	13482	668.06	668.64	670.89	LIDAR TOPO
Berry Creek	Berry Creek	13039	664.78	665.03	667.26	LIDAR TOPO
Berry Creek	Berry Creek	12578	663.94	664.10	666.17	LIDAR TOPO
Berry Creek	Berry Creek	12087	662.92	662.84	665.61	LIDAR TOPO
Berry Creek	Berry Creek	12025	662.69	662.53	664.38	LIDAR TOPO/2015-2016 FIELD SURVEY

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	11992 COUNTY RD 152				2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	11956	660.97	661.43	663.03	LIDAR TOPO
Berry Creek	Berry Creek	11791	660.45	660.93	662.40	LIDAR TOPO
Berry Creek	Berry Creek	11435	660.29	660.80	662.75	LIDAR TOPO
Berry Creek	Berry Creek	11010	658.29	658.77	660.30	LIDAR TOPO
Berry Creek	Berry Creek	10490	657.94	658.52	660.11	LIDAR TOPO
Berry Creek	Berry Creek	10017	657.22	657.78	659.43	LIDAR TOPO
Berry Creek	Berry Creek	9574	656.26	656.91	658.72	LIDAR TOPO
Berry Creek	Berry Creek	9238	655.41	656.08	657.94	LIDAR TOPO
Berry Creek	Berry Creek	8781	654.87	655.54	657.38	LIDAR TOPO
Berry Creek	Berry Creek	8630	653.36	654.03	655.73	LIDAR TOPO
Berry Creek	Berry Creek	8223	651.72	652.35	654.14	LIDAR TOPO
Berry Creek	Berry Creek	7791	650.67	651.30	653.06	LIDAR TOPO
Berry Creek	Berry Creek	7371	650.13	650.73	652.48	LIDAR TOPO
Berry Creek	Berry Creek	6927	646.93	647.42	648.73	LIDAR TOPO
Berry Creek	Berry Creek	6533	647.48	647.97	649.30	LIDAR TOPO
Berry Creek	Berry Creek	6154	645.32	645.84	647.21	LIDAR TOPO
Berry Creek	Berry Creek	5683	643.98	644.41	645.63	LIDAR TOPO
Berry Creek	Berry Creek	5199	641.18	641.76	643.23	LIDAR TOPO
Berry Creek	Berry Creek	4685	641.91	642.40	643.67	LIDAR TOPO
Berry Creek	Berry Creek	4296	641.41	641.90	643.23	LIDAR TOPO
Berry Creek	Berry Creek	3833	640.97	641.46	642.79	LIDAR TOPO
Berry Creek	Berry Creek	3370	640.57	641.05	642.34	LIDAR TOPO
Berry Creek	Berry Creek	2890	640.22	640.69	641.92	LIDAR TOPO
Berry Creek	Berry Creek	2761	640.10	640.55	641.74	LIDAR TOPO
Berry Creek	Berry Creek	2727	640.19	640.65	641.85	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	2681 FM 971				2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	2616	639.87	640.37	641.69	LIDAR TOPO
Berry Creek	Berry Creek	2588	639.76	640.22	641.40	LIDAR TOPO
Berry Creek	Berry Creek	2477	639.64	640.09	641.22	LIDAR TOPO
Berry Creek	Berry Creek	2074	639.43	639.87	640.99	LIDAR TOPO
Berry Creek	Berry Creek	1608	639.08	639.50	640.56	LIDAR TOPO
Berry Creek	Berry Creek	1135	638.91	639.31	640.32	LIDAR TOPO
Berry Creek	Berry Creek	718	638.77	639.17	640.16	LIDAR TOPO
Berry Creek	Berry Creek	543	638.79	639.19	640.17	LIDAR TOPO
Berry Creek	Berry Creek	462	638.48	638.85	639.45	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Berry Creek	419 RAILROAD CROSSING				2015-2016 FIELD SURVEY

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Berry Creek	363	636.75	637.28	638.67	LIDAR TOPO
Berry Creek	Berry Creek	314	636.52	637.05	638.46	LIDAR TOPO
Berry Creek	Berry Creek	174	636.48	637.01	638.42	LIDAR TOPO
Berry Creek	Dry Berry Creek	42785	785.71	785.52	785.81	LIDAR TOPO
Berry Creek	Dry Berry Creek	42235	782.79	782.63	782.81	LIDAR TOPO
Berry Creek	Dry Berry Creek	41757	780.02	780.39	781.02	LIDAR TOPO
Berry Creek	Dry Berry Creek	41245	777.69	778.36	779.11	LIDAR TOPO
Berry Creek	Dry Berry Creek	41062	776.62	777.32	777.99	LIDAR TOPO
Berry Creek	Dry Berry Creek	40695	774.75	775.47	776.14	LIDAR TOPO
Berry Creek	Dry Berry Creek	40230	772.72	773.45	774.23	LIDAR TOPO
Berry Creek	Dry Berry Creek	39729	770.63	771.37	772.16	LIDAR TOPO
Berry Creek	Dry Berry Creek	39248	769.46	770.22	771.02	LIDAR TOPO
Berry Creek	Dry Berry Creek	39094	768.42	769.16	769.87	LIDAR TOPO
Berry Creek	Dry Berry Creek	39018 RONALD REAGAN BLVD				Ronald W. Reagan Boulevard North Phase IV As-builts
Berry Creek	Dry Berry Creek	38920	768.18	768.92	769.63	LIDAR TOPO
Berry Creek	Dry Berry Creek	38691	765.35	765.98	766.73	LIDAR TOPO
Berry Creek	Dry Berry Creek	38282	763.52	764.16	764.86	LIDAR TOPO
Berry Creek	Dry Berry Creek	37801	761.98	762.64	763.42	LIDAR TOPO
Berry Creek	Dry Berry Creek	37323	760.36	760.93	761.76	LIDAR TOPO
Berry Creek	Dry Berry Creek	36833	755.39	756.43	757.00	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	36747 LIVE OAK TRL				2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	36677	755.85	756.47	757.12	LIDAR TOPO
Berry Creek	Dry Berry Creek	36374	755.30	755.92	756.56	LIDAR TOPO
Berry Creek	Dry Berry Creek	35886	754.19	754.82	755.48	LIDAR TOPO
Berry Creek	Dry Berry Creek	35398	751.32	751.93	752.63	LIDAR TOPO
Berry Creek	Dry Berry Creek	34924	750.24	750.72	751.29	LIDAR TOPO
Berry Creek	Dry Berry Creek	34446	748.43	748.96	749.51	LIDAR TOPO
Berry Creek	Dry Berry Creek	34273	747.11	747.56	748.12	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	34248 COUNTY RD 234				2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	34213	747.17	747.64	748.23	LIDAR TOPO
Berry Creek	Dry Berry Creek	34048	746.91	747.35	747.92	LIDAR TOPO
Berry Creek	Dry Berry Creek	33588	745.64	746.10	746.66	LIDAR TOPO
Berry Creek	Dry Berry Creek	33088	744.73	745.14	745.68	LIDAR TOPO
Berry Creek	Dry Berry Creek	32637	744.02	744.44	745.00	LIDAR TOPO
Berry Creek	Dry Berry Creek	32148	743.14	743.52	744.02	LIDAR TOPO
Berry Creek	Dry Berry Creek	31543	740.78	741.09	741.49	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Dry Berry Creek	31103	739.29	739.72	740.33	LIDAR TOPO
Berry Creek	Dry Berry Creek	30667	738.52	738.99	739.67	LIDAR TOPO
Berry Creek	Dry Berry Creek	30196	737.72	738.23	738.96	LIDAR TOPO
Berry Creek	Dry Berry Creek	29611	736.97	737.50	738.28	LIDAR TOPO
Berry Creek	Dry Berry Creek	29363	736.36	736.88	737.65	LIDAR TOPO
Berry Creek	Dry Berry Creek	29010	735.77	736.29	737.05	LIDAR TOPO
Berry Creek	Dry Berry Creek	28627	735.22	735.73	736.47	LIDAR TOPO
Berry Creek	Dry Berry Creek	28118	733.96	734.44	735.12	LIDAR TOPO
Berry Creek	Dry Berry Creek	27705	732.45	732.96	733.70	LIDAR TOPO
Berry Creek	Dry Berry Creek	27396	731.45	731.94	732.67	LIDAR TOPO
Berry Creek	Dry Berry Creek	26906	730.42	730.92	731.70	LIDAR TOPO
Berry Creek	Dry Berry Creek	26755	730.10	730.61	731.40	LIDAR TOPO
Berry Creek	Dry Berry Creek	26266	729.32	729.82	730.61	LIDAR TOPO
Berry Creek	Dry Berry Creek	25761	728.31	728.79	729.57	LIDAR TOPO
Berry Creek	Dry Berry Creek	25306	727.21	727.72	728.53	LIDAR TOPO
Berry Creek	Dry Berry Creek	25224	725.83	726.39	727.21	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	25160 COUNTY RD 143				2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	25100	725.93	726.41	727.18	LIDAR TOPO
Berry Creek	Dry Berry Creek	24896	725.21	725.67	726.42	LIDAR TOPO
Berry Creek	Dry Berry Creek	24397	723.63	724.20	725.20	LIDAR TOPO
Berry Creek	Dry Berry Creek	23913	722.95	723.61	724.74	LIDAR TOPO
Berry Creek	Dry Berry Creek	23507	722.10	722.80	723.95	LIDAR TOPO
Berry Creek	Dry Berry Creek	23019	721.08	721.89	723.18	LIDAR TOPO
Berry Creek	Dry Berry Creek	22555	720.29	721.04	722.23	LIDAR TOPO
Berry Creek	Dry Berry Creek	22057	717.99	718.54	719.38	LIDAR TOPO
Berry Creek	Dry Berry Creek	21588	716.34	716.81	717.50	LIDAR TOPO
Berry Creek	Dry Berry Creek	21119	714.96	715.42	716.15	LIDAR TOPO
Berry Creek	Dry Berry Creek	20651	713.48	713.94	714.69	LIDAR TOPO
Berry Creek	Dry Berry Creek	20175	712.12	712.57	713.32	LIDAR TOPO
Berry Creek	Dry Berry Creek	19712	710.98	711.39	712.11	LIDAR TOPO
Berry Creek	Dry Berry Creek	19212	709.36	709.88	710.83	LIDAR TOPO
Berry Creek	Dry Berry Creek	18737	708.19	708.92	710.07	LIDAR TOPO
Berry Creek	Dry Berry Creek	18278	707.63	708.49	709.74	LIDAR TOPO
Berry Creek	Dry Berry Creek	17761	707.18	708.04	709.28	LIDAR TOPO
Berry Creek	Dry Berry Creek	17279	706.47	707.33	708.53	LIDAR TOPO
Berry Creek	Dry Berry Creek	16823	705.70	706.60	707.78	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Dry Berry Creek	16356	704.35	705.37	706.49	LIDAR TOPO
Berry Creek	Dry Berry Creek	15860	703.10	704.26	705.28	LIDAR TOPO
Berry Creek	Dry Berry Creek	15378	702.14	703.49	704.36	LIDAR TOPO
Berry Creek	Dry Berry Creek	14902	701.61	703.18	704.02	LIDAR TOPO
Berry Creek	Dry Berry Creek	14402	701.33	702.97	703.76	LIDAR TOPO
Berry Creek	Dry Berry Creek	13929	701.14	702.83	703.59	LIDAR TOPO
Berry Creek	Dry Berry Creek	13431	701.08	702.77	703.52	LIDAR TOPO
Berry Creek	Dry Berry Creek	13350	701.00	702.72	703.44	LIDAR TOPO
Berry Creek	Dry Berry Creek	13272 I.H. 35 SB FRONTAGE RD				TXDOT 0015-08-108
Berry Creek	Dry Berry Creek	13233	700.17	702.18	702.88	LIDAR TOPO
Berry Creek	Dry Berry Creek	13135 I.H. 35 SB				TXDOT 0015-08-108
Berry Creek	Dry Berry Creek	13039	699.08	701.11	701.51	LIDAR TOPO
Berry Creek	Dry Berry Creek	12950 I.H. 35 NB				TXDOT 0015-08-108
Berry Creek	Dry Berry Creek	12850	698.08	699.57	699.46	LIDAR TOPO
Berry Creek	Dry Berry Creek	12786 I.H. 35 NB FRONTAGE RD				TXDOT 0015-08-108
Berry Creek	Dry Berry Creek	12713	693.69	694.44	695.60	LIDAR TOPO
Berry Creek	Dry Berry Creek	12559	693.04	693.82	695.02	LIDAR TOPO
Berry Creek	Dry Berry Creek	12269	692.66	693.46	694.69	LIDAR TOPO
Berry Creek	Dry Berry Creek	11839	689.57	690.31	691.47	LIDAR TOPO
Berry Creek	Dry Berry Creek	11362	689.30	689.97	690.91	LIDAR TOPO
Berry Creek	Dry Berry Creek	10908	688.02	688.69	689.73	LIDAR TOPO
Berry Creek	Dry Berry Creek	10403	686.21	686.87	687.89	LIDAR TOPO
Berry Creek	Dry Berry Creek	9912	684.42	685.30	686.51	LIDAR TOPO
Berry Creek	Dry Berry Creek	9461	682.34	682.96	684.00	LIDAR TOPO
Berry Creek	Dry Berry Creek	9000	681.87	682.52	683.54	LIDAR TOPO
Berry Creek	Dry Berry Creek	8556	679.00	679.81	681.13	LIDAR TOPO
Berry Creek	Dry Berry Creek	8071	677.51	678.21	679.29	LIDAR TOPO
Berry Creek	Dry Berry Creek	7581	675.26	675.81	676.85	LIDAR TOPO
Berry Creek	Dry Berry Creek	7133	674.33	674.96	676.13	LIDAR TOPO
Berry Creek	Dry Berry Creek	6665	673.27	673.97	675.25	LIDAR TOPO
Berry Creek	Dry Berry Creek	6178	672.17	673.05	674.45	LIDAR TOPO
Berry Creek	Dry Berry Creek	5710	672.10	672.96	674.35	LIDAR TOPO
Berry Creek	Dry Berry Creek	5222	671.89	672.74	674.09	LIDAR TOPO
Berry Creek	Dry Berry Creek	4739	671.20	672.08	673.56	LIDAR TOPO
Berry Creek	Dry Berry Creek	4259	669.30	670.14	671.61	LIDAR TOPO
Berry Creek	Dry Berry Creek	3960	667.65	668.75	671.02	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Dry Berry Creek	3648	668.25	669.35	671.31	LIDAR TOPO
Berry Creek	Dry Berry Creek	3355	666.31	666.94	667.60	LIDAR TOPO
Berry Creek	Dry Berry Creek	2854	664.23	665.26	667.72	LIDAR TOPO
Berry Creek	Dry Berry Creek	2337	662.41	663.72	667.15	LIDAR TOPO
Berry Creek	Dry Berry Creek	2251	662.67	663.84	667.06	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	2216 COUNTY RD 152				2015-2016 FIELD SURVEY
Berry Creek	Dry Berry Creek	2161	662.53	663.21	664.44	LIDAR TOPO
Berry Creek	Dry Berry Creek	2035	662.20	662.92	664.26	LIDAR TOPO
Berry Creek	Dry Berry Creek	1786	660.44	661.53	662.22	LIDAR TOPO
Berry Creek	Dry Berry Creek	1329	657.73	658.18	660.39	LIDAR TOPO
Berry Creek	Dry Berry Creek	852	656.28	656.60	658.19	LIDAR TOPO
Berry Creek	Dry Berry Creek	326	656.42	656.63	658.31	LIDAR TOPO
Berry Creek	Cowan Creek	34278	986.41	986.50	986.65	LIDAR TOPO
Berry Creek	Cowan Creek	33861	979.05	979.22	979.31	LIDAR TOPO
Berry Creek	Cowan Creek	33434	974.54	974.66	974.79	LIDAR TOPO
Berry Creek	Cowan Creek	32941	968.00	968.09	968.13	LIDAR TOPO
Berry Creek	Cowan Creek	32486	963.21	963.33	963.43	LIDAR TOPO
Berry Creek	Cowan Creek	32061	959.15	959.27	959.34	LIDAR TOPO
Berry Creek	Cowan Creek	31559	955.08	955.19	955.26	LIDAR TOPO
Berry Creek	Cowan Creek	31091	951.94	952.13	952.28	LIDAR TOPO
Berry Creek	Cowan Creek	30625	949.45	949.65	949.82	LIDAR TOPO
Berry Creek	Cowan Creek	30116	947.32	947.51	947.66	LIDAR TOPO
Berry Creek	Cowan Creek	29670	944.11	944.30	944.45	LIDAR TOPO
Berry Creek	Cowan Creek	29167	940.64	940.81	940.95	LIDAR TOPO
Berry Creek	Cowan Creek	28702	938.19	938.34	938.48	LIDAR TOPO
Berry Creek	Cowan Creek	28217	935.22	935.35	935.45	LIDAR TOPO
Berry Creek	Cowan Creek	27752	933.04	933.21	933.36	LIDAR TOPO
Berry Creek	Cowan Creek	27305	930.40	930.61	930.76	LIDAR TOPO
Berry Creek	Cowan Creek	26798	929.20	929.47	929.69	LIDAR TOPO
Berry Creek	Cowan Creek	26324	927.71	927.95	928.11	LIDAR TOPO
Berry Creek	Cowan Creek	25827	924.20	924.50	924.81	LIDAR TOPO
Berry Creek	Cowan Creek	25342	920.71	920.88	920.90	LIDAR TOPO
Berry Creek	Cowan Creek	24862	916.14	916.52	916.81	LIDAR TOPO
Berry Creek	Cowan Creek	24385	915.88	916.27	916.51	LIDAR TOPO
Berry Creek	Cowan Creek	24375	915.71	916.10	916.34	LIDAR TOPO
Berry Creek	Cowan Creek	23885	912.99	913.44	913.79	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Cowan Creek	23458	912.51	912.99	913.28	LIDAR TOPO
Berry Creek	Cowan Creek	23337	912.54	913.02	913.32	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Cowan Creek	23202 RR 2338 / ANDICE RD				2015-2016 FIELD SURVEY
Berry Creek	Cowan Creek	23078	907.32	907.65	907.89	LIDAR TOPO
Berry Creek	Cowan Creek	22979	906.66	906.97	907.21	LIDAR TOPO
Berry Creek	Cowan Creek	22670	904.90	905.17	905.36	LIDAR TOPO
Berry Creek	Cowan Creek	22208	902.08	902.38	902.63	LIDAR TOPO
Berry Creek	Cowan Creek	21724	900.01	900.39	900.66	LIDAR TOPO
Berry Creek	Cowan Creek	21255	896.85	897.08	897.30	LIDAR TOPO
Berry Creek	Cowan Creek	20784	893.97	894.31	894.57	LIDAR TOPO
Berry Creek	Cowan Creek	20330	893.18	893.48	893.67	LIDAR TOPO
Berry Creek	Cowan Creek	20239	892.95	893.22	893.37	LIDAR TOPO/2015-2016 FIELD SURVEY
Berry Creek	Cowan Creek	20200 COUNTY RD 245				2015-2016 FIELD SURVEY
Berry Creek	Cowan Creek	20166	891.21	891.91	892.31	LIDAR TOPO
Berry Creek	Cowan Creek	20131	891.15	891.83	892.23	LIDAR TOPO
Berry Creek	Cowan Creek	19668	888.31	888.83	889.24	LIDAR TOPO
Berry Creek	Cowan Creek	19220	885.79	886.33	886.72	LIDAR TOPO
Berry Creek	Cowan Creek	18973	885.20	885.89	886.36	LIDAR TOPO
Berry Creek	Cowan Creek	18637	883.58	884.23	884.76	LIDAR TOPO
Berry Creek	Cowan Creek	18164	882.27	882.98	883.51	LIDAR TOPO
Berry Creek	Cowan Creek	17721	880.61	881.15	881.65	LIDAR TOPO
Berry Creek	Cowan Creek	17242	877.19	877.80	878.32	LIDAR TOPO
Berry Creek	Cowan Creek	16782	875.67	876.38	876.98	LIDAR TOPO
Berry Creek	Cowan Creek	16321	872.89	873.51	874.07	LIDAR TOPO
Berry Creek	Cowan Creek	15890	872.09	872.60	873.10	LIDAR TOPO
Berry Creek	Cowan Creek	15491	870.04	870.80	871.16	LIDAR TOPO
Berry Creek	Cowan Creek	15311	868.09	868.51	869.33	LIDAR TOPO
Berry Creek	Cowan Creek	15104	867.34	868.09	868.68	LIDAR TOPO
Berry Creek	Cowan Creek	14827	866.50	867.26	867.88	LIDAR TOPO
Berry Creek	Cowan Creek	14382	864.97	865.75	866.36	LIDAR TOPO
Berry Creek	Cowan Creek	13899	861.23	861.70	862.52	LIDAR TOPO
Berry Creek	Cowan Creek	13434	860.43	861.44	862.13	LIDAR TOPO
Berry Creek	Cowan Creek	12944	858.01	858.71	859.39	LIDAR TOPO
Berry Creek	Cowan Creek	12477	856.49	857.08	857.66	LIDAR TOPO
Berry Creek	Cowan Creek	11973	852.88	853.41	853.73	LIDAR TOPO
Berry Creek	Cowan Creek	11504	850.48	851.11	851.63	LIDAR TOPO

Table B-5 Computed Water Surface Elevations and Topographic Data Source – Berry Creek (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Berry Creek	Cowan Creek	10997	848.25	849.11	849.89	LIDAR TOPO
Berry Creek	Cowan Creek	10506	846.12	846.94	847.67	LIDAR TOPO
Berry Creek	Cowan Creek	9976	841.84	842.54	843.11	LIDAR TOPO
Berry Creek	Cowan Creek	9487	840.97	841.97	842.93	LIDAR TOPO
Berry Creek	Cowan Creek	9060	840.42	841.46	842.46	LIDAR TOPO
Berry Creek	Cowan Creek	8901	839.23	840.32	841.26	LIDAR TOPO
Berry Creek	Cowan Creek	8834 COOL SPRING WAY				Sun City Texas Cool Spring Way Bridge
Berry Creek	Cowan Creek	8798	836.84	837.35	837.78	LIDAR TOPO
Berry Creek	Cowan Creek	8606	836.38	836.96	837.45	LIDAR TOPO
Berry Creek	Cowan Creek	8128	833.39	833.83	834.32	LIDAR TOPO
Berry Creek	Cowan Creek	7669	831.94	832.66	833.31	LIDAR TOPO
Berry Creek	Cowan Creek	7192	830.57	831.26	831.92	LIDAR TOPO
Berry Creek	Cowan Creek	6706	828.95	829.60	830.35	LIDAR TOPO
Berry Creek	Cowan Creek	6222	827.16	827.68	828.68	LIDAR TOPO
Berry Creek	Cowan Creek	5756	824.52	825.04	826.15	LIDAR TOPO
Berry Creek	Cowan Creek	5292	822.19	822.73	823.76	LIDAR TOPO
Berry Creek	Cowan Creek	4831	819.24	819.86	821.03	LIDAR TOPO
Berry Creek	Cowan Creek	4335	816.90	817.54	819.05	LIDAR TOPO
Berry Creek	Cowan Creek	3881	815.28	815.94	817.38	LIDAR TOPO
Berry Creek	Cowan Creek	3502	813.71	814.40	815.85	LIDAR TOPO
Berry Creek	Cowan Creek	3017	809.77	810.22	811.26	LIDAR TOPO
Berry Creek	Cowan Creek	2535	806.91	807.59	809.06	LIDAR TOPO
Berry Creek	Cowan Creek	2033	805.72	806.36	807.76	LIDAR TOPO
Berry Creek	Cowan Creek	1552	802.82	803.25	804.77	LIDAR TOPO
Berry Creek	Cowan Creek	1102	802.02	802.26	803.86	LIDAR TOPO
Berry Creek	Cowan Creek	616	801.34	801.40	803.03	LIDAR TOPO
Berry Creek	Cowan Creek	291	801.24	801.28	802.97	LIDAR TOPO
Berry Creek	Cowan Creek	152	801.15	801.16	802.86	LIDAR TOPO

Note: All elevations are in NAVD88.

Table B-6 Computed Water Surface Elevations and Topographic Data Source – Mankins Branch

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Mankins Branch	1	27434	762.58	762.70	762.82	LIDAR TOPO
Mankins Branch	1	26990	762.03	762.20	762.34	LIDAR TOPO
Mankins Branch	1	26910	762.00	762.18	762.31	LIDAR TOPO/2015-2016 FIELD SURVEY
Mankins Branch	1	26857 COUNTY RD 110 / ROCKRIDE LN				2015-2016 FIELD SURVEY
Mankins Branch	1	26823	759.92	760.09	760.22	LIDAR TOPO
Mankins Branch	1	26758	759.88	760.06	760.19	LIDAR TOPO
Mankins Branch	1	26676	759.76	759.90	759.99	LIDAR TOPO
Mankins Branch	1	26599	759.75	759.88	759.98	LIDAR TOPO/2015-2016 FIELD SURVEY
Mankins Branch	1	26549 CR 104 / BELL GIN RD				2015-2016 FIELD SURVEY
Mankins Branch	1	26511	754.38	754.58	754.75	LIDAR TOPO
Mankins Branch	1	26379	753.46	753.65	753.81	LIDAR TOPO
Mankins Branch	1	26157	751.68	751.90	752.10	LIDAR TOPO
Mankins Branch	1	25680	747.98	748.18	748.37	LIDAR TOPO
Mankins Branch	1	25199	744.39	744.56	744.71	LIDAR TOPO
Mankins Branch	1	24689	741.04	741.20	741.35	LIDAR TOPO
Mankins Branch	1	24197	735.41	735.59	735.77	LIDAR TOPO
Mankins Branch	1	23842	733.60	733.91	734.17	LIDAR TOPO
Mankins Branch	1	23401	731.22	731.65	731.95	LIDAR TOPO
Mankins Branch	1	22922	726.70	727.03	727.30	LIDAR TOPO
Mankins Branch	1	22433	724.31	724.78	725.14	LIDAR TOPO
Mankins Branch	1	21976	722.03	722.44	722.78	LIDAR TOPO
Mankins Branch	1	21513	719.07	719.57	719.86	LIDAR TOPO
Mankins Branch	1	21040	715.38	715.69	716.00	LIDAR TOPO
Mankins Branch	1	20560	711.74	712.26	712.52	LIDAR TOPO
Mankins Branch	1	20037	708.88	709.41	709.99	LIDAR TOPO
Mankins Branch	1	19528	705.66	706.14	706.56	LIDAR TOPO
Mankins Branch	1	19197	703.88	704.42	704.89	LIDAR TOPO
Mankins Branch	1	19151	703.80	704.35	704.82	LIDAR TOPO
Mankins Branch	1	19039 SH 130 SB SERVICE RD				TXDOT 0440-05-004
Mankins Branch	1	18954	702.61	703.25	703.74	LIDAR TOPO
Mankins Branch	1	18865 SH 130 SB				TXDOT 0440-05-004
Mankins Branch	1	18752	699.78	700.45	701.06	LIDAR TOPO
Mankins Branch	1	18751	699.09	699.69	700.26	LIDAR TOPO
Mankins Branch	1	18631 SH 130 NB				TXDOT 0440-05-004

Table B-6 Computed Water Surface Elevations and Topographic Data Source – Mankins Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Mankins Branch	1	18561	697.87	698.52	699.17	LIDAR TOPO
Mankins Branch	1	18503 SH 130 NB SERVICE RD				TXDOT 0440-05-004
Mankins Branch	1	18342	697.46	698.21	698.91	LIDAR TOPO
Mankins Branch	1	18256	696.69	697.34	697.93	LIDAR TOPO
Mankins Branch	1	18043	695.05	695.47	695.88	LIDAR TOPO
Mankins Branch	1	17556	692.31	692.86	693.24	LIDAR TOPO
Mankins Branch	1	17063	688.13	688.72	689.44	LIDAR TOPO
Mankins Branch	1	16601	684.69	685.45	685.75	LIDAR TOPO
Mankins Branch	1	16531	685.08	686.08	686.58	LIDAR TOPO/2015-2016 FIELD SURVEY
Mankins Branch	1	16486 COUNTY RD 104				2015-2016 FIELD SURVEY
Mankins Branch	1	16409	683.65	684.46	685.04	LIDAR TOPO
Mankins Branch	1	16306	682.60	683.30	684.31	LIDAR TOPO
Mankins Branch	1	16012	681.62	681.91	682.69	LIDAR TOPO
Mankins Branch	1	15688	681.67	681.99	682.80	LIDAR TOPO
Mankins Branch	1	15161	677.56	678.74	678.74	LIDAR TOPO
Mankins Branch	1	15022	675.22	677.21	677.32	LIDAR TOPO/2015-2016 FIELD SURVEY
Mankins Branch	1	14869 COUNTY RD 104				2015-2016 FIELD SURVEY
Mankins Branch	1	14797	675.15	676.12	676.69	LIDAR TOPO
Mankins Branch	1	14728	674.18	675.12	675.65	LIDAR TOPO
Mankins Branch	1	14328	671.15	672.30	672.96	LIDAR TOPO
Mankins Branch	1	13832	669.92	671.06	671.74	LIDAR TOPO
Mankins Branch	1	13345	668.71	669.93	670.64	LIDAR TOPO
Mankins Branch	1	12883	665.92	667.30	668.34	LIDAR TOPO
Mankins Branch	1	12406	663.74	665.48	666.45	LIDAR TOPO
Mankins Branch	1	12332	663.60	665.44	666.52	LIDAR TOPO
Mankins Branch	1	12308				LIDAR TOPO
Mankins Branch	1	12293 PRIVATE DR	664.04	665.81	666.87	LIDAR TOPO
Mankins Branch	1	12200	661.75	662.63	663.02	LIDAR TOPO
Mankins Branch	1	12000	662.09	663.19	663.79	LIDAR TOPO
Mankins Branch	1	11537	659.70	661.08	661.77	LIDAR TOPO
Mankins Branch	1	11076	655.11	656.90	657.79	LIDAR TOPO
Mankins Branch	1	10823	654.38	656.56	657.55	LIDAR TOPO
Mankins Branch	1	10377	654.22	656.39	657.33	LIDAR TOPO
Mankins Branch	1	10029	650.79	652.24	654.02	LIDAR TOPO
Mankins Branch	1	9576	647.83	648.33	648.50	LIDAR TOPO
Mankins Branch	1	9078	646.56	647.98	648.83	LIDAR TOPO

Table B-6 Computed Water Surface Elevations and Topographic Data Source – Mankins Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Mankins Branch	1	8675	645.14	646.15	646.63	LIDAR TOPO
Mankins Branch	1	8315	641.54	642.94	644.19	LIDAR TOPO
Mankins Branch	1	7961	640.93	643.00	644.01	LIDAR TOPO
Mankins Branch	1	7635	637.63	641.12	642.44	LIDAR TOPO
Mankins Branch	1	7134	635.28	640.25	641.75	LIDAR TOPO
Mankins Branch	1	7060	635.44	640.65	642.10	LIDAR TOPO
Mankins Branch	1	7032 COUNTY RD 106				Field Measurement
Mankins Branch	1	7017	633.00	634.52	635.52	LIDAR TOPO
Mankins Branch	1	6958	632.38	633.74	634.64	LIDAR TOPO
Mankins Branch	1	6823	629.56	630.92	631.77	LIDAR TOPO
Mankins Branch	1	6409	626.84	628.28	629.05	LIDAR TOPO
Mankins Branch	1	5936	622.99	624.12	625.22	LIDAR TOPO
Mankins Branch	1	5457	622.21	623.45	624.87	LIDAR TOPO
Mankins Branch	1	4990	619.28	620.37	621.46	LIDAR TOPO
Mankins Branch	1	4523	616.46	617.46	618.46	LIDAR TOPO
Mankins Branch	1	4069	613.87	614.98	616.17	LIDAR TOPO
Mankins Branch	1	3579	611.38	612.41	613.54	LIDAR TOPO
Mankins Branch	1	3116	609.39	610.73	612.25	LIDAR TOPO
Mankins Branch	1	2665	608.20	609.68	611.33	LIDAR TOPO
Mankins Branch	1	2241	605.96	607.54	609.36	LIDAR TOPO
Mankins Branch	1	1946	604.93	606.54	608.34	LIDAR TOPO
Mankins Branch	1	1471	603.94	605.57	607.58	LIDAR TOPO
Mankins Branch	1	1320	601.24	602.43	603.54	LIDAR TOPO
Mankins Branch	1	890	599.16	600.48	601.47	LIDAR TOPO
Mankins Branch	1	465	595.99	596.28	597.41	LIDAR TOPO
Mankins Branch	1	354	595.69	595.65	596.32	LIDAR TOPO/2015-2016 FIELD SURVEY
Mankins Branch	1	322 COUNTY RD 100				2015-2016 FIELD SURVEY
Mankins Branch	1	294	593.53	594.39	595.05	LIDAR TOPO
Mankins Branch	1	223	593.58	594.54	595.39	LIDAR TOPO
Mankins Branch	2	17316	795.24	795.35	795.39	LIDAR TOPO
Mankins Branch	2	17071	793.05	793.58	793.64	LIDAR TOPO
Mankins Branch	2	16667	790.58	790.39	790.44	LIDAR TOPO
Mankins Branch	2	16478	788.20	789.50	789.85	LIDAR TOPO
Mankins Branch	2	16274	787.88	789.43	789.78	LIDAR TOPO
Mankins Branch	2	16184 SAM HOUSTON AVE				S.E. Arterial 1 Phase 1 Drainage No. 5 As-builts
Mankins Branch	2	16037	784.88	785.15	785.21	LIDAR TOPO

Table B-6 Computed Water Surface Elevations and Topographic Data Source – Mankins Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Mankins Branch	2	15956	784.36	784.60	784.65	LIDAR TOPO
Mankins Branch	2	15563	781.35	781.63	781.70	LIDAR TOPO
Mankins Branch	2	15107	777.68	777.99	778.04	LIDAR TOPO
Mankins Branch	2	14799	775.05	775.43	775.53	LIDAR TOPO
Mankins Branch	2	14417	771.66	771.95	772.00	LIDAR TOPO
Mankins Branch	2	13960	768.89	769.22	769.33	LIDAR TOPO
Mankins Branch	2	13417	764.54	764.76	764.79	LIDAR TOPO
Mankins Branch	2	13031	761.04	761.45	761.60	LIDAR TOPO
Mankins Branch	2	12552	755.50	755.98	756.02	LIDAR TOPO
Mankins Branch	2	12097	751.86	752.20	752.29	LIDAR TOPO
Mankins Branch	2	11744	749.11	749.41	749.48	LIDAR TOPO
Mankins Branch	2	11346	745.46	745.84	745.94	LIDAR TOPO
Mankins Branch	2	10881	741.51	741.82	741.89	LIDAR TOPO
Mankins Branch	2	10405	738.25	738.60	738.68	LIDAR TOPO
Mankins Branch	2	9961	734.69	734.99	735.06	LIDAR TOPO
Mankins Branch	2	9496	731.15	731.50	731.61	LIDAR TOPO
Mankins Branch	2	9099	727.28	727.64	727.71	LIDAR TOPO
Mankins Branch	2	8796	725.08	726.93	727.49	LIDAR TOPO
Mankins Branch	2	8706	725.02	726.87	727.43	LIDAR TOPO
Mankins Branch	2	8456 SH 130				TXDOT 0440-05-004
Mankins Branch	2	7953	719.80	720.34	720.50	LIDAR TOPO
Mankins Branch	2	7693	719.13	719.69	719.88	LIDAR TOPO
Mankins Branch	2	7257	716.83	717.33	717.52	LIDAR TOPO
Mankins Branch	2	6792	713.03	713.45	713.60	LIDAR TOPO
Mankins Branch	2	6315	710.11	710.48	710.61	LIDAR TOPO
Mankins Branch	2	5964	708.06	708.41	708.55	LIDAR TOPO
Mankins Branch	2	5549	706.62	706.99	707.13	LIDAR TOPO
Mankins Branch	2	5059	703.84	704.36	704.58	LIDAR TOPO
Mankins Branch	2	4614	701.28	701.74	701.94	LIDAR TOPO
Mankins Branch	2	4292	698.45	699.20	699.55	LIDAR TOPO
Mankins Branch	2	3769	695.05	695.63	695.89	LIDAR TOPO
Mankins Branch	2	3295	692.09	692.94	693.31	LIDAR TOPO
Mankins Branch	2	2792	689.12	689.89	690.27	LIDAR TOPO
Mankins Branch	2	2287	686.09	686.67	686.88	LIDAR TOPO
Mankins Branch	2	1791	683.61	684.67	685.19	LIDAR TOPO
Mankins Branch	2	1450	682.16	683.30	683.86	LIDAR TOPO

Table B-6 Computed Water Surface Elevations and Topographic Data Source – Mankins Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Mankins Branch	2	954	679.73	680.85	681.43	LIDAR TOPO
Mankins Branch	2	499	676.99	677.87	678.22	LIDAR TOPO
Mankins Branch	2	48	675.69	677.14	677.67	LIDAR TOPO
Mankins Branch	2.1	7565	776.54	776.92	777.02	LIDAR TOPO
Mankins Branch	2.1	7430 ROCKRIDE LN				Georgetown Inner Loop STA 151+75 to STA 164+90 As-builts
Mankins Branch	2.1	7384	774.50	774.73	774.79	LIDAR TOPO
Mankins Branch	2.1	7149	773.63	773.81	773.86	LIDAR TOPO
Mankins Branch	2.1	6824	771.75	771.93	771.98	LIDAR TOPO
Mankins Branch	2.1	6310	769.42	769.60	769.66	LIDAR TOPO
Mankins Branch	2.1	5821	766.86	767.05	767.10	LIDAR TOPO
Mankins Branch	2.1	5381	763.63	763.94	764.01	LIDAR TOPO
Mankins Branch	2.1	4803	759.06	759.28	759.36	LIDAR TOPO
Mankins Branch	2.1	4248	753.45	753.70	753.78	LIDAR TOPO
Mankins Branch	2.1	3800	750.74	751.02	751.11	LIDAR TOPO
Mankins Branch	2.1	3320	745.87	746.11	746.18	LIDAR TOPO
Mankins Branch	2.1	2987	743.32	743.62	743.72	LIDAR TOPO
Mankins Branch	2.1	2491	740.89	741.18	741.24	LIDAR TOPO
Mankins Branch	2.1	2018	738.06	738.33	738.45	LIDAR TOPO
Mankins Branch	2.1	1584	734.22	734.69	734.74	LIDAR TOPO
Mankins Branch	2.1	1115	731.66	732.05	732.33	LIDAR TOPO
Mankins Branch	2.1	642	728.88	729.23	729.10	LIDAR TOPO
Mankins Branch	2.1	332	727.01	727.31	727.84	LIDAR TOPO
Mankins Branch	2.1	164	725.64	725.99	727.72	LIDAR TOPO
Mankins Branch	2.1	63	725.32	726.16	727.72	LIDAR TOPO

Note: All elevations are in NAVD88.

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	48493	847.79	848.01	848.25	LIDAR TOPO
Pecan Branch	Pecan Branch	48000	835.43	835.64	835.91	LIDAR TOPO
Pecan Branch	Pecan Branch	47526	831.82	832.02	832.27	LIDAR TOPO
Pecan Branch	Pecan Branch	47433	831.76	831.95	832.18	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	47419 W SEQUOIA SPUR				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	47345	827.78	828.31	828.96	LIDAR TOPO
Pecan Branch	Pecan Branch	47155	824.04	824.25	824.44	LIDAR TOPO
Pecan Branch	Pecan Branch	47000	823.35	823.67	823.91	LIDAR TOPO
Pecan Branch	Pecan Branch	46498	815.12	815.33	815.83	LIDAR TOPO
Pecan Branch	Pecan Branch	46113	813.70	814.04	814.26	LIDAR TOPO
Pecan Branch	Pecan Branch	45924	813.58	813.91	814.10	LIDAR TOPO
Pecan Branch	Pecan Branch	45887 LA PALOMA DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	45852	809.82	810.11	810.43	LIDAR TOPO
Pecan Branch	Pecan Branch	45502	806.81	807.05	807.36	LIDAR TOPO
Pecan Branch	Pecan Branch	44983	800.69	800.98	801.27	LIDAR TOPO
Pecan Branch	Pecan Branch	44500	796.93	797.18	797.48	LIDAR TOPO
Pecan Branch	Pecan Branch	44302	796.61	796.83	797.10	LIDAR TOPO
Pecan Branch	Pecan Branch	44268 MALAGA DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	44231	794.27	794.53	794.95	LIDAR TOPO
Pecan Branch	Pecan Branch	44121	793.84	794.06	794.44	LIDAR TOPO
Pecan Branch	Pecan Branch	43930	793.29	793.49	793.70	LIDAR TOPO
Pecan Branch	Pecan Branch	43798	793.00	793.20	793.29	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	43788 VAL VERDE DR				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	43720	791.48	791.43	791.88	LIDAR TOPO
Pecan Branch	Pecan Branch	43502	789.63	789.85	790.37	LIDAR TOPO
Pecan Branch	Pecan Branch	43346	788.82	789.00	789.48	LIDAR TOPO
Pecan Branch	Pecan Branch	43207	787.86	787.49	787.86	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	43193 SEVILLA DR				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	43127	786.23	786.34	786.69	LIDAR TOPO
Pecan Branch	Pecan Branch	43001	785.59	785.77	786.20	LIDAR TOPO
Pecan Branch	Pecan Branch	42514	782.45	782.65	783.13	LIDAR TOPO
Pecan Branch	Pecan Branch	42402	781.57	781.76	782.22	LIDAR TOPO
Pecan Branch	Pecan Branch	42384 PRIVATE DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	42366	781.48	781.69	782.17	LIDAR TOPO
Pecan Branch	Pecan Branch	42084	780.45	780.67	781.12	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	42074 W SEQUIOA TRL				2015-2016 FIELD SURVEY

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	42010	779.54	779.82	780.37	LIDAR TOPO
Pecan Branch	Pecan Branch	41874	778.29	778.57	779.15	LIDAR TOPO
Pecan Branch	Pecan Branch	41510	775.94	776.19	776.70	LIDAR TOPO
Pecan Branch	Pecan Branch	41339	774.65	774.89	775.36	LIDAR TOPO
Pecan Branch	Pecan Branch	41166	773.83	774.02	774.41	LIDAR TOPO
Pecan Branch	Pecan Branch	41074	773.47	773.61	773.94	LIDAR TOPO
Pecan Branch	Pecan Branch	41039 ESPARADA DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	40994	772.97	773.20	773.78	LIDAR TOPO
Pecan Branch	Pecan Branch	40807	772.36	772.65	773.18	LIDAR TOPO
Pecan Branch	Pecan Branch	40456	771.28	771.53	772.14	LIDAR TOPO
Pecan Branch	Pecan Branch	39972	768.13	768.39	769.01	LIDAR TOPO
Pecan Branch	Pecan Branch	39497	765.78	766.14	766.78	LIDAR TOPO
Pecan Branch	Pecan Branch	39000	763.97	764.22	764.81	LIDAR TOPO
Pecan Branch	Pecan Branch	38892	763.55	763.78	764.32	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	38878 SERENADA DR				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	38826	762.37	762.62	763.26	LIDAR TOPO
Pecan Branch	Pecan Branch	38732	761.72	761.98	762.64	LIDAR TOPO
Pecan Branch	Pecan Branch	38558	760.91	761.15	761.76	LIDAR TOPO
Pecan Branch	Pecan Branch	37989	755.97	756.23	757.07	LIDAR TOPO
Pecan Branch	Pecan Branch	37568	753.00	753.43	754.78	LIDAR TOPO
Pecan Branch	Pecan Branch	37344	752.06	752.57	754.10	LIDAR TOPO
Pecan Branch	Pecan Branch	37185	751.73	752.26	753.87	LIDAR TOPO
Pecan Branch	Pecan Branch	37120 NORTHWEST BLVD				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	37086	750.44	750.73	751.59	LIDAR TOPO
Pecan Branch	Pecan Branch	37001	750.17	750.48	751.35	LIDAR TOPO
Pecan Branch	Pecan Branch	36853	749.84	750.14	751.01	LIDAR TOPO
Pecan Branch	Pecan Branch	36454	748.13	748.40	749.15	LIDAR TOPO
Pecan Branch	Pecan Branch	36000	746.35	746.62	747.49	LIDAR TOPO
Pecan Branch	Pecan Branch	35489	745.85	746.10	747.00	LIDAR TOPO
Pecan Branch	Pecan Branch	35122	745.73	745.98	746.86	LIDAR TOPO
Pecan Branch	Pecan Branch	34909	745.36	745.60	746.43	LIDAR TOPO
Pecan Branch	Pecan Branch	34499	743.61	743.81	744.57	LIDAR TOPO
Pecan Branch	Pecan Branch	34320	743.29	743.46	744.19	LIDAR TOPO
Pecan Branch	Pecan Branch	34107	743.08	743.24	743.93	LIDAR TOPO
Pecan Branch	Pecan Branch	33941	742.98	743.13	743.80	LIDAR TOPO/2015-2016 FIELD SURVEY

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	33919 ABANDONED				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	33849	742.28	742.67	743.62	LIDAR TOPO
Pecan Branch	Pecan Branch	33840	742.26	742.65	743.60	LIDAR TOPO
Pecan Branch	Pecan Branch	33824	742.14	742.54	743.57	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	33807 LAKEWAY DR				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	33731	740.09	740.30	740.99	LIDAR TOPO
Pecan Branch	Pecan Branch	33634	739.81	740.06	740.93	LIDAR TOPO
Pecan Branch	Pecan Branch	33307	738.66	738.92	739.90	LIDAR TOPO
Pecan Branch	Pecan Branch	33047	738.04	738.30	739.35	LIDAR TOPO
Pecan Branch	Pecan Branch	32851	737.53	737.77	738.84	LIDAR TOPO
Pecan Branch	Pecan Branch	32491	736.91	737.15	738.22	LIDAR TOPO
Pecan Branch	Pecan Branch	32181	735.61	735.84	736.79	LIDAR TOPO
Pecan Branch	Pecan Branch	31916	734.59	734.84	735.83	LIDAR TOPO
Pecan Branch	Pecan Branch	31757	734.07	734.34	735.30	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	31748 W SHADY HOLLOW				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	31702	733.95	734.23	735.21	LIDAR TOPO
Pecan Branch	Pecan Branch	31500	733.45	733.73	734.67	LIDAR TOPO
Pecan Branch	Pecan Branch	31200	732.42	732.65	733.57	LIDAR TOPO
Pecan Branch	Pecan Branch	30825	731.07	731.19	732.05	LIDAR TOPO
Pecan Branch	Pecan Branch	30712	730.83	730.93	731.77	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	30700 W GOLDEN OAKS				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	30648	730.71	730.87	731.68	LIDAR TOPO
Pecan Branch	Pecan Branch	30505	730.20	730.33	731.00	LIDAR TOPO
Pecan Branch	Pecan Branch	30400	730.03	730.15	730.77	LIDAR TOPO
Pecan Branch	Pecan Branch	30343	729.92	730.02	730.63	LIDAR TOPO
Pecan Branch	Pecan Branch	30324 PRIVATE DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	30305	728.69	728.90	729.93	LIDAR TOPO
Pecan Branch	Pecan Branch	30240	728.43	728.65	729.70	LIDAR TOPO
Pecan Branch	Pecan Branch	30114	728.29	728.50	729.58	LIDAR TOPO
Pecan Branch	Pecan Branch	30034	728.19	728.41	729.50	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	30020 E GOLDEN OAKS				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	29970	728.08	728.33	729.42	LIDAR TOPO
Pecan Branch	Pecan Branch	29868	727.79	728.05	729.15	LIDAR TOPO
Pecan Branch	Pecan Branch	29507	726.71	726.97	728.18	LIDAR TOPO
Pecan Branch	Pecan Branch	28995	725.50	725.77	727.14	LIDAR TOPO

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	28898	725.31	725.58	726.99	LIDAR TOPO
Pecan Branch	Pecan Branch	28853 PRIVATE DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	28823	725.27	725.54	726.95	LIDAR TOPO
Pecan Branch	Pecan Branch	28761	725.18	725.45	726.87	LIDAR TOPO
Pecan Branch	Pecan Branch	28736 PRIVATE DR				JULY 2017 FIELD MEASUREMENTS
Pecan Branch	Pecan Branch	28711	725.11	725.38	726.81	LIDAR TOPO
Pecan Branch	Pecan Branch	28491	724.68	724.94	726.43	LIDAR TOPO
Pecan Branch	Pecan Branch	28002	723.84	724.03	725.69	LIDAR TOPO
Pecan Branch	Pecan Branch	27864	723.65	723.83	725.53	LIDAR TOPO
Pecan Branch	Pecan Branch	27705	723.59	723.76	725.47	LIDAR TOPO
Pecan Branch	Pecan Branch	27605	723.47	723.62	725.36	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	27593 E SHADY HOLLOW				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	27532	723.45	723.64	725.36	LIDAR TOPO
Pecan Branch	Pecan Branch	27342	723.32	723.48	725.23	LIDAR TOPO
Pecan Branch	Pecan Branch	26909	723.07	723.20	724.97	LIDAR TOPO
Pecan Branch	Pecan Branch	26488	722.96	723.08	724.86	LIDAR TOPO
Pecan Branch	Pecan Branch	26240	722.94	723.06	724.84	LIDAR TOPO
Pecan Branch	Pecan Branch	26127	722.93	723.05	724.83	LIDAR TOPO
Pecan Branch	Pecan Branch	26000	722.93	723.04	724.82	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	25961 AIRPORT				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	25912	722.90	723.04	724.82	LIDAR TOPO
Pecan Branch	Pecan Branch	25756	722.89	723.03	724.81	LIDAR TOPO
Pecan Branch	Pecan Branch	25574	722.89	723.03	724.80	LIDAR TOPO
Pecan Branch	Pecan Branch	25435	722.88	723.02	724.80	LIDAR TOPO
Pecan Branch	Pecan Branch	25226	722.80	722.93	724.68	LIDAR TOPO
Pecan Branch	Pecan Branch	25193	722.67	722.80	724.56	LIDAR TOPO/AS-BUILT: TxDOT 0015-08-044
Pecan Branch	Pecan Branch	25144 SB I.H. 35				AS-BUILT: TxDOT 0015-08-044
Pecan Branch	Pecan Branch	25122	721.65	721.71	721.19	LIDAR TOPO
Pecan Branch	Pecan Branch	25076	721.77	721.84	721.74	LIDAR TOPO/AS-BUILT: TxDOT 0015-08-044
Pecan Branch	Pecan Branch	24989 ML/NB I.H. 35				AS-BUILT: TxDOT 0015-08-044, 0015-08-116
Pecan Branch	Pecan Branch	24786	714.04	714.04	714.51	LIDAR TOPO
Pecan Branch	Pecan Branch	24631	714.03	714.03	714.91	LIDAR TOPO
Pecan Branch	Pecan Branch	24522	714.04	714.05	714.86	LIDAR TOPO
Pecan Branch	Pecan Branch	24393	713.95	713.94	714.74	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	24353 N AUSTIN AVE				2015-2016 FIELD SURVEY

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	24250	710.95	711.06	712.01	LIDAR TOPO
Pecan Branch	Pecan Branch	24070	710.59	710.71	711.68	LIDAR TOPO
Pecan Branch	Pecan Branch	23785	709.69	709.79	710.78	LIDAR TOPO
Pecan Branch	Pecan Branch	23592	709.19	709.29	710.20	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	23562 CR 151				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	23490	708.80	708.92	710.02	LIDAR TOPO
Pecan Branch	Pecan Branch	23291	707.91	708.06	709.32	LIDAR TOPO
Pecan Branch	Pecan Branch	23035	707.14	707.32	708.60	LIDAR TOPO
Pecan Branch	Pecan Branch	22714	706.27	706.43	707.60	LIDAR TOPO
Pecan Branch	Pecan Branch	22387	705.07	705.19	706.19	LIDAR TOPO
Pecan Branch	Pecan Branch	22195	704.21	704.33	705.27	LIDAR TOPO
Pecan Branch	Pecan Branch	21679	701.25	701.35	702.41	LIDAR TOPO
Pecan Branch	Pecan Branch	21407	700.16	700.27	701.47	LIDAR TOPO
Pecan Branch	Pecan Branch	21163	699.75	699.87	701.13	LIDAR TOPO
Pecan Branch	Pecan Branch	20838	699.37	699.49	700.82	LIDAR TOPO
Pecan Branch	Pecan Branch	20465	698.73	698.86	700.10	LIDAR TOPO
Pecan Branch	Pecan Branch	20361	698.07	698.18	699.11	LIDAR TOPO
Pecan Branch	Pecan Branch	20016	697.81	697.93	698.71	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	19892 NE INNER				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	19814	695.38	695.49	696.44	LIDAR TOPO
Pecan Branch	Pecan Branch	19450	693.81	693.93	695.01	LIDAR TOPO
Pecan Branch	Pecan Branch	19153	692.70	692.81	693.86	LIDAR TOPO
Pecan Branch	Pecan Branch	18676	690.79	690.88	691.91	LIDAR TOPO
Pecan Branch	Pecan Branch	18265	689.39	689.46	690.36	LIDAR TOPO
Pecan Branch	Pecan Branch	18099	688.61	688.70	689.64	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	18074 CR 152				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	17985	687.57	687.66	689.06	LIDAR TOPO
Pecan Branch	Pecan Branch	17765	686.36	686.49	688.07	LIDAR TOPO
Pecan Branch	Pecan Branch	17576	685.80	685.92	687.69	LIDAR TOPO
Pecan Branch	Pecan Branch	17546	685.73	685.85	687.45	LIDAR TOPO
Pecan Branch	Pecan Branch	17351	685.44	685.56	687.10	LIDAR TOPO
Pecan Branch	Pecan Branch	16987	684.99	685.10	686.57	LIDAR TOPO
Pecan Branch	Pecan Branch	16551	684.80	684.91	686.38	LIDAR TOPO
Pecan Branch	Pecan Branch	16355 SB SH 130				AS-BUILT: TxDOT 0440-05-004
Pecan Branch	Pecan Branch	16242	683.40	683.51	685.01	LIDAR TOPO

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	16220	683.37	683.48	684.96	LIDAR TOPO
Pecan Branch	Pecan Branch	16151 NB SH 130				AS-BUILT: TxDOT 0440-05-004
Pecan Branch	Pecan Branch	15980	683.03	683.15	684.55	LIDAR TOPO
Pecan Branch	Pecan Branch	15799	682.82	682.94	684.25	LIDAR TOPO
Pecan Branch	Pecan Branch	15750	681.49	681.49	682.46	LIDAR TOPO
Pecan Branch	Pecan Branch	15697	679.38	679.81	681.07	LIDAR TOPO
Pecan Branch	Pecan Branch	15507	678.50	678.59	679.76	LIDAR TOPO
Pecan Branch	Pecan Branch	14917	675.88	675.96	677.01	LIDAR TOPO
Pecan Branch	Pecan Branch	14597	674.94	675.00	675.86	LIDAR TOPO
Pecan Branch	Pecan Branch	14342	673.87	673.92	674.59	LIDAR TOPO
Pecan Branch	Pecan Branch	14043	671.60	671.66	672.52	LIDAR TOPO
Pecan Branch	Pecan Branch	13843	670.60	670.68	671.66	LIDAR TOPO
Pecan Branch	Pecan Branch	13487	669.95	670.04	671.06	LIDAR TOPO
Pecan Branch	Pecan Branch	13048	667.93	667.99	668.86	LIDAR TOPO
Pecan Branch	Pecan Branch	12714	666.41	666.47	667.25	LIDAR TOPO
Pecan Branch	Pecan Branch	11996	664.17	664.25	665.17	LIDAR TOPO
Pecan Branch	Pecan Branch	11474	662.38	662.45	663.50	LIDAR TOPO
Pecan Branch	Pecan Branch	11155	661.43	661.50	662.56	LIDAR TOPO
Pecan Branch	Pecan Branch	10702	659.94	660.01	661.28	LIDAR TOPO
Pecan Branch	Pecan Branch	10475	659.45	659.54	660.93	LIDAR TOPO
Pecan Branch	Pecan Branch	9998	658.60	658.70	660.23	LIDAR TOPO
Pecan Branch	Pecan Branch	9548	658.08	658.19	659.81	LIDAR TOPO
Pecan Branch	Pecan Branch	8984	657.34	657.46	659.11	LIDAR TOPO
Pecan Branch	Pecan Branch	8519	656.30	656.43	658.04	LIDAR TOPO
Pecan Branch	Pecan Branch	7988	654.62	654.75	656.40	LIDAR TOPO
Pecan Branch	Pecan Branch	7486	653.12	653.25	654.83	LIDAR TOPO
Pecan Branch	Pecan Branch	6995	651.27	651.38	652.77	LIDAR TOPO
Pecan Branch	Pecan Branch	6546	649.52	649.61	650.73	LIDAR TOPO
Pecan Branch	Pecan Branch	5956	647.35	647.42	648.34	LIDAR TOPO
Pecan Branch	Pecan Branch	5520	647.20	647.27	648.17	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	5470 FM 971				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	5370	646.27	646.36	647.58	LIDAR TOPO
Pecan Branch	Pecan Branch	5044	645.04	645.12	646.23	LIDAR TOPO
Pecan Branch	Pecan Branch	4921	644.46	644.55	645.61	LIDAR TOPO

Table B-7 Computed Water Surface Elevations and Topographic Data Source – Pecan Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Source
			Existing Conditions	Future Conditions	Existing Conditions	
Pecan Branch	Pecan Branch	4479	642.95	643.05	643.72	LIDAR TOPO
Pecan Branch	Pecan Branch	3904	641.96	642.05	642.56	LIDAR TOPO
Pecan Branch	Pecan Branch	3497	641.58	641.66	642.17	LIDAR TOPO
Pecan Branch	Pecan Branch	3052	641.27	641.36	641.81	LIDAR TOPO
Pecan Branch	Pecan Branch	2919	641.26	641.34	641.79	LIDAR TOPO
Pecan Branch	Pecan Branch	2709	640.87	640.93	641.62	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	2671 RAILROAD				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	2621	637.70	637.80	637.97	LIDAR TOPO
Pecan Branch	Pecan Branch	2616	637.70	637.81	637.99	LIDAR TOPO/2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	2600 PRIVATE DR				2015-2016 FIELD SURVEY
Pecan Branch	Pecan Branch	2564	637.24	637.32	637.86	LIDAR TOPO
Pecan Branch	Pecan Branch	2321	636.48	636.54	637.05	LIDAR TOPO
Pecan Branch	Pecan Branch	2009	635.56	635.63	636.15	LIDAR TOPO
Pecan Branch	Pecan Branch	1506	633.64	633.78	634.78	LIDAR TOPO
Pecan Branch	Pecan Branch	1016	632.02	632.21	633.52	LIDAR TOPO
Pecan Branch	Pecan Branch	497	630.91	631.11	632.46	LIDAR TOPO

Table B-8 Computed Water Surface Elevations and Topographic Data Source – Smith Branch

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Smith-West Fork	1	22395	824.93	824.09	824.65	LIDAR TOPO
Smith-West Fork	1	22014	822.01	822.19	822.29	LIDAR TOPO
Smith-West Fork	1	21398	817.80	818.00	818.14	LIDAR TOPO
Smith-West Fork	1	20777	812.35	812.58	812.68	LIDAR TOPO
Smith-West Fork	1	20251	807.82	807.99	808.09	LIDAR TOPO
Smith-West Fork	1	19952	806.12	806.32	806.43	LIDAR TOPO
Smith-West Fork	1	19356	803.37	803.57	803.67	LIDAR TOPO
Smith-West Fork	1	18945	801.36	801.53	801.64	LIDAR TOPO
Smith-West Fork	1	18442	798.78	798.93	799.05	LIDAR TOPO
Smith-West Fork	1	17894	795.86	796.06	796.12	LIDAR TOPO
Smith-West Fork	1	17402	793.11	793.34	793.52	LIDAR TOPO
Smith-West Fork	1	16918	789.18	789.40	789.36	LIDAR TOPO
Smith-West Fork	1	16360	784.62	785.03	785.58	LIDAR TOPO
Smith-West Fork	1	16036	782.95	783.55	784.91	LIDAR TOPO
Smith-West Fork	1	15807	782.47	783.15	784.77	LIDAR TOPO
Smith-West Fork	1	15443	781.11	782.23	784.50	LIDAR TOPO
Smith-West Fork	1	15289	780.56	781.98	784.45	LIDAR TOPO
Smith-West Fork	1	15223	780.05	781.84	784.43	LIDAR TOPO
Smith-West Fork	1	15040	778.13	781.66	784.39	LIDAR TOPO
Smith-West Fork	1	14942	777.92	781.64	784.39	LIDAR TOPO
Smith-West Fork	1	14879	777.85	781.63	784.38	LIDAR TOPO
Smith-West Fork	1	14690	777.69	781.61	784.38	LIDAR TOPO
Smith-West Fork	1	14267	777.70	781.62	784.38	LIDAR TOPO
Smith-West Fork	1	14148 SB I.H. 35 FR				AS-BUILT: TxDOT 0015-09-102
Smith-West Fork	1	14098	777.68	781.62	784.37	LIDAR TOPO
Smith-West Fork	1	14079	777.46	781.42	784.36	LIDAR TOPO
Smith-West Fork	1	13936 I.H. 35 ML				AS-BUILT: TxDOT 0015-08-044
Smith-West Fork	1	13770	768.91	771.65	771.78	LIDAR TOPO
Smith-West Fork	1	13636	768.69	771.66	771.80	LIDAR TOPO
Smith-West Fork	1	13341	768.99	771.79	771.96	LIDAR TOPO
Smith-West Fork	1	13250 NB I.H. 35 FR				AS-BUILT: TxDOT 0015-09-160
Smith-West Fork	1	13200	769.11	771.91	772.10	LIDAR TOPO
Smith-West Fork	1	13182	768.98	771.91	772.11	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	13115 RAILROAD				2015-2016 FIELD SURVEY

Table B-8 Computed Water Surface Elevations and Topographic Data Source – Smith Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Smith-West Fork	1	13100	762.92	763.41	763.70	LIDAR TOPO
Smith-West Fork	1	12935	761.82	762.29	762.55	LIDAR TOPO
Smith-West Fork	1	12589	759.99	760.33	760.56	LIDAR TOPO
Smith-West Fork	1	12277	758.92	759.28	759.31	LIDAR TOPO
Smith-West Fork	1	11766	756.23	756.11	756.49	LIDAR TOPO
Smith-West Fork	1	11402	751.54	751.82	752.06	LIDAR TOPO
Smith-West Fork	1	11261	751.85	752.13	752.37	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	11209 MADISON OAKS AVE				2015-2016 FIELD SURVEY
Smith-West Fork	1	11131	751.42	751.67	751.89	LIDAR TOPO
Smith-West Fork	1	11021	751.40	751.65	751.86	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	11020				2015-2016 FIELD SURVEY
Smith-West Fork	1	10566	751.36	751.60	751.81	LIDAR TOPO
Smith-West Fork	1	10161	751.31	751.54	751.75	LIDAR TOPO
Smith-West Fork	1	9937	751.24	751.46	751.67	LIDAR TOPO
Smith-West Fork	1	9746	750.96	751.15	751.34	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	9696 S AUSTIN AVE				2015-2016 FIELD SURVEY
Smith-West Fork	1	9646	749.40	749.50	749.77	LIDAR TOPO
Smith-West Fork	1	9104	748.20	748.38	748.68	LIDAR TOPO
Smith-West Fork	1	8723	747.46	747.30	747.59	LIDAR TOPO
Smith-West Fork	1	8479	745.59	746.28	746.36	LIDAR TOPO
Smith-West Fork	1	8351	745.92	746.14	746.16	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	8320				2015-2016 FIELD SURVEY
Smith-West Fork	1	8290	744.92	745.19	745.53	LIDAR TOPO
Smith-West Fork	1	7884	744.40	744.67	745.03	LIDAR TOPO
Smith-West Fork	1	7583	743.77	744.11	744.54	LIDAR TOPO
Smith-West Fork	1	7326	743.29	743.89	744.35	LIDAR TOPO
Smith-West Fork	1	6807	743.11	743.84	744.30	LIDAR TOPO
Smith-West Fork	1	6538	743.09	743.82	744.28	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	6465 N FM 1460				2015-2016 FIELD SURVEY
Smith-West Fork	1	6326	740.46	740.78	740.50	LIDAR TOPO
Smith-West Fork	1	5921	738.77	739.08	739.56	LIDAR TOPO
Smith-West Fork	1	5657	737.78	738.07	738.49	LIDAR TOPO
Smith-West Fork	1	5217	736.59	736.87	737.28	LIDAR TOPO
Smith-West Fork	1	4821	733.02	733.15	733.42	LIDAR TOPO

Table B-8 Computed Water Surface Elevations and Topographic Data Source – Smith Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Smith-West Fork	1	4460	730.65	731.05	731.77	LIDAR TOPO
Smith-West Fork	1	4033	730.02	730.51	731.32	LIDAR TOPO
Smith-West Fork	1	3706	729.43	730.02	730.92	LIDAR TOPO
Smith-West Fork	1	3443	728.93	729.52	730.39	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	3392 MAPLE ST				2015-2016 FIELD SURVEY
Smith-West Fork	1	3341	727.64	727.90	728.32	LIDAR TOPO
Smith-West Fork	1	2900	725.74	725.92	726.21	LIDAR TOPO
Smith-West Fork	1	2309	723.71	723.96	724.38	LIDAR TOPO
Smith-West Fork	1	1575	721.50	721.76	722.20	LIDAR TOPO
Smith-West Fork	1	988	719.07	719.38	720.04	LIDAR TOPO
Smith-West Fork	1	980				LIDAR TOPO
Smith-West Fork	1	832	718.32	718.69	719.46	LIDAR TOPO
Smith-West Fork	1	675	717.72	718.13	718.96	LIDAR TOPO
Smith-West Fork	1	365	717.19	717.62	718.50	LIDAR TOPO
Smith-West Fork	1	294	717.12	717.54	718.44	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-West Fork	1	258 QUAIL VALLEY				2015-2016 FIELD SURVEY
Smith-West Fork	1	228	716.88	717.39	718.34	LIDAR TOPO
Smith-West Fork	1	138	716.80	717.30	718.26	LIDAR TOPO
Smith-Main	2	14111	812.80	813.21	813.69	LIDAR TOPO
Smith-Main	2	13772	807.50	807.82	808.14	LIDAR TOPO
Smith-Main	2	13473	804.49	804.86	805.25	LIDAR TOPO
Smith-Main	2	13002	798.20	798.49	798.77	LIDAR TOPO
Smith-Main	2	12633	794.23	794.40	794.60	LIDAR TOPO
Smith-Main	2	12318	792.33	792.54	792.77	LIDAR TOPO
Smith-Main	2	11836	789.99	790.23	790.51	LIDAR TOPO
Smith-Main	2	11769	790.01	790.23	790.49	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-Main	2	11742 CR 166				2015-2016 FIELD SURVEY
Smith-Main	2	11715	788.06	788.35	788.65	LIDAR TOPO
Smith-Main	2	11638	787.30	787.56	787.78	LIDAR TOPO
Smith-Main	2	11183	781.26	781.52	781.98	LIDAR TOPO
Smith-Main	2	10668	776.44	776.58	776.80	LIDAR TOPO
Smith-Main	2	10114	771.40	771.51	771.75	LIDAR TOPO
Smith-Main	2	9513	767.59	767.75	768.02	LIDAR TOPO
Smith-Main	2	9018	762.67	762.82	763.19	LIDAR TOPO

Table B-8 Computed Water Surface Elevations and Topographic Data Source – Smith Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Smith-Main	2	8614	760.74	760.88	761.07	LIDAR TOPO
Smith-Main	2	8270	758.42	758.69	759.11	LIDAR TOPO
Smith-Main	2	8003	757.64	758.10	758.65	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-Main	2	7945 SE INNER LOOP				2015-2016 FIELD SURVEY
Smith-Main	2	7882	756.40	756.62	757.00	LIDAR TOPO
Smith-Main	2	7619	755.69	755.84	756.13	LIDAR TOPO
Smith-Main	2	7438	754.53	754.63	754.77	LIDAR TOPO
Smith-Main	2	7257	752.44	752.63	752.99	LIDAR TOPO
Smith-Main	2	7077	751.81	752.10	752.57	LIDAR TOPO
Smith-Main	2	6925	751.58	751.92	752.42	LIDAR TOPO
Smith-Main	2	6773	751.29	751.70	752.26	LIDAR TOPO
Smith-Main	2	6622	751.08	751.55	752.13	LIDAR TOPO
Smith-Main	2	6594	751.09	751.55	752.14	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-Main	2	6548 S FM 1460				2015-2016 FIELD SURVEY
Smith-Main	2	6484	746.62	746.91	747.48	LIDAR TOPO
Smith-Main	2	6178	745.34	746.42	747.74	LIDAR TOPO
Smith-Main	2	5960 S FM 1460 (NEW)				FINAL PLANS: TxDOT 221-02-017 2014
Smith-Main	2	5713	742.29	742.37	743.10	LIDAR TOPO
Smith-Main	2	5201	741.42	741.54	741.82	LIDAR TOPO
Smith-Main	2	4985	739.99	740.05	740.21	LIDAR TOPO
Smith-Main	2	4529	737.68	737.88	738.56	LIDAR TOPO
Smith-Main	2	4066	736.82	737.18	738.16	LIDAR TOPO
Smith-Main	2	3703	736.36	736.75	737.79	LIDAR TOPO
Smith-Main	2	3627	734.49	734.75	735.32	LIDAR TOPO
Smith-Main	2	3558	733.17	733.30	733.58	LIDAR TOPO
Smith-Main	2	3061	729.93	730.11	730.45	LIDAR TOPO
Smith-Main	2	2636	728.47	728.66	729.03	LIDAR TOPO
Smith-Main	2	2168	726.31	726.48	726.80	LIDAR TOPO
Smith-Main	2	1727	723.68	723.86	724.22	LIDAR TOPO
Smith-Main	2	1190	720.82	721.05	721.50	LIDAR TOPO
Smith-Main	2	717	718.56	718.88	719.51	LIDAR TOPO
Smith-Main	2	165	716.79	717.25	718.23	LIDAR TOPO
Smith-Main	1	13223	715.74	716.27	717.32	LIDAR TOPO
Smith-Main	1	12776	713.27	713.95	714.92	LIDAR TOPO

Table B-8 Computed Water Surface Elevations and Topographic Data Source – Smith Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Smith-Main	1	12566	712.65	713.35	714.25	LIDAR TOPO
Smith-Main	1	12388	712.34	713.05	713.91	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-Main	1	12341 SOUTHWESTERN BLV				2015-2016 FIELD SURVEY
Smith-Main	1	12294	711.82	712.31	713.31	LIDAR TOPO
Smith-Main	1	12142	710.90	711.36	712.29	LIDAR TOPO
Smith-Main	Quail_Valley	1285	716.47	716.72	717.28	LIDAR TOPO
Smith-Main	Quail_Valley	1028	716.25	716.45	716.92	LIDAR TOPO
Smith-Main	Quail_Valley	726	714.03	714.18	714.56	LIDAR TOPO
Smith-Main	Quail_Valley	506	712.70	713.11	714.24	LIDAR TOPO
Smith-Main	Quail_Valley	398	712.70	713.11	714.24	LIDAR TOPO
Smith-Main	Quail_Valley	248	712.69	713.11	714.23	LIDAR TOPO
Smith-Main	1a	11911	708.82	709.19	709.49	LIDAR TOPO
Smith-Main	1a	11420	706.08	706.39	707.05	LIDAR TOPO
Smith-Main	1a	10884	704.71	705.09	705.95	LIDAR TOPO
Smith-Main	1a	10411	704.14	704.52	705.36	LIDAR TOPO
Smith-Main	1a	9900	702.86	703.35	704.33	LIDAR TOPO
Smith-Main	1a	9816	702.98	703.45	704.38	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-Main	1a	9774 UNIV. / SH 29				2015-2016 FIELD SURVEY
Smith-Main	1a	9716	700.15	700.43	701.07	LIDAR TOPO
Smith-Main	1a	9464	699.09	699.37	699.98	LIDAR TOPO
Smith-Main	1a	9240	698.17	698.44	699.06	LIDAR TOPO
Smith-Main	1a	8795	696.08	696.32	696.87	LIDAR TOPO
Smith-Main	1a	8308	692.80	693.02	693.50	LIDAR TOPO
Smith-Main	1a	7883	690.67	690.98	691.64	LIDAR TOPO
Smith-Main	1a	7750	690.46	690.77	691.42	LIDAR TOPO/2015-2016 FIELD SURVEY
Smith-Main	1a	7708 SMITH CREEK				2015-2016 FIELD SURVEY
Smith-Main	1a	7679	690.41	690.72	691.35	LIDAR TOPO
Smith-Main	1a	7307	688.54	688.80	689.35	LIDAR TOPO
Smith-Main	1a	6991	686.13	686.43	687.15	LIDAR TOPO
Smith-Main	1a	6516	684.03	684.32	685.05	LIDAR TOPO
Smith-Main	1a	5981	682.01	682.32	683.04	LIDAR TOPO
Smith-Main	1a	5448	678.65	678.92	679.56	LIDAR TOPO
Smith-Main	1a	4999	677.16	677.41	678.05	LIDAR TOPO

Table B-8 Computed Water Surface Elevations and Topographic Data Source – Smith Branch (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Smith-Main	1a	4583	675.69	676.00	676.76	LIDAR TOPO
Smith-Main	1a	3967	673.78	674.11	674.98	LIDAR TOPO
Smith-Main	1a	3592	671.27	671.75	672.96	LIDAR TOPO
Smith-Main	1a	2988	669.28	669.96	671.45	LIDAR TOPO
Smith-Main	1a	2551	668.35	669.03	670.55	LIDAR TOPO
Smith-Main	1a	1993	664.81	665.43	666.97	LIDAR TOPO
Smith-Main	1a	1559	662.41	663.02	664.55	LIDAR TOPO
Smith-Main	1a	943	660.21	660.80	662.25	LIDAR TOPO
Smith-Main	1a	494	657.84	658.41	659.85	LIDAR TOPO

Table B-9 Computed Water Surface Elevations and Topographic Data Source – Middle Fork San Gabriel River

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Middle Fork	Middle Fork	68236	950	950.28	950.67	LIDAR TOPO
Middle Fork	Middle Fork	67844	947.85	948.15	948.6	LIDAR TOPO
Middle Fork	Middle Fork	67356	945.45	945.88	946.56	LIDAR TOPO
Middle Fork	Middle Fork	66891	943.75	944.36	945.25	LIDAR TOPO
Middle Fork	Middle Fork	66459	942.06	942.76	943.78	LIDAR TOPO
Middle Fork	Middle Fork	66024	939.16	939.71	940.47	LIDAR TOPO
Middle Fork	Middle Fork	65564	938.12	938.57	939.28	LIDAR TOPO
Middle Fork	Middle Fork	65063	937.27	937.64	938.34	LIDAR TOPO
Middle Fork	Middle Fork	64595	936.38	936.55	937.18	LIDAR TOPO
Middle Fork	Middle Fork	64146	933.4	934.05	934.53	LIDAR TOPO
Middle Fork	Middle Fork	63636	931.08	931.41	932.01	LIDAR TOPO
Middle Fork	Middle Fork	63164	929.45	929.77	930.32	LIDAR TOPO
Middle Fork	Middle Fork	62791	928.86	929.19	929.72	LIDAR TOPO
Middle Fork	Middle Fork	62370	926.69	926.99	927.76	LIDAR TOPO
Middle Fork	Middle Fork	61979	925.84	926.24	926.98	LIDAR TOPO
Middle Fork	Middle Fork	61499	923.65	923.98	924.59	LIDAR TOPO
Middle Fork	Middle Fork	61023	921.17	921.42	921.87	LIDAR TOPO
Middle Fork	Middle Fork	60540	921.15	921.4	921.89	LIDAR TOPO
Middle Fork	Middle Fork	60163	920.95	921.17	921.6	LIDAR TOPO
Middle Fork	Middle Fork	60075	920.91	921.12	921.55	LIDAR TOPO/2015-2016 FIELD SURVEY
Middle Fork	Middle Fork	60038 CROSS CREEK RD				2015-2016 FIELD SURVEY
Middle Fork	Middle Fork	60017	920.06	920.34	920.66	LIDAR TOPO
Middle Fork	Middle Fork	59935	919.21	919.66	920.36	LIDAR TOPO
Middle Fork	Middle Fork	59729	918.91	919.35	920.04	LIDAR TOPO
Middle Fork	Middle Fork	59266	917.82	918.25	918.97	LIDAR TOPO
Middle Fork	Middle Fork	58794	916.08	916.64	917.6	LIDAR TOPO
Middle Fork	Middle Fork	58364	915.07	915.74	916.85	LIDAR TOPO
Middle Fork	Middle Fork	57930	914.2	914.94	916.11	LIDAR TOPO
Middle Fork	Middle Fork	57536	913.55	914.31	915.5	LIDAR TOPO
Middle Fork	Middle Fork	57039	912.34	913.09	914.17	LIDAR TOPO
Middle Fork	Middle Fork	56519	911.4	912.16	913.22	LIDAR TOPO
Middle Fork	Middle Fork	56087	910.81	911.57	912.57	LIDAR TOPO
Middle Fork	Middle Fork	55621	908.72	909.18	910.21	LIDAR TOPO
Middle Fork	Middle Fork	55161	908.49	909.12	910.06	LIDAR TOPO
Middle Fork	Middle Fork	54770	908.04	908.71	909.63	LIDAR TOPO
Middle Fork	Middle Fork	54378	906.93	907.65	908.37	LIDAR TOPO
Middle Fork	Middle Fork	54262	907.01	907.75	908.49	LIDAR TOPO

Table B-9 Computed Water Surface Elevations and Topographic Data Source – Middle Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Middle Fork	Middle Fork	54176 CIMARRON HILLS TRL				Cimarron Hills Phase II, Section 2 As-builts
Middle Fork	Middle Fork	54121	906.42	907.01	908.25	LIDAR TOPO
Middle Fork	Middle Fork	54023	906.39	906.99	908.26	LIDAR TOPO
Middle Fork	Middle Fork	53836	905.99	906.59	907.84	LIDAR TOPO
Middle Fork	Middle Fork	53363	902.58	902.82	904.06	LIDAR TOPO
Middle Fork	Middle Fork	52913	902.41	902.9	904.02	LIDAR TOPO
Middle Fork	Middle Fork	52446	901.47	901.94	902.99	LIDAR TOPO
Middle Fork	Middle Fork	51978	900.81	901.26	902.26	LIDAR TOPO
Middle Fork	Middle Fork	51698	899.69	900.08	901	LIDAR TOPO
Middle Fork	Middle Fork	51379	899.11	899.51	900.44	LIDAR TOPO
Middle Fork	Middle Fork	50875	896.52	897	898.1	LIDAR TOPO
Middle Fork	Middle Fork	50456	895.99	896.49	897.65	LIDAR TOPO
Middle Fork	Middle Fork	49988	894.49	894.97	896.15	LIDAR TOPO
Middle Fork	Middle Fork	49646	893.47	893.98	895.2	LIDAR TOPO
Middle Fork	Middle Fork	49444	892.83	893.37	894.6	LIDAR TOPO
Middle Fork	Middle Fork	48970	890.96	891.51	892.62	LIDAR TOPO
Middle Fork	Middle Fork	48501	889.8	890.54	891.79	LIDAR TOPO
Middle Fork	Middle Fork	48098	889.16	889.89	890.98	LIDAR TOPO
Middle Fork	Middle Fork	47600	885.13	885.35	887.2	LIDAR TOPO
Middle Fork	Middle Fork	47080	885.51	886.15	887.88	LIDAR TOPO
Middle Fork	Middle Fork	46612	882.94	883.41	884.6	LIDAR TOPO
Middle Fork	Middle Fork	46179	882.07	882.58	883.95	LIDAR TOPO
Middle Fork	Middle Fork	45753	881.31	881.83	883.18	LIDAR TOPO
Middle Fork	Middle Fork	45283	880.19	880.68	882.07	LIDAR TOPO
Middle Fork	Middle Fork	44845	879.33	879.86	881.36	LIDAR TOPO
Middle Fork	Middle Fork	44380	877.66	878.15	879.5	LIDAR TOPO
Middle Fork	Middle Fork	43949	876.54	877.04	878.5	LIDAR TOPO
Middle Fork	Middle Fork	43438	875.25	875.86	877.56	LIDAR TOPO
Middle Fork	Middle Fork	42992	874.27	874.95	876.83	LIDAR TOPO
Middle Fork	Middle Fork	42532	872.58	872.96	873.92	LIDAR TOPO
Middle Fork	Middle Fork	42134	872.68	873.18	874.53	LIDAR TOPO
Middle Fork	Middle Fork	41721	871.46	871.94	873.23	LIDAR TOPO
Middle Fork	Middle Fork	41370	871.52	872.01	873.33	LIDAR TOPO
Middle Fork	Middle Fork	41299	871.31	871.78	873.05	LIDAR TOPO/2015-2016 FIELD SURVEY
Middle Fork	Middle Fork	41263 CEDAR HOLLOW RD				2015-2016 FIELD SURVEY
Middle Fork	Middle Fork	41217	871.44	871.93	873.26	LIDAR TOPO

Table B-9 Computed Water Surface Elevations and Topographic Data Source – Middle Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Middle Fork	Middle Fork	41028	871.29	871.78	873.09	LIDAR TOPO
Middle Fork	Middle Fork	40621	871.01	871.49	872.79	LIDAR TOPO
Middle Fork	Middle Fork	40189	869.24	869.58	870.46	LIDAR TOPO
Middle Fork	Middle Fork	39802	866.73	867.14	868.39	LIDAR TOPO
Middle Fork	Middle Fork	39348	865.83	866.11	867.07	LIDAR TOPO
Middle Fork	Middle Fork	38890	865.41	865.62	866.47	LIDAR TOPO
Middle Fork	Middle Fork	38826	865.34	865.55	866.36	LIDAR TOPO
Middle Fork	Middle Fork	38769 WAY CROSS DR				FIELD MEASUREMENT
Middle Fork	Middle Fork	38713	863.11	863.36	864.79	LIDAR TOPO
Middle Fork	Middle Fork	38300	861.17	861.56	863.01	LIDAR TOPO
Middle Fork	Middle Fork	37813	858.93	859.26	860.61	LIDAR TOPO
Middle Fork	Middle Fork	37346	857.56	857.91	859.34	LIDAR TOPO
Middle Fork	Middle Fork	36928	856.58	856.94	858.33	LIDAR TOPO
Middle Fork	Middle Fork	36474	855.32	855.72	857.15	LIDAR TOPO
Middle Fork	Middle Fork	35996	854.39	854.84	856.3	LIDAR TOPO
Middle Fork	Middle Fork	35679	853.49	853.89	855.09	LIDAR TOPO
Middle Fork	Middle Fork	35369	852.79	853.09	853.94	LIDAR TOPO
Middle Fork	Middle Fork	35086	852.24	852.49	853.08	LIDAR TOPO
Middle Fork	Middle Fork	35006	852.17	852.41	852.96	LIDAR TOPO/2015-2016 FIELD SURVEY
Middle Fork	Middle Fork	34965 RANCHO BUENO DR				2015-2016 FIELD SURVEY
Middle Fork	Middle Fork	34921	849.95	850.38	851.8	LIDAR TOPO
Middle Fork	Middle Fork	34678	849.55	850	851.46	LIDAR TOPO
Middle Fork	Middle Fork	34304	847.28	847.69	849.06	LIDAR TOPO
Middle Fork	Middle Fork	33927	845.72	846.18	847.66	LIDAR TOPO
Middle Fork	Middle Fork	33456	844.42	844.86	846.2	LIDAR TOPO
Middle Fork	Middle Fork	32946	843.32	843.73	844.9	LIDAR TOPO
Middle Fork	Middle Fork	32469	842.58	842.98	844.05	LIDAR TOPO
Middle Fork	Middle Fork	32032	841.02	841.45	843	LIDAR TOPO
Middle Fork	Middle Fork	31582	840.7	841.14	842.58	LIDAR TOPO
Middle Fork	Middle Fork	31066	839.94	840.38	841.85	LIDAR TOPO
Middle Fork	Middle Fork	30604	837.72	838.03	839.19	LIDAR TOPO
Middle Fork	Middle Fork	30132	836.36	836.55	837.54	LIDAR TOPO
Middle Fork	Middle Fork	29729	836.33	836.56	837.6	LIDAR TOPO
Middle Fork	Middle Fork	29662 DAM				LIDAR TOPO
Middle Fork	Middle Fork	29220	830.35	830.6	831.63	LIDAR TOPO
Middle Fork	Middle Fork	28708	827.83	828.19	829.92	LIDAR TOPO

Table B-9 Computed Water Surface Elevations and Topographic Data Source – Middle Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Middle Fork	Middle Fork	28275	825.1	825.36	826.52	LIDAR TOPO
Middle Fork	Middle Fork	28025	824.56	824.81	825.96	LIDAR TOPO
Middle Fork	Middle Fork	27690	822.33	822.57	823.68	LIDAR TOPO
Middle Fork	Middle Fork	27392	820.67	820.88	821.87	LIDAR TOPO
Middle Fork	Middle Fork	27036	818.63	818.88	820.24	LIDAR TOPO
Middle Fork	Middle Fork	26543	816.55	816.92	818.67	LIDAR TOPO
Middle Fork	Middle Fork	26077	815.77	816.19	818.13	LIDAR TOPO
Middle Fork	Middle Fork	25826	815.75	816.17	818.09	LIDAR TOPO
Middle Fork	Middle Fork	25536	812.91	813.18	814.52	LIDAR TOPO
Middle Fork	Middle Fork	25081	813.1	813.41	814.87	LIDAR TOPO
Middle Fork	Middle Fork	24605	811.76	812.01	813.2	LIDAR TOPO
Middle Fork	Middle Fork	24072	811.13	811.38	812.59	LIDAR TOPO
Middle Fork	Middle Fork	23607	810.69	810.94	812.13	LIDAR TOPO
Middle Fork	Middle Fork	23094	810.08	810.32	811.44	LIDAR TOPO
Middle Fork	Middle Fork	22673	809.06	809.27	810.24	LIDAR TOPO
Middle Fork	Middle Fork	22657 DAM				LIDAR TOPO
Middle Fork	Middle Fork	22429	799.69	800.08	802.08	LIDAR TOPO
Middle Fork	Middle Fork	22168	798.23	798.59	800.36	LIDAR TOPO
Middle Fork	Middle Fork	21743	797.13	797.49	799.32	LIDAR TOPO
Middle Fork	Middle Fork	21261	793.63	793.91	795.37	LIDAR TOPO
Middle Fork	Middle Fork	20776	791.16	791.42	792.73	LIDAR TOPO
Middle Fork	Middle Fork	20298	788.47	788.67	789.84	LIDAR TOPO
Middle Fork	Middle Fork	19813	786.01	786.38	788.33	LIDAR TOPO
Middle Fork	Middle Fork	19332	784.71	785.08	787.03	LIDAR TOPO
Middle Fork	Middle Fork	18894	783.17	783.52	785.33	LIDAR TOPO
Middle Fork	Middle Fork	18395	780.74	780.99	782.31	LIDAR TOPO
Middle Fork	Middle Fork	17912	777.95	778.25	779.84	LIDAR TOPO
Middle Fork	Middle Fork	17475	776.76	777.08	778.82	LIDAR TOPO
Middle Fork	Middle Fork	17039	774.93	775.21	776.65	LIDAR TOPO
Middle Fork	Middle Fork	16602	771.93	772.26	774.22	LIDAR TOPO
Middle Fork	Middle Fork	16082	770.84	771.16	773.31	LIDAR TOPO
Middle Fork	Middle Fork	15629	768.77	769.04	770.79	LIDAR TOPO
Middle Fork	Middle Fork	15200	766.85	767.23	769.68	LIDAR TOPO
Middle Fork	Middle Fork	14719	765.36	765.87	768.87	LIDAR TOPO
Middle Fork	Middle Fork	14223	764.59	765.19	768.51	LIDAR TOPO
Middle Fork	Middle Fork	14056	764.3	764.89	768.09	LIDAR TOPO

Table B-9 Computed Water Surface Elevations and Topographic Data Source – Middle Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Middle Fork	Middle Fork	13968 D B WOOD RD				FIELD MEASUREMENT
Middle Fork	Middle Fork	13857	760.65	760.89	762.44	LIDAR TOPO
Middle Fork	Middle Fork	13556	759.51	759.77	761.44	LIDAR TOPO
Middle Fork	Middle Fork	13281	758.25	758.57	760.49	LIDAR TOPO
Middle Fork	Middle Fork	13102	757.53	757.86	759.77	LIDAR TOPO
Middle Fork	Middle Fork	12730	754.85	755.14	756.8	LIDAR TOPO
Middle Fork	Middle Fork	12339	753.52	753.83	755.6	LIDAR TOPO
Middle Fork	Middle Fork	11866	750.4	750.66	752.04	LIDAR TOPO
Middle Fork	Middle Fork	11436	748.77	749.04	750.59	LIDAR TOPO
Middle Fork	Middle Fork	10999	747.02	747.28	748.83	LIDAR TOPO
Middle Fork	Middle Fork	10606	743.24	743.54	745.27	LIDAR TOPO
Middle Fork	Middle Fork	10185	741.62	741.92	743.69	LIDAR TOPO
Middle Fork	Middle Fork	9723	738.67	738.95	740.61	LIDAR TOPO
Middle Fork	Middle Fork	9258	737.02	737.32	739.04	LIDAR TOPO
Middle Fork	Middle Fork	8790	735.3	735.58	737.32	LIDAR TOPO
Middle Fork	Middle Fork	8282	733.65	733.97	735.88	LIDAR TOPO
Middle Fork	Middle Fork	7771	730.17	730.43	731.81	LIDAR TOPO
Middle Fork	Middle Fork	7331	727.4	727.66	729.44	LIDAR TOPO
Middle Fork	Middle Fork	7083	727.07	727.41	729.49	LIDAR TOPO
Middle Fork	Middle Fork	6769	725.7	726.02	727.97	LIDAR TOPO
Middle Fork	Middle Fork	6371	722.96	723.21	724.65	LIDAR TOPO
Middle Fork	Middle Fork	5874	720.3	720.6	722.28	LIDAR TOPO
Middle Fork	Middle Fork	5386	718.48	718.81	720.48	LIDAR TOPO
Middle Fork	Middle Fork	4997	718.19	718.53	720.18	LIDAR TOPO
Middle Fork	Middle Fork	4526	717.26	717.6	719.16	LIDAR TOPO
Middle Fork	Middle Fork	4039	713.76	713.81	715.35	LIDAR TOPO
Middle Fork	Middle Fork	3956	713.65	713.68	714.46	LIDAR TOPO
Middle Fork	Middle Fork	3942 DAM				LIDAR TOPO
Middle Fork	Middle Fork	3539	710.77	711.09	712.99	LIDAR TOPO
Middle Fork	Middle Fork	3232	707.88	708.13	709.51	LIDAR TOPO
Middle Fork	Middle Fork	2910	707.35	707.65	709.47	LIDAR TOPO
Middle Fork	Middle Fork	2629	706.27	706.6	708.58	LIDAR TOPO
Middle Fork	Middle Fork	2154	705.41	705.74	707.75	LIDAR TOPO
Middle Fork	Middle Fork	1689	703.52	703.77	705.25	LIDAR TOPO
Middle Fork	Middle Fork	1212	702.86	703.1	704.55	LIDAR TOPO
Middle Fork	Middle Fork	827	702.4	702.62	704.03	LIDAR TOPO

Table B-9 Computed Water Surface Elevations and Topographic Data Source – Middle Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
Middle Fork	Middle Fork	362	701.22	701.45	703.04	LIDAR TOPO
Middle Fork	Middle Fork	286	699.61	699.65	700.22	LIDAR TOPO
Middle Fork	Middle Fork	277 DAM				LIDAR TOPO
Middle Fork	Middle Fork	88	695.97	696.38	698.78	LIDAR TOPO

Note: All elevations are in NAVD88.

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	322253	1350.75	1351.14	1351.56	LIDAR TOPO
North Fork	North Fork	321743	1348.75	1349.07	1349.43	LIDAR TOPO
North Fork	North Fork	321276	1344.98	1345.42	1345.88	LIDAR TOPO
North Fork	North Fork	320772	1342.67	1343.15	1343.67	LIDAR TOPO
North Fork	North Fork	320258	1340.94	1341.47	1342.06	LIDAR TOPO
North Fork	North Fork	319722	1337.01	1337.30	1337.61	LIDAR TOPO
North Fork	North Fork	319260	1334.32	1334.72	1335.22	LIDAR TOPO
North Fork	North Fork	318695	1332.10	1332.49	1332.96	LIDAR TOPO
North Fork	North Fork	318225	1329.77	1330.33	1330.94	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	318168 FM 2340				2015-2016 FIELD SURVEY
North Fork	North Fork	318126	1329.77	1330.29	1330.90	LIDAR TOPO
North Fork	North Fork	317935	1328.90	1329.41	1329.93	LIDAR TOPO
North Fork	North Fork	317611	1327.20	1327.69	1328.23	LIDAR TOPO
North Fork	North Fork	317117	1324.59	1325.13	1325.68	LIDAR TOPO
North Fork	North Fork	316647	1321.32	1321.74	1322.20	LIDAR TOPO
North Fork	North Fork	316184	1318.40	1318.72	1319.07	LIDAR TOPO
North Fork	North Fork	315663	1316.03	1316.33	1316.64	LIDAR TOPO
North Fork	North Fork	315160	1312.26	1312.55	1312.88	LIDAR TOPO
North Fork	North Fork	314660	1309.73	1310.15	1310.60	LIDAR TOPO
North Fork	North Fork	314188	1307.14	1307.60	1308.10	LIDAR TOPO
North Fork	North Fork	313661	1304.13	1304.54	1304.98	LIDAR TOPO
North Fork	North Fork	313176	1301.49	1301.87	1302.27	LIDAR TOPO
North Fork	North Fork	312693	1298.65	1299.03	1299.43	LIDAR TOPO
North Fork	North Fork	312234	1295.78	1296.02	1296.26	LIDAR TOPO
North Fork	North Fork	311722	1292.41	1292.65	1292.91	LIDAR TOPO
North Fork	North Fork	311203	1289.26	1289.53	1289.83	LIDAR TOPO
North Fork	North Fork	310708	1287.79	1288.09	1288.42	LIDAR TOPO
North Fork	North Fork	310221	1285.47	1285.78	1286.11	LIDAR TOPO
North Fork	North Fork	309731	1282.67	1283.02	1283.38	LIDAR TOPO
North Fork	North Fork	309163	1280.55	1280.93	1281.35	LIDAR TOPO
North Fork	North Fork	308679	1278.40	1278.79	1279.21	LIDAR TOPO
North Fork	North Fork	308192	1275.73	1276.17	1276.65	LIDAR TOPO
North Fork	North Fork	307754	1273.59	1274.23	1274.77	LIDAR TOPO
North Fork	North Fork	307217	1270.14	1270.63	1271.13	LIDAR TOPO
North Fork	North Fork	306753	1267.73	1268.29	1268.84	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	306291	1266.73	1267.25	1267.73	LIDAR TOPO
North Fork	North Fork	305798	1263.68	1264.26	1264.77	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	305742 COUNTY RD 203				2015-2016 FIELD SURVEY
North Fork	North Fork	305705	1262.60	1263.41	1263.75	LIDAR TOPO
North Fork	North Fork	305366	1259.27	1259.55	1260.32	LIDAR TOPO
North Fork	North Fork	305068	1258.31	1258.94	1259.56	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	305024 COUNTY RD 202				2015-2016 FIELD SURVEY
North Fork	North Fork	304993	1258.12	1258.78	1259.41	LIDAR TOPO
North Fork	North Fork	304508	1257.03	1257.72	1258.37	LIDAR TOPO
North Fork	North Fork	304172	1254.13	1254.76	1255.45	LIDAR TOPO
North Fork	North Fork	303900	1252.20	1252.78	1253.38	LIDAR TOPO
North Fork	North Fork	303398	1250.13	1250.84	1251.53	LIDAR TOPO
North Fork	North Fork	302981	1247.71	1248.41	1249.13	LIDAR TOPO
North Fork	North Fork	302449	1245.33	1245.93	1246.58	LIDAR TOPO
North Fork	North Fork	301936	1242.61	1243.14	1243.69	LIDAR TOPO
North Fork	North Fork	301462	1240.75	1241.24	1241.77	LIDAR TOPO
North Fork	North Fork	300973	1239.01	1239.58	1240.17	LIDAR TOPO
North Fork	North Fork	300482	1237.12	1237.63	1238.24	LIDAR TOPO
North Fork	North Fork	300039	1235.97	1236.32	1236.93	LIDAR TOPO
North Fork	North Fork	299536	1233.01	1233.80	1234.59	LIDAR TOPO
North Fork	North Fork	299083	1231.13	1231.85	1232.58	LIDAR TOPO
North Fork	North Fork	298599	1229.32	1230.03	1230.78	LIDAR TOPO
North Fork	North Fork	298103	1227.57	1228.36	1229.23	LIDAR TOPO
North Fork	North Fork	297617	1226.21	1226.99	1227.80	LIDAR TOPO
North Fork	North Fork	297114	1223.88	1224.47	1225.10	LIDAR TOPO
North Fork	North Fork	296643	1221.94	1222.64	1223.42	LIDAR TOPO
North Fork	North Fork	296157	1220.58	1221.29	1222.10	LIDAR TOPO
North Fork	North Fork	295663	1218.76	1219.47	1220.38	LIDAR TOPO
North Fork	North Fork	295261	1218.00	1218.64	1219.60	LIDAR TOPO
North Fork	North Fork	294796	1216.03	1216.64	1217.61	LIDAR TOPO
North Fork	North Fork	294322	1213.34	1214.06	1215.17	LIDAR TOPO
North Fork	North Fork	293835	1211.75	1212.52	1213.68	LIDAR TOPO
North Fork	North Fork	293353	1208.95	1209.78	1211.01	LIDAR TOPO
North Fork	North Fork	292883	1207.17	1207.73	1208.60	LIDAR TOPO
North Fork	North Fork	292420	1205.18	1205.80	1206.71	LIDAR TOPO
North Fork	North Fork	291929	1203.30	1203.89	1204.75	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	291042	1200.89	1201.24	1201.75	LIDAR TOPO
North Fork	North Fork	290884	1200.75	1201.07	1201.54	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	290833 FM 963				2015-2016 FIELD SURVEY
North Fork	North Fork	290782	1198.00	1198.54	1199.37	LIDAR TOPO
North Fork	North Fork	290486	1196.88	1197.38	1198.15	LIDAR TOPO
North Fork	North Fork	289983	1194.78	1195.31	1196.11	LIDAR TOPO
North Fork	North Fork	289484	1192.25	1192.74	1193.49	LIDAR TOPO
North Fork	North Fork	288982	1189.18	1189.86	1190.68	LIDAR TOPO
North Fork	North Fork	288556	1186.84	1187.57	1188.74	LIDAR TOPO
North Fork	North Fork	287974	1186.04	1186.83	1187.97	LIDAR TOPO
North Fork	North Fork	287482	1184.13	1184.91	1186.13	LIDAR TOPO
North Fork	North Fork	286992	1182.41	1183.15	1184.26	LIDAR TOPO
North Fork	North Fork	286478	1181.09	1181.83	1182.84	LIDAR TOPO
North Fork	North Fork	286164	1180.70	1181.42	1182.91	LIDAR TOPO
North Fork	North Fork	285915	1180.67	1181.40	1182.76	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	285707	1180.33	1181.08	1182.45	LIDAR TOPO
North Fork	North Fork	285421	1179.29	1180.04	1181.37	LIDAR TOPO
North Fork	North Fork	285008	1177.56	1178.26	1179.53	LIDAR TOPO
North Fork	North Fork	284466	1176.01	1176.65	1177.82	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	284435 PRIVATE DR				2015-2016 FIELD SURVEY
North Fork	North Fork	284392	1175.66	1176.28	1177.52	LIDAR TOPO
North Fork	North Fork	284067	1174.69	1175.31	1176.32	LIDAR TOPO
North Fork	North Fork	283561	1172.36	1172.99	1174.25	LIDAR TOPO
North Fork	North Fork	283143	1171.67	1172.26	1173.48	LIDAR TOPO
North Fork	North Fork	282607	1170.98	1171.59	1172.84	LIDAR TOPO
North Fork	North Fork	282039	1169.10	1169.83	1171.21	LIDAR TOPO
North Fork	North Fork	281517	1168.19	1168.89	1170.17	LIDAR TOPO
North Fork	North Fork	281040	1167.05	1167.67	1168.86	LIDAR TOPO
North Fork	North Fork	280487	1165.80	1166.39	1167.43	LIDAR TOPO
North Fork	North Fork	280103	1164.84	1165.42	1166.31	LIDAR TOPO
North Fork	North Fork	279684	1163.30	1163.76	1164.71	LIDAR TOPO
North Fork	North Fork	279187	1161.83	1162.29	1163.17	LIDAR TOPO
North Fork	North Fork	278711	1160.56	1161.08	1162.11	LIDAR TOPO
North Fork	North Fork	278189	1159.72	1160.21	1161.16	LIDAR TOPO
North Fork	North Fork	277625	1158.83	1159.22	1160.00	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	277207	1158.72	1159.10	1159.85	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	277136 FM 1174				2015-2016 FIELD SURVEY
North Fork	North Fork	277069	1156.43	1156.96	1157.96	LIDAR TOPO
North Fork	North Fork	276326	1155.31	1155.86	1156.82	LIDAR TOPO
North Fork	North Fork	275814	1153.07	1153.85	1154.99	LIDAR TOPO
North Fork	North Fork	275326	1151.09	1151.68	1153.04	LIDAR TOPO
North Fork	North Fork	274868	1150.50	1151.17	1152.45	LIDAR TOPO
North Fork	North Fork	274312	1148.85	1149.56	1150.94	LIDAR TOPO
North Fork	North Fork	273843	1148.25	1148.95	1150.28	LIDAR TOPO
North Fork	North Fork	273343	1146.69	1147.34	1148.58	LIDAR TOPO
North Fork	North Fork	272811	1145.65	1146.28	1147.51	LIDAR TOPO
North Fork	North Fork	272321	1143.99	1144.61	1145.84	LIDAR TOPO
North Fork	North Fork	271849	1142.64	1143.26	1144.51	LIDAR TOPO
North Fork	North Fork	271342	1141.53	1142.18	1143.50	LIDAR TOPO
North Fork	North Fork	270836	1140.12	1140.82	1142.25	LIDAR TOPO
North Fork	North Fork	270339	1139.23	1139.94	1141.43	LIDAR TOPO
North Fork	North Fork	269847	1137.78	1138.53	1140.15	LIDAR TOPO
North Fork	North Fork	269488	1135.88	1136.77	1138.63	LIDAR TOPO
North Fork	North Fork	268776	1134.89	1135.81	1137.73	LIDAR TOPO
North Fork	North Fork	268340	1133.97	1134.90	1136.78	LIDAR TOPO
North Fork	North Fork	267835	1133.13	1134.10	1136.06	LIDAR TOPO
North Fork	North Fork	267310	1132.45	1133.43	1135.41	LIDAR TOPO
North Fork	North Fork	266801	1131.15	1132.08	1134.01	LIDAR TOPO
North Fork	North Fork	266308	1129.16	1129.99	1131.65	LIDAR TOPO
North Fork	North Fork	265810	1126.66	1127.45	1128.92	LIDAR TOPO
North Fork	North Fork	265392	1125.46	1126.20	1127.67	LIDAR TOPO
North Fork	North Fork	264795	1123.89	1124.60	1126.00	LIDAR TOPO
North Fork	North Fork	264384	1122.79	1123.51	1124.93	LIDAR TOPO
North Fork	North Fork	263825	1122.06	1122.83	1124.29	LIDAR TOPO
North Fork	North Fork	263276	1121.37	1122.10	1123.48	LIDAR TOPO
North Fork	North Fork	262803	1120.06	1120.71	1122.05	LIDAR TOPO
North Fork	North Fork	262370	1118.90	1119.58	1120.95	LIDAR TOPO
North Fork	North Fork	261966	1118.19	1118.89	1120.28	LIDAR TOPO
North Fork	North Fork	261457	1117.65	1118.36	1119.80	LIDAR TOPO
North Fork	North Fork	260869	1115.70	1116.46	1117.95	LIDAR TOPO
North Fork	North Fork	260380	1113.37	1114.03	1115.29	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	259892	1111.79	1112.41	1113.59	LIDAR TOPO
North Fork	North Fork	259373	1109.64	1110.20	1111.33	LIDAR TOPO
North Fork	North Fork	258867	1108.40	1108.92	1110.01	LIDAR TOPO
North Fork	North Fork	258355	1106.97	1107.34	1108.58	LIDAR TOPO
North Fork	North Fork	257914	1105.31	1105.69	1107.06	LIDAR TOPO
North Fork	North Fork	257412	1104.04	1104.49	1106.12	LIDAR TOPO
North Fork	North Fork	256874	1103.36	1103.85	1105.66	LIDAR TOPO
North Fork	North Fork	256427	1102.76	1103.32	1105.31	LIDAR TOPO
North Fork	North Fork	255964	1102.24	1102.87	1105.00	LIDAR TOPO
North Fork	North Fork	255464	1101.71	1102.36	1104.60	LIDAR TOPO
North Fork	North Fork	254932	1100.61	1101.26	1103.54	LIDAR TOPO
North Fork	North Fork	254431	1098.86	1099.55	1102.00	LIDAR TOPO
North Fork	North Fork	253982	1097.43	1098.10	1100.07	LIDAR TOPO
North Fork	North Fork	253522	1096.26	1096.95	1099.03	LIDAR TOPO
North Fork	North Fork	253024	1094.52	1095.21	1097.28	LIDAR TOPO
North Fork	North Fork	252530	1094.06	1094.74	1096.74	LIDAR TOPO
North Fork	North Fork	251999	1092.63	1093.31	1095.32	LIDAR TOPO
North Fork	North Fork	251489	1090.56	1091.22	1093.31	LIDAR TOPO
North Fork	North Fork	251000	1089.34	1090.00	1092.10	LIDAR TOPO
North Fork	North Fork	250502	1087.94	1088.65	1090.91	LIDAR TOPO
North Fork	North Fork	250024	1087.02	1087.75	1090.04	LIDAR TOPO
North Fork	North Fork	249506	1086.15	1086.86	1089.07	LIDAR TOPO
North Fork	North Fork	248997	1084.67	1085.41	1087.68	LIDAR TOPO
North Fork	North Fork	248470	1084.21	1084.90	1087.07	LIDAR TOPO
North Fork	North Fork	247988	1082.00	1082.60	1084.64	LIDAR TOPO
North Fork	North Fork	247489	1080.60	1081.19	1083.21	LIDAR TOPO
North Fork	North Fork	246990	1079.89	1080.52	1082.71	LIDAR TOPO
North Fork	North Fork	246420	1078.68	1079.30	1081.52	LIDAR TOPO
North Fork	North Fork	246062	1077.83	1078.46	1080.79	LIDAR TOPO
North Fork	North Fork	245971	1077.16	1077.75	1080.00	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	245927 COUNTY RD 200				2015-2016 FIELD SURVEY
North Fork	North Fork	245900	1076.83	1077.45	1079.64	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	245875 FOOTBRIDGE				LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	245857	1076.88	1077.50	1079.68	LIDAR TOPO
North Fork	North Fork	245608	1074.79	1075.33	1077.01	LIDAR TOPO
North Fork	North Fork	245016	1073.15	1073.62	1075.21	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	244488	1071.52	1072.06	1073.80	LIDAR TOPO
North Fork	North Fork	243982	1069.71	1070.20	1071.85	LIDAR TOPO
North Fork	North Fork	243459	1069.20	1069.67	1071.24	LIDAR TOPO
North Fork	North Fork	242942	1068.32	1068.77	1070.30	LIDAR TOPO
North Fork	North Fork	242429	1066.88	1067.32	1068.79	LIDAR TOPO
North Fork	North Fork	241964	1065.21	1065.67	1067.12	LIDAR TOPO
North Fork	North Fork	241450	1064.16	1064.61	1066.07	LIDAR TOPO
North Fork	North Fork	240940	1062.82	1063.28	1064.70	LIDAR TOPO
North Fork	North Fork	240477	1062.04	1062.51	1063.91	LIDAR TOPO
North Fork	North Fork	239905	1060.10	1060.50	1061.95	LIDAR TOPO
North Fork	North Fork	239398	1058.88	1059.22	1060.49	LIDAR TOPO
North Fork	North Fork	239014	1058.48	1058.82	1060.08	LIDAR TOPO
North Fork	North Fork	238375	1055.84	1056.34	1058.24	LIDAR TOPO
North Fork	North Fork	237908	1055.27	1055.66	1057.39	LIDAR TOPO
North Fork	North Fork	237428	1054.60	1055.03	1056.92	LIDAR TOPO
North Fork	North Fork	236948	1053.96	1054.41	1056.41	LIDAR TOPO
North Fork	North Fork	236444	1053.41	1053.85	1055.87	LIDAR TOPO
North Fork	North Fork	235940	1053.22	1053.65	1055.65	LIDAR TOPO
North Fork	North Fork	235484	1051.97	1052.33	1054.11	LIDAR TOPO
North Fork	North Fork	234960	1050.75	1051.07	1052.83	LIDAR TOPO
North Fork	North Fork	234474	1049.08	1049.53	1051.77	LIDAR TOPO
North Fork	North Fork	233958	1047.80	1048.36	1050.98	LIDAR TOPO
North Fork	North Fork	233434	1047.28	1047.84	1050.49	LIDAR TOPO
North Fork	North Fork	232835	1046.93	1047.51	1050.18	LIDAR TOPO
North Fork	North Fork	232436	1046.32	1046.89	1049.50	LIDAR TOPO
North Fork	North Fork	231948	1045.79	1046.39	1049.05	LIDAR TOPO
North Fork	North Fork	231448	1044.96	1045.54	1048.16	LIDAR TOPO
North Fork	North Fork	230980	1043.73	1044.28	1046.74	LIDAR TOPO
North Fork	North Fork	230458	1043.39	1043.95	1046.38	LIDAR TOPO
North Fork	North Fork	230002	1042.06	1042.70	1045.44	LIDAR TOPO
North Fork	North Fork	229456	1041.46	1042.11	1044.90	LIDAR TOPO
North Fork	North Fork	228944	1039.53	1040.05	1042.65	LIDAR TOPO
North Fork	North Fork	228451	1037.43	1037.97	1040.63	LIDAR TOPO
North Fork	North Fork	227982	1036.37	1036.87	1039.23	LIDAR TOPO
North Fork	North Fork	227477	1036.61	1037.12	1039.48	LIDAR TOPO
North Fork	North Fork	226976	1034.67	1035.11	1037.24	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	226514	1033.65	1034.11	1036.32	LIDAR TOPO
North Fork	North Fork	226006	1032.56	1032.99	1035.17	LIDAR TOPO
North Fork	North Fork	225515	1031.74	1032.18	1034.37	LIDAR TOPO
North Fork	North Fork	225036	1030.66	1031.13	1033.45	LIDAR TOPO
North Fork	North Fork	224558	1030.21	1030.71	1033.12	LIDAR TOPO
North Fork	North Fork	224082	1029.54	1030.07	1032.65	LIDAR TOPO
North Fork	North Fork	223568	1028.70	1029.28	1032.01	LIDAR TOPO
North Fork	North Fork	223067	1027.76	1028.32	1031.04	LIDAR TOPO
North Fork	North Fork	222556	1026.41	1026.98	1029.85	LIDAR TOPO
North Fork	North Fork	222031	1025.19	1025.74	1028.60	LIDAR TOPO
North Fork	North Fork	221541	1024.02	1024.59	1027.52	LIDAR TOPO
North Fork	North Fork	221025	1023.93	1024.47	1027.26	LIDAR TOPO
North Fork	North Fork	220516	1023.09	1023.64	1026.54	LIDAR TOPO
North Fork	North Fork	220032	1021.69	1022.13	1024.70	LIDAR TOPO
North Fork	North Fork	219518	1020.33	1020.83	1023.39	LIDAR TOPO
North Fork	North Fork	219019	1019.76	1020.25	1022.73	LIDAR TOPO
North Fork	North Fork	218520	1018.67	1019.10	1021.38	LIDAR TOPO
North Fork	North Fork	218009	1017.80	1018.23	1020.50	LIDAR TOPO
North Fork	North Fork	217488	1017.16	1017.57	1019.74	LIDAR TOPO
North Fork	North Fork	217023	1016.98	1017.39	1019.53	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	216901 FM 243				2015-2016 FIELD SURVEY
North Fork	North Fork	216800	1015.83	1016.39	1019.34	LIDAR TOPO
North Fork	North Fork	216443	1014.58	1015.14	1018.00	LIDAR TOPO
North Fork	North Fork	215952	1013.85	1014.39	1017.25	LIDAR TOPO
North Fork	North Fork	215426	1013.39	1013.90	1016.60	LIDAR TOPO
North Fork	North Fork	214916	1011.18	1011.61	1013.90	LIDAR TOPO
North Fork	North Fork	214394	1009.76	1010.21	1012.64	LIDAR TOPO
North Fork	North Fork	213871	1008.95	1009.38	1011.69	LIDAR TOPO
North Fork	North Fork	213341	1007.42	1007.88	1010.39	LIDAR TOPO
North Fork	North Fork	212843	1006.87	1007.32	1009.74	LIDAR TOPO
North Fork	North Fork	212322	1006.26	1006.68	1008.96	LIDAR TOPO
North Fork	North Fork	211804	1005.44	1005.83	1008.00	LIDAR TOPO
North Fork	North Fork	211319	1004.21	1004.65	1007.05	LIDAR TOPO
North Fork	North Fork	210843	1004.07	1004.49	1006.73	LIDAR TOPO
North Fork	North Fork	210303	1003.32	1003.70	1005.76	LIDAR TOPO
North Fork	North Fork	209803	1002.47	1002.85	1004.83	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	209302	1001.21	1001.59	1003.50	LIDAR TOPO
North Fork	North Fork	208791	999.78	1000.11	1001.92	LIDAR TOPO
North Fork	North Fork	208288	998.33	998.67	1000.59	LIDAR TOPO
North Fork	North Fork	207807	997.50	997.83	999.72	LIDAR TOPO
North Fork	North Fork	207318	996.11	996.49	998.58	LIDAR TOPO
North Fork	North Fork	206790	995.45	995.81	997.82	LIDAR TOPO
North Fork	North Fork	206240	994.73	995.09	997.10	LIDAR TOPO
North Fork	North Fork	205737	993.97	994.32	996.30	LIDAR TOPO
North Fork	North Fork	205234	992.19	992.54	994.60	LIDAR TOPO
North Fork	North Fork	204742	991.25	991.61	993.78	LIDAR TOPO
North Fork	North Fork	204254	990.04	990.38	992.55	LIDAR TOPO
North Fork	North Fork	203761	989.30	989.64	991.86	LIDAR TOPO
North Fork	North Fork	203223	988.49	988.85	991.18	2015-2016 FIELD SURVEY
North Fork	North Fork	202749	987.66	988.05	990.51	LIDAR TOPO
North Fork	North Fork	202280	987.02	987.42	989.96	LIDAR TOPO
North Fork	North Fork	201770	986.30	986.71	989.29	LIDAR TOPO
North Fork	North Fork	201239	985.73	986.13	988.72	LIDAR TOPO
North Fork	North Fork	200754	984.83	985.24	987.87	LIDAR TOPO
North Fork	North Fork	200135	983.16	983.56	986.16	LIDAR TOPO
North Fork	North Fork	199740	982.43	982.83	985.44	LIDAR TOPO
North Fork	North Fork	199257	981.73	982.14	984.84	LIDAR TOPO
North Fork	North Fork	198781	980.87	981.28	983.98	LIDAR TOPO
North Fork	North Fork	198257	979.84	980.26	983.00	LIDAR TOPO
North Fork	North Fork	197765	978.96	979.38	982.03	2015-2016 FIELD SURVEY
North Fork	North Fork	197296	978.05	978.44	980.92	LIDAR TOPO
North Fork	North Fork	196791	976.93	977.30	979.62	LIDAR TOPO
North Fork	North Fork	196313	975.83	976.18	978.46	LIDAR TOPO
North Fork	North Fork	195784	974.27	974.65	976.98	LIDAR TOPO
North Fork	North Fork	195298	973.27	973.63	975.89	LIDAR TOPO
North Fork	North Fork	194813	972.86	973.23	975.52	LIDAR TOPO
North Fork	North Fork	194341	972.59	972.97	975.30	LIDAR TOPO
North Fork	North Fork	193813	971.90	972.27	974.55	LIDAR TOPO
North Fork	North Fork	193331	970.86	971.24	973.49	LIDAR TOPO
North Fork	North Fork	192992	969.27	969.68	971.88	LIDAR TOPO
North Fork	North Fork	192846	968.30	968.65	971.59	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	192787 PRIVATE DR				2015-2016 FIELD SURVEY

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	192715	968.47	968.83	971.53	LIDAR TOPO
North Fork	North Fork	192305	968.59	968.97	971.51	2015-2016 FIELD SURVEY
North Fork	North Fork	191968	968.05	968.46	971.11	LIDAR TOPO
North Fork	North Fork	191503	967.57	968.00	970.75	LIDAR TOPO
North Fork	North Fork	190991	967.23	967.66	970.46	LIDAR TOPO
North Fork	North Fork	190481	966.65	967.07	969.74	LIDAR TOPO
North Fork	North Fork	189943	964.99	965.41	968.04	LIDAR TOPO
North Fork	North Fork	189507	963.70	964.09	966.64	LIDAR TOPO
North Fork	North Fork	188971	963.01	963.38	965.95	LIDAR TOPO
North Fork	North Fork	188468	962.08	962.51	965.24	LIDAR TOPO
North Fork	North Fork	187950	960.95	961.33	963.85	LIDAR TOPO
North Fork	North Fork	187400	960.84	961.21	963.64	LIDAR TOPO
North Fork	North Fork	186718	959.50	959.90	962.63	2015-2016 FIELD SURVEY
North Fork	North Fork	186383	959.08	959.44	962.04	LIDAR TOPO
North Fork	North Fork	186001	958.36	958.67	961.06	LIDAR TOPO
North Fork	North Fork	185461	957.63	957.90	960.19	LIDAR TOPO
North Fork	North Fork	184977	956.96	957.21	959.54	LIDAR TOPO
North Fork	North Fork	184500	955.58	956.82	959.06	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	184428 COUNTY RD 236				2015-2016 FIELD SURVEY
North Fork	North Fork	184371	953.50	953.84	956.03	LIDAR TOPO
North Fork	North Fork	183854	952.55	952.89	955.05	LIDAR TOPO
North Fork	North Fork	183233	951.28	951.63	953.77	LIDAR TOPO
North Fork	North Fork	182719	950.09	950.46	952.85	LIDAR TOPO
North Fork	North Fork	182263	949.66	950.03	952.38	LIDAR TOPO
North Fork	North Fork	181710	949.28	949.66	952.03	LIDAR TOPO
North Fork	North Fork	181215	948.34	948.71	951.07	2015-2016 FIELD SURVEY
North Fork	North Fork	180698	947.43	947.81	950.20	LIDAR TOPO
North Fork	North Fork	180214	946.99	947.38	949.77	LIDAR TOPO
North Fork	North Fork	179692	946.38	946.74	949.05	LIDAR TOPO
North Fork	North Fork	179202	945.26	945.58	947.65	LIDAR TOPO
North Fork	North Fork	178689	943.38	943.77	945.94	LIDAR TOPO
North Fork	North Fork	178185	942.90	943.25	945.21	LIDAR TOPO
North Fork	North Fork	177654	942.18	942.52	944.35	LIDAR TOPO
North Fork	North Fork	177149	939.47	939.55	941.05	LIDAR TOPO
North Fork	North Fork	176646	938.49	939.13	941.16	LIDAR TOPO
North Fork	North Fork	176152	937.85	938.51	940.12	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	175620	937.54	938.23	939.72	2015-2016 FIELD SURVEY
North Fork	North Fork	175116	932.93	933.11	937.26	LIDAR TOPO
North Fork	North Fork	174603	933.89	934.37	937.42	LIDAR TOPO
North Fork	North Fork	174118	932.90	933.35	936.65	LIDAR TOPO
North Fork	North Fork	173559	932.60	933.06	936.39	LIDAR TOPO
North Fork	North Fork	173008	931.86	932.45	936.11	LIDAR TOPO
North Fork	North Fork	172553	931.49	932.08	935.74	LIDAR TOPO
North Fork	North Fork	172035	930.83	931.44	935.10	LIDAR TOPO
North Fork	North Fork	171489	930.06	930.64	934.13	LIDAR TOPO
North Fork	North Fork	171002	928.34	928.91	932.08	LIDAR TOPO
North Fork	North Fork	170624	926.24	926.69	929.25	2015-2016 FIELD SURVEY
North Fork	North Fork	170125	924.88	925.40	928.22	LIDAR TOPO
North Fork	North Fork	169578	925.08	925.59	928.35	LIDAR TOPO
North Fork	North Fork	169013	921.71	922.18	925.89	LIDAR TOPO
North Fork	North Fork	168542	922.39	922.90	926.26	LIDAR TOPO
North Fork	North Fork	168041	921.15	921.59	924.41	LIDAR TOPO
North Fork	North Fork	167531	919.82	920.28	923.35	LIDAR TOPO
North Fork	North Fork	167052	918.71	919.15	922.10	LIDAR TOPO
North Fork	North Fork	166626	917.16	917.67	920.87	LIDAR TOPO
North Fork	North Fork	166137	915.36	915.91	918.34	LIDAR TOPO
North Fork	North Fork	165689	915.11	915.70	918.32	LIDAR TOPO
North Fork	North Fork	165125	914.92	915.52	918.06	LIDAR TOPO
North Fork	North Fork	164787	912.30	912.76	916.02	2015-2016 FIELD SURVEY
North Fork	North Fork	164648	911.79	912.29	915.92	LIDAR TOPO
North Fork	North Fork	164142	912.05	912.62	915.79	LIDAR TOPO
North Fork	North Fork	163601	911.22	911.74	915.10	LIDAR TOPO
North Fork	North Fork	163155	908.79	909.24	912.35	LIDAR TOPO
North Fork	North Fork	162611	907.63	908.07	911.21	LIDAR TOPO
North Fork	North Fork	162072	907.34	907.79	910.94	LIDAR TOPO
North Fork	North Fork	161606	906.67	907.12	910.26	LIDAR TOPO
North Fork	North Fork	161124	905.27	905.74	908.87	LIDAR TOPO
North Fork	North Fork	160646	904.02	904.42	907.69	LIDAR TOPO
North Fork	North Fork	160159	903.62	904.04	907.44	LIDAR TOPO
North Fork	North Fork	159690	903.00	903.40	906.75	2015-2016 FIELD SURVEY
North Fork	North Fork	159683	901.96	902.42	905.79	LIDAR TOPO
North Fork	North Fork	159185	901.17	901.66	905.15	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	158701	899.82	900.38	903.89	LIDAR TOPO
North Fork	North Fork	158217	899.01	899.61	903.09	LIDAR TOPO
North Fork	North Fork	157620	898.45	899.07	902.54	LIDAR TOPO
North Fork	North Fork	157002	897.24	897.88	901.22	2015-2016 FIELD SURVEY
North Fork	North Fork	156628	896.80	897.47	900.86	LIDAR TOPO
North Fork	North Fork	156211	896.77	897.45	900.80	LIDAR TOPO
North Fork	North Fork	155725	894.82	895.55	899.25	LIDAR TOPO
North Fork	North Fork	155225	893.75	894.54	898.21	LIDAR TOPO
North Fork	North Fork	154743	894.18	894.96	898.50	LIDAR TOPO
North Fork	North Fork	154257	889.87	890.41	893.91	2015-2016 FIELD SURVEY
North Fork	North Fork	153772	890.14	890.85	893.66	LIDAR TOPO
North Fork	North Fork	153220	889.60	890.36	893.09	LIDAR TOPO
North Fork	North Fork	152770	889.13	889.95	892.55	LIDAR TOPO
North Fork	North Fork	152272	888.57	889.44	891.91	LIDAR TOPO
North Fork	North Fork	151774	886.02	886.78	890.43	LIDAR TOPO
North Fork	North Fork	151312	884.20	885.09	889.49	LIDAR TOPO
North Fork	North Fork	150840	877.34	877.59	886.11	LIDAR TOPO
North Fork	North Fork	150392	881.20	881.81	887.27	LIDAR TOPO
North Fork	North Fork	149847	880.59	881.25	886.75	LIDAR TOPO
North Fork	North Fork	149376	879.52	880.13	885.13	LIDAR TOPO
North Fork	North Fork	148841	878.64	879.25	884.28	2015-2016 FIELD SURVEY
North Fork	North Fork	148360	877.95	878.60	883.77	LIDAR TOPO
North Fork	North Fork	147924	877.81	878.46	883.65	LIDAR TOPO
North Fork	North Fork	147389	876.91	877.57	882.73	LIDAR TOPO
North Fork	North Fork	146933	875.60	876.23	880.98	LIDAR TOPO
North Fork	North Fork	146427	875.44	876.09	880.94	LIDAR TOPO
North Fork	North Fork	145944	873.03	873.60	878.73	LIDAR TOPO
North Fork	North Fork	145454	872.48	873.07	878.12	LIDAR TOPO
North Fork	North Fork	144959	871.69	872.30	877.05	LIDAR TOPO
North Fork	North Fork	144454	870.13	870.66	875.52	LIDAR TOPO
North Fork	North Fork	143962	870.16	870.73	875.79	LIDAR TOPO
North Fork	North Fork	143443	867.61	868.10	873.23	2015-2016 FIELD SURVEY
North Fork	North Fork	142948	867.79	868.37	873.79	LIDAR TOPO
North Fork	North Fork	142467	867.38	867.94	873.35	LIDAR TOPO
North Fork	North Fork	142006	866.73	867.29	872.81	LIDAR TOPO
North Fork	North Fork	141508	865.97	866.54	872.29	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	141065	864.44	865.02	871.49	LIDAR TOPO
North Fork	North Fork	140548	863.38	863.97	870.85	LIDAR TOPO
North Fork	North Fork	140076	861.44	862.12	870.61	LIDAR TOPO
North Fork	North Fork	139756	861.26	861.87	870.55	LIDAR TOPO
North Fork	North Fork	139273	861.84	862.50	870.68	LIDAR TOPO
North Fork	North Fork	139087	860.70	861.32	869.12	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	138964 N U.S. 183				2015-2016 FIELD SURVEY
North Fork	North Fork	138865	859.98	860.57	865.81	LIDAR TOPO
North Fork	North Fork	138151	859.26	859.87	865.34	2015-2016 FIELD SURVEY
North Fork	North Fork	137656	858.11	858.68	863.81	LIDAR TOPO
North Fork	North Fork	137287	856.92	857.47	862.45	LIDAR TOPO
North Fork	North Fork	136775	856.04	856.58	862.93	LIDAR TOPO
North Fork	North Fork	136371	854.77	855.26	860.51	LIDAR TOPO
North Fork	North Fork	136056	855.30	855.83	861.10	2015-2016 FIELD SURVEY
North Fork	North Fork	135794	855.10	855.64	861.02	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	135723 COUNTY RD 257				2015-2016 FIELD SURVEY
North Fork	North Fork	135651	853.32	853.96	859.13	LIDAR TOPO
North Fork	North Fork	135132	851.94	852.58	857.52	LIDAR TOPO
North Fork	North Fork	134648	849.86	850.33	856.73	LIDAR TOPO
North Fork	North Fork	134180	848.07	848.54	852.32	LIDAR TOPO
North Fork	North Fork	133713	847.30	847.78	851.68	LIDAR TOPO
North Fork	North Fork	133223	847.60	848.12	852.40	LIDAR TOPO
North Fork	North Fork	132739	847.57	848.11	852.56	2015-2016 FIELD SURVEY
North Fork	North Fork	132252	845.84	846.35	851.36	LIDAR TOPO
North Fork	North Fork	131773	844.20	844.70	849.21	LIDAR TOPO
North Fork	North Fork	131288	842.80	843.21	846.89	LIDAR TOPO
North Fork	North Fork	130840	843.07	843.55	847.62	LIDAR TOPO
North Fork	North Fork	130357	842.07	842.49	846.51	LIDAR TOPO
North Fork	North Fork	129883	841.66	842.09	845.96	LIDAR TOPO
North Fork	North Fork	129361	840.97	841.39	845.21	LIDAR TOPO
North Fork	North Fork	128885	840.21	840.65	844.76	LIDAR TOPO
North Fork	North Fork	128412	839.77	840.20	843.85	LIDAR TOPO
North Fork	North Fork	128308 RONALD W REAGAN BLVD				Williamson County Parmer Lane As-builts
North Fork	North Fork	128194	838.80	839.19	842.28	LIDAR TOPO
North Fork	North Fork	127839	837.63	838.10	841.93	LIDAR TOPO
North Fork	North Fork	127090	836.31	836.80	840.92	2015-2016 FIELD SURVEY

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	126639	835.38	835.88	840.29	LIDAR TOPO
North Fork	North Fork	125891	833.04	833.48	837.77	LIDAR TOPO
North Fork	North Fork	125453	832.10	832.53	836.39	LIDAR TOPO
North Fork	North Fork	124857	831.32	831.78	835.93	LIDAR TOPO
North Fork	North Fork	124406	830.12	830.59	834.83	LIDAR TOPO
North Fork	North Fork	123939	828.79	829.24	832.93	LIDAR TOPO
North Fork	North Fork	123455	828.01	828.46	832.31	LIDAR TOPO
North Fork	North Fork	123028	827.85	828.33	832.50	LIDAR TOPO
North Fork	North Fork	122431	827.43	827.94	832.24	2015-2016 FIELD SURVEY
North Fork	North Fork	122094	826.05	826.52	830.95	LIDAR TOPO
North Fork	North Fork	121641	825.49	825.94	830.56	LIDAR TOPO
North Fork	North Fork	121120	824.32	824.80	829.55	LIDAR TOPO
North Fork	North Fork	120623	823.42	823.91	828.51	LIDAR TOPO
North Fork	North Fork	120106	821.60	822.07	826.82	LIDAR TOPO
North Fork	North Fork	119643	821.09	821.58	826.56	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	119539 COUNTY RD 258				2015-2016 FIELD SURVEY
North Fork	North Fork	119446	820.59	821.08	826.11	LIDAR TOPO
North Fork	North Fork	119108	819.72	820.19	825.29	LIDAR TOPO
North Fork	North Fork	118640	818.91	819.41	825.10	LIDAR TOPO
North Fork	North Fork	118134	817.99	818.43	823.90	LIDAR TOPO
North Fork	North Fork	117638	817.24	817.68	823.43	LIDAR TOPO
North Fork	North Fork	117284	816.67	817.09	823.05	LIDAR TOPO
North Fork	North Fork	116813	816.29	816.70	822.90	2015-2016 FIELD SURVEY
North Fork	North Fork	116350	815.18	815.56	822.18	LIDAR TOPO
North Fork	North Fork	115867	814.12	814.43	821.53	LIDAR TOPO
North Fork	North Fork	115297	813.57	813.84	821.20	LIDAR TOPO
North Fork	North Fork	114744	813.11	813.36	821.04	LIDAR TOPO
North Fork	North Fork	114257	813.24	813.50	821.17	LIDAR TOPO
North Fork	North Fork	113815	812.78	813.00	820.90	LIDAR TOPO
North Fork	North Fork	113330	812.56	812.77	820.74	LIDAR TOPO
North Fork	North Fork	112850	812.31	812.50	820.67	LIDAR TOPO
North Fork	North Fork	112340	812.22	812.41	820.65	LIDAR TOPO
North Fork	North Fork	111929	812.24	812.43	820.70	LIDAR TOPO
North Fork	North Fork	111422	812.15	812.33	820.64	2015-2016 FIELD SURVEY
North Fork	North Fork	110957	812.02	812.19	820.60	LIDAR TOPO
North Fork	North Fork	110504	812.05	812.23	820.63	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	109982	811.88	812.04	820.59	LIDAR TOPO
North Fork	North Fork	109518	811.90	812.07	820.59	LIDAR TOPO
North Fork	North Fork	109039	811.75	811.90	820.46	LIDAR TOPO
North Fork	North Fork	108546	811.70	811.84	820.39	LIDAR TOPO
North Fork	North Fork	108037	811.66	811.80	820.35	LIDAR TOPO
North Fork	North Fork	107591	811.62	811.75	820.32	LIDAR TOPO
North Fork	North Fork	107112	811.57	811.70	820.27	LIDAR TOPO
North Fork	North Fork	106740	811.57	811.71	820.29	2015-2016 FIELD SURVEY
North Fork	North Fork	106679	811.53	811.65	820.25	LIDAR TOPO
North Fork	North Fork	106228	811.50	811.63	820.23	LIDAR TOPO
North Fork	North Fork	105836	811.50	811.62	820.23	LIDAR TOPO
North Fork	North Fork	105352	811.49	811.62	820.23	LIDAR TOPO
North Fork	North Fork	104838	811.50	811.63	820.24	LIDAR TOPO
North Fork	North Fork	104302	811.49	811.62	820.23	LIDAR TOPO
North Fork	North Fork	103847	811.48	811.61	820.22	LIDAR TOPO
North Fork	North Fork	103373	811.44	811.56	820.17	LIDAR TOPO
North Fork	North Fork	102906	811.46	811.58	820.19	LIDAR TOPO
North Fork	North Fork	102452	811.46	811.58	820.20	LIDAR TOPO
North Fork	North Fork	101982	811.46	811.58	820.19	LIDAR TOPO
North Fork	North Fork	101575	811.46	811.58	820.19	LIDAR TOPO
North Fork	North Fork	101080	811.46	811.58	820.20	LIDAR TOPO
North Fork	North Fork	100737	811.46	811.58	820.20	LIDAR TOPO
North Fork	North Fork	100187	811.46	811.58	820.19	LIDAR TOPO
North Fork	North Fork	99656	811.46	811.58	820.20	LIDAR TOPO
North Fork	North Fork	99119	811.46	811.58	820.19	LIDAR TOPO
North Fork	North Fork	98652	811.45	811.57	820.19	LIDAR TOPO
North Fork	North Fork	98177	811.45	811.57	820.18	LIDAR TOPO
North Fork	North Fork	97664	811.45	811.57	820.18	LIDAR TOPO
North Fork	North Fork	76012 DAM				LIDAR TOPO
North Fork	North Fork	71322	732.65	712.03	738.47	LIDAR TOPO
North Fork	North Fork	71076	729.85	711.10	736.90	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	70782 D B WOOD RD				2015-2016 FIELD SURVEY
North Fork	North Fork	70556	731.12	711.00	737.34	LIDAR TOPO
North Fork	North Fork	69916	728.58	709.26	735.15	LIDAR TOPO
North Fork	North Fork	69397	727.33	707.88	734.21	2015-2016 FIELD SURVEY
North Fork	North Fork	68873	727.23	706.95	734.09	LIDAR TOPO

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	68376	726.14	705.80	733.00	LIDAR TOPO
North Fork	North Fork	67856	724.90	704.42	732.05	LIDAR TOPO
North Fork	North Fork	67359	723.81	703.58	730.53	LIDAR TOPO
North Fork	North Fork	66856	721.96	702.66	728.77	LIDAR TOPO
North Fork	North Fork	66322	719.64	701.79	727.12	LIDAR TOPO
North Fork	North Fork	65834	719.31	701.00	726.79	LIDAR TOPO
North Fork	North Fork	65341	718.54	700.03	726.12	LIDAR TOPO
North Fork	North Fork	64857	715.82	699.20	721.61	LIDAR TOPO
North Fork	North Fork	64810 DAM				LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	64742	717.11	698.91	724.33	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	64706 FOOTBRIDGE				LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	64669	716.64	698.83	723.97	LIDAR TOPO
North Fork	North Fork	64565	715.16	698.61	721.88	LIDAR TOPO
North Fork	North Fork	64316	713.55	698.08	720.35	LIDAR TOPO
North Fork	North Fork	64076	713.69	697.63	720.74	2015-2016 FIELD SURVEY
North Fork	North Fork	63543	706.20	697.01	712.04	LIDAR TOPO
North Fork	North Fork	63049	696.09	696.70	697.51	LIDAR TOPO
North Fork	North Fork	62557	695.70	696.30	697.10	LIDAR TOPO
North Fork	North Fork	62039	695.17	695.74	696.50	LIDAR TOPO
North Fork	North Fork	61530	694.58	695.12	695.84	LIDAR TOPO
North Fork	North Fork	61081	693.90	694.41	695.10	LIDAR TOPO
North Fork	North Fork	60508	693.09	693.58	694.25	LIDAR TOPO
North Fork	North Fork	59996	692.76	693.22	693.85	LIDAR TOPO
North Fork	North Fork	59494	692.65	693.09	693.70	LIDAR TOPO
North Fork	North Fork	59446 DAM				LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	59398	692.54	692.97	693.55	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	59348 COUNTRY CLUB RD				LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	59302	692.50	692.91	693.48	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	59272 FOOTPATH				LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	59238	688.09	688.69	690.26	LIDAR TOPO
North Fork	North Fork	59101	687.75	688.36	690.06	LIDAR TOPO
North Fork	North Fork	58596	687.00	687.66	689.67	2015-2016 FIELD SURVEY
North Fork	North Fork	58109	686.41	687.10	689.38	LIDAR TOPO
North Fork	North Fork	57587	685.69	686.44	689.09	LIDAR TOPO
North Fork	North Fork	57113	685.28	686.07	688.94	LIDAR TOPO
North Fork	North Fork	57064 FOOTPATH				LIDAR TOPO/2015-2016 FIELD SURVEY

Table B-10 Computed Water Surface Elevations and Topographic Data Source – North Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
North Fork	North Fork	57019	685.19	685.98	688.89	LIDAR TOPO
North Fork	North Fork	56610	684.96	685.76	688.78	LIDAR TOPO
North Fork	North Fork	56134	684.72	685.53	688.67	LIDAR TOPO
North Fork	North Fork	55661	684.66	685.46	688.63	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	55512 RIVERY BLVD				2015-2016 FIELD SURVEY
North Fork	North Fork	55406	684.59	685.40	688.60	LIDAR TOPO
North Fork	North Fork	55084	684.47	685.26	688.53	LIDAR TOPO
North Fork	North Fork	54575	684.30	685.06	688.44	LIDAR TOPO
North Fork	North Fork	54130	684.26	685.01	688.42	LIDAR TOPO
North Fork	North Fork	53670	684.21	684.95	688.39	2015-2016 FIELD SURVEY
North Fork	North Fork	53207	684.17	684.91	688.36	LIDAR TOPO
North Fork	North Fork	52654	684.13	684.87	688.34	LIDAR TOPO
North Fork	North Fork	52542 I.H. 35 SB FRONTAGE RD				TXDOT 0015-08-091 As-builts
North Fork	North Fork	52452	684.12	684.85	688.33	LIDAR TOPO
North Fork	North Fork	52331 I.H. 35 SB				TXDOT 0015-08-044 As-builts
North Fork	North Fork	52276	684.11	684.84	688.32	LIDAR TOPO
North Fork	North Fork	52208 I.H. 35 NB				TXDOT 0015-08-044 As-builts
North Fork	North Fork	52115	684.10	684.83	688.31	LIDAR TOPO
North Fork	North Fork	52035 I.H. 35 NB FRONTAGE RD				TXDOT 0015-08-100 As-builts
North Fork	North Fork	51982	684.09	684.82	688.31	LIDAR TOPO
North Fork	North Fork	51736	684.08	684.80	688.29	LIDAR TOPO
North Fork	North Fork	51317	684.06	684.79	688.28	LIDAR TOPO
North Fork	North Fork	50856	684.05	684.77	688.26	LIDAR TOPO
North Fork	North Fork	50352	684.04	684.76	688.26	LIDAR TOPO/2015-2016 FIELD SURVEY
North Fork	North Fork	50282 AUSTIN AVE				2015-2016 FIELD SURVEY
North Fork	North Fork	50191	684.03	684.76	688.25	LIDAR TOPO
North Fork	North Fork	49728	684.02	684.74	688.24	LIDAR TOPO
North Fork	North Fork	49299	684.01	684.73	688.23	2015-2016 FIELD SURVEY
North Fork	North Fork	48745	684.01	684.73	688.23	LIDAR TOPO
North Fork	North Fork	48333	682.61	683.25	686.59	LIDAR TOPO

Note: All elevations are in NAVD88.

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	196830	1273.50	1273.89	1274.25	LIDAR TOPO
SSG	SSG	196199	1270.91	1271.36	1271.73	LIDAR TOPO
SSG	SSG	195697	1268.34	1268.61	1268.91	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	195620 CR 330B				2015-2016 FIELD SURVEY
SSG	SSG	195455	1266.29	1266.63	1266.84	LIDAR TOPO
SSG	SSG	194340	1259.16	1259.44	1259.81	LIDAR TOPO
SSG	SSG	193199	1252.33	1252.62	1252.77	LIDAR TOPO
SSG	SSG	192270	1246.29	1246.59	1246.84	LIDAR TOPO
SSG	SSG	192105	1244.60	1245.40	1245.82	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	192089 CR 330A				2015-2016 FIELD SURVEY
SSG	SSG	192004	1244.99	1245.78	1246.15	LIDAR TOPO
SSG	SSG	191831	1243.34	1244.15	1244.61	LIDAR TOPO
SSG	SSG	191195	1237.45	1238.06	1238.65	LIDAR TOPO
SSG	SSG	190216	1233.00	1233.54	1234.03	LIDAR TOPO
SSG	SSG	189190	1227.17	1227.62	1228.04	LIDAR TOPO
SSG	SSG	188680	1225.04	1225.40	1225.82	LIDAR TOPO
SSG	SSG	188532	1224.05	1224.38	1224.74	LIDAR TOPO
SSG	SSG	188462	1224.08	1224.37	1224.72	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	188425 FM 243				2015-2016 FIELD SURVEY
SSG	SSG	188372	1222.61	1223.03	1223.21	LIDAR TOPO
SSG	SSG	187818	1218.89	1219.28	1219.85	LIDAR TOPO
SSG	SSG	187193	1215.28	1215.62	1216.17	LIDAR TOPO
SSG	SSG	186190	1208.53	1208.97	1209.61	LIDAR TOPO
SSG	SSG	185122	1200.61	1201.54	1202.86	LIDAR TOPO
SSG	SSG	184081	1193.50	1194.05	1195.15	LIDAR TOPO
SSG	SSG	183187	1190.07	1191.01	1191.64	LIDAR TOPO
SSG	SSG	182503	1183.70	1183.70	1185.83	LIDAR TOPO
SSG	SSG	182325 PRIVATE LWC				LIDAR TOPO
SSG	SSG	182218	1183.82	1184.73	1186.23	LIDAR TOPO
SSG	SSG	181891	1181.45	1182.29	1183.42	LIDAR TOPO
SSG	SSG	181185	1179.07	1179.94	1181.19	LIDAR TOPO
SSG	SSG	180648	1176.99	1177.84	1179.15	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	179970	1172.82	1173.35	1174.17	LIDAR TOPO
SSG	SSG	179109	1166.14	1166.99	1168.60	LIDAR TOPO
SSG	SSG	178187	1159.57	1160.20	1161.18	LIDAR TOPO
SSG	SSG	177183	1157.15	1157.53	1158.44	LIDAR TOPO
SSG	SSG	176501	1154.21	1154.94	1155.79	LIDAR TOPO
SSG	SSG	175794	1151.16	1151.86	1153.11	LIDAR TOPO
SSG	SSG	175181	1148.06	1148.76	1149.88	LIDAR TOPO
SSG	SSG	174178	1142.63	1143.17	1144.04	LIDAR TOPO
SSG	SSG	173176	1138.27	1138.94	1140.12	LIDAR TOPO
SSG	SSG	172306	1134.16	1134.42	1134.62	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	172293 N WILSON LN				2015-2016 FIELD SURVEY
SSG	SSG	172271	1132.09	1132.64	1133.73	LIDAR TOPO
SSG	SSG	171175	1126.89	1127.61	1128.73	LIDAR TOPO
SSG	SSG	170174	1123.81	1124.41	1125.52	LIDAR TOPO
SSG	SSG	169175	1120.85	1121.50	1122.56	LIDAR TOPO
SSG	SSG	168252	1120.32	1120.99	1122.03	LIDAR TOPO
SSG	SSG	168106	1120.31	1120.97	1122.00	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	168068 RM 1174				2015-2016 FIELD SURVEY
SSG	SSG	168017	1114.95	1115.47	1116.38	LIDAR TOPO
SSG	SSG	167546	1112.55	1113.02	1113.89	LIDAR TOPO
SSG	SSG	166972	1111.56	1112.06	1112.96	LIDAR TOPO
SSG	SSG	166172	1107.55	1107.96	1108.92	LIDAR TOPO
SSG	SSG	165167	1105.04	1105.64	1106.85	LIDAR TOPO
SSG	SSG	164160	1102.86	1103.70	1105.30	LIDAR TOPO
SSG	SSG	163169	1099.51	1100.25	1101.73	LIDAR TOPO
SSG	SSG	162167	1096.35	1096.95	1098.11	LIDAR TOPO
SSG	SSG	161162	1093.75	1094.62	1096.07	LIDAR TOPO
SSG	SSG	160162	1092.61	1093.69	1095.29	LIDAR TOPO
SSG	SSG	159154	1089.52	1090.74	1092.70	LIDAR TOPO
SSG	SSG	158453	1087.24	1088.38	1090.38	LIDAR TOPO
SSG	SSG	158074	1085.50	1086.10	1087.55	LIDAR TOPO
SSG	SSG	157717	1085.02	1085.59	1087.26	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	157654 CR 323				2015-2016 FIELD SURVEY

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	157596	1084.43	1084.99	1086.21	LIDAR TOPO
SSG	SSG	157268	1083.20	1083.97	1085.50	LIDAR TOPO
SSG	SSG	156923	1082.22	1082.77	1083.97	LIDAR TOPO
SSG	SSG	156158	1080.11	1080.98	1081.56	LIDAR TOPO
SSG	SSG	155152	1071.55	1072.66	1074.04	LIDAR TOPO
SSG	SSG	154189 PRIVATE LWC				LIDAR TOPO
SSG	SSG	154130	1071.68	1072.62	1074.09	LIDAR TOPO
SSG	SSG	153158	1069.95	1070.83	1072.11	LIDAR TOPO
SSG	SSG	151756	1064.11	1065.09	1067.53	LIDAR TOPO
SSG	SSG	151151	1063.39	1064.48	1066.84	LIDAR TOPO
SSG	SSG	150156	1055.33	1056.66	1058.29	LIDAR TOPO
SSG	SSG	149207 PRIVATE LWC				LIDAR TOPO
SSG	SSG	149160	1055.47	1055.45	1054.72	LIDAR TOPO
SSG	SSG	148732 PRIVATE DAM				LIDAR TOPO
SSG	SSG	148701	1056.58	1057.43	1058.37	LIDAR TOPO
SSG	SSG	148525	1055.45	1055.35	1056.38	LIDAR TOPO
SSG	SSG	148150	1052.25	1053.18	1053.92	LIDAR TOPO
SSG	SSG	147151	1049.33	1049.82	1050.67	LIDAR TOPO
SSG	SSG	146152	1047.04	1047.46	1048.32	LIDAR TOPO
SSG	SSG	145148	1044.70	1045.35	1046.43	LIDAR TOPO
SSG	SSG	144839	1042.17	1042.46	1045.02	LIDAR TOPO
SSG	SSG	144633 PRIVATE LWC				LIDAR TOPO
SSG	SSG	144544	1042.27	1043.24	1045.06	LIDAR TOPO
SSG	SSG	143798	1040.79	1041.65	1043.35	LIDAR TOPO
SSG	SSG	143142	1039.86	1040.75	1042.48	LIDAR TOPO
SSG	SSG	142190	1036.16	1036.91	1038.66	LIDAR TOPO
SSG	SSG	141222	1033.07	1034.13	1036.50	LIDAR TOPO
SSG	SSG	140751 PRIVATE LWC				LIDAR TOPO
SSG	SSG	140673	1032.58	1033.57	1035.93	LIDAR TOPO
SSG	SSG	140501 PRIVATE LWC				LIDAR TOPO
SSG	SSG	140445	1032.66	1033.67	1035.94	LIDAR TOPO
SSG	SSG	140142	1030.95	1032.07	1034.54	LIDAR TOPO
SSG	SSG	139233	1027.65	1028.45	1030.02	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	138566	1026.12	1026.69	1027.25	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	138430 W ENO RIVER RANC				2015-2016 FIELD SURVEY
SSG	SSG	138315	1026.57	1027.26	1028.50	LIDAR TOPO
SSG	SSG	138013	1025.95	1026.75	1028.18	LIDAR TOPO
SSG	SSG	137139	1020.49	1021.08	1022.84	LIDAR TOPO
SSG	SSG	136264 PRIVATE DAM				LIDAR TOPO
SSG	SSG	136239	1018.62	1019.34	1020.33	LIDAR TOPO
SSG	SSG	135320 PRIVATE DAM				LIDAR TOPO
SSG	SSG	135283	1015.73	1017.21	1018.71	LIDAR TOPO
SSG	SSG	135223 PRIVATE LWC				LIDAR TOPO
SSG	SSG	135183	1016.30	1017.91	1019.63	LIDAR TOPO
SSG	SSG	135056 PRIVATE DAM				LIDAR TOPO
SSG	SSG	135028	1015.66	1017.43	1019.17	LIDAR TOPO
SSG	SSG	134755 PRIVATE DAM				LIDAR TOPO
SSG	SSG	134733	1012.24	1012.97	1017.46	LIDAR TOPO
SSG	SSG	134160 PRIVATE DAM				LIDAR TOPO
SSG	SSG	134140	1013.48	1014.26	1016.04	LIDAR TOPO
SSG	SSG	133135	1011.10	1012.25	1014.66	LIDAR TOPO
SSG	SSG	132134	1007.92	1008.88	1009.96	LIDAR TOPO
SSG	SSG	131136	1005.66	1006.51	1009.16	LIDAR TOPO
SSG	SSG	130486	1004.96	1006.00	1008.41	LIDAR TOPO
SSG	SSG	130348	1004.65	1005.64	1007.98	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	130282 E RIVER RANCH				2015-2016 FIELD SURVEY
SSG	SSG	130242	1004.57	1005.49	1007.70	LIDAR TOPO
SSG	SSG	130054	1003.57	1004.44	1006.64	LIDAR TOPO
SSG	SSG	129132	1001.54	1002.27	1004.10	LIDAR TOPO
SSG	SSG	128777	1000.80	1001.48	1003.22	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	128760 PRIVATE DAM				2015-2016 FIELD SURVEY
SSG	SSG	128728	1001.05	1001.76	1003.57	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	128693 PRIVATE LWC				2015-2016 FIELD SURVEY
SSG	SSG	128638	1000.51	1001.20	1002.92	LIDAR TOPO
SSG	SSG	128341	999.68	1000.16	1001.70	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	128299 PRIVATE DAM				2015-2016 FIELD SURVEY

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	128256	999.77	1000.30	1001.84	LIDAR TOPO
SSG	SSG	127897	998.82	999.47	1000.99	LIDAR TOPO
SSG	SSG	127133	996.14	996.98	998.84	LIDAR TOPO
SSG	SSG	126269	995.02	995.80	997.57	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	126202 SW LIBERTY HILL				2015-2016 FIELD SURVEY
SSG	SSG	126140	994.31	995.12	996.83	LIDAR TOPO
SSG	SSG	125127	991.15	992.32	994.00	LIDAR TOPO
SSG	SSG	124125	987.96	988.85	991.18	LIDAR TOPO
SSG	SSG	123123	986.54	987.42	989.65	LIDAR TOPO
SSG	SSG	122125	983.81	984.59	986.61	LIDAR TOPO
SSG	SSG	121121	982.38	983.18	985.31	LIDAR TOPO
SSG	SSG	120124	980.62	981.54	983.87	LIDAR TOPO
SSG	SSG	118690	976.90	977.53	979.16	LIDAR TOPO
SSG	SSG	117838	975.84	976.45	978.19	LIDAR TOPO
SSG	SSG	117401	975.68	976.31	978.07	LIDAR TOPO
SSG	SSG	117160	974.74	975.22	976.39	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	117106 FM 1869				2015-2016 FIELD SURVEY
SSG	SSG	116992	971.66	972.10	973.36	LIDAR TOPO
SSG	SSG	116269	970.58	971.19	972.99	LIDAR TOPO
SSG	SSG	115290	968.46	969.11	971.35	LIDAR TOPO
SSG	SSG	114059	965.26	965.81	967.47	LIDAR TOPO
SSG	SSG	113113	964.25	964.82	966.84	LIDAR TOPO
SSG	SSG	112093	962.44	963.03	965.08	LIDAR TOPO
SSG	SSG	111128	959.85	960.47	962.54	LIDAR TOPO
SSG	SSG	110112	956.55	957.22	959.53	LIDAR TOPO
SSG	SSG	109112	954.43	955.08	957.33	LIDAR TOPO
SSG	SSG	108113	952.76	953.43	955.90	LIDAR TOPO
SSG	SSG	107112	949.57	950.34	952.51	LIDAR TOPO
SSG	SSG	106092	949.64	950.34	952.44	LIDAR TOPO
SSG	SSG	105105	945.06	945.59	948.42	LIDAR TOPO
SSG	SSG	104559	945.21	946.20	948.50	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	104526 CR 279 LWC				2015-2016 FIELD SURVEY
SSG	SSG	104479	945.28	946.23	948.52	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	104338	945.20	946.14	948.43	LIDAR TOPO
SSG	SSG	104210	945.50	946.47	948.84	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	104157 CR 279 BRIDGE				2015-2016 FIELD SURVEY
SSG	SSG	104092	943.59	944.36	946.50	LIDAR TOPO
SSG	SSG	103695	943.31	944.08	946.20	LIDAR TOPO
SSG	SSG	102858	942.02	942.83	944.75	LIDAR TOPO
SSG	SSG	102102	939.92	941.08	942.69	LIDAR TOPO
SSG	SSG	101103	931.66	932.42	937.42	LIDAR TOPO
SSG	SSG	100099	931.04	931.97	935.21	LIDAR TOPO
SSG	SSG	99099	929.53	930.43	933.61	LIDAR TOPO
SSG	SSG	98095	928.07	928.94	932.02	LIDAR TOPO
SSG	SSG	97096	924.56	925.46	928.35	LIDAR TOPO
SSG	SSG	95857	920.60	921.48	924.59	LIDAR TOPO
SSG	SSG	95117	918.37	919.16	922.04	LIDAR TOPO
SSG	SSG	94092	916.17	916.85	919.85	LIDAR TOPO
SSG	SSG	93125	912.91	913.93	917.93	LIDAR TOPO
SSG	SSG	92063	911.34	912.39	916.66	LIDAR TOPO
SSG	SSG	91087	909.49	910.49	914.82	LIDAR TOPO
SSG	SSG	90090	907.90	908.83	913.15	LIDAR TOPO
SSG	SSG	89387	906.24	907.38	912.33	LIDAR TOPO
SSG	SSG	88459	904.70	905.82	910.73	LIDAR TOPO
SSG	SSG	87087	901.62	902.89	908.43	LIDAR TOPO
SSG	SSG	86423	900.56	901.86	907.53	LIDAR TOPO
SSG	SSG	86026	900.20	901.51	907.44	LIDAR TOPO
SSG	SSG	85919 RAILROAD				LIDAR TOPO/2017 AERIAL IMAGERY
SSG	SSG	85772	896.16	897.24	901.38	LIDAR TOPO
SSG	SSG	85445	895.03	896.17	900.74	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	85371 INDIAN TRL				2015-2016 FIELD SURVEY
SSG	SSG	85337	895.53	896.69	901.25	LIDAR TOPO
SSG	SSG	85042	895.31	896.47	901.02	LIDAR TOPO
SSG	SSG	84083	891.78	892.72	895.86	LIDAR TOPO
SSG	SSG	83080	889.92	890.87	895.19	LIDAR TOPO
SSG	SSG	82077	887.06	888.15	892.96	LIDAR TOPO
SSG	SSG	81080	884.17	885.21	889.87	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	79894	881.42	882.52	888.30	LIDAR TOPO
SSG	SSG	79405.7	880.65	881.76	887.83	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	79370 ABANDONED BRIDGE				2015-2016 FIELD SURVEY
SSG	SSG	79333.26	880.63	881.75	887.76	LIDAR TOPO
SSG	SSG	79328.09	880.74	881.84	887.71	LIDAR TOPO
SSG	SSG	79226 U.S. 183 SB				LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	79127	880.05	881.11	884.72	2015-2016 FIELD SURVEY
SSG	SSG	79000	879.61	880.69	884.35	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	78923 U.S. 183 NB				2015-2016 FIELD SURVEY
SSG	SSG	78847	878.82	879.82	883.09	LIDAR TOPO
SSG	SSG	77951	875.87	877.11	881.27	LIDAR TOPO
SSG	SSG	77073	874.65	875.92	880.26	LIDAR TOPO
SSG	SSG	76417	868.98	869.69	875.37	LIDAR TOPO
SSG	SSG	75717	867.10	867.52	867.20	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	75683 DAM E OF 183				2015-2016 FIELD SURVEY
SSG	SSG	75642	867.96	868.73	871.75	LIDAR TOPO
SSG	SSG	75078	866.62	867.31	870.06	LIDAR TOPO
SSG	SSG	74075	864.64	865.70	868.78	LIDAR TOPO
SSG	SSG	73075	862.36	863.26	866.04	LIDAR TOPO
SSG	SSG	72071	860.43	861.38	864.40	LIDAR TOPO
SSG	SSG	71092	856.57	857.43	860.99	LIDAR TOPO
SSG	SSG	70072	854.09	855.20	859.76	LIDAR TOPO
SSG	SSG	69067	851.81	852.90	857.37	LIDAR TOPO
SSG	SSG	68068	847.08	848.05	851.60	LIDAR TOPO
SSG	SSG	67057	846.67	847.68	851.69	LIDAR TOPO
SSG	SSG	66054	843.09	844.25	849.27	LIDAR TOPO
SSG	SSG	65063	841.04	842.32	847.82	LIDAR TOPO
SSG	SSG	64495	840.82	842.12	847.67	LIDAR TOPO
SSG	SSG	64366 SB RONALD REGAN				AS-BUILT: WILCO 81-21122-001
SSG	SSG	64332	840.47	841.75	846.71	LIDAR TOPO
SSG	SSG	64319	840.42	841.72	846.72	LIDAR TOPO
SSG	SSG	64268 NB RONALD REGAN				AS-BUILT: WILCO 81-21122-001
SSG	SSG	64145	839.73	840.95	845.68	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	63042	836.43	837.62	842.17	LIDAR TOPO
SSG	SSG	62472	835.13	836.30	841.53	LIDAR TOPO
SSG	SSG	62060	834.24	835.41	840.27	LIDAR TOPO
SSG	SSG	61060	831.81	832.97	837.65	LIDAR TOPO
SSG	SSG	60060	828.60	829.74	834.05	LIDAR TOPO
SSG	SSG	59056	826.73	827.87	832.19	LIDAR TOPO
SSG	SSG	58059	824.41	825.53	829.14	LIDAR TOPO
SSG	SSG	57054	822.16	823.47	827.71	LIDAR TOPO
SSG	SSG	56056	819.51	820.67	824.43	LIDAR TOPO
SSG	SSG	54904	818.11	819.38	823.12	LIDAR TOPO
SSG	SSG	54050	816.75	818.03	821.82	LIDAR TOPO
SSG	SSG	53050	812.48	813.70	817.34	LIDAR TOPO
SSG	SSG	52050	809.29	810.40	814.50	LIDAR TOPO
SSG	SSG	51049	806.59	807.69	811.91	LIDAR TOPO
SSG	SSG	50044	804.49	805.72	809.40	LIDAR TOPO
SSG	SSG	49033	802.22	803.08	806.16	LIDAR TOPO
SSG	SSG	48043	799.70	800.65	804.62	LIDAR TOPO
SSG	SSG	47043	798.71	799.72	803.75	LIDAR TOPO
SSG	SSG	46039	797.67	798.70	802.65	LIDAR TOPO
SSG	SSG	45029	794.93	795.74	797.70	LIDAR TOPO
SSG	SSG	44136	793.94	794.72	796.40	LIDAR TOPO
SSG	SSG	43873	793.81	794.74	796.90	LIDAR TOPO
SSG	SSG	43042	787.97	788.91	793.05	LIDAR TOPO
SSG	SSG	42128	786.31	786.97	789.51	LIDAR TOPO
SSG	SSG	41039	784.58	785.36	787.97	LIDAR TOPO
SSG	SSG	40030	781.54	782.54	786.25	LIDAR TOPO
SSG	SSG	39027	779.32	779.89	781.00	LIDAR TOPO
SSG	SSG	38036	778.31	779.12	781.61	LIDAR TOPO
SSG	SSG	37033	774.14	774.79	777.16	LIDAR TOPO
SSG	SSG	36035	768.88	769.60	772.74	LIDAR TOPO
SSG	SSG	35032	768.05	768.70	771.62	LIDAR TOPO
SSG	SSG	34041	767.17	767.86	770.97	LIDAR TOPO
SSG	SSG	33031	764.47	765.37	769.71	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	32029	764.24	765.05	769.03	LIDAR TOPO
SSG	SSG	31028	762.96	763.78	767.92	LIDAR TOPO
SSG	SSG	30023	760.36	761.45	765.93	LIDAR TOPO
SSG	SSG	28996	756.86	757.22	760.18	LIDAR TOPO
SSG	SSG	28008	755.73	755.92	758.17	LIDAR TOPO
SSG	SSG	27025	748.45	749.96	752.73	LIDAR TOPO
SSG	SSG	26024	749.06	749.84	752.95	LIDAR TOPO
SSG	SSG	25022	746.28	747.19	750.74	LIDAR TOPO
SSG	SSG	24019	743.54	744.26	747.04	LIDAR TOPO
SSG	SSG	22927	740.67	741.71	744.85	LIDAR TOPO
SSG	SSG	22020	737.05	737.95	742.33	LIDAR TOPO
SSG	SSG	21059	735.77	736.78	741.15	LIDAR TOPO
SSG	SSG	20016	734.57	735.63	740.17	LIDAR TOPO
SSG	SSG	19069	732.96	734.10	738.94	LIDAR TOPO
SSG	SSG	18016	730.72	731.83	736.73	LIDAR TOPO
SSG	SSG	17015	729.75	730.90	735.97	LIDAR TOPO
SSG	SSG	16091	728.54	729.84	735.36	LIDAR TOPO
SSG	SSG	15013	726.66	727.99	733.49	LIDAR TOPO
SSG	SSG	14054	725.31	726.67	732.26	LIDAR TOPO
SSG	SSG	13194	724.86	726.22	731.75	LIDAR TOPO
SSG	SSG	12994	724.48	725.84	731.36	LIDAR TOPO
SSG	SSG	12906 SB I.H. 35 FR				AS-BUILT: TxDOT 0015-09-119
SSG	SSG	12844	723.95	725.33	730.90	LIDAR TOPO
SSG	SSG	12829	723.95	725.33	730.90	LIDAR TOPO
SSG	SSG	12733 I.H. 35 ML				AS-BUILT: TxDOT 0015-19-124
SSG	SSG	12643	722.23	723.62	729.22	LIDAR TOPO
SSG	SSG	12608	722.09	723.48	729.12	LIDAR TOPO
SSG	SSG	12557 NB I.H. 35 FR				AS-BUILT: TxDOT 0015-08-128
SSG	SSG	12451	720.59	721.90	727.26	LIDAR TOPO
SSG	SSG	12003	719.04	720.30	725.40	LIDAR TOPO
SSG	SSG	11008	717.47	718.64	723.82	LIDAR TOPO
SSG	SSG	10007	714.72	715.94	721.18	LIDAR TOPO
SSG	SSG	9148	712.79	713.96	719.09	LIDAR TOPO

Table B-11 Computed Water Surface Elevations and Topographic Data Source – South Fork San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
SSG	SSG	9035	713.05	714.26	719.46	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	8964 SH 29				2015-2016 FIELD SURVEY
SSG	SSG	8895	710.55	711.63	716.55	LIDAR TOPO
SSG	SSG	8487	709.87	710.96	715.91	LIDAR TOPO
SSG	SSG	8388	709.73	710.81	715.64	LIDAR TOPO
SSG	SSG	8005	709.23	710.33	715.34	LIDAR TOPO
SSG	SSG	7002	707.69	708.88	714.27	LIDAR TOPO
SSG	SSG	6020	704.03	705.06	709.47	LIDAR TOPO
SSG	SSG	5009	700.90	701.77	705.73	LIDAR TOPO
SSG	SSG	4376	699.72	700.66	705.10	LIDAR TOPO
SSG	SSG	4005	695.29	696.14	700.72	LIDAR TOPO
SSG	SSG	3004	693.49	694.34	699.81	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	2988 LWC				2015-2016 FIELD SURVEY
SSG	SSG	2939	693.71	694.60	700.08	LIDAR TOPO
SSG	SSG	2792	693.65	694.56	700.22	LIDAR TOPO
SSG	SSG	2699	693.61	694.50	699.81	LIDAR TOPO/2015-2016 FIELD SURVEY
SSG	SSG	2629 AUSTIN AVE				2015-2016 FIELD SURVEY
SSG	SSG	2556	692.95	693.79	697.75	LIDAR TOPO
SSG	SSG	2371	692.56	693.43	697.47	LIDAR TOPO
SSG	SSG	2001	691.46	692.24	696.25	LIDAR TOPO
SSG	SSG	1397	690.43	691.21	694.83	LIDAR TOPO
SSG	SSG	1007	690.53	691.35	695.17	LIDAR TOPO

Table B-12 Computed Water Surface Elevations and Topographic Data Source – San Gabriel River

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
San Gabriel River	San Gabriel River	48018 FOOTBRIDGE				LIDAR TOPO
San Gabriel River	San Gabriel River	47973	681.86	682.51	685.85	LIDAR TOPO
San Gabriel River	San Gabriel River	47665	681.42	682.07	685.46	LIDAR TOPO
San Gabriel River	San Gabriel River	47177	680.50	681.17	684.65	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	46713	679.66	680.35	683.94	LIDAR TOPO
San Gabriel River	San Gabriel River	46319	678.68	679.38	682.97	LIDAR TOPO
San Gabriel River	San Gabriel River	45747	677.30	678.00	681.67	LIDAR TOPO
San Gabriel River	San Gabriel River	45370	676.95	677.68	681.49	LIDAR TOPO/2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	45220 DAM				2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	45066	676.19	676.89	680.79	LIDAR TOPO/2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	45013 FOOTBRIDGE				2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	44944	675.48	676.16	679.99	LIDAR TOPO
San Gabriel River	San Gabriel River	44763	675.32	676.00	679.83	LIDAR TOPO
San Gabriel River	San Gabriel River	44722 COLLEGE ST				WILCO 0914-05-136 As-builts
San Gabriel River	San Gabriel River	44656	675.06	675.76	679.61	LIDAR TOPO
San Gabriel River	San Gabriel River	44401	674.11	674.92	679.13	LIDAR TOPO
San Gabriel River	San Gabriel River	43899	673.47	674.26	678.44	LIDAR TOPO
San Gabriel River	San Gabriel River	43493	673.10	673.91	678.21	LIDAR TOPO
San Gabriel River	San Gabriel River	42910	672.11	672.85	677.08	LIDAR TOPO
San Gabriel River	San Gabriel River	42346	671.24	671.98	676.10	LIDAR TOPO
San Gabriel River	San Gabriel River	42278	670.70	671.42	675.50	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	41964	669.59	670.28	674.34	LIDAR TOPO/2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	41885 RAILROAD				2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	41778	668.97	669.59	673.28	LIDAR TOPO
San Gabriel River	San Gabriel River	41457	667.72	668.26	671.68	LIDAR TOPO
San Gabriel River	San Gabriel River	40929	667.01	667.52	670.91	LIDAR TOPO
San Gabriel River	San Gabriel River	40439	665.96	666.41	669.58	LIDAR TOPO
San Gabriel River	San Gabriel River	39943	665.37	665.81	669.12	LIDAR TOPO
San Gabriel River	San Gabriel River	39454	665.23	665.65	669.01	LIDAR TOPO
San Gabriel River	San Gabriel River	38973	664.22	664.57	668.49	LIDAR TOPO
San Gabriel River	San Gabriel River	38527	663.69	664.38	668.23	LIDAR TOPO
San Gabriel River	San Gabriel River	37920	663.47	664.01	667.71	LIDAR TOPO
San Gabriel River	San Gabriel River	37521	662.58	663.14	666.90	LIDAR TOPO
San Gabriel River	San Gabriel River	37417 GEORGETOWN INNER LOOP				Georgetown Inner Loop Extension As-builts
San Gabriel River	San Gabriel River	37311	662.08	662.62	666.20	LIDAR TOPO

Table B-12 Computed Water Surface Elevations and Topographic Data Source – San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
San Gabriel River	San Gabriel River	36926	661.28	661.84	665.77	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	36647	660.76	661.33	665.24	LIDAR TOPO
San Gabriel River	San Gabriel River	35987	660.53	661.13	665.13	LIDAR TOPO
San Gabriel River	San Gabriel River	35728	660.45	661.06	665.06	LIDAR TOPO
San Gabriel River	San Gabriel River	35261	658.87	659.49	663.50	LIDAR TOPO
San Gabriel River	San Gabriel River	35116 SH 130 SB				TXDOT 0440-05-004 As-builts
San Gabriel River	San Gabriel River	35016	657.77	658.35	661.98	LIDAR TOPO
San Gabriel River	San Gabriel River	34924 SH 130 NB				TXDOT 0440-05-004 As-builts
San Gabriel River	San Gabriel River	34770	657.31	657.88	661.56	LIDAR TOPO
San Gabriel River	San Gabriel River	34250	653.73	654.15	656.99	LIDAR TOPO
San Gabriel River	San Gabriel River	33774	653.94	654.43	657.90	LIDAR TOPO
San Gabriel River	San Gabriel River	33294	652.55	653.00	656.52	LIDAR TOPO
San Gabriel River	San Gabriel River	32814	651.81	652.28	655.82	LIDAR TOPO
San Gabriel River	San Gabriel River	32340	652.00	652.47	655.99	LIDAR TOPO
San Gabriel River	San Gabriel River	31656	651.29	651.76	655.29	LIDAR TOPO
San Gabriel River	San Gabriel River	31380	650.50	650.98	654.56	LIDAR TOPO
San Gabriel River	San Gabriel River	31028	648.64	649.17	653.07	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	30905	646.59	647.04	650.67	LIDAR TOPO
San Gabriel River	San Gabriel River	30444	645.32	645.76	649.26	LIDAR TOPO
San Gabriel River	San Gabriel River	29968	644.53	644.96	648.26	LIDAR TOPO
San Gabriel River	San Gabriel River	29492	644.43	644.86	648.20	LIDAR TOPO
San Gabriel River	San Gabriel River	28980	644.26	644.72	648.24	LIDAR TOPO
San Gabriel River	San Gabriel River	28497	644.18	644.63	648.15	LIDAR TOPO
San Gabriel River	San Gabriel River	28050	643.98	644.43	647.89	LIDAR TOPO
San Gabriel River	San Gabriel River	27509	643.84	644.28	647.73	LIDAR TOPO
San Gabriel River	San Gabriel River	26927	643.49	643.91	647.31	LIDAR TOPO
San Gabriel River	San Gabriel River	26449	643.03	643.44	646.74	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	25997	642.79	643.21	646.48	LIDAR TOPO
San Gabriel River	San Gabriel River	25521	642.24	642.66	646.09	LIDAR TOPO
San Gabriel River	San Gabriel River	25051	641.75	642.17	645.61	LIDAR TOPO
San Gabriel River	San Gabriel River	24586	641.46	641.86	645.27	LIDAR TOPO
San Gabriel River	San Gabriel River	24116	640.49	640.90	644.83	LIDAR TOPO
San Gabriel River	San Gabriel River	23626	640.30	640.70	644.61	LIDAR TOPO
San Gabriel River	San Gabriel River	23185	640.63	641.03	644.84	LIDAR TOPO
San Gabriel River	San Gabriel River	22649	639.69	640.11	643.90	LIDAR TOPO

Table B-12 Computed Water Surface Elevations and Topographic Data Source – San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
San Gabriel River	San Gabriel River	22108	638.27	638.73	642.44	LIDAR TOPO
San Gabriel River	San Gabriel River	21640	637.13	637.53	641.29	LIDAR TOPO
San Gabriel River	San Gabriel River	21217	636.74	637.13	640.63	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	20679	636.03	636.43	639.80	LIDAR TOPO
San Gabriel River	San Gabriel River	20183	635.68	636.10	639.52	LIDAR TOPO
San Gabriel River	San Gabriel River	19733	635.11	635.55	638.99	LIDAR TOPO
San Gabriel River	San Gabriel River	19190	634.69	635.13	638.42	LIDAR TOPO
San Gabriel River	San Gabriel River	18683	634.38	634.82	638.00	LIDAR TOPO
San Gabriel River	San Gabriel River	18177	633.40	633.85	636.82	LIDAR TOPO
San Gabriel River	San Gabriel River	17820	633.25	633.69	636.59	LIDAR TOPO
San Gabriel River	San Gabriel River	17269	631.28	631.67	636.07	LIDAR TOPO
San Gabriel River	San Gabriel River	16788	630.76	631.25	635.20	LIDAR TOPO
San Gabriel River	San Gabriel River	16251	627.48	627.83	634.16	LIDAR TOPO
San Gabriel River	San Gabriel River	15948	626.63	627.11	633.05	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	15350	624.96	625.16	628.04	LIDAR TOPO
San Gabriel River	San Gabriel River	14854	625.74	626.02	630.48	LIDAR TOPO
San Gabriel River	San Gabriel River	14409	623.75	624.01	627.48	LIDAR TOPO
San Gabriel River	San Gabriel River	14140	624.14	624.41	627.84	LIDAR TOPO
San Gabriel River	San Gabriel River	13686	622.46	622.71	626.24	LIDAR TOPO
San Gabriel River	San Gabriel River	13205	622.44	622.72	626.48	LIDAR TOPO
San Gabriel River	San Gabriel River	12711	622.17	622.45	626.55	LIDAR TOPO
San Gabriel River	San Gabriel River	12247	621.65	621.94	625.69	LIDAR TOPO
San Gabriel River	San Gabriel River	11809	620.50	620.82	624.94	LIDAR TOPO
San Gabriel River	San Gabriel River	11296	621.32	621.62	625.48	LIDAR TOPO
San Gabriel River	San Gabriel River	10657	620.81	621.11	625.07	LIDAR TOPO
San Gabriel River	San Gabriel River	10484	620.21	620.52	624.49	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	10140	619.78	620.08	624.00	LIDAR TOPO
San Gabriel River	San Gabriel River	9774	619.18	619.46	622.81	LIDAR TOPO
San Gabriel River	San Gabriel River	9353	618.38	618.63	622.27	LIDAR TOPO
San Gabriel River	San Gabriel River	8782	616.58	616.93	621.10	LIDAR TOPO
San Gabriel River	San Gabriel River	8339	616.55	616.89	620.94	LIDAR TOPO
San Gabriel River	San Gabriel River	7869	615.77	616.15	620.35	LIDAR TOPO
San Gabriel River	San Gabriel River	7396	614.87	615.27	619.43	LIDAR TOPO
San Gabriel River	San Gabriel River	6995	613.94	614.48	619.06	LIDAR TOPO
San Gabriel River	San Gabriel River	6868	613.89	614.36	619.06	LIDAR TOPO/2015-2016 FIELD SURVEY

Table B-12 Computed Water Surface Elevations and Topographic Data Source – San Gabriel River (continued)

River	Reach	Cross Section	100-Year Water Surface Elevation (ft NAVD88)		500-Year Water Surface Elevation (ft NAVD88)	Topographic Data Source
			Existing Conditions	Future Conditions	Existing Conditions	
San Gabriel River	San Gabriel River	6759 SH 29				2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	6645	613.32	613.64	618.12	LIDAR TOPO
San Gabriel River	San Gabriel River	6474	612.76	613.10	617.69	LIDAR TOPO/2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	6414 COUNTY RD 100				2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	6353	612.74	613.01	617.39	LIDAR TOPO
San Gabriel River	San Gabriel River	5833	612.22	612.51	616.92	LIDAR TOPO
San Gabriel River	San Gabriel River	5428	611.81	612.09	616.54	2015-2016 FIELD SURVEY
San Gabriel River	San Gabriel River	5041	611.12	611.40	616.21	LIDAR TOPO
San Gabriel River	San Gabriel River	4596	610.90	611.21	616.14	LIDAR TOPO
San Gabriel River	San Gabriel River	4019	609.80	610.09	614.81	LIDAR TOPO
San Gabriel River	San Gabriel River	3417	607.85	608.13	612.91	LIDAR TOPO
San Gabriel River	San Gabriel River	3081	606.76	607.06	612.35	LIDAR TOPO
San Gabriel River	San Gabriel River	2654	606.53	606.86	612.42	LIDAR TOPO
San Gabriel River	San Gabriel River	2195	603.60	603.82	607.29	LIDAR TOPO
San Gabriel River	San Gabriel River	1705	602.60	602.81	605.86	LIDAR TOPO
San Gabriel River	San Gabriel River	1272	600.99	601.22	605.20	LIDAR TOPO
San Gabriel River	San Gabriel River	632	600.81	601.04	605.10	LIDAR TOPO
San Gabriel River	San Gabriel River	156	598.76	598.99	602.75	LIDAR TOPO

Note: All elevations are in NAVD88.

FIGURES

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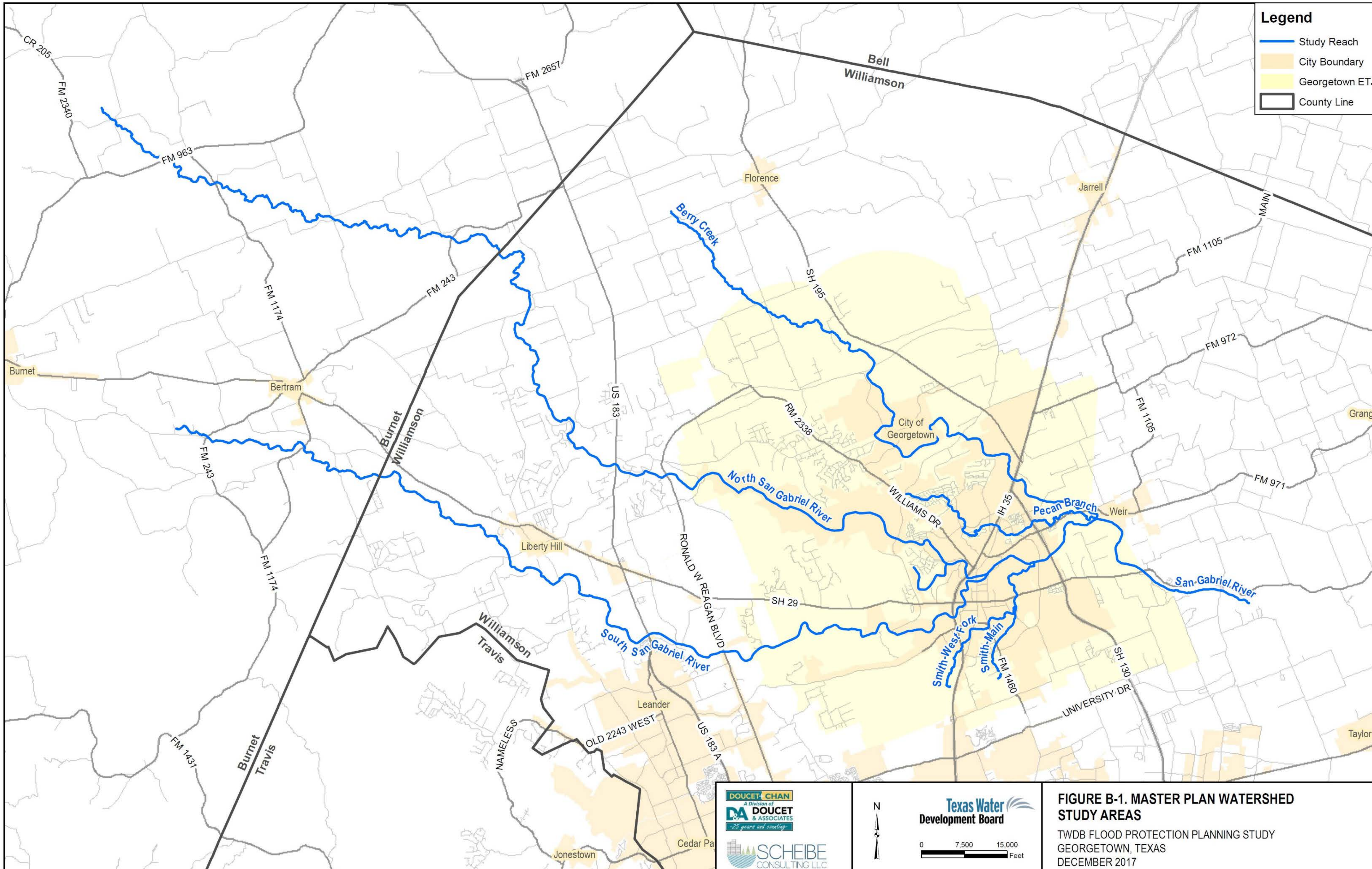
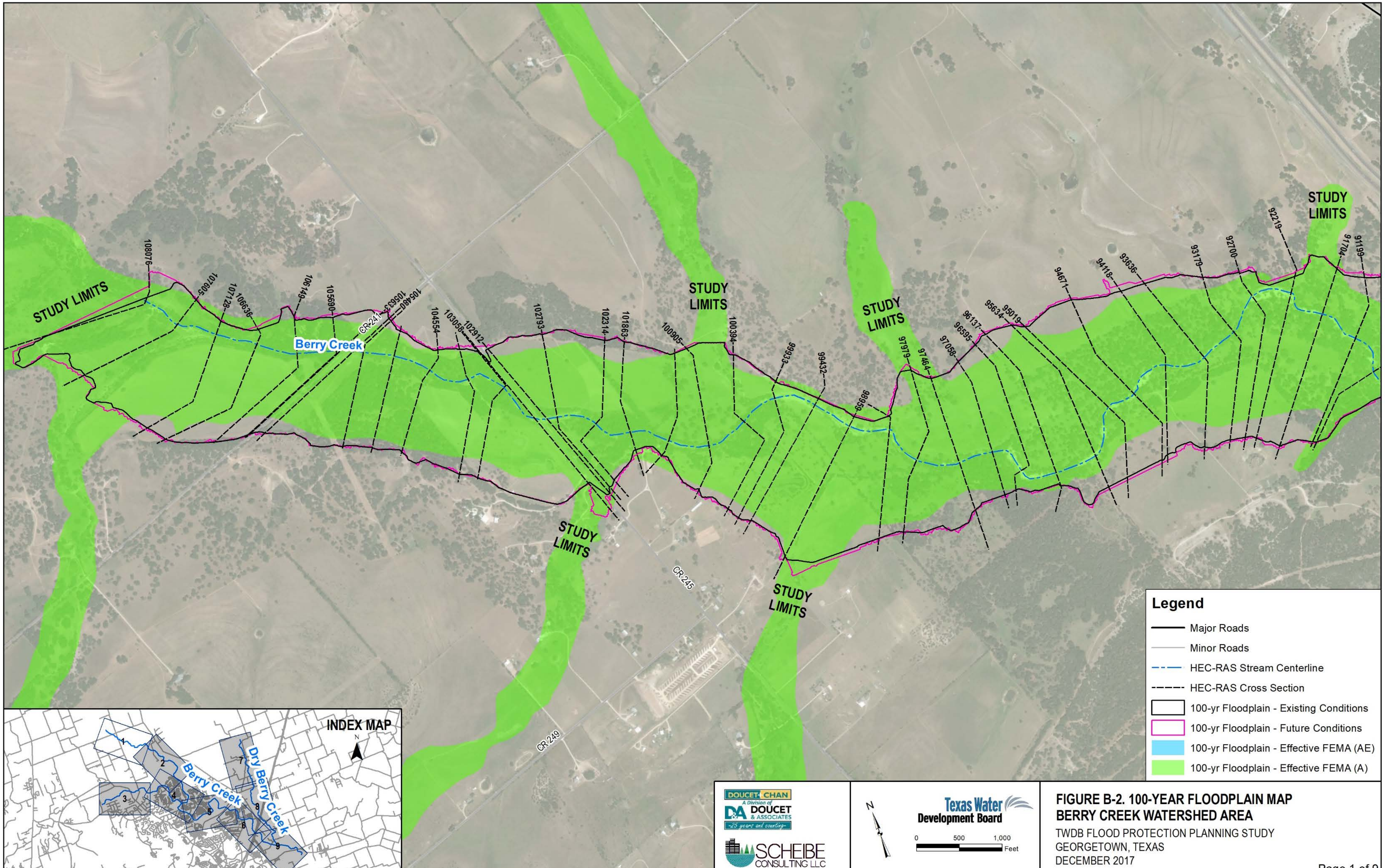

Legend
Study Reach
City Boundary
Georgetown ETJ
County Line
Bell
Williamson
Burnet
Williamson
Travis
Berry Creek
North San Gabriel River
South San Gabriel River
San Gabriel River
Pecan Branch
Smith-West Fork
Smith-Main
Florence
Jarrell
City of Georgetown
Weir
Granger
Burnet
Bertram
Liberty Hill
Leander
Jonestown
Cedar Pa
Taylor
CR 205
FM 2340
FM 963
FM 2657
FM 1174
FM 243
SH 195
US 183
RM 2338
WILLIAMS DR
IH 35
FM 1105
FM 972
FM 971
MAIN
SH 29
RONALD W REAGAN BLVD
FM 1460
SH 130
UNIVERSITY DR
OLD 2243 WEST
US 183 A
NAMELESS
FM 1431
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
-25 years and counting-
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
7,500
15,000
Feet
FIGURE B-1. MASTER PLAN WATERSHED STUDY AREAS
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017


STUDY LIMITS
Berry Creek
CR 241
CR 245
CR 249
108076
107605
107128
106636
106149
105690
105633
105480
104554
103058
102912
102793
102314
101863
100905
100394
99993
99432
98586
97979
97464
97056
96595
96137
95634
95019
94671
94116
93636
93179
92700
92219
91704
91199
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HEC-RAS Cross Section
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100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 500 1,000 Feet
FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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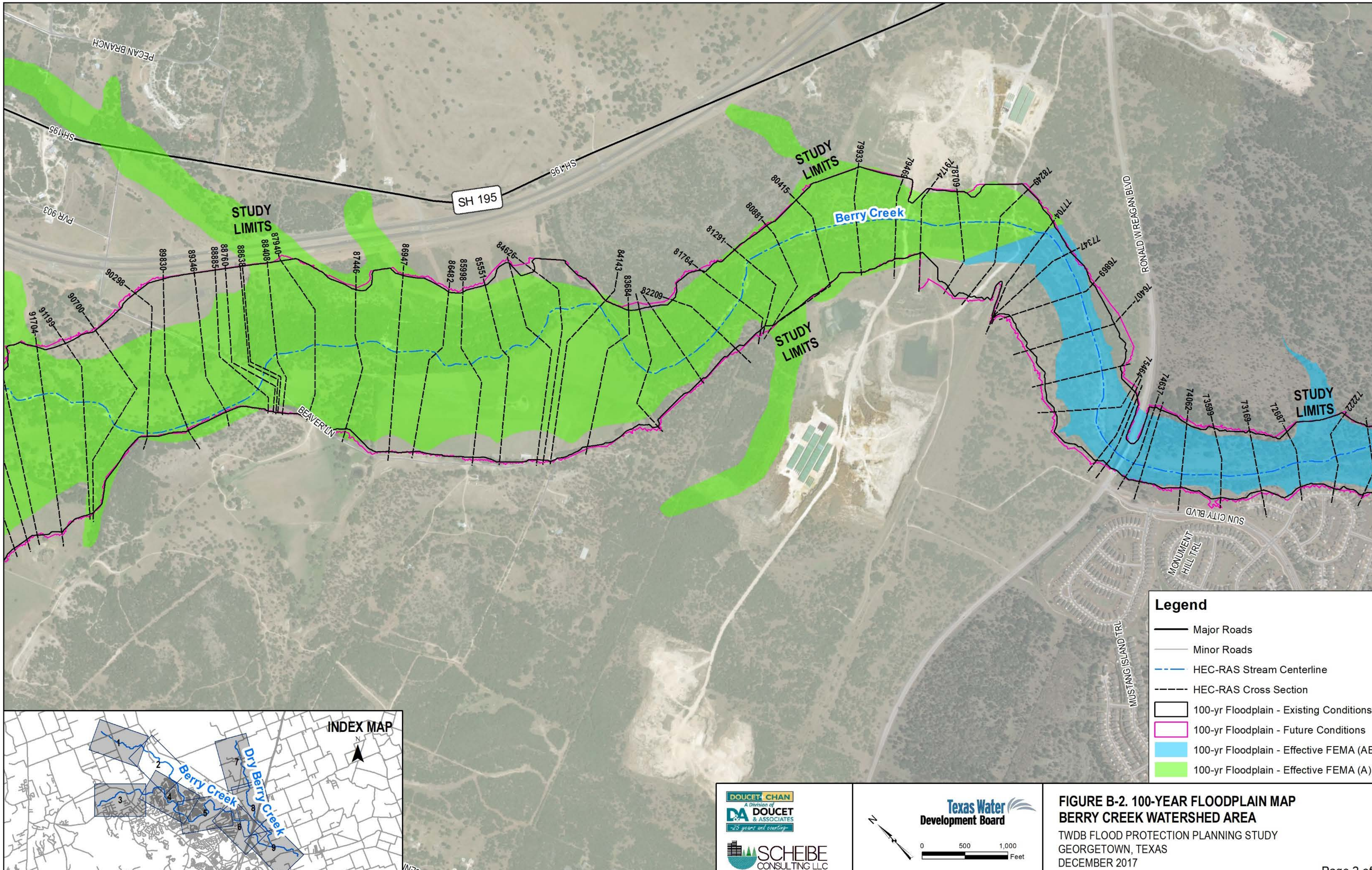
STUDY LIMITS
Berry Creek
SH 195
BEAVER LN
RONALD W REAGAN BLVD
SUN CITY BLVD
MONUMENT HILL TRL
MUSTANG ISLAND TRL
PECAN BRANCH
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100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 500 1,000 Feet
FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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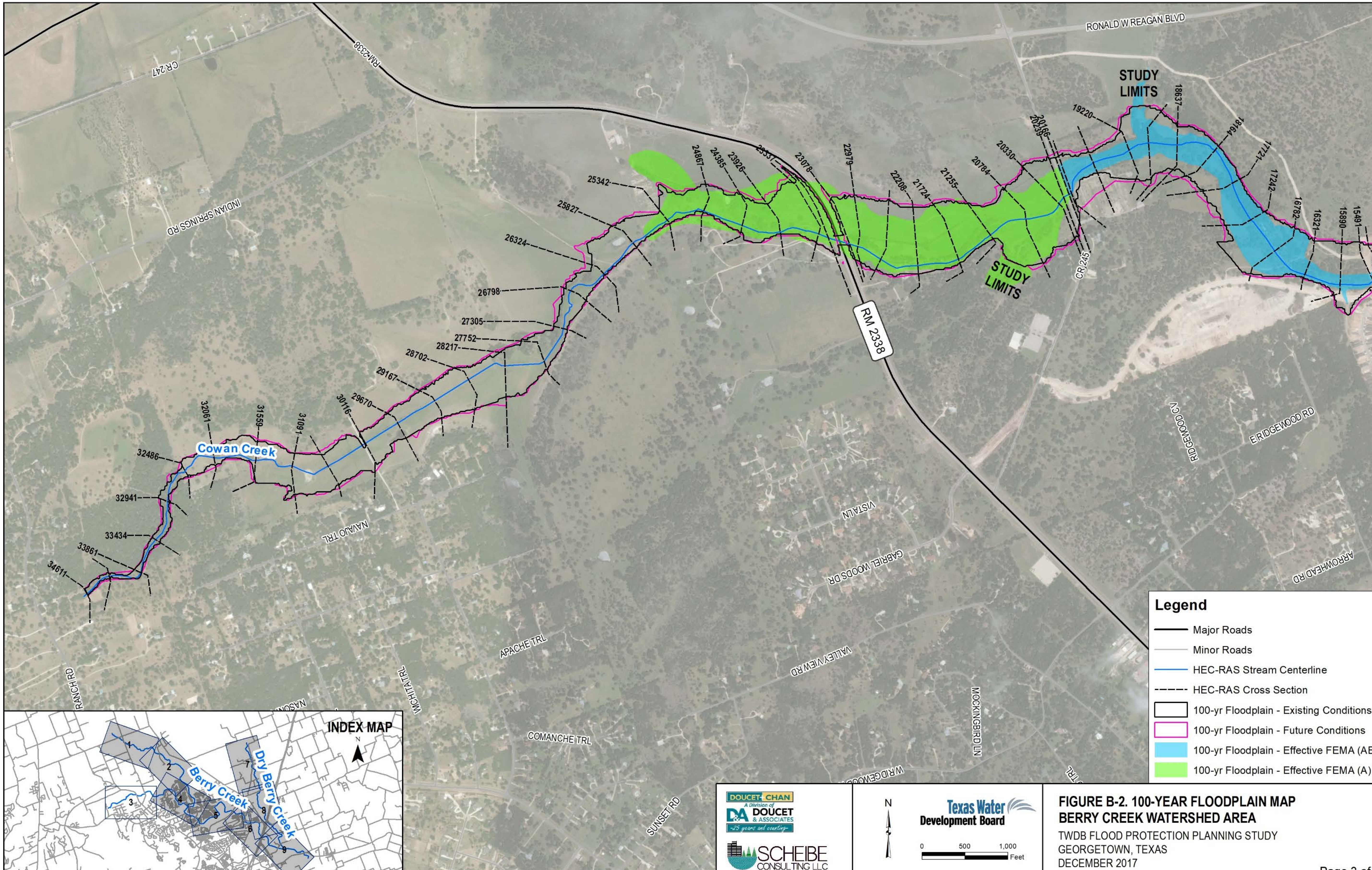

FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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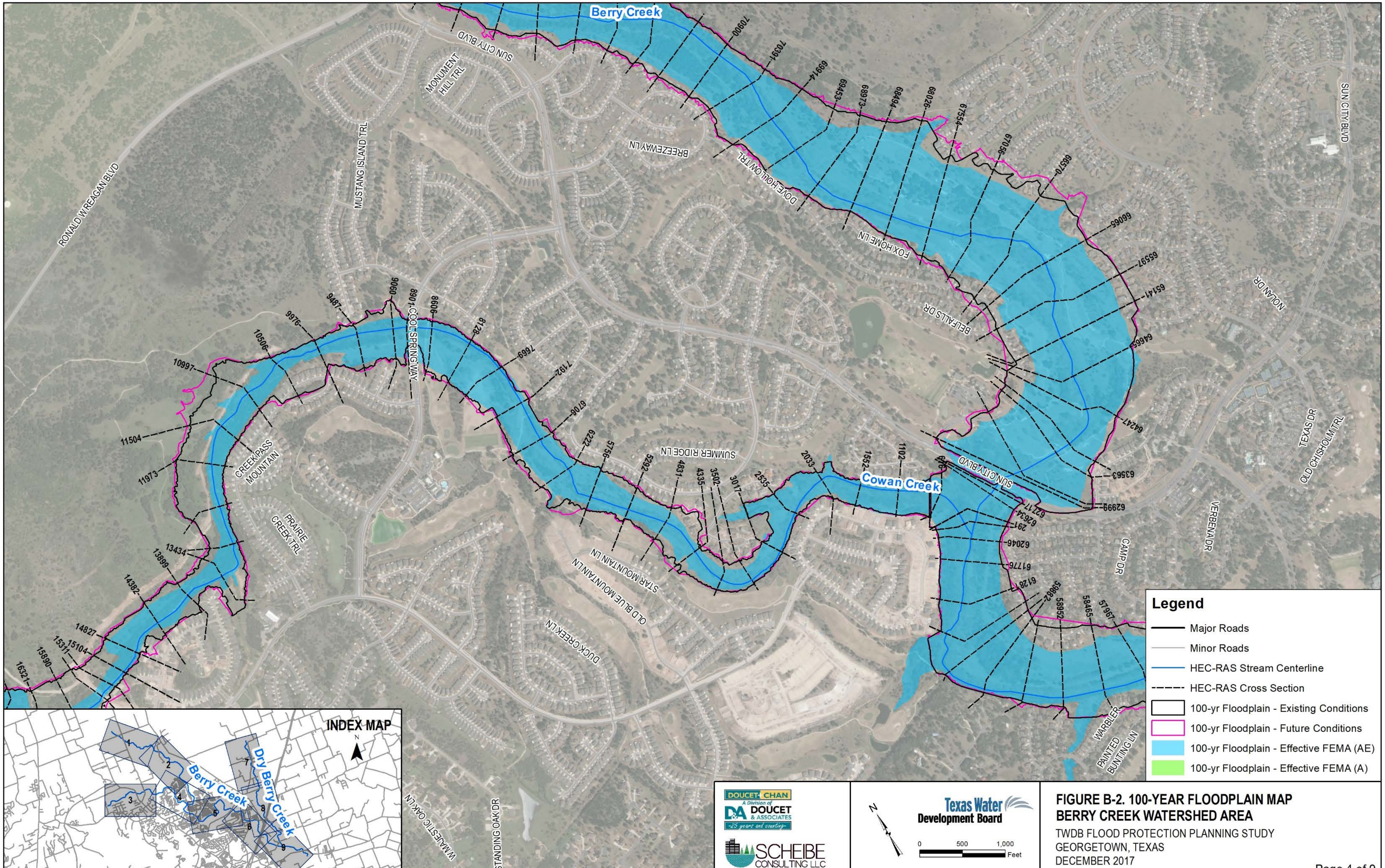
Berry Creek
Cowan Creek
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
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100-yr Floodplain - Future Conditions
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TWDB FLOOD PROTECTION PLANNING STUDY
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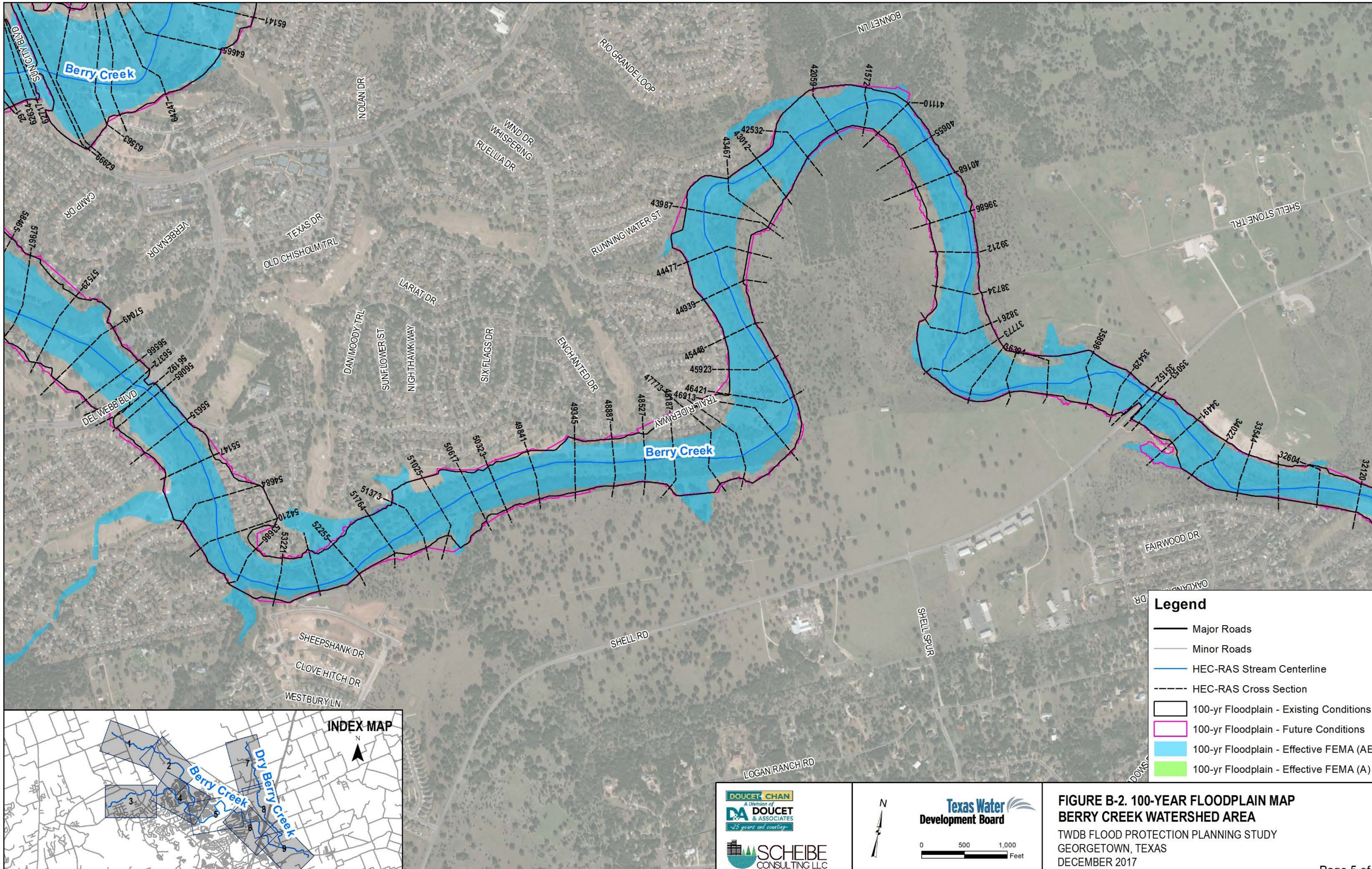

FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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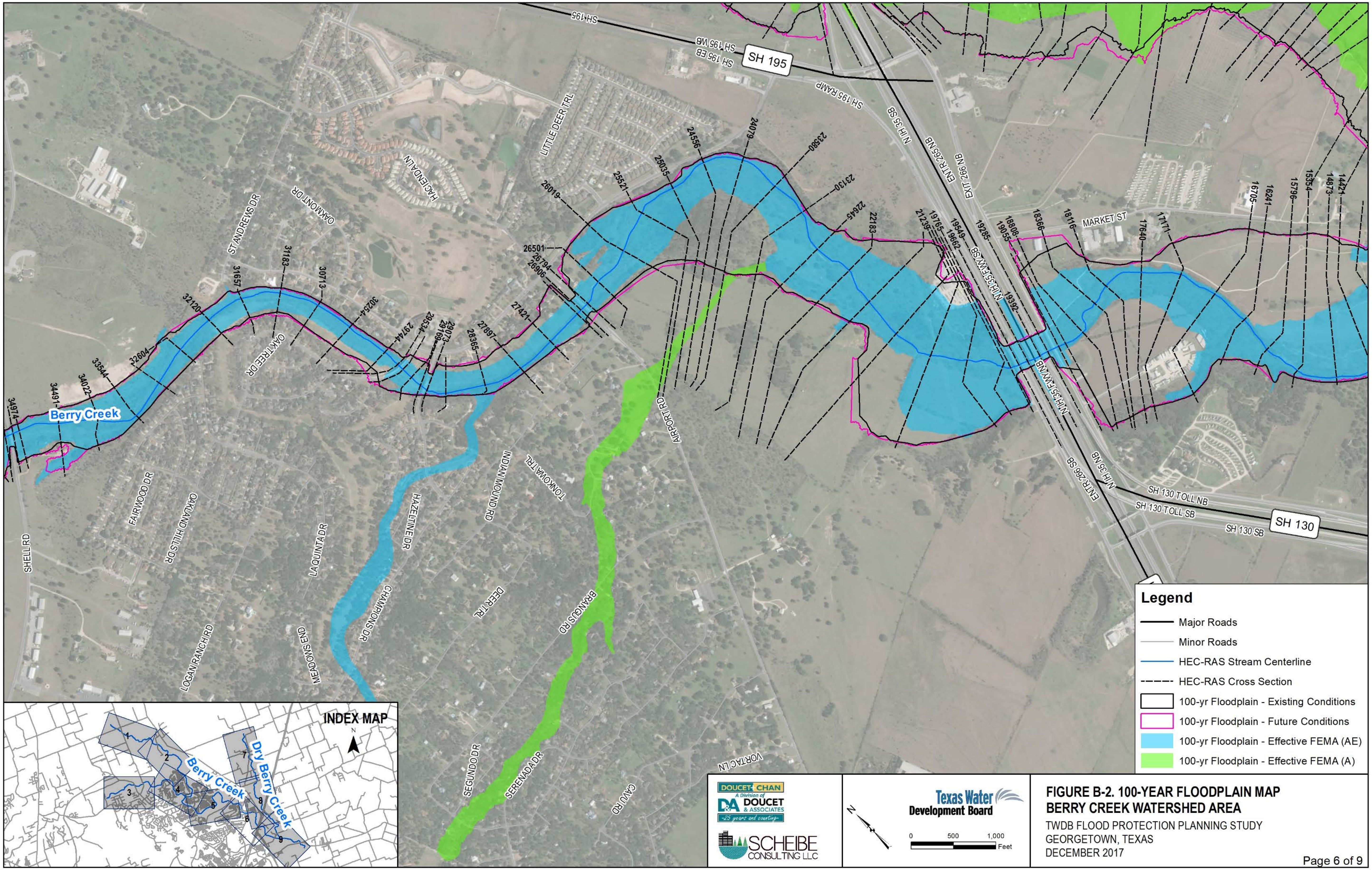
SH 195
SH 130
Berry Creek
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Dry Berry Creek
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HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 500 1,000 Feet
FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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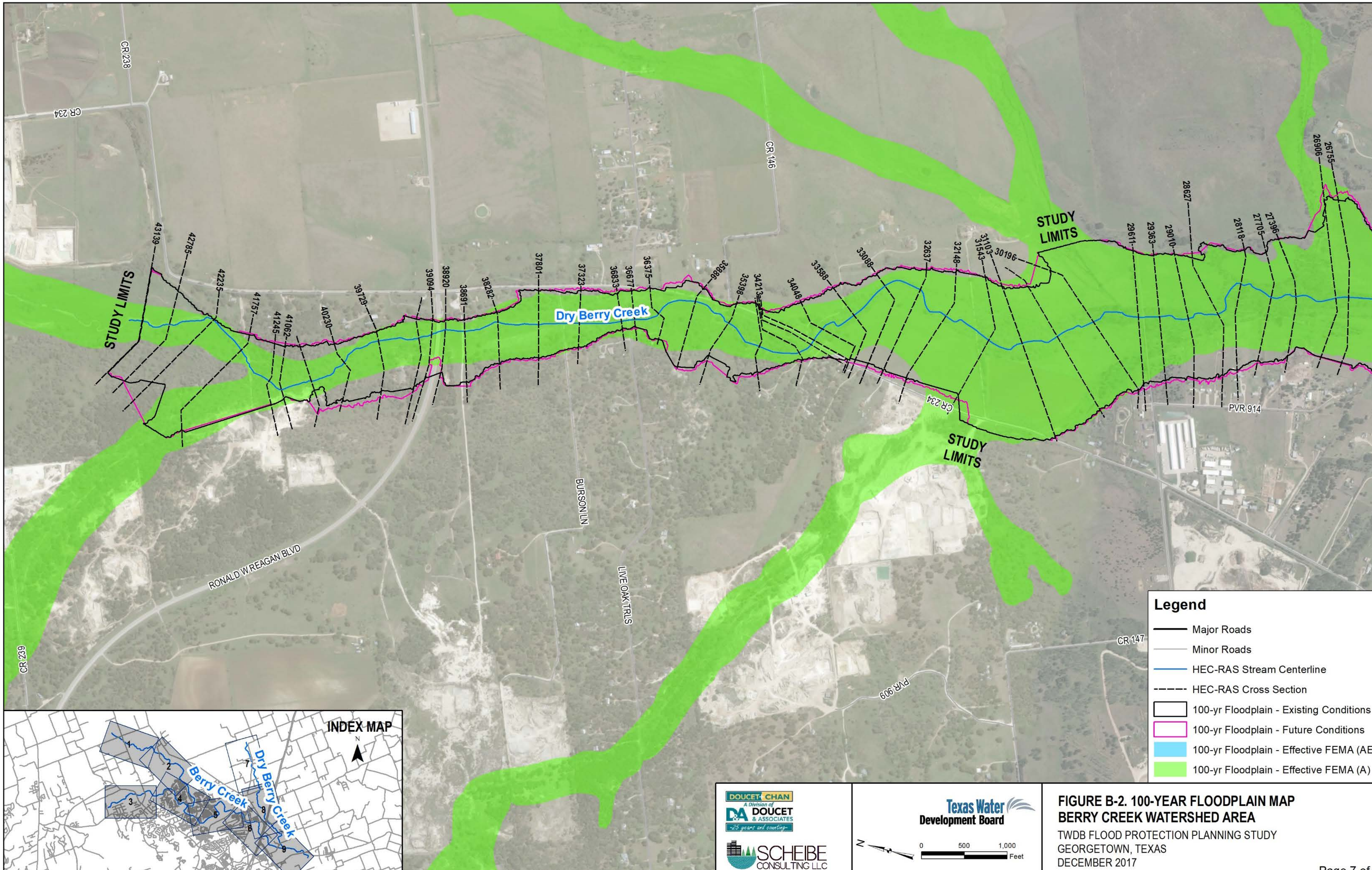
STUDY LIMITS
STUDY LIMITS
STUDY LIMITS
Dry Berry Creek
CR 238
CR 234
CR 146
CR 234
PVR 914
BURSON LN
LIVE OAK TRLS
RONALD W REAGAN BLVD
CR 239
CR 147
PVR 909
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100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET-CHAN A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 500 1,000 Feet
FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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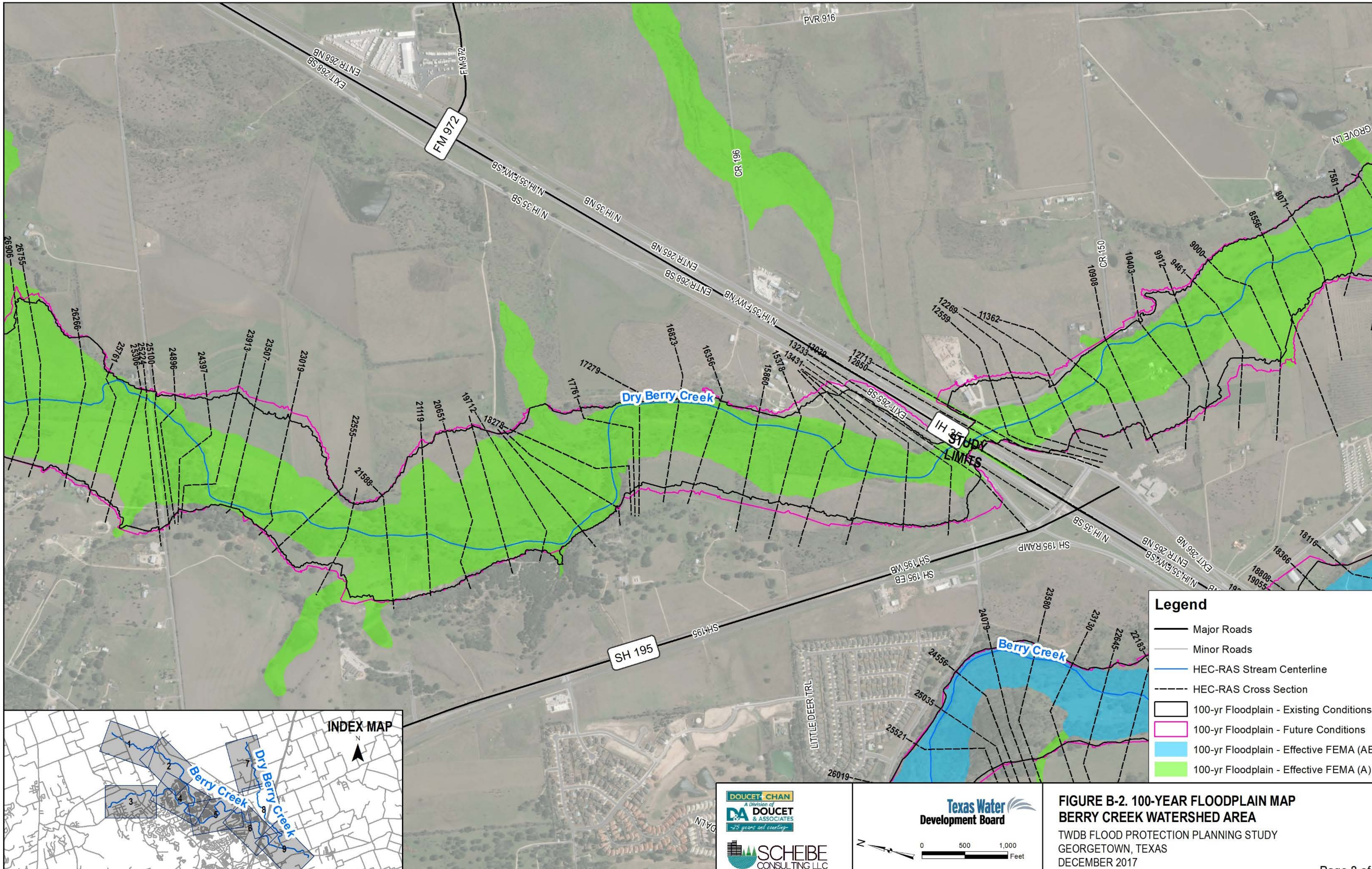
Dry Berry Creek
Berry Creek
STUDY LIMITS
IH 35
FM 972
SH 195
CR 196
CR 150
PVR 916
GROVE LN
LITTLE DEER TRL
INDEX MAP
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100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 500 1,000 Feet
FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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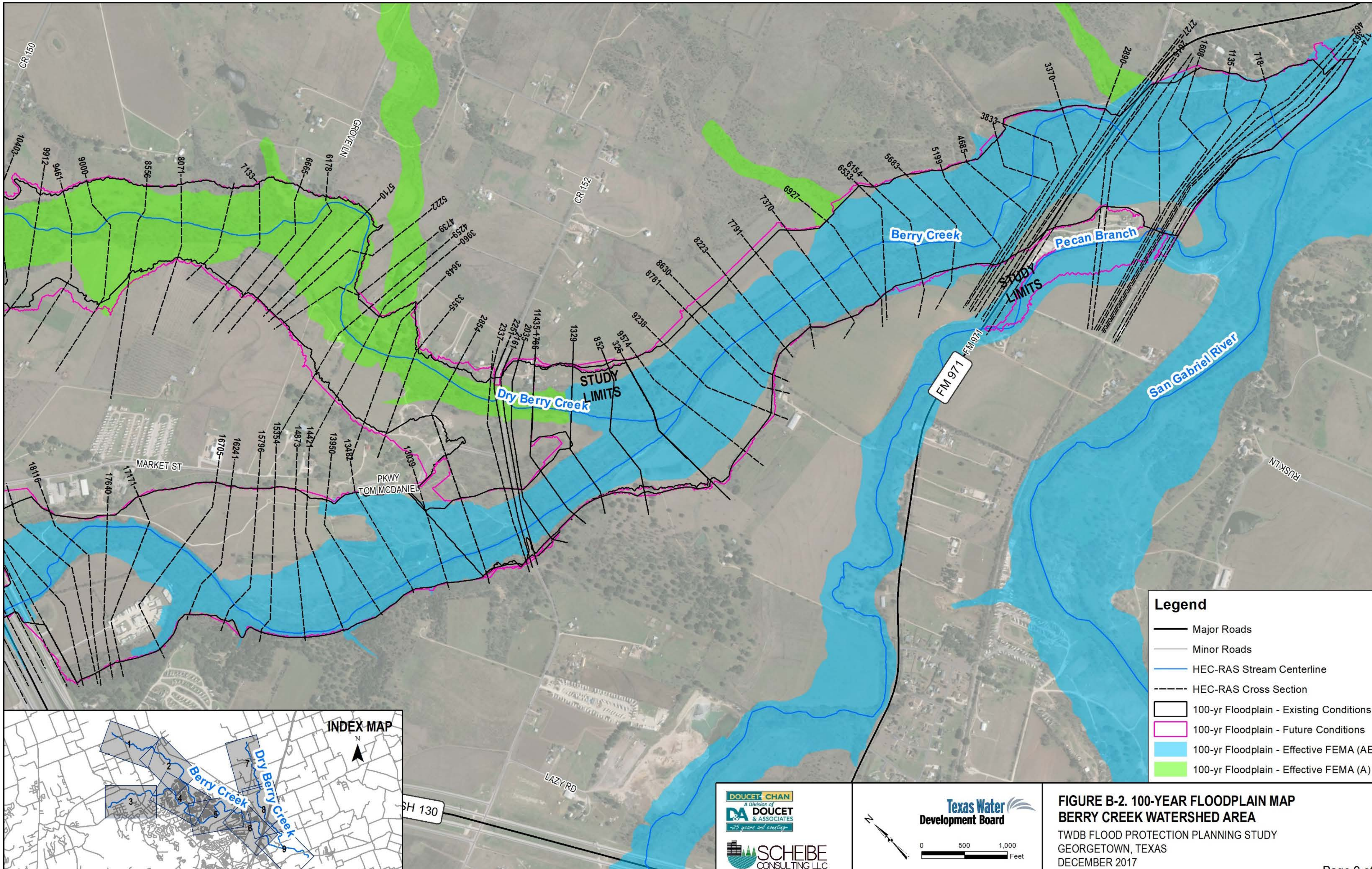
Berry Creek
Dry Berry Creek
Pecan Branch
San Gabriel River
STUDY LIMITS
STUDY LIMITS
CR 150
CR 152
GROVE LN
MARKET ST
TOM MCDANIEL PKWY
FM 971
SH 130
LAZY RD
RUSK LN
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100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET-CHAN A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 500 1,000 Feet
FIGURE B-2. 100-YEAR FLOODPLAIN MAP
BERRY CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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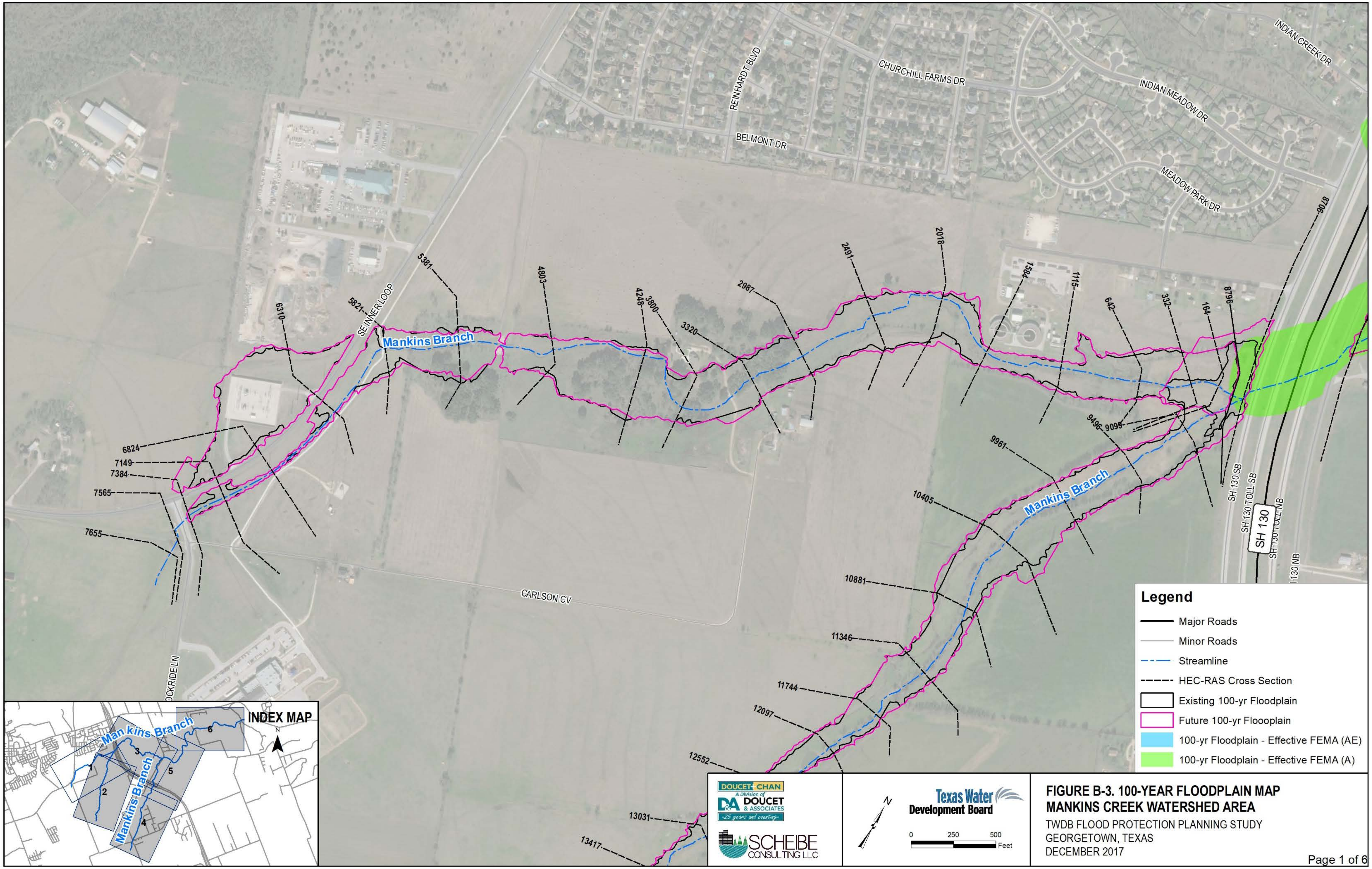
Legend
Major Roads
Minor Roads
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Future 100-yr Floooplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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Mankins Branch
CHURCHILL FARMS DR
BELMONT DR
REINHARDT BLVD
INDIAN MEADOW DR
MEADOW PARK DR
INDIAN CREEK DR
SE INNER LOOP
CARLSON CV
SH 130
SH 130 SB
SH 130 TOLL SB
SH 130 TOLL NB
Texas Water Development Board
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
0 250 500 Feet
FIGURE B-3. 100-YEAR FLOODPLAIN MAP
MANKINS CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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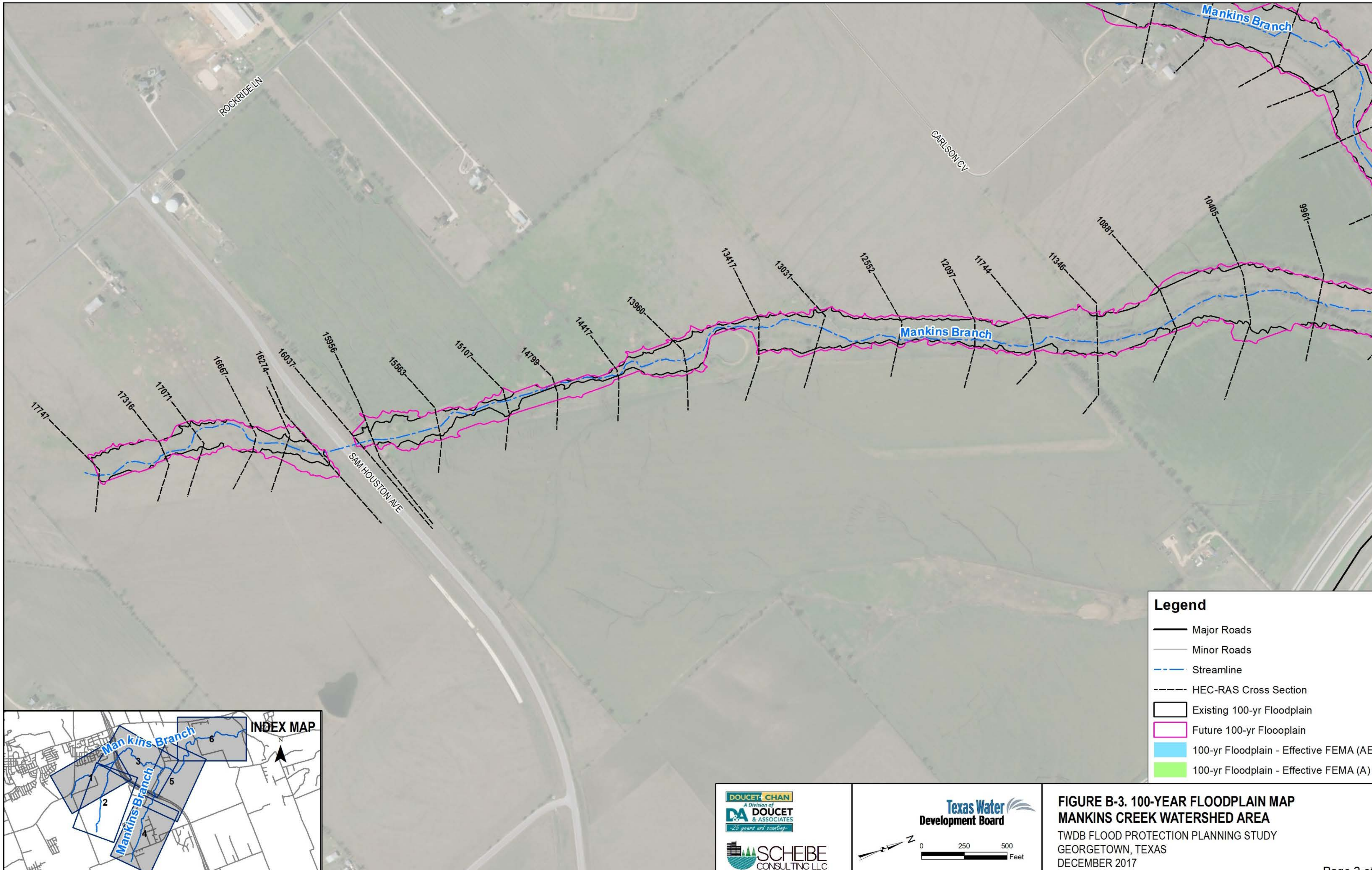

FIGURE B-3. 100-YEAR FLOODPLAIN MAP
MANKINS CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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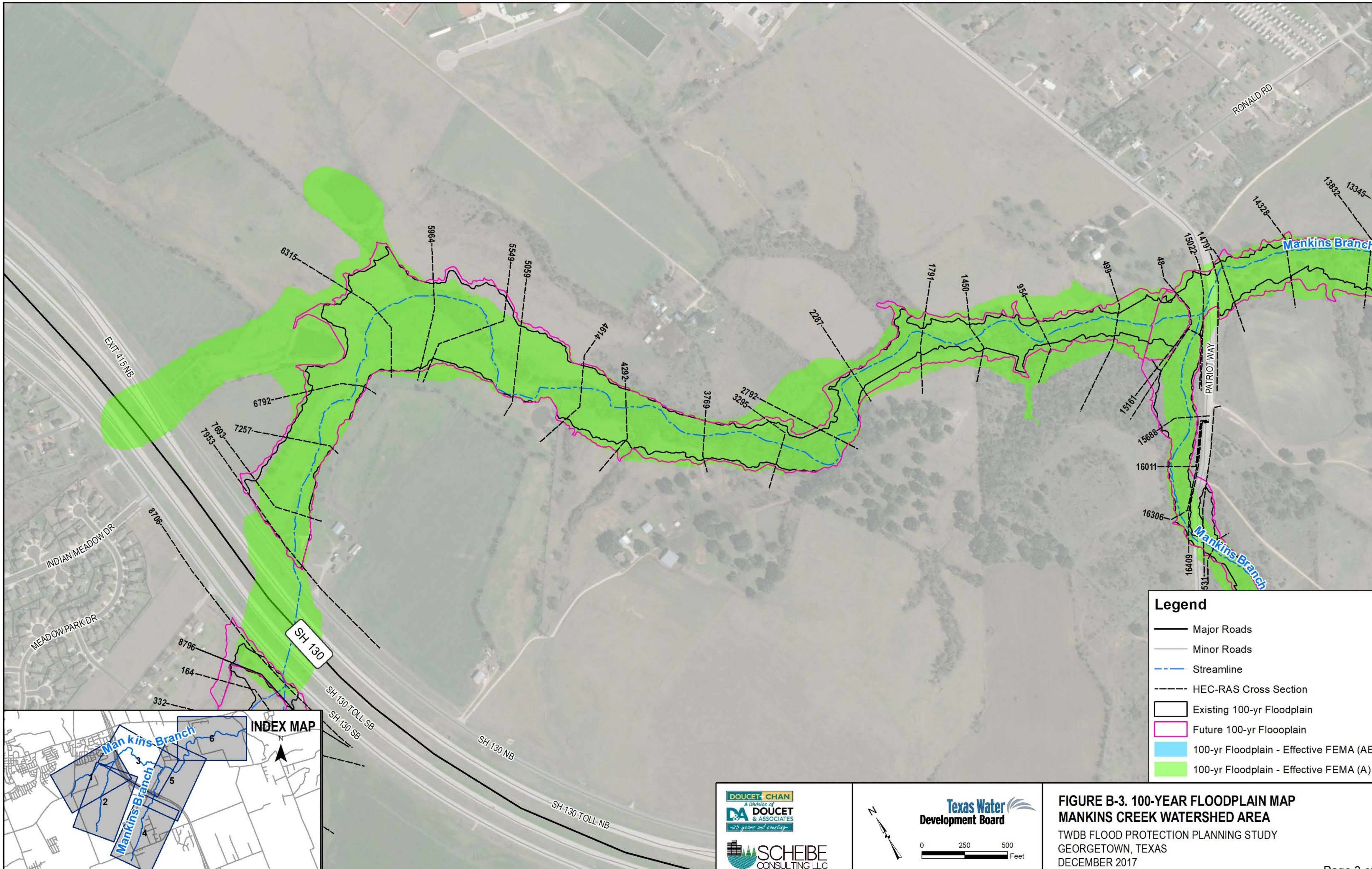
Mankins Branch
RONALD RD
PATRIOT WAY
EXIT 415 NB
INDIAN MEADOW DR
MEADOW PARK DR
SH 130
SH 130 TOLL SB
SH 130 SB
SH 130 NB
SH 130 TOLL NB
6315
5964
5549
5059
4614
4292
3769
2792
3295
2287
1791
1450
954
499
48
15022
14797
14328
13832
13345
15161
15688
16011
16306
16409
531
6792
7257
7693
7953
8706
8796
164
332
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Man kins Branch
Mankins Branch
1
2
3
4
5
6
Legend
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Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floooplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 250 500 Feet
FIGURE B-3. 100-YEAR FLOODPLAIN MAP
MANKINS CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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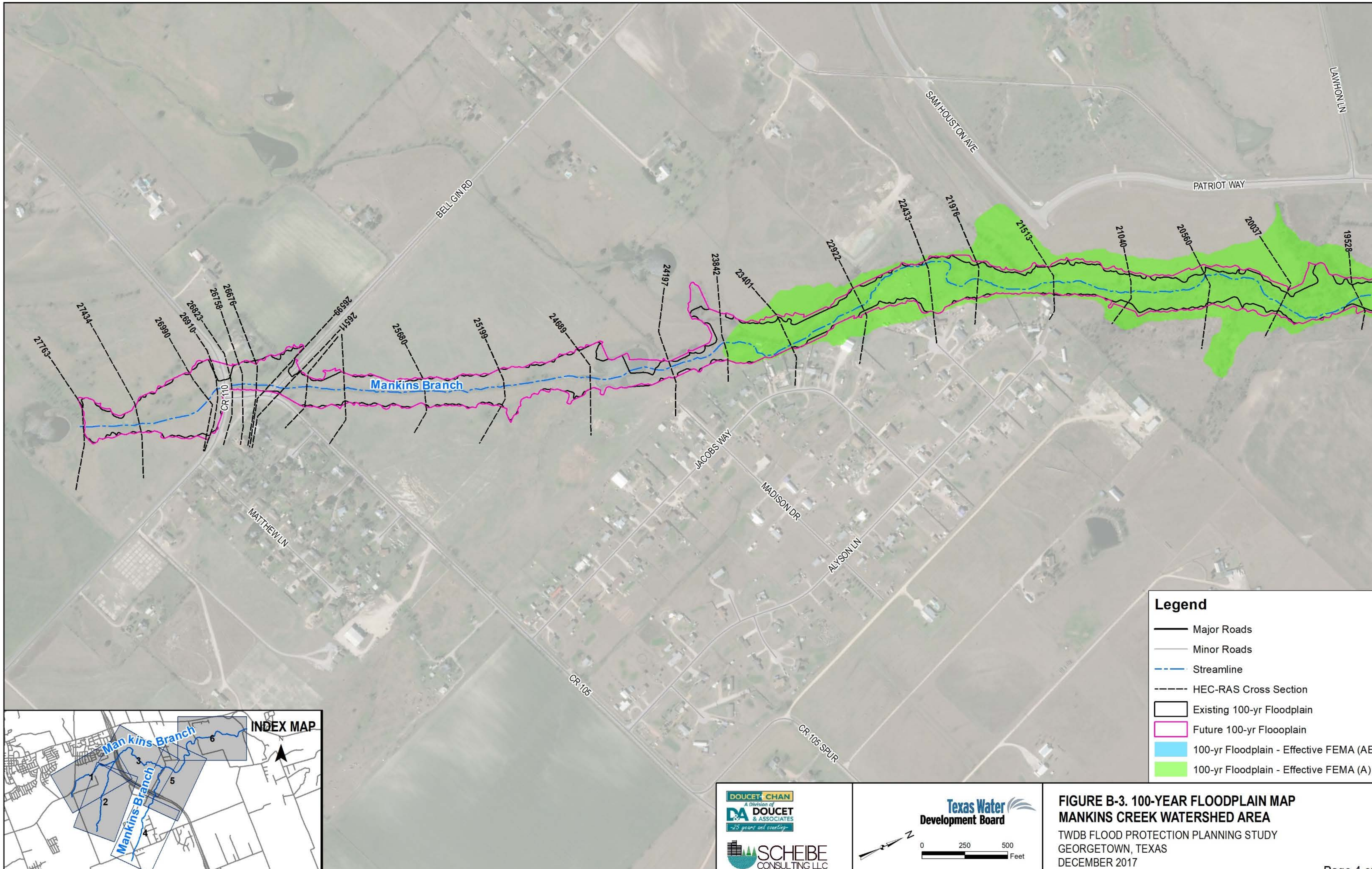
Mankins Branch
BELL GIN RD
SAM HOUSTON AVE
PATRIOT WAY
LAWHON LN
CR 110
JACOBS WAY
MADISON DR
ALYSON LN
MATTHEW LN
CR 105
CR 105 SPUR
27763
27434
26990
26910
26823
26758
26676
26599
26511
25680
25199
24689
24197
23842
23401
22922
22433
21976
21513
21040
20560
20037
19528
INDEX MAP
Mankins Branch
1
2
3
4
5
6
Legend
Major Roads
Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floooplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET-CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0
250
500
Feet
FIGURE B-3. 100-YEAR FLOODPLAIN MAP
MANKINS CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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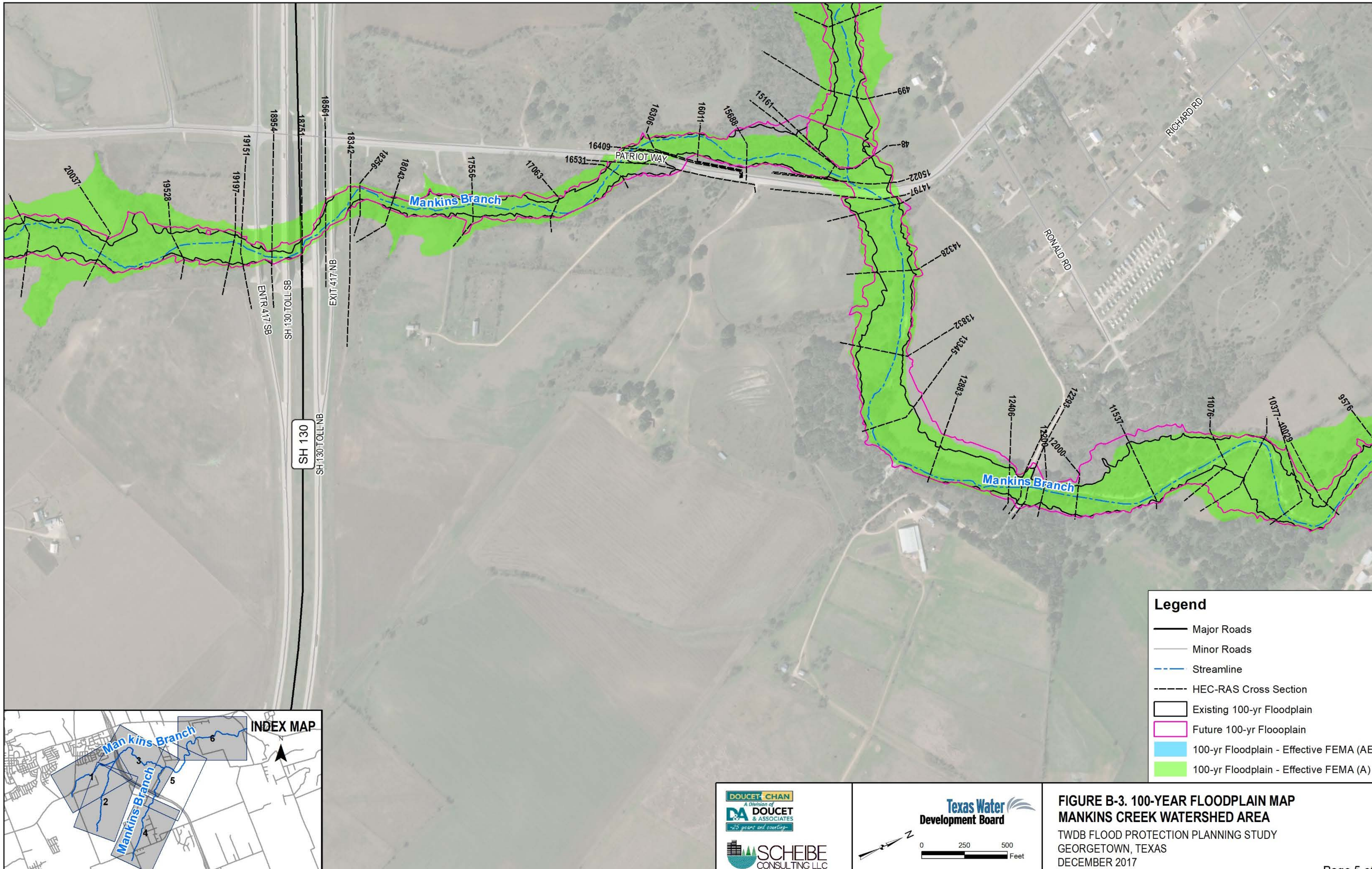
Mankins Branch
PATRIOT WAY
SH 130
SH 130 TOLL SB
SH 130 TOLL NB
ENTR 417 SB
EXIT 417 NB
RICHARD RD
RONALD RD
INDEX MAP
Legend
Major Roads
Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floooplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 250 500 Feet
FIGURE B-3. 100-YEAR FLOODPLAIN MAP
MANKINS CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017
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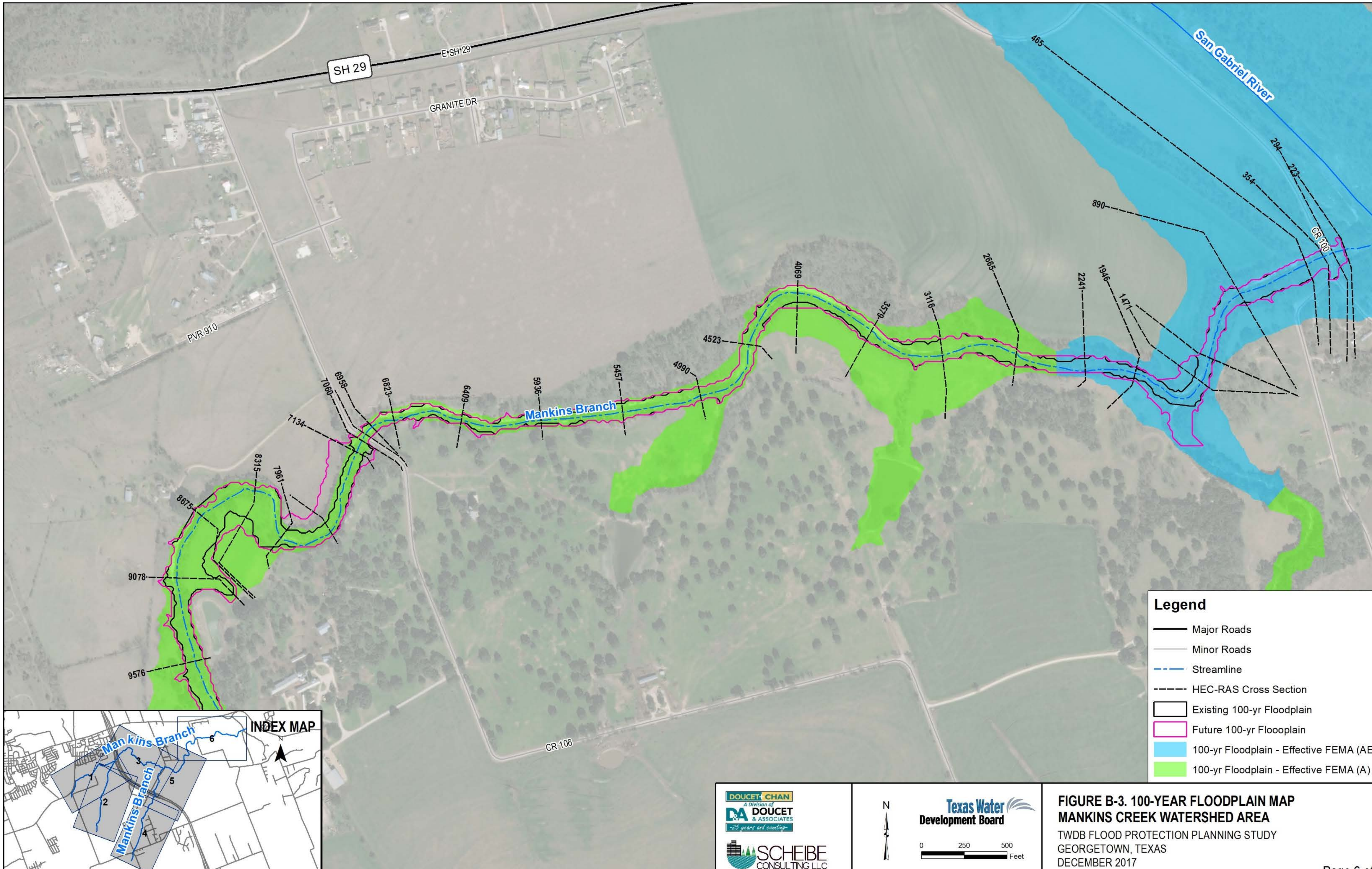
SH 29
E SH 29
GRANITE DR
PVR 910
CR 106
CR 100
San Gabriel River
Mankins Branch
465
294
223
354
890
4069
2665
2241
1946
1471
3579
3116
4523
4990
5457
5936
6409
6823
6958
7060
7134
8315
7961
8675
9078
9576
INDEX MAP
Man kins Branch
Mankins Branch
1
2
3
4
5
6
Legend
Major Roads
Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floooplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0
250
500
Feet
FIGURE B-3. 100-YEAR FLOODPLAIN MAP
MANKINS CREEK WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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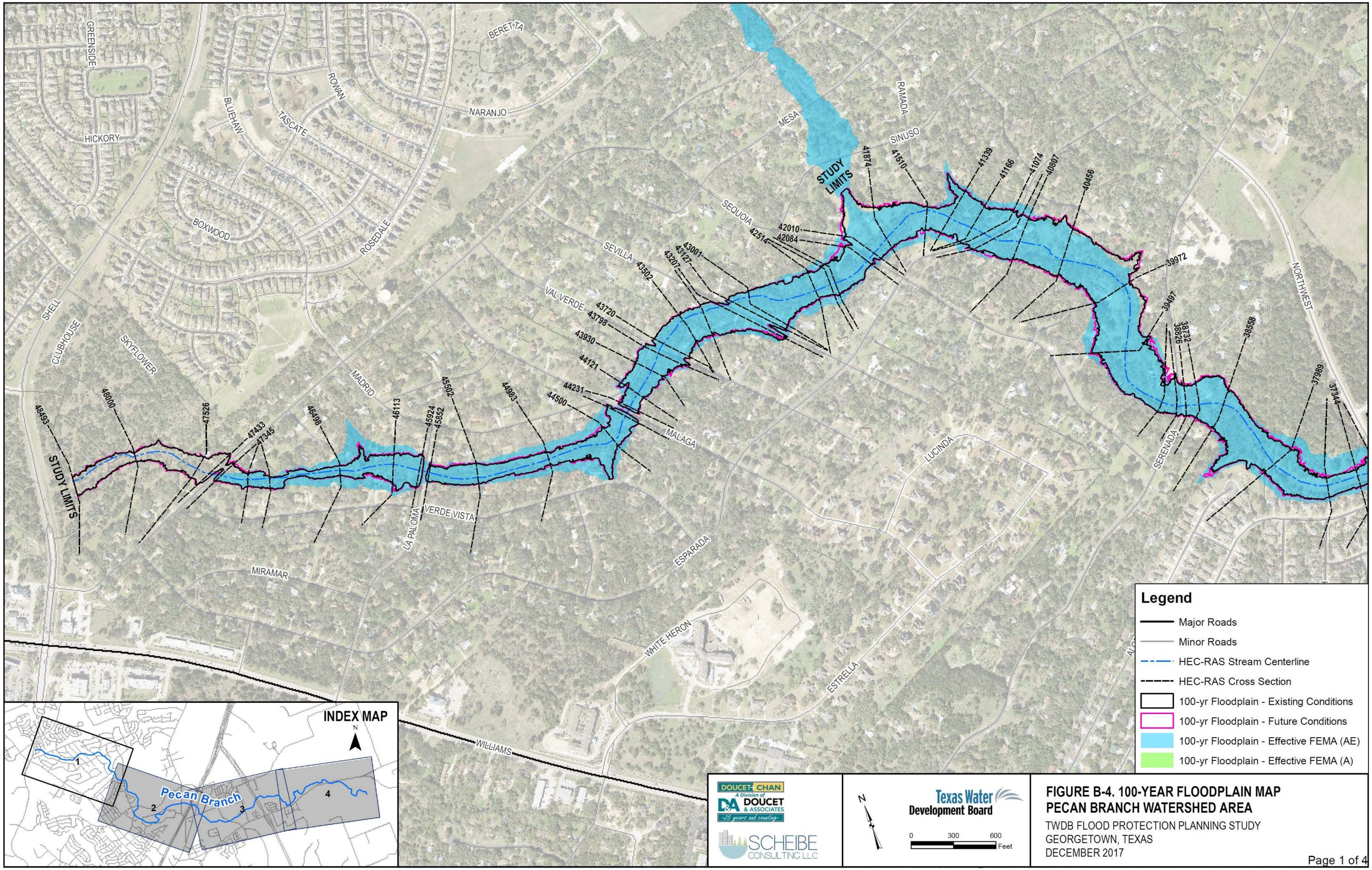
STUDY LIMITS
STUDY LIMITS
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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Pecan Branch
1
2
3
4
DOUCET-CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 300 600 Feet
FIGURE B-4. 100-YEAR FLOODPLAIN MAP
PECAN BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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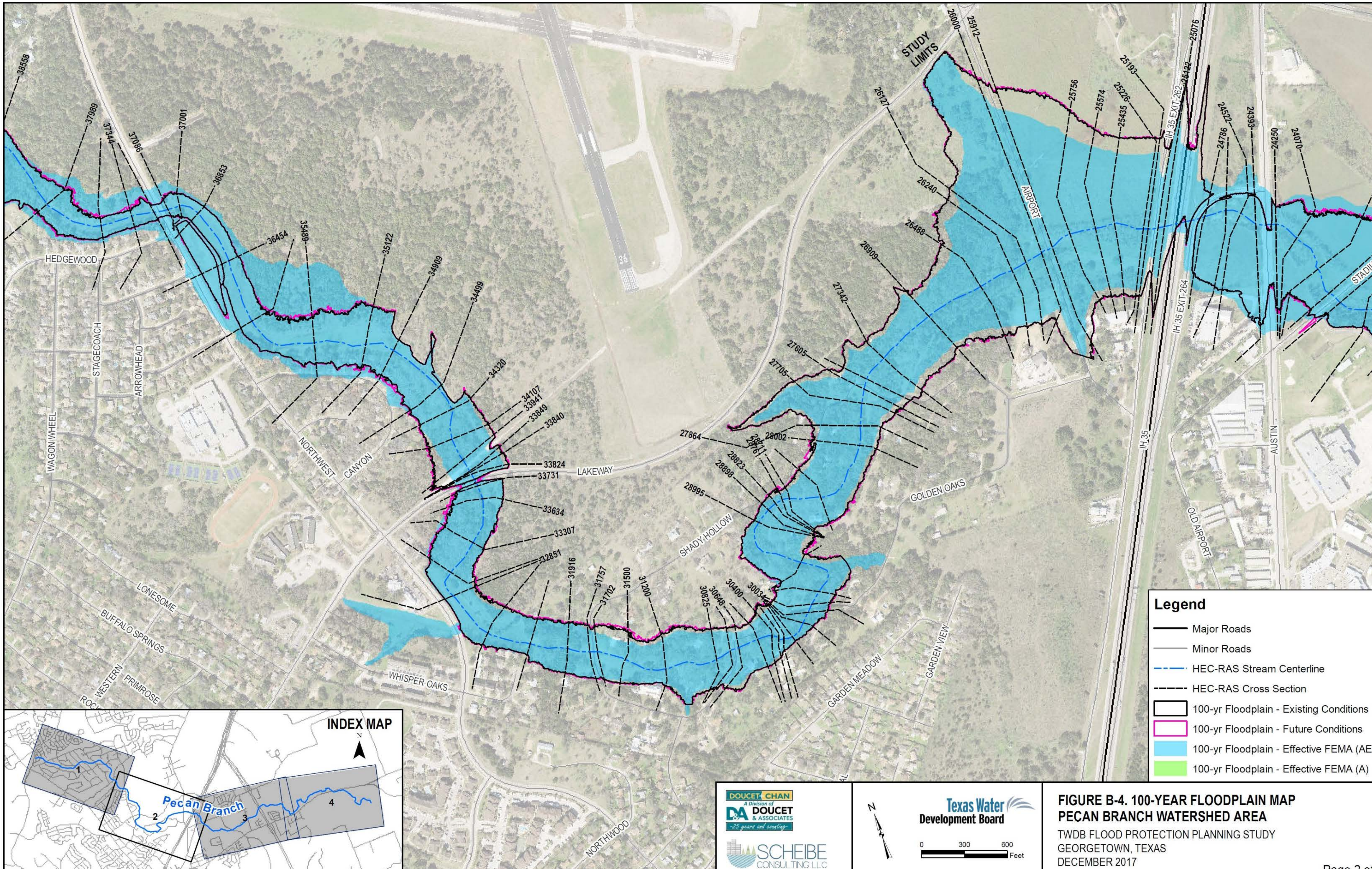
STUDY LIMITS
HEDGEWOOD
STAGECOACH
ARROWHEAD
WAGON WHEEL
NORTHWEST
CANYON
LAKEWAY
AIRPORT
IH 35 EXIT 262
IH 35 EXIT 264
IH 35
AUSTIN
STADIUM
OLD AIRPORT
GOLDEN OAKS
SHADY HOLLOW
LONESOME
BUFFALO SPRINGS
WESTERN
PRIMROSE
WHISPER OAKS
GARDEN MEADOW
GARDEN VIEW
NORTHWOOD
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
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100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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1
2
3
4
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
25 years and counting
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 300 600 Feet
FIGURE B-4. 100-YEAR FLOODPLAIN MAP
PECAN BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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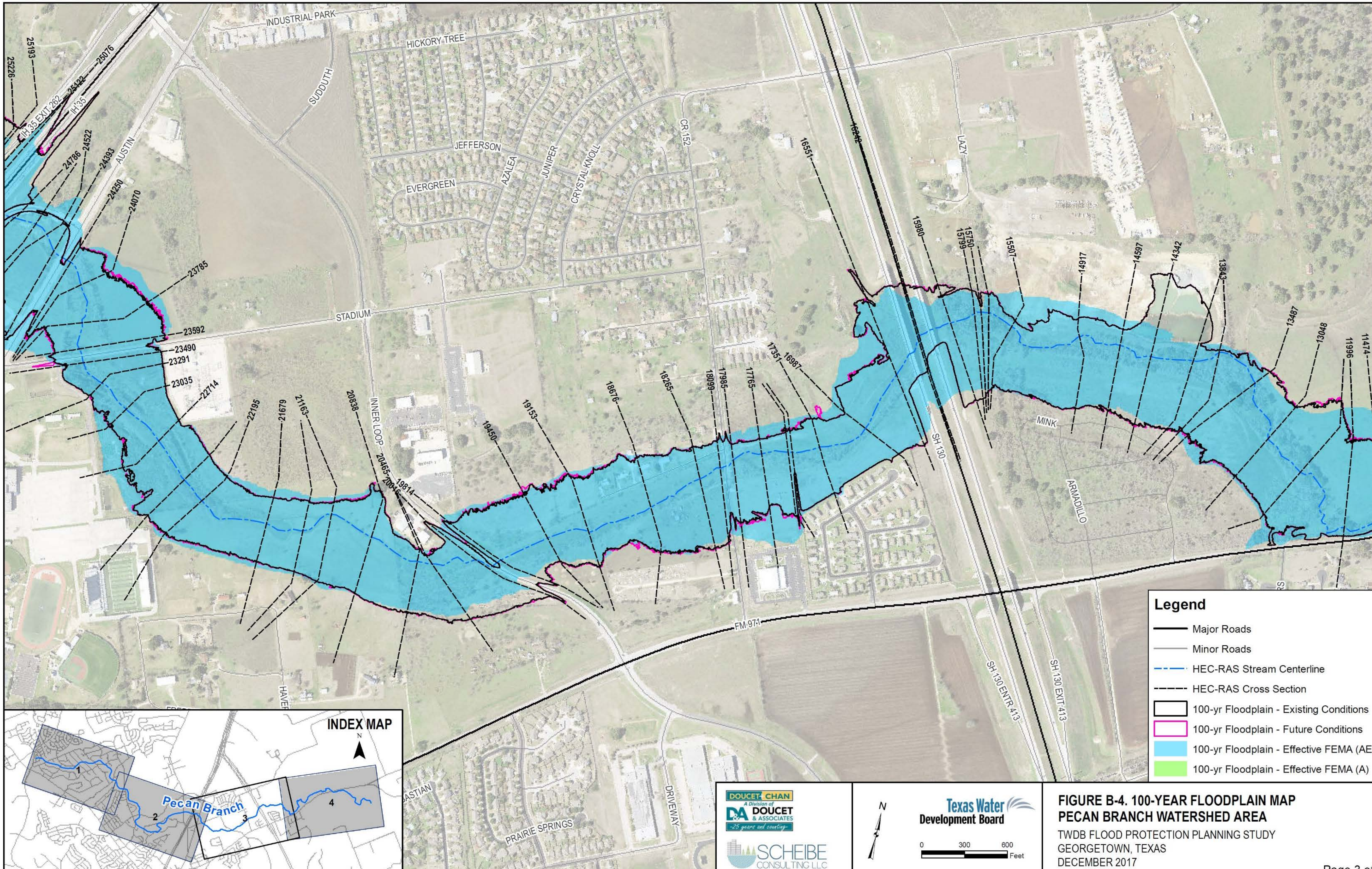

FIGURE B-4. 100-YEAR FLOODPLAIN MAP
PECAN BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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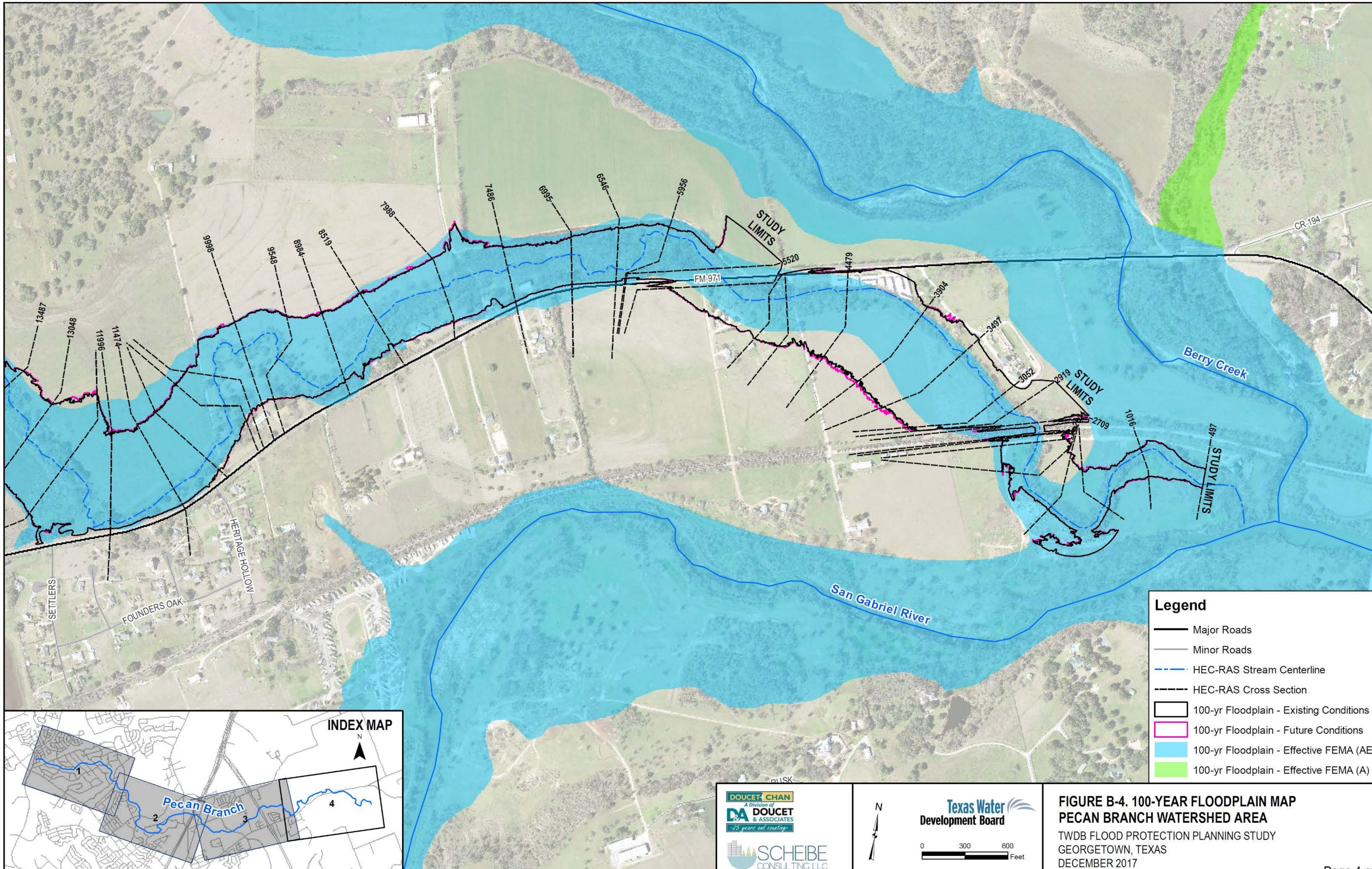

FIGURE B-4. 100-YEAR FLOODPLAIN MAP
PECAN BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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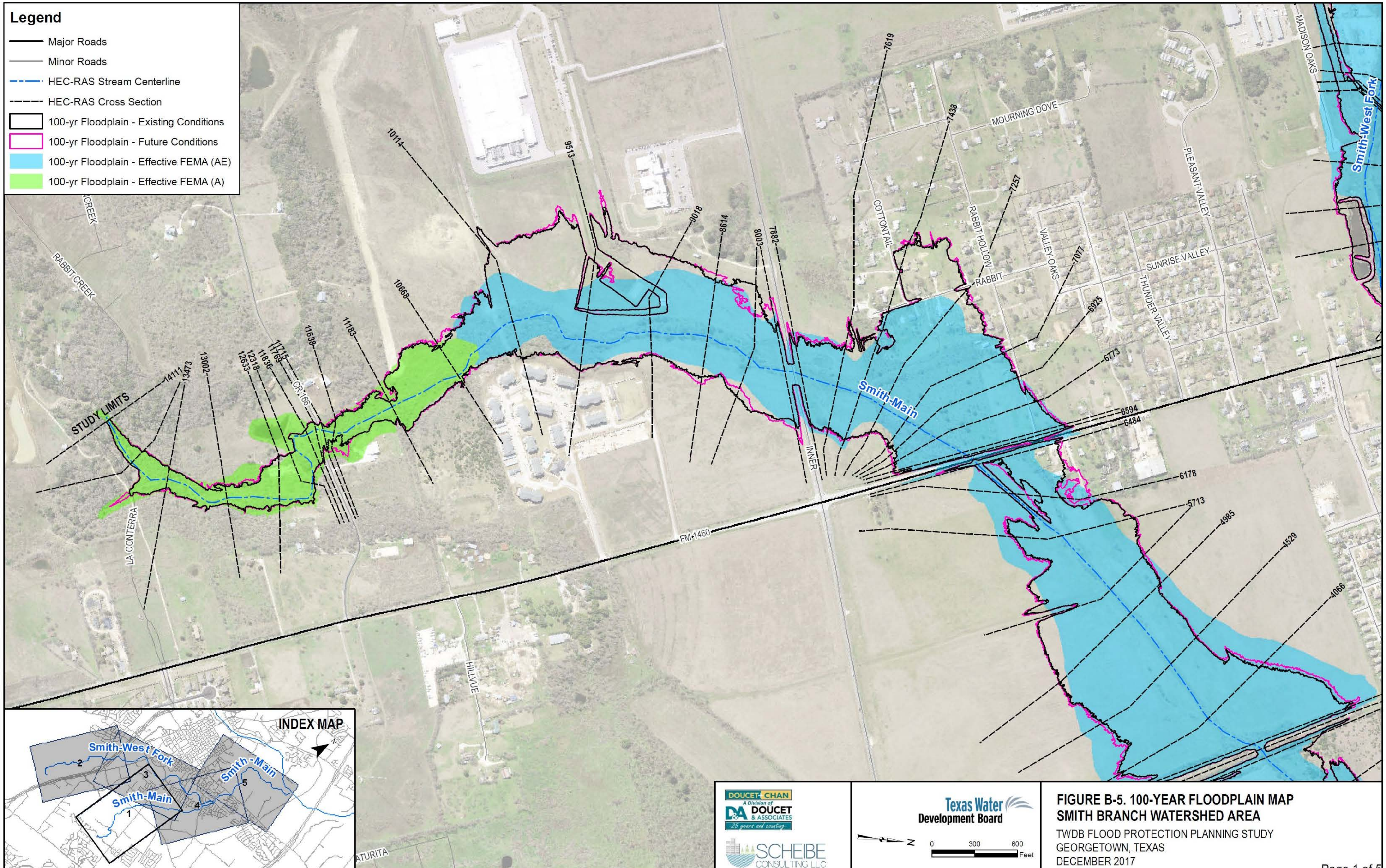
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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Smith-Main
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FM 1460
MOURNING DOVE
SUNRISE VALLEY
Smith-Main
Smith-West Fork
DOUCET-CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 300 600 Feet
FIGURE B-5. 100-YEAR FLOODPLAIN MAP
SMITH BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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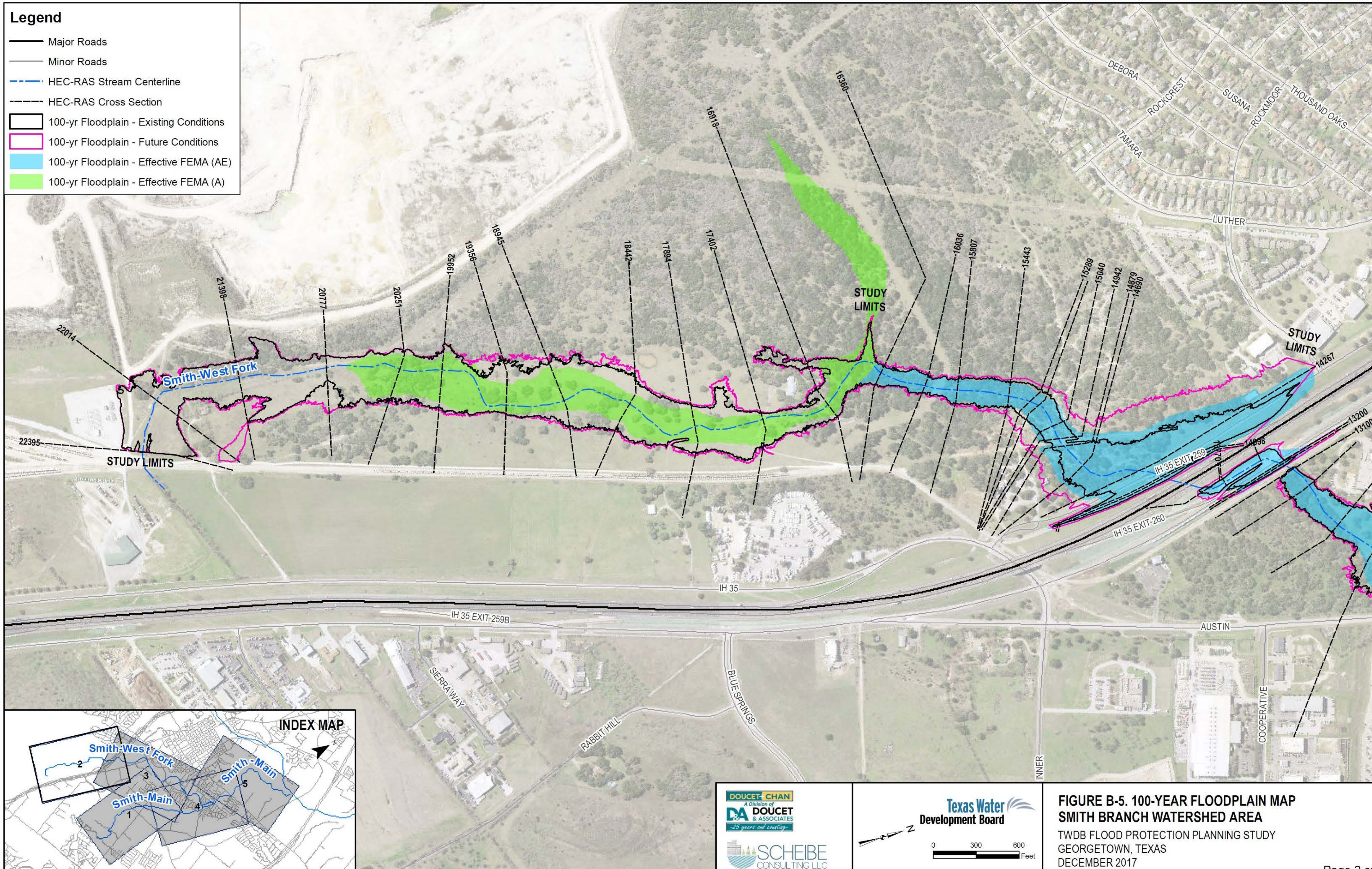
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
Smith-West Fork
STUDY LIMITS
STUDY LIMITS
STUDY LIMITS
22014
22395
21398
20777
20251
19952
19356
18945
18442
17894
17402
16918
16360
16036
15807
15443
15289
15040
14942
14879
14690
14267
13200
13100
14098
DEBORA
ROCKCREST
SUSANA
ROCKMOOR
THOUSAND OAKS
TAMARA
LUTHER
IH 35 EXIT 259
IH 35 EXIT 260
IH 35
IH 35 EXIT 259B
AUSTIN
SIERRA WAY
RABBIT HILL
BLUE SPRINGS
INNER
COOPERATIVE
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Smith-West Fork
Smith-Main
Smith-Main
1
2
3
4
5
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0
300
600
Feet
FIGURE B-5. 100-YEAR FLOODPLAIN MAP
SMITH BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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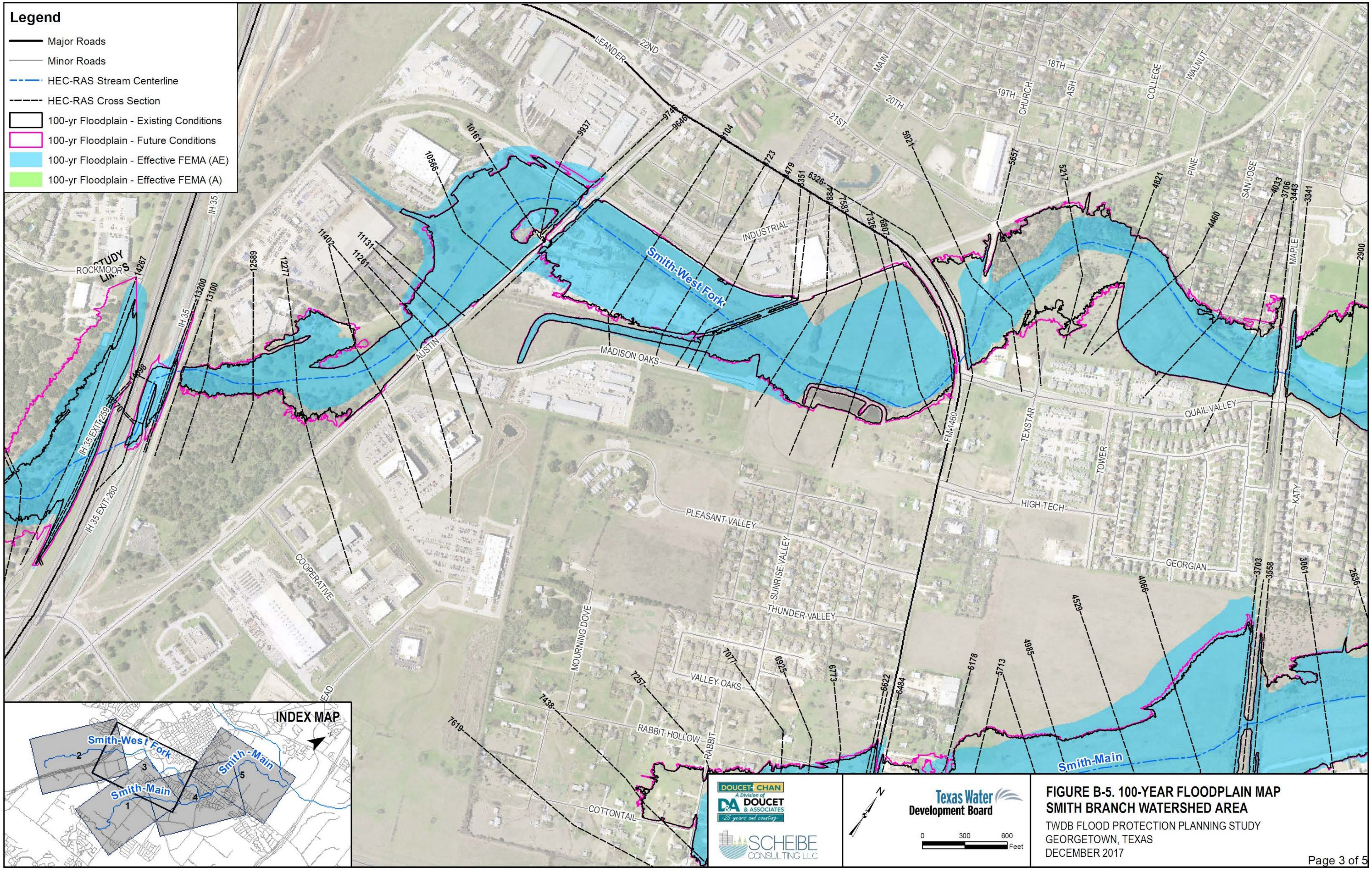
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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Smith-Main
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LEANDER
22ND
MAIN
18TH
19TH
20TH
21ST
CHURCH
ASH
COLLEGE
WALNUT
PINE
SAN JOSE
MAPLE
INDUSTRIAL
ROCKMOOR
STUDY LIMITS
IH 35
IH 35 EXIT 259
IH 35 EXIT 260
AUSTIN
MADISON OAKS
FM 1460
TEXSTAR
QUAIL VALLEY
TOWER
HIGH TECH
KATY
PLEASANT VALLEY
SUNRISE VALLEY
GEORGIAN
THUNDER VALLEY
MOURNING DOVE
VALLEY OAKS
RABBIT HOLLOW
RABBIT
COTTONTAIL
COOPERATIVE
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
25 years and counting
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 300 600 Feet
FIGURE B-5. 100-YEAR FLOODPLAIN MAP
SMITH BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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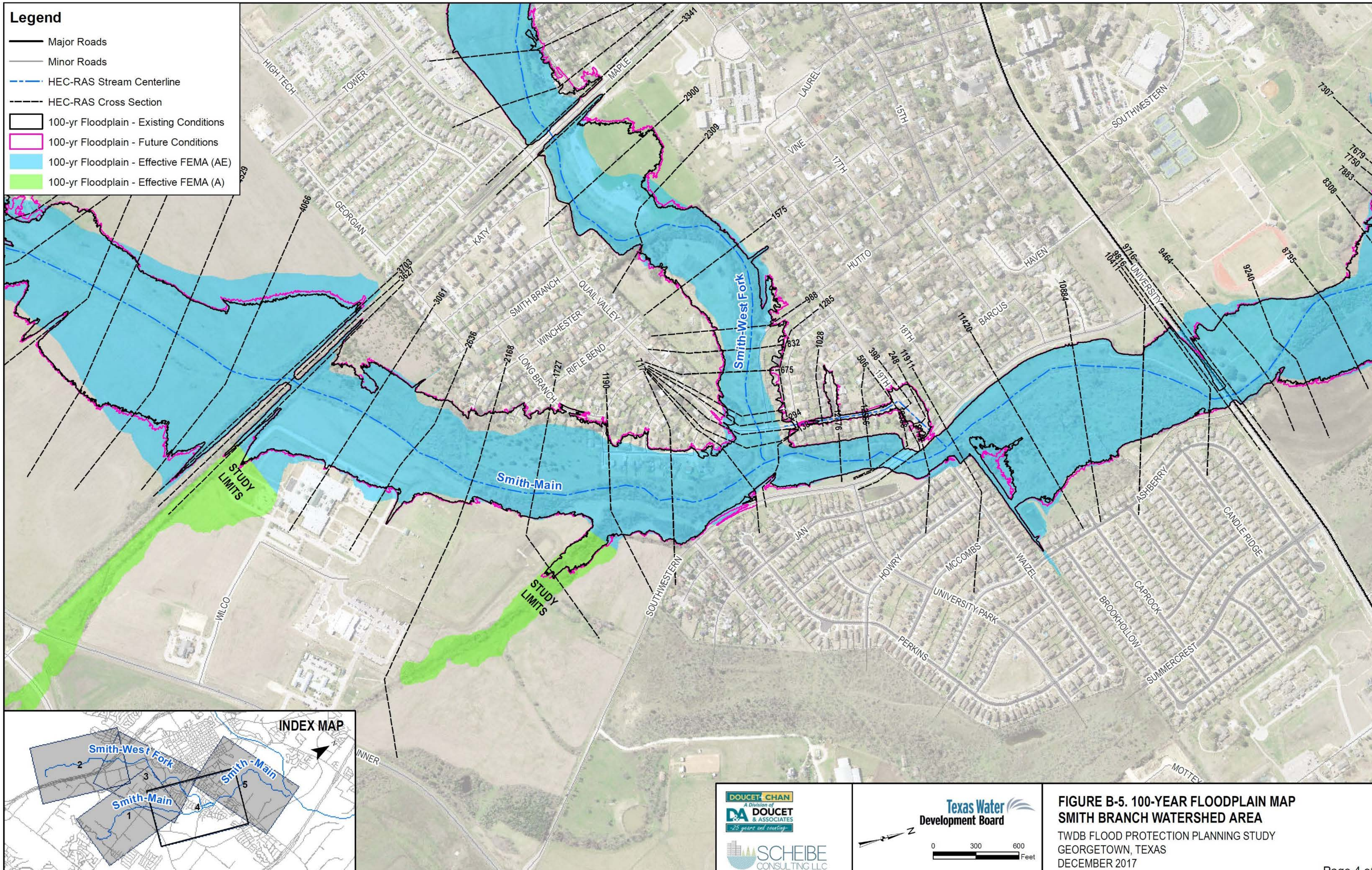
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
Smith-West Fork
Smith-Main
STUDY LIMITS
STUDY LIMITS
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SCHEIBE CONSULTING LLC
Texas Water Development Board
0 300 600 Feet
FIGURE B-5. 100-YEAR FLOODPLAIN MAP
SMITH BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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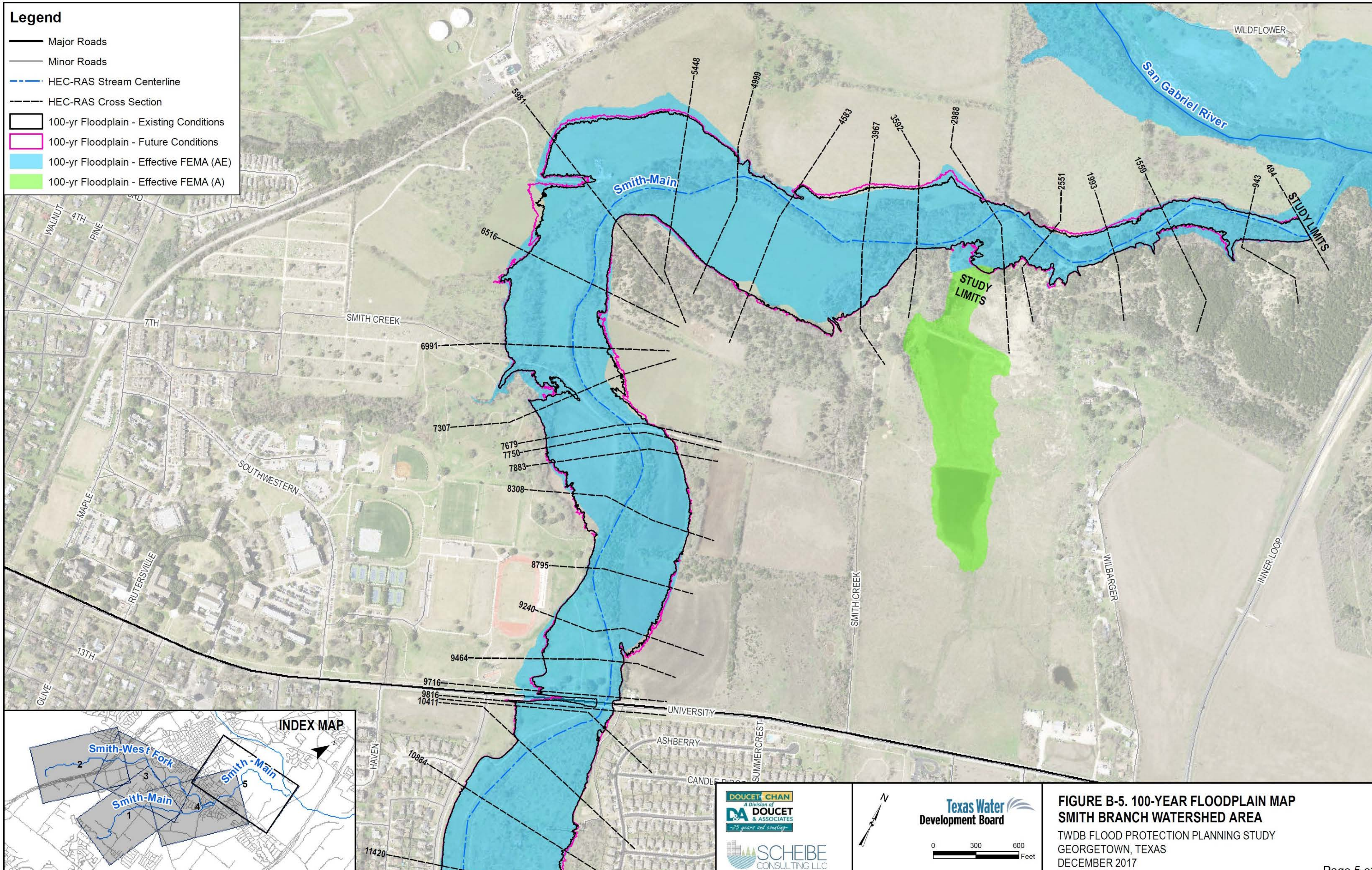
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
San Gabriel River
Smith-Main
STUDY LIMITS
WILDFLOWER
SMITH CREEK
SOUTHWESTERN
UNIVERSITY
ASHBERRY
SUMMERCREST
WILBARGER
INNER LOOP
MAPLE
RUTERSVILLE
HAVEN
OLIVE
13TH
7TH
4TH
PINE
WALNUT
5981
5448
4999
4583
3967
3592
2988
2551
1993
1559
943
494
6516
6991
7307
7679
7750
7883
8308
8795
9240
9464
9716
9816
10411
10884
11420
INDEX MAP
Smith-West Fork
Smith-Main
1
2
3
4
5
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0
300
600
Feet
FIGURE B-5. 100-YEAR FLOODPLAIN MAP
SMITH BRANCH WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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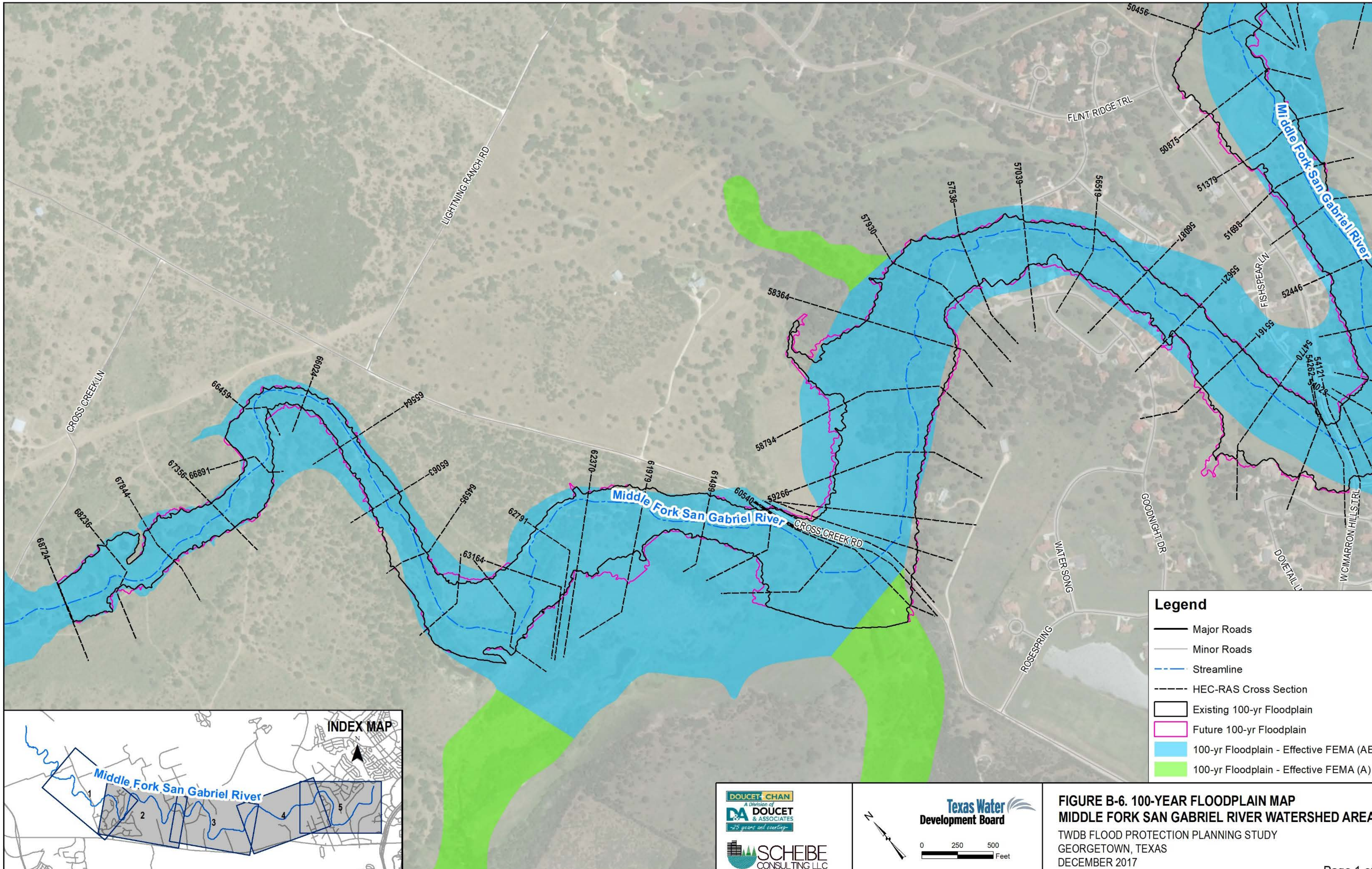

FIGURE B-6. 100-YEAR FLOODPLAIN MAP
MIDDLE FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
DECEMBER 2017

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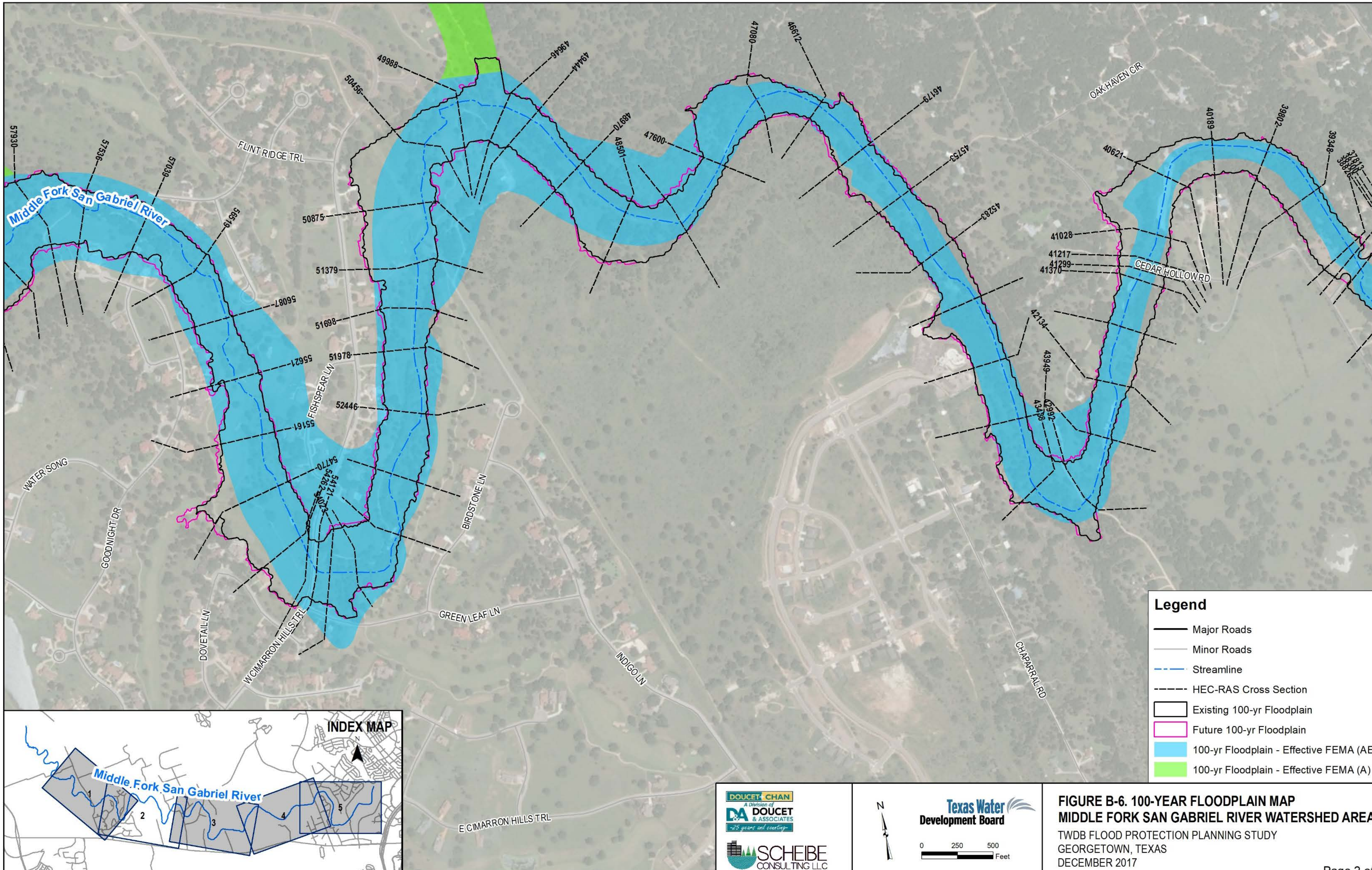

FIGURE B-6. 100-YEAR FLOODPLAIN MAP
MIDDLE FORK SAN GABRIEL RIVER WATERSHED AREA

TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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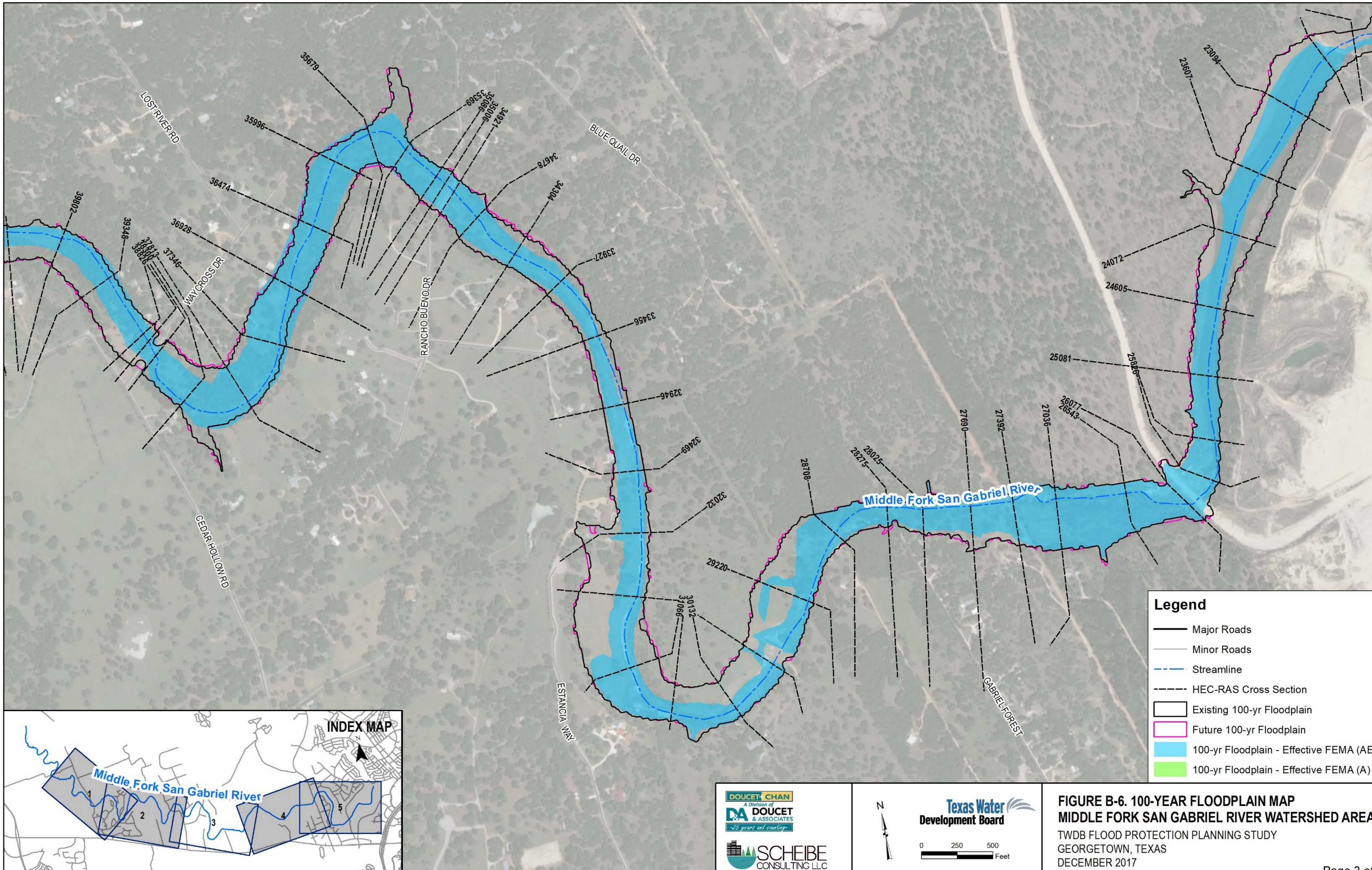
LOST RIVER RD
BLUE QUAIL DR
WAYCROSS DR
RANCHO BUENO DR
CEDAR HOLLOW RD
ESTANCIA WAY
GABRIEL FOREST
Middle Fork San Gabriel River
35679
35996
36474
36928
37346
39348
39802
35369
35006
34921
34678
34304
33927
33456
32946
32469
32032
31066
30132
29220
28708
28275
28025
27690
27392
27036
26077
26543
25081
24605
24072
23607
23094
Legend
Major Roads
Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floodplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
INDEX MAP
Middle Fork San Gabriel River
1
2
3
4
5
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 250 500
Feet
FIGURE B-6. 100-YEAR FLOODPLAIN MAP
MIDDLE FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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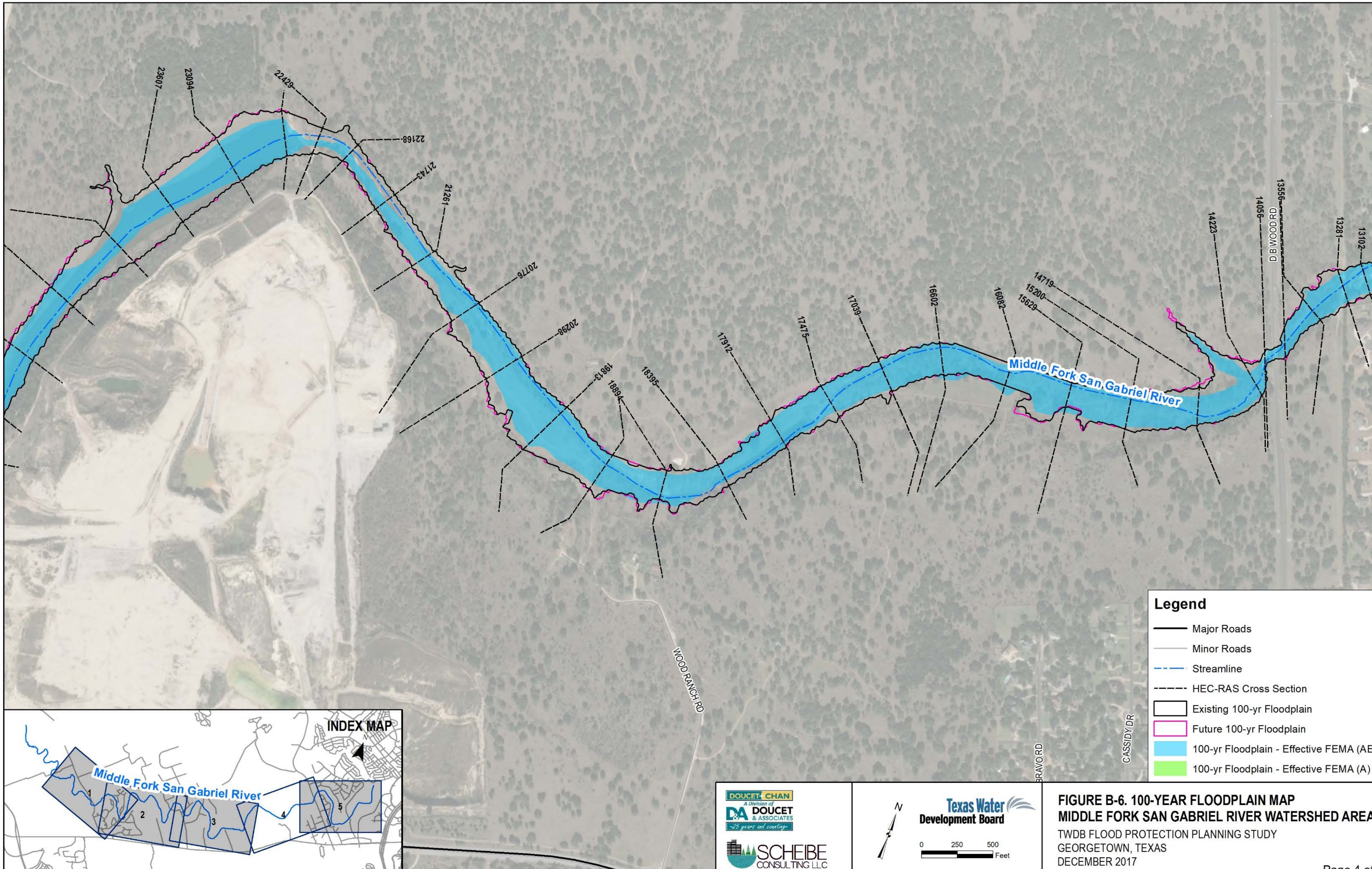
23607
23094
22429
22168
21743
21261
20776
20298
19813
18894
18395
17912
17475
17039
16602
16082
15629
15200
14719
14223
14056
13556
13281
13102
D B WOOD RD
WOOD RANCH RD
BRAVO RD
CASSIDY DR
Middle Fork San Gabriel River
INDEX MAP
1
2
3
4
5
Legend
Major Roads
Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floodplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
N
Texas Water Development Board
0 250 500
Feet
FIGURE B-6. 100-YEAR FLOODPLAIN MAP
MIDDLE FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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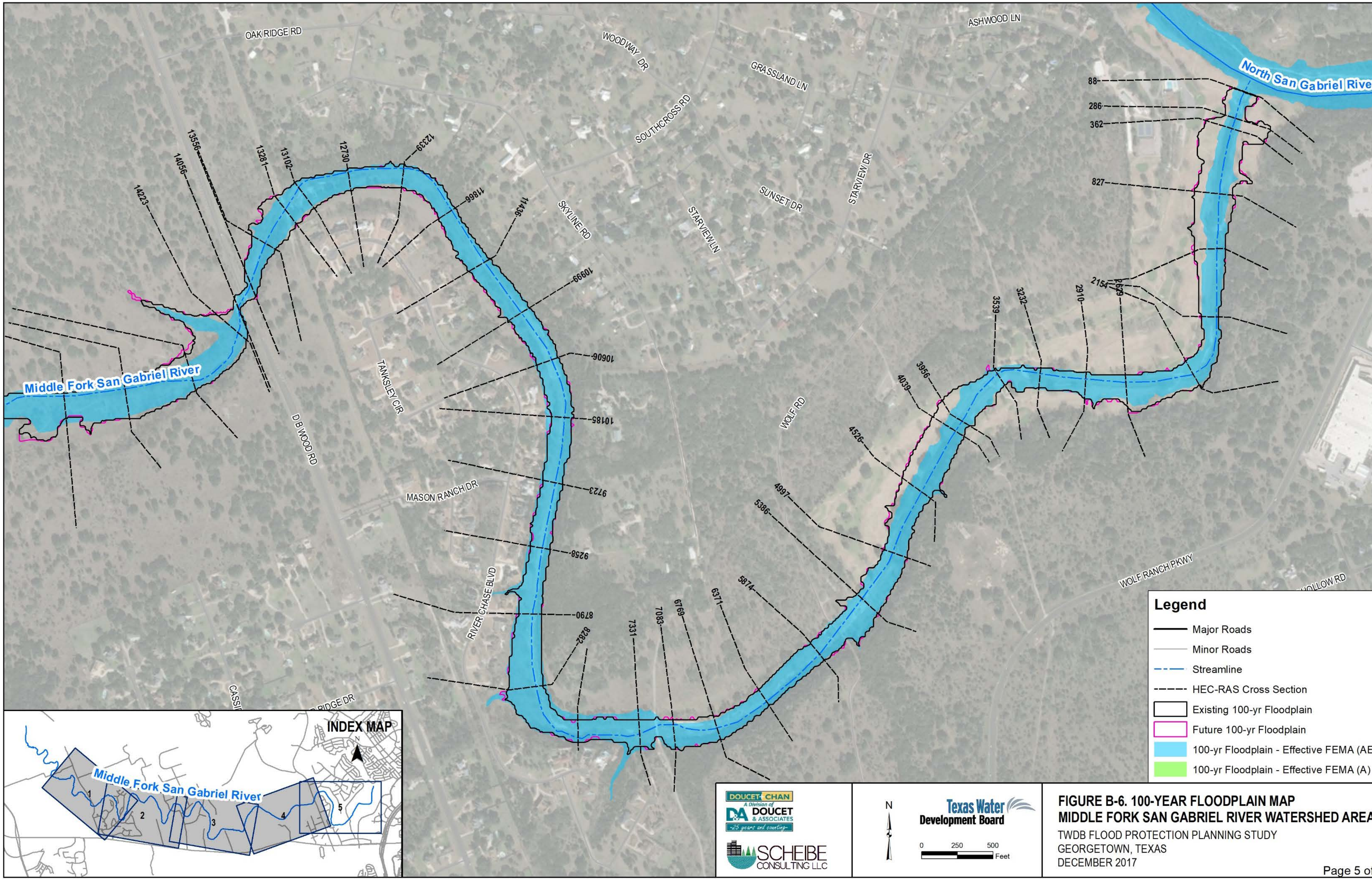
North San Gabriel River
Middle Fork San Gabriel River
OAK RIDGE RD
WOODWAY DR
GRASSLAND LN
ASHWOOD LN
SOUTHCROSS RD
SUNSET DR
STARVIEW DR
STARVIEW LN
SKYLINE RD
TANKSLEY CIR
D B WOOD RD
MASON RANCH DR
RIVER CHASE BLVD
WOLF RD
WOLF RANCH PKWY
HOLLOW RD
88
286
362
827
2154
2629
2910
3232
3539
3956
4039
4526
4997
5386
5874
6371
6769
7083
7331
8282
8790
9258
9723
10185
10606
10999
11436
11866
12339
12730
13102
13281
13556
14056
14223
Legend
Major Roads
Minor Roads
Streamline
HEC-RAS Cross Section
Existing 100-yr Floodplain
Future 100-yr Floodplain
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
INDEX MAP
1
2
3
4
5
DOUCET CHAN A Division of DOUCET & ASSOCIATES 25 years and counting
SCHEIBE CONSULTING LLC
Texas Water Development Board
N
0 250 500 Feet
FIGURE B-6. 100-YEAR FLOODPLAIN MAP
MIDDLE FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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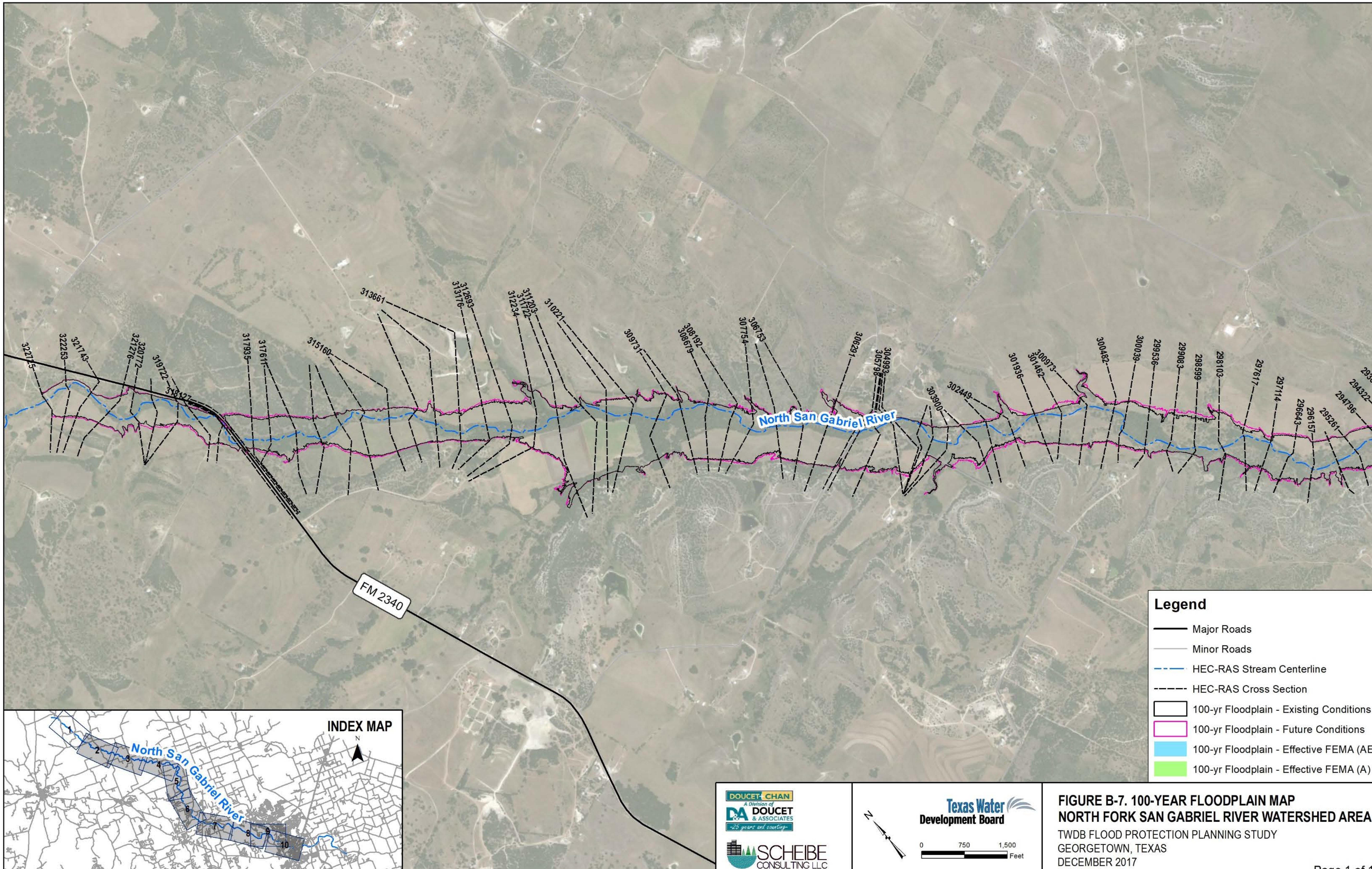
North San Gabriel River
FM 2340
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
INDEX MAP
North San Gabriel River
DOUCET-CHAN
A Division of
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0
750
1,500
Feet
FIGURE B-7. 100-YEAR FLOODPLAIN MAP
NORTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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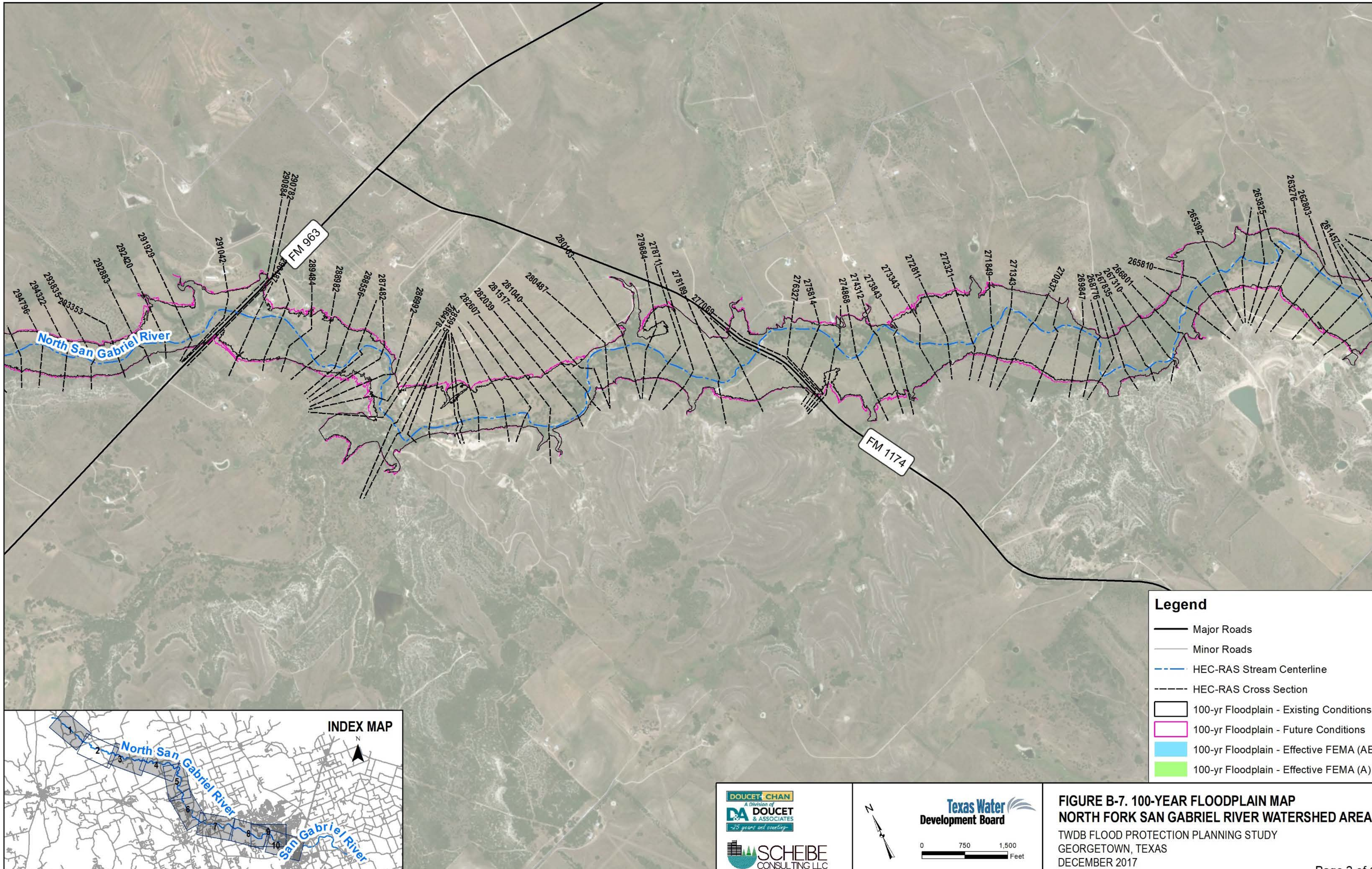
North San Gabriel River
FM 963
FM 1174
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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North San Gabriel River
San Gabriel River
DOUCET CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 750 1,500 Feet
FIGURE B-7. 100-YEAR FLOODPLAIN MAP
NORTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
GEORGETOWN, TEXAS
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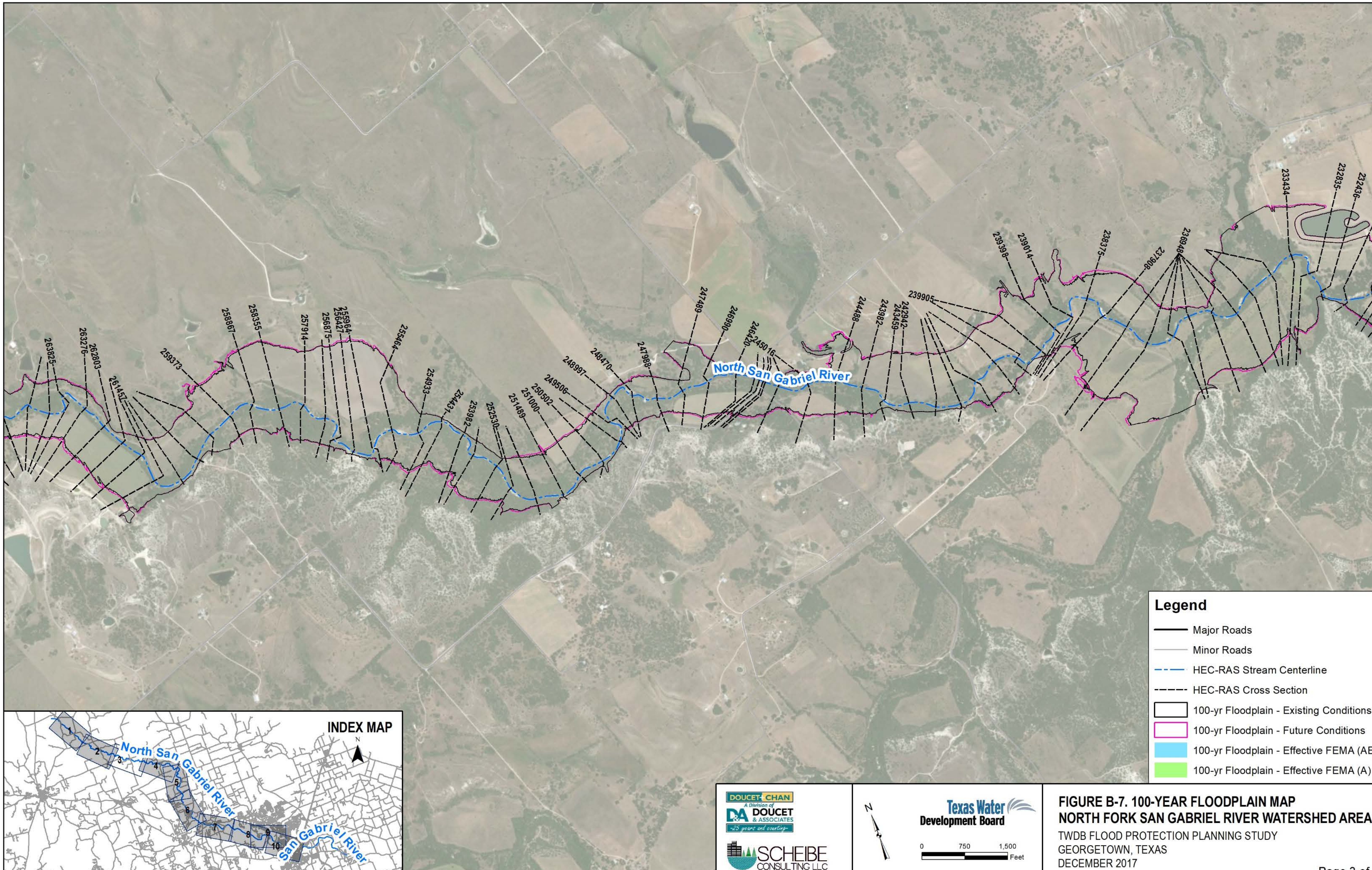
North San Gabriel River
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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San Gabriel River
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 750 1,500 Feet
FIGURE B-7. 100-YEAR FLOODPLAIN MAP
NORTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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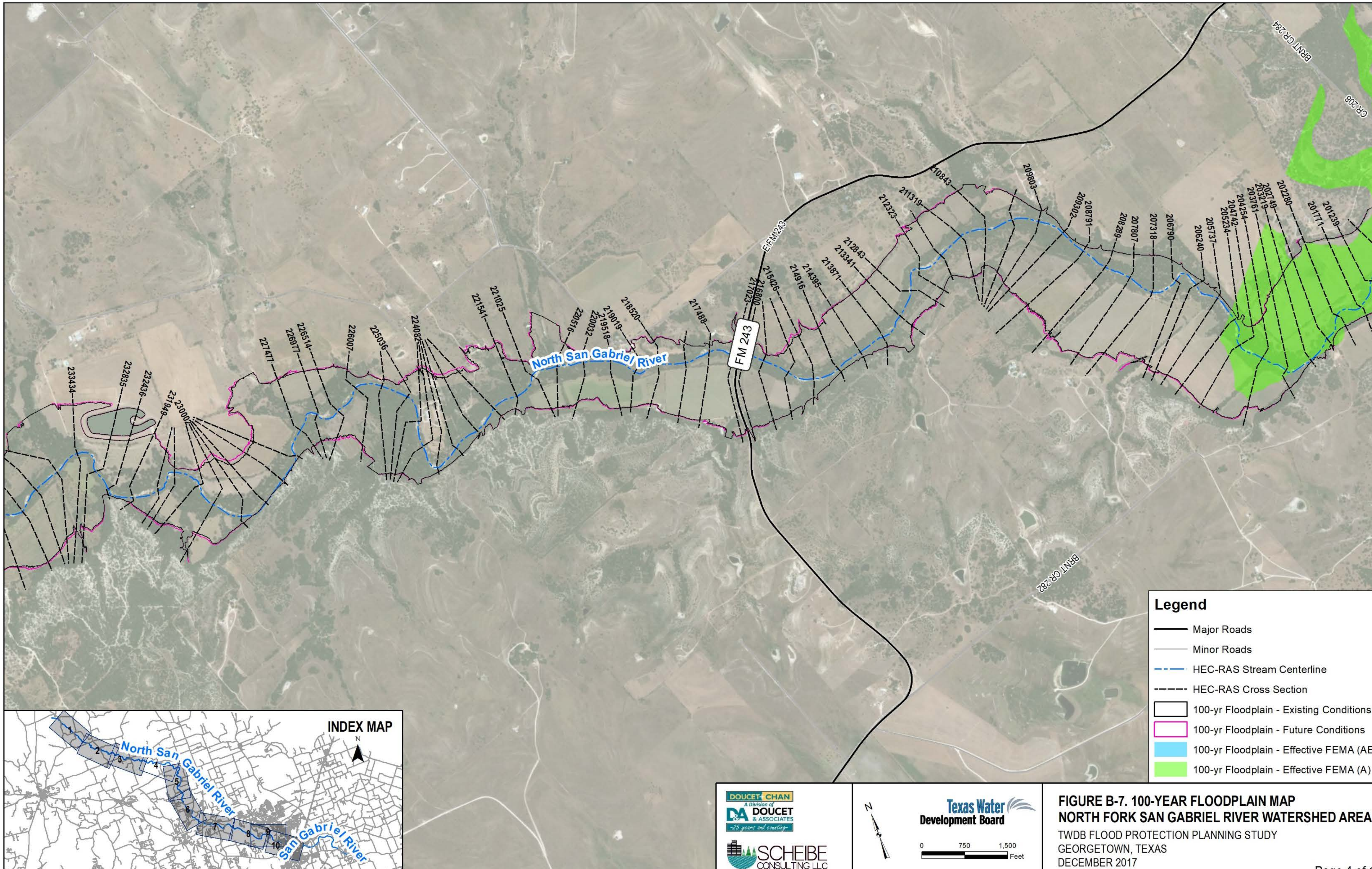

FIGURE B-7. 100-YEAR FLOODPLAIN MAP
NORTH FORK SAN GABRIEL RIVER WATERSHED AREA
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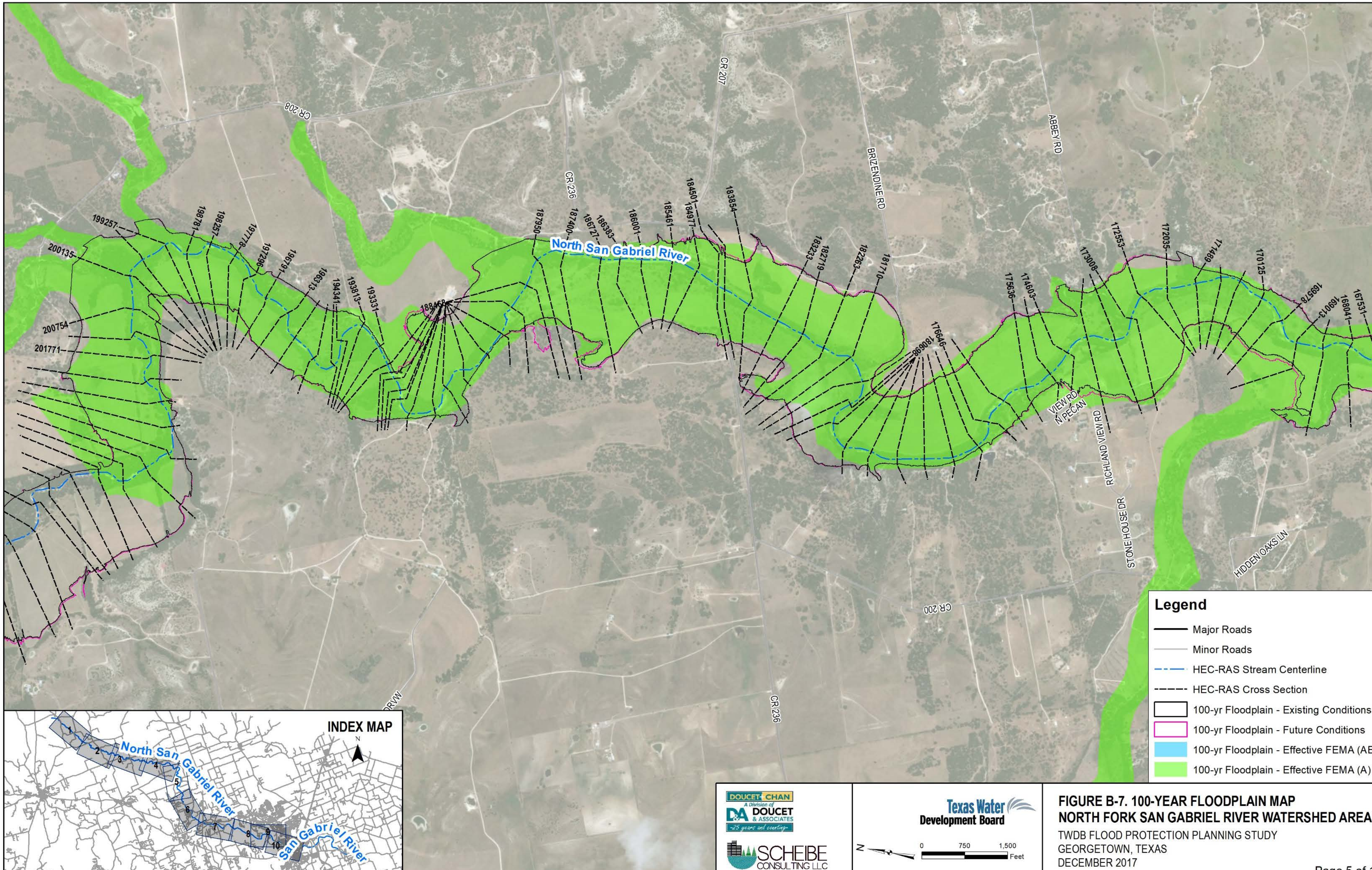
North San Gabriel River
CR 208
CR 207
CR 236
BRIZENDINE RD
ABBEY RD
VIEW RD
N PECAN
RICHLAND VIEW RD
STONE HOUSE DR
HIDDEN OAKS LN
CR 200
199257
200135
200754
201771
198257
197778
197298
196791
195613
194341
193813
193331
187950
187400
186727
186363
186001
185461
184501
184977
183854
183223
182719
182263
181710
175636
174603
173008
172553
172035
171489
170125
169578
169013
168041
167531
Legend
Major Roads
Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
INDEX MAP
N
North San Gabriel River
San Gabriel River
1
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3
4
5
6
7
8
9
10
DOUCET-CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
0 750 1,500 Feet
FIGURE B-7. 100-YEAR FLOODPLAIN MAP
NORTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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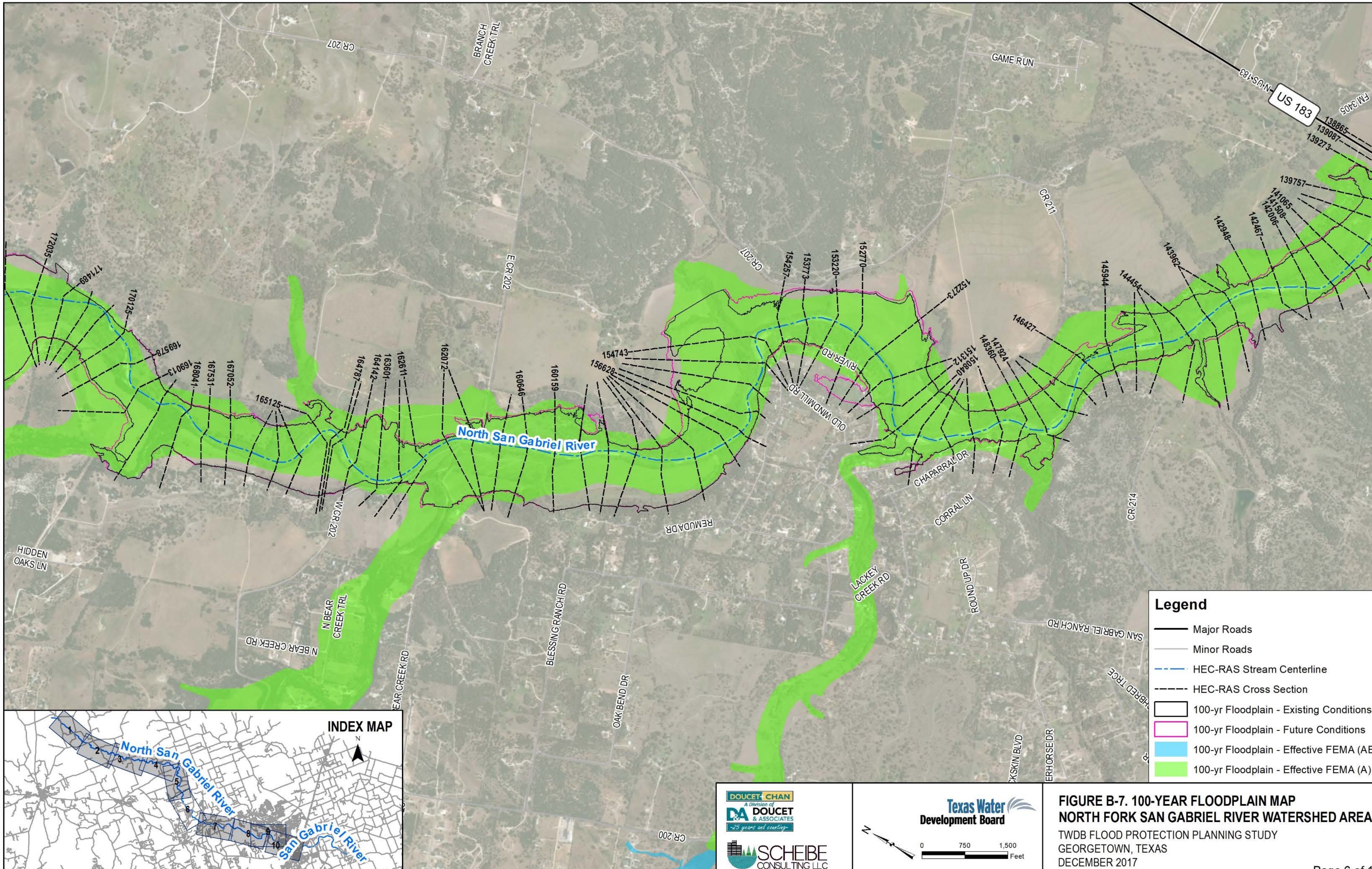
FIGURE B-7. 100-YEAR FLOODPLAIN MAP
NORTH FORK SAN GABRIEL RIVER WATERSHED AREA
TWDB FLOOD PROTECTION PLANNING STUDY
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Minor Roads
HEC-RAS Stream Centerline
HEC-RAS Cross Section
100-yr Floodplain - Existing Conditions
100-yr Floodplain - Future Conditions
100-yr Floodplain - Effective FEMA (AE)
100-yr Floodplain - Effective FEMA (A)
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North San Gabriel River
San Gabriel River
Texas Water Development Board
DOUCET-CHAN
DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
0
750
1,500
Feet
North San Gabriel River
US 183
N US 183
FM 3405
CR 207
BRANCH CREEK TRL
GAME RUN
CR 211
E CR 202
W CR 202
RIVER RD
OLD WINDMILL RD
CHAPARRAL DR
CORRAL LN
CR 214
REMUDA DR
HIDDEN OAKS LN
N BEAR CREEK TRL
N BEAR CREEK RD
BLESSING RANCH RD
OAK BEND DR
LACKEY CREEK RD
ROUND UP DR
SAN GABRIEL RANCH RD
CR 200
172035
171489
170125
169578
169013
168041
167531
167052
165125
164787
164142
163601
162611
162072
160646
160159
154743
156628
154257
153773
153220
152770
152273
151312
150840
148360
147924
146427
145944
144454
143962
142948
142467
142006
141508
141065
139757
139273
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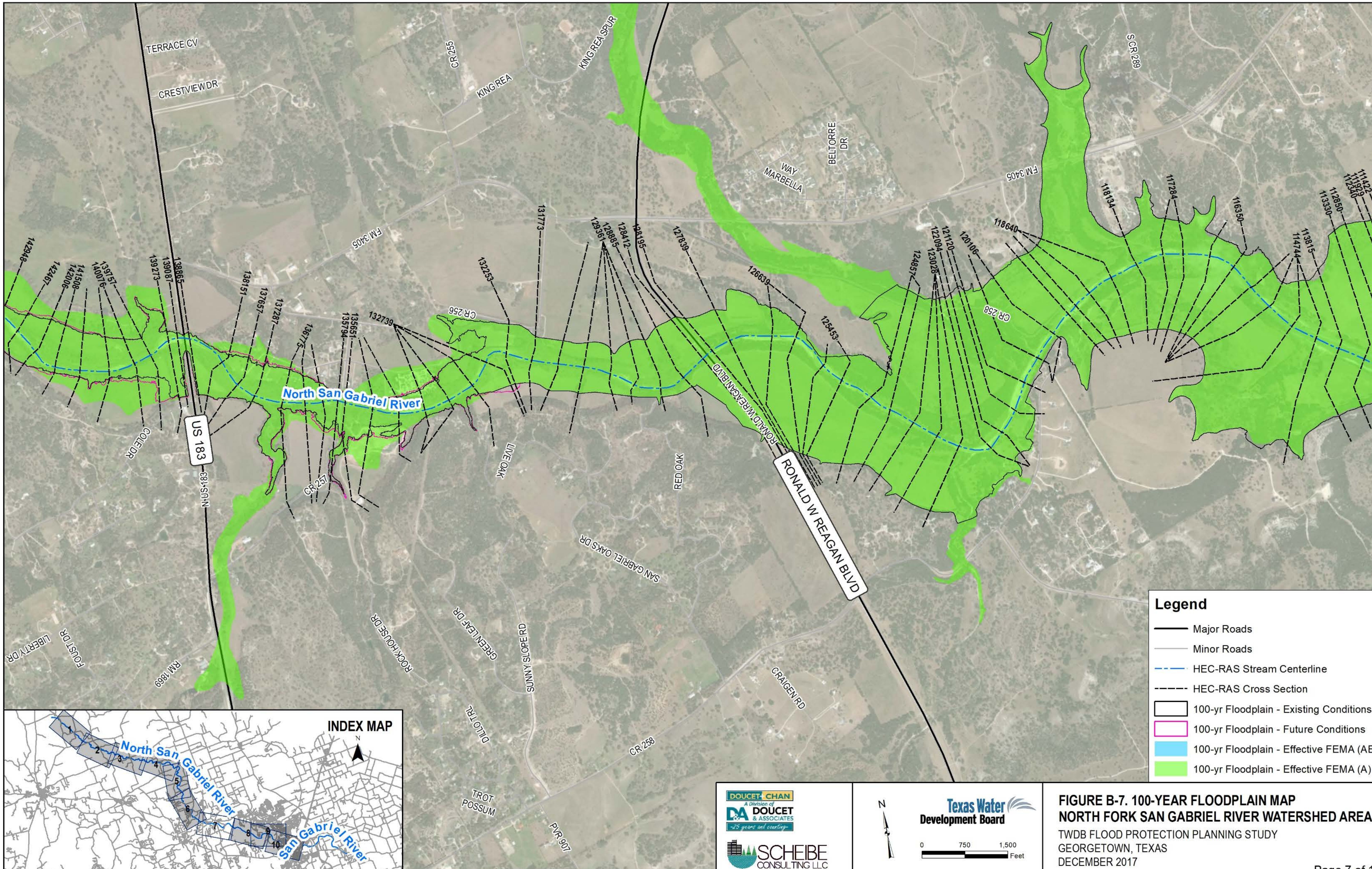
138865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CR 256
CR 257
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CR 255
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TERRACE CV
CRESTVIEW DR
COLE DR
LIVE OAK
RED OAK
SAN GABRIEL OAKS DR
ROCK HOUSE DR
GREEN LEAF DR
SUNNY SLOPE RD
DILLO TRL
TROT POSSUM
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CRAIGEN RD
RM 1869
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BELTORRE DR
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100-yr Floodplain - Effective FEMA (A)
DOUCET CHAN
A Division of DOUCET & ASSOCIATES
SCHEIBE CONSULTING LLC
Texas Water Development Board
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FIGURE B-7. 100-YEAR FLOODPLAIN MAP
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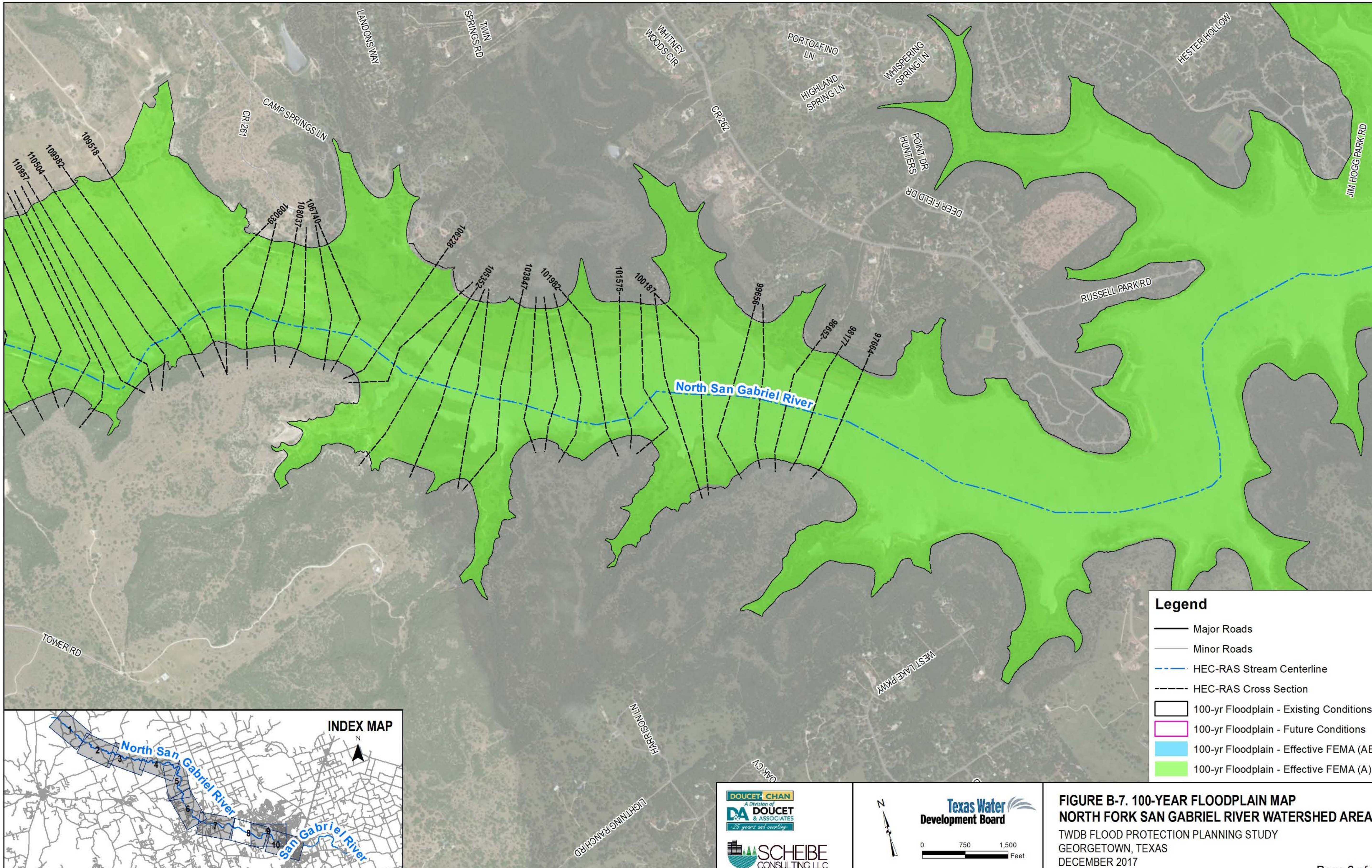

FIGURE B-7. 100-YEAR FLOODPLAIN MAP
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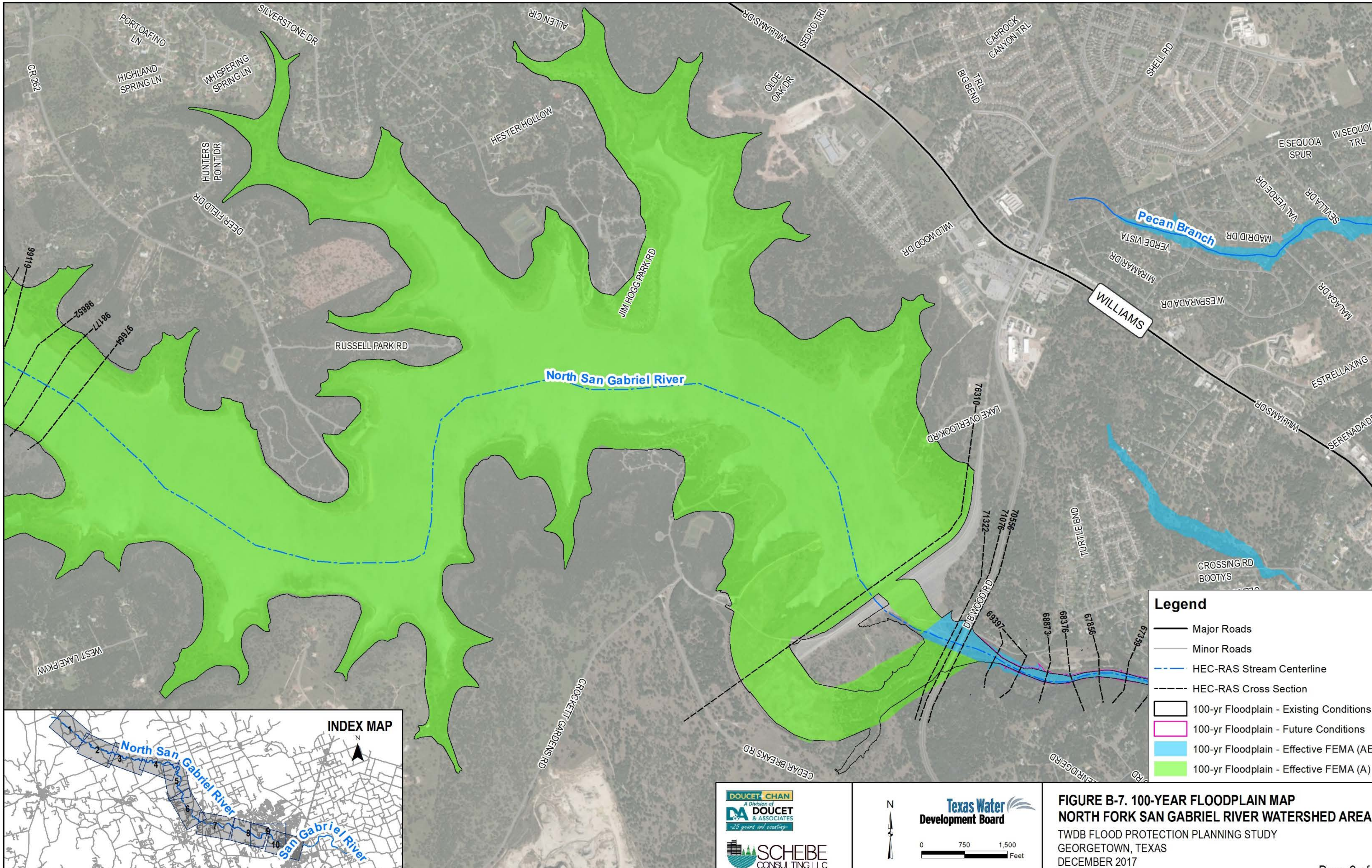

FIGURE B-7. 100-YEAR FLOODPLAIN MAP
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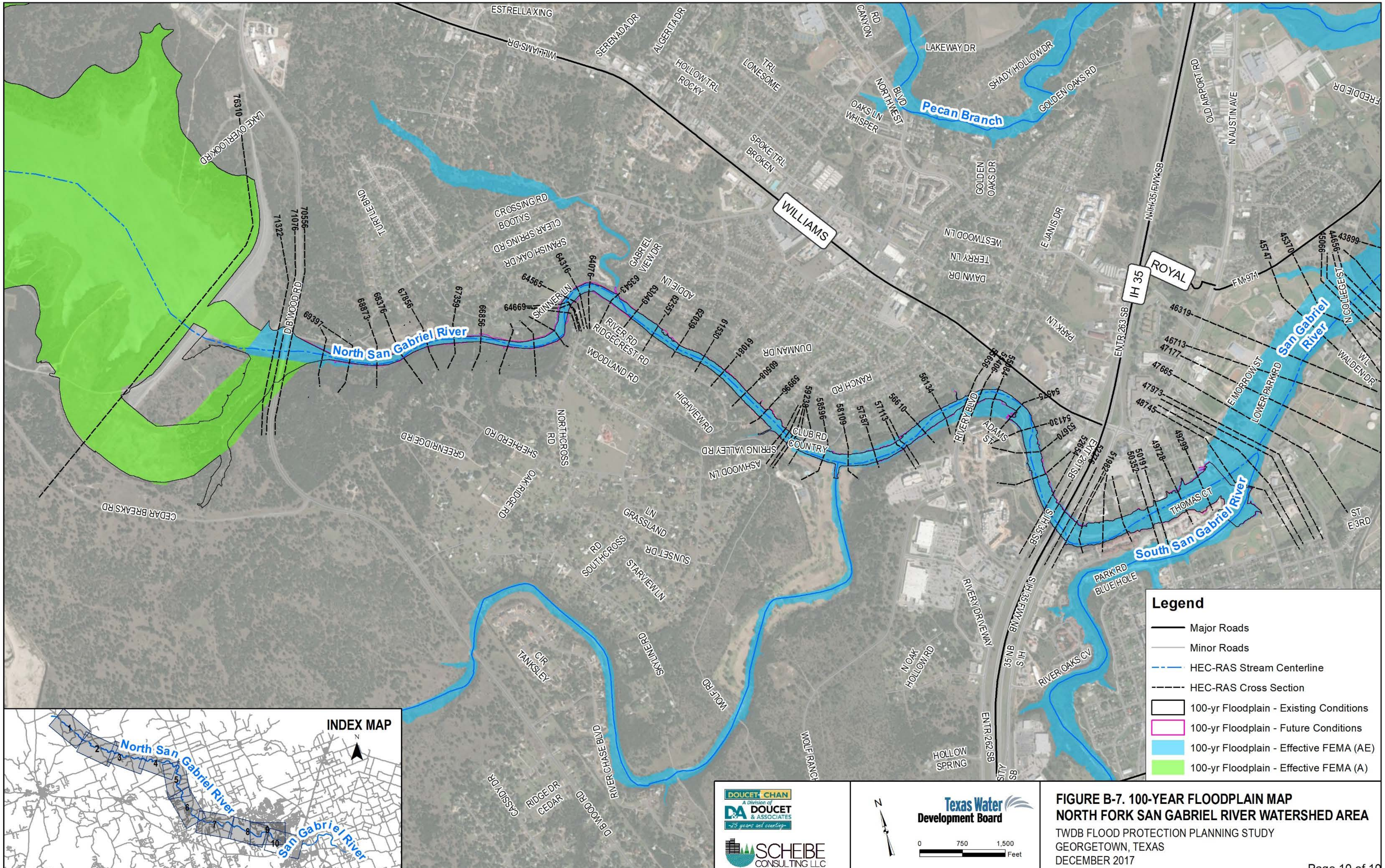
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San Gabriel River
South San Gabriel River
Pecan Branch
WILLIAMS
IH 35
ROYAL
Legend
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Minor Roads
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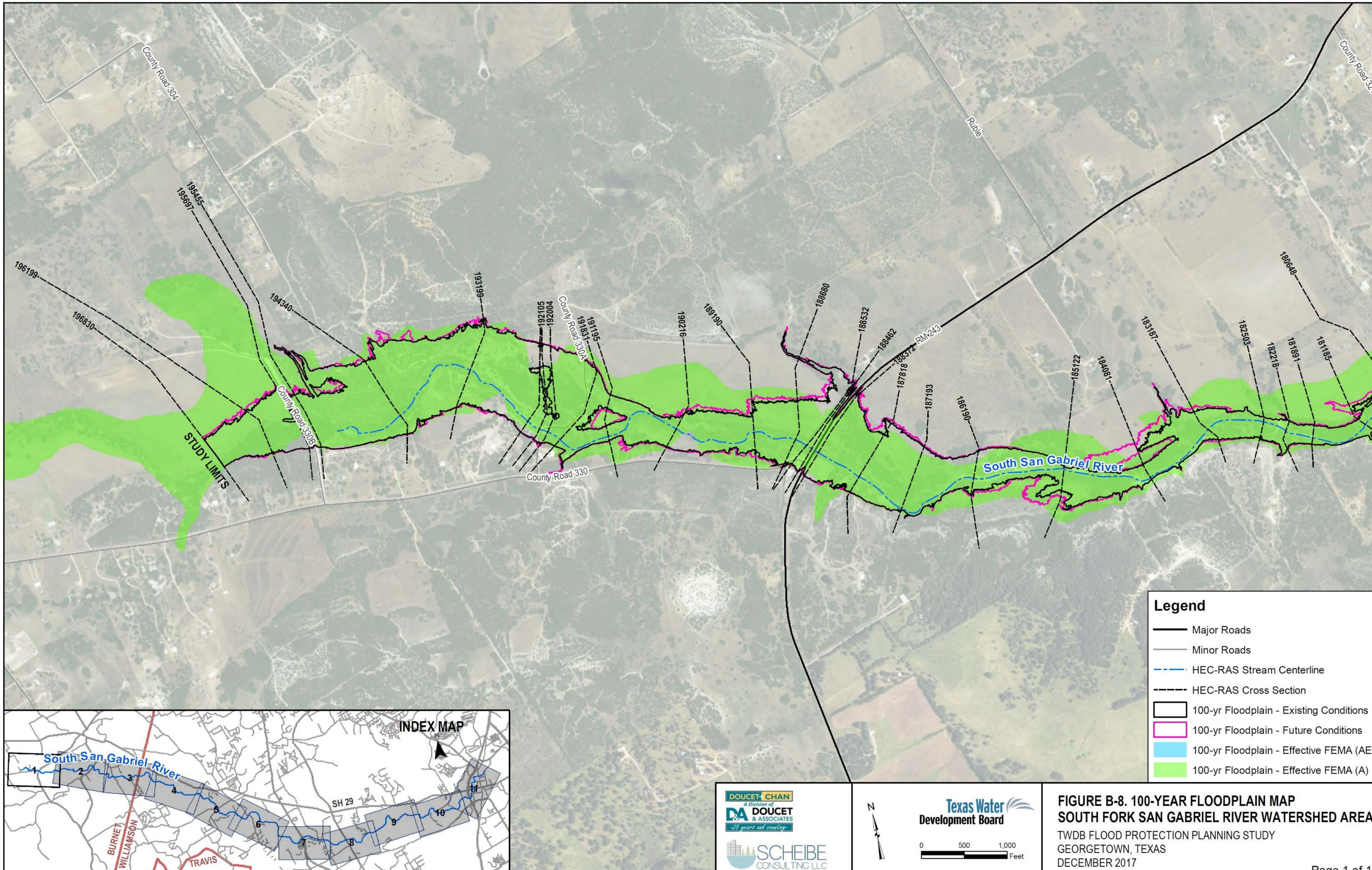
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Ruble
RM 243
County Road 330A
County Road 330B
County Road 330
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195455
194340
193199
192105
192004
191831
191195
190216
189190
188680
188532
188462
185122
184081
183187
182503
182218
181891
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186190
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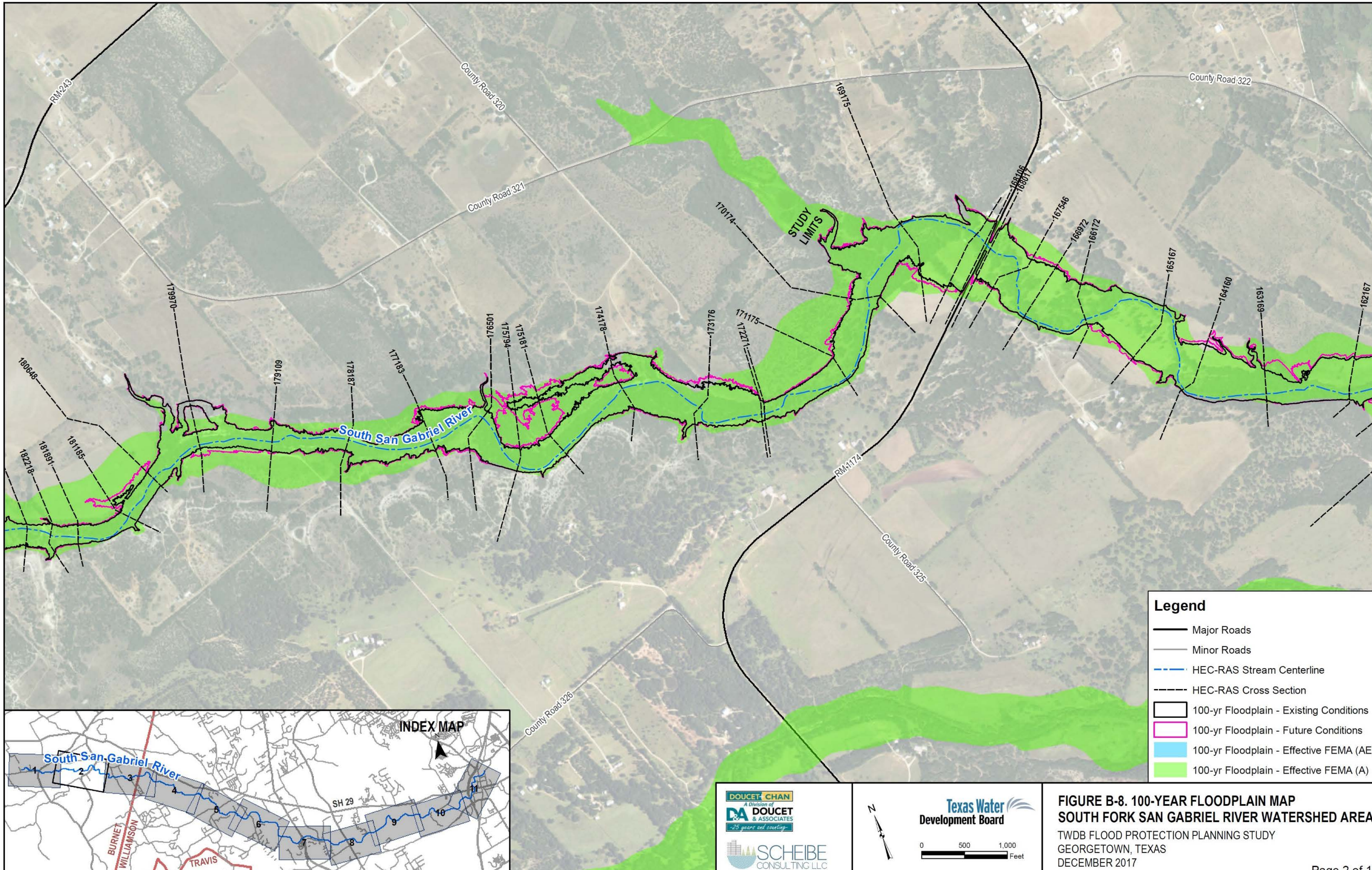
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180648
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179109
178187
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176501
175794
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171175
170174
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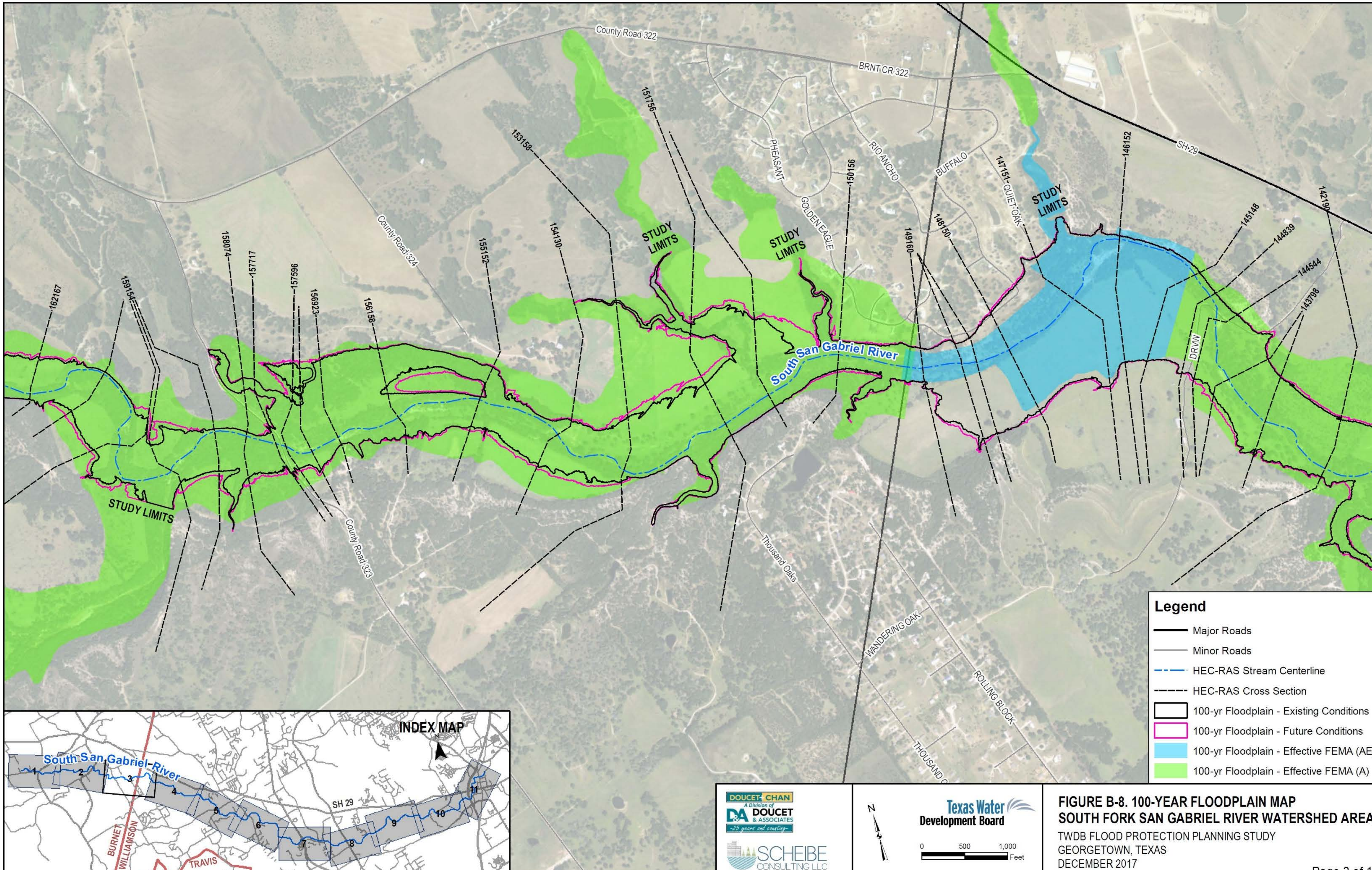
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SH 29
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County Road 323
PHEASANT
GOLDEN EAGLE
RIO ANCHO
BUFFALO
QUIET OAK
Thousand Oaks
WANDERING OAK
ROLLING BLOCK
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157717
157596
156923
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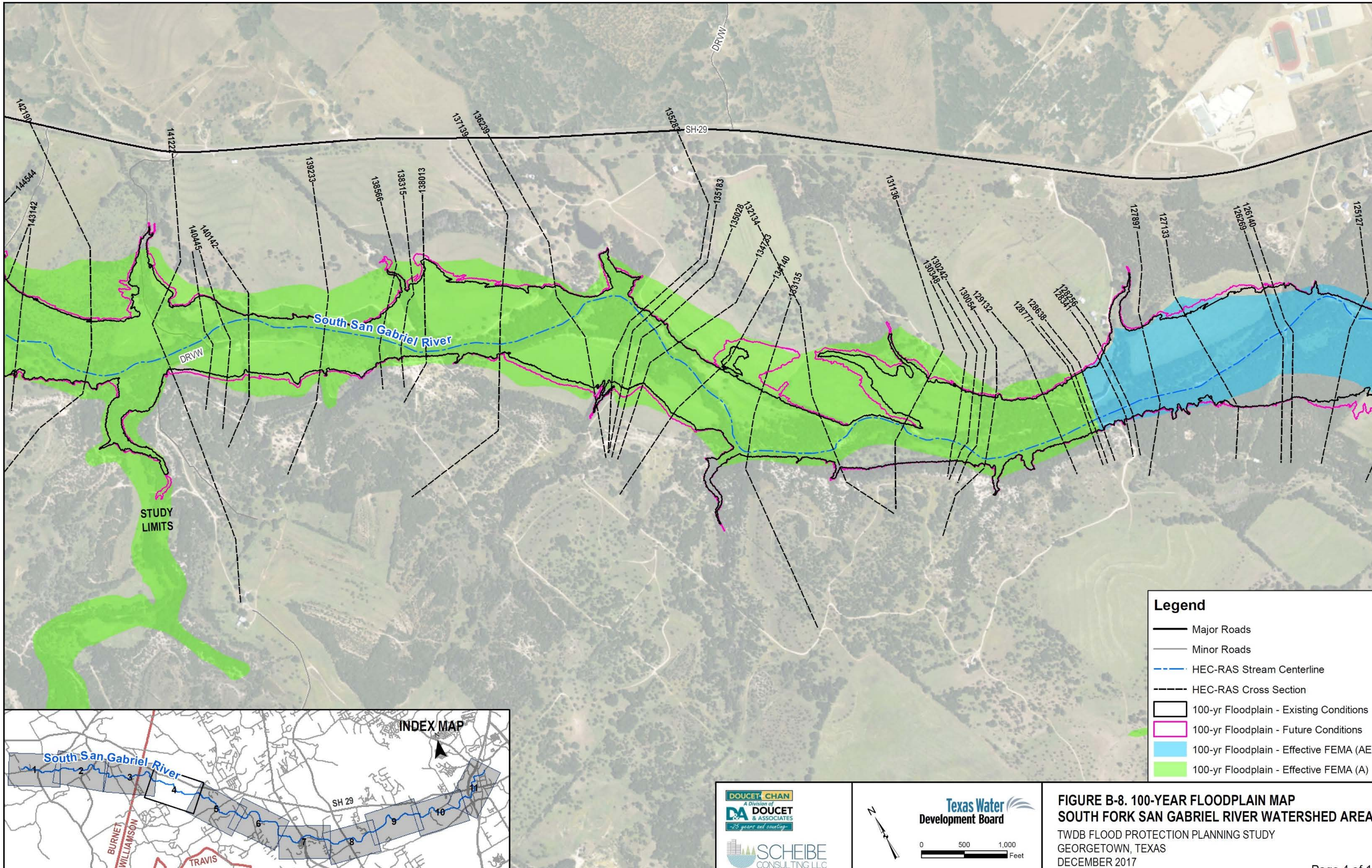

FIGURE B-8. 100-YEAR FLOODPLAIN MAP
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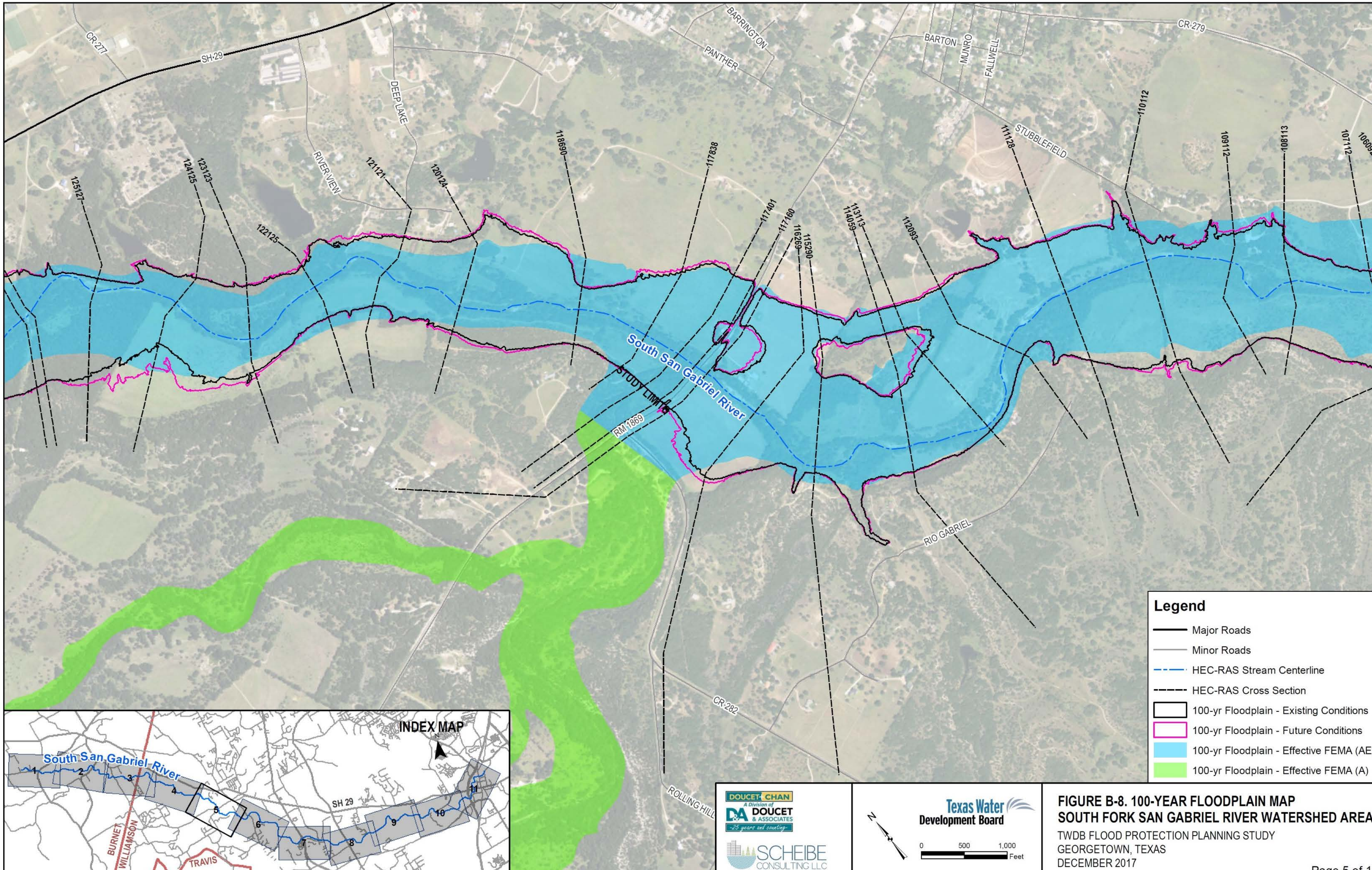
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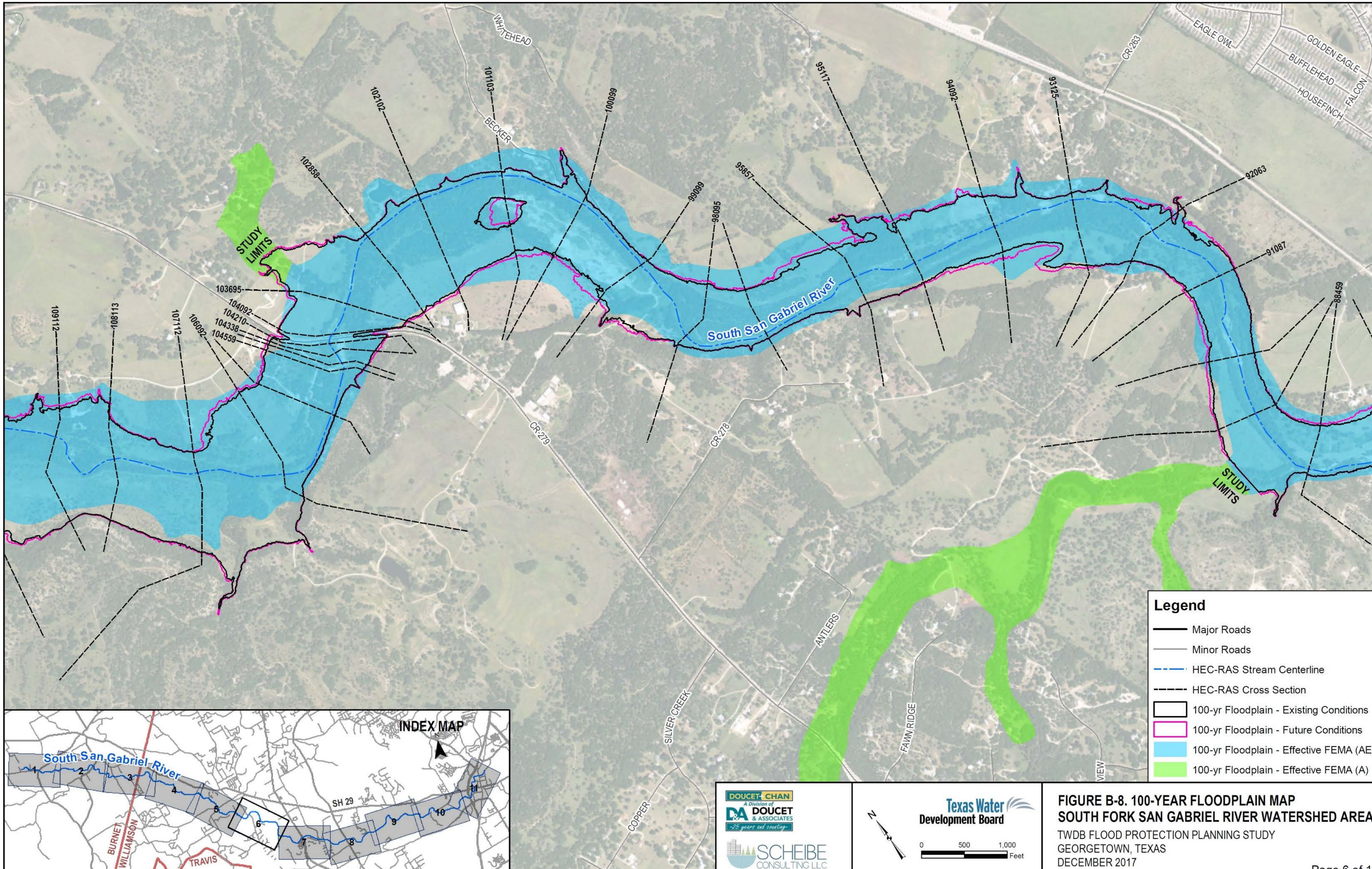

FIGURE B-8. 100-YEAR FLOODPLAIN MAP
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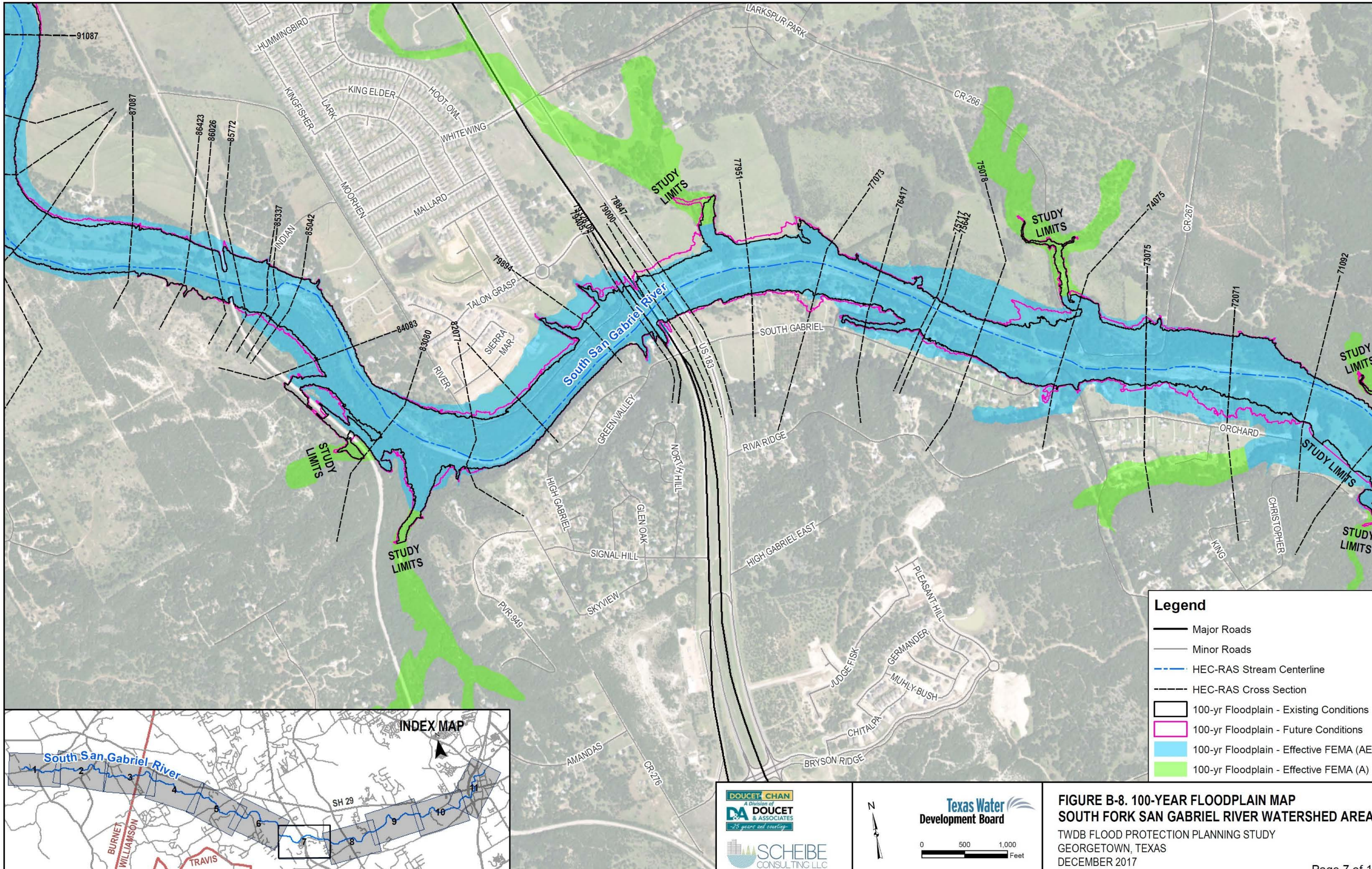
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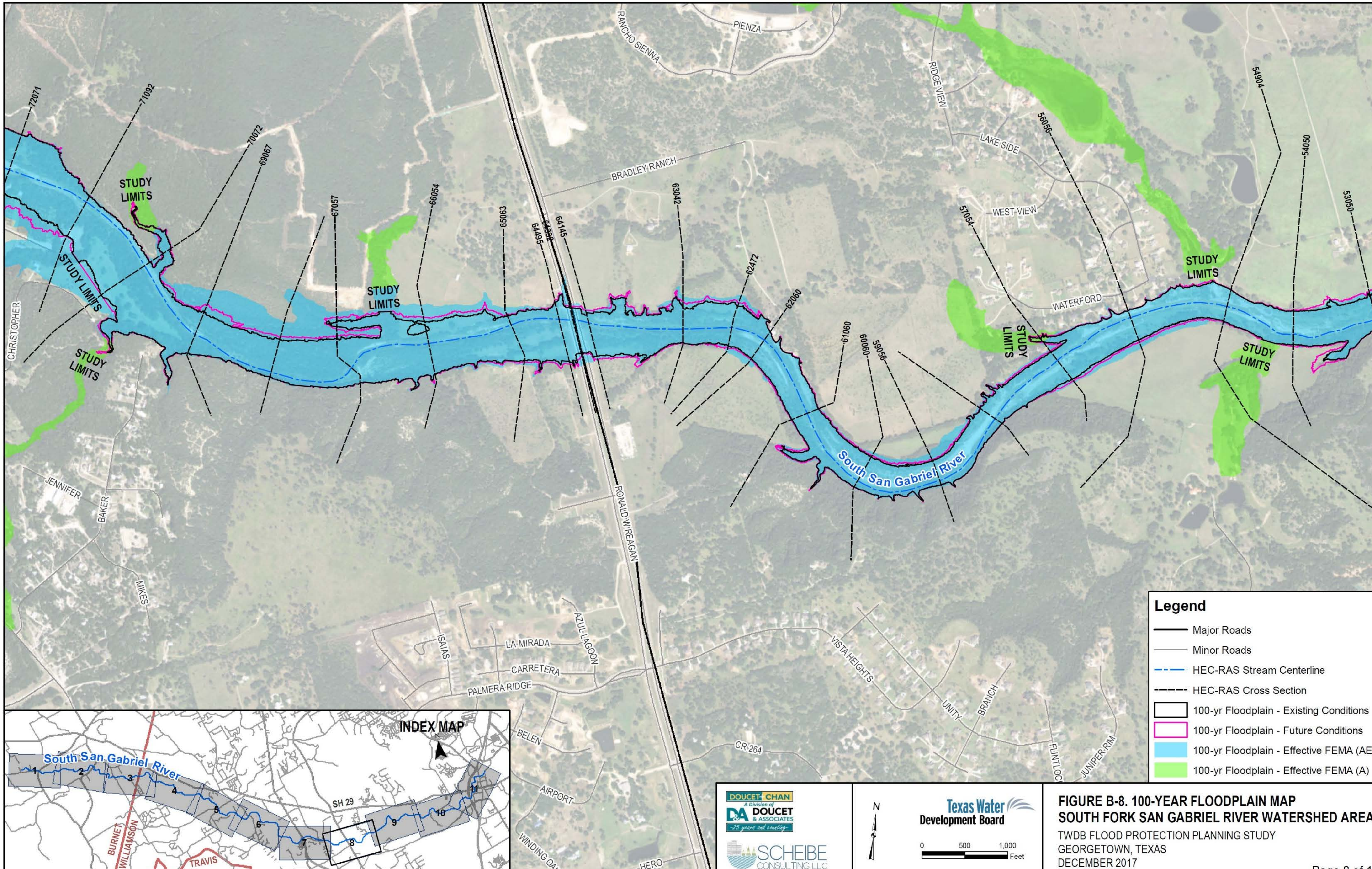

FIGURE B-8. 100-YEAR FLOODPLAIN MAP
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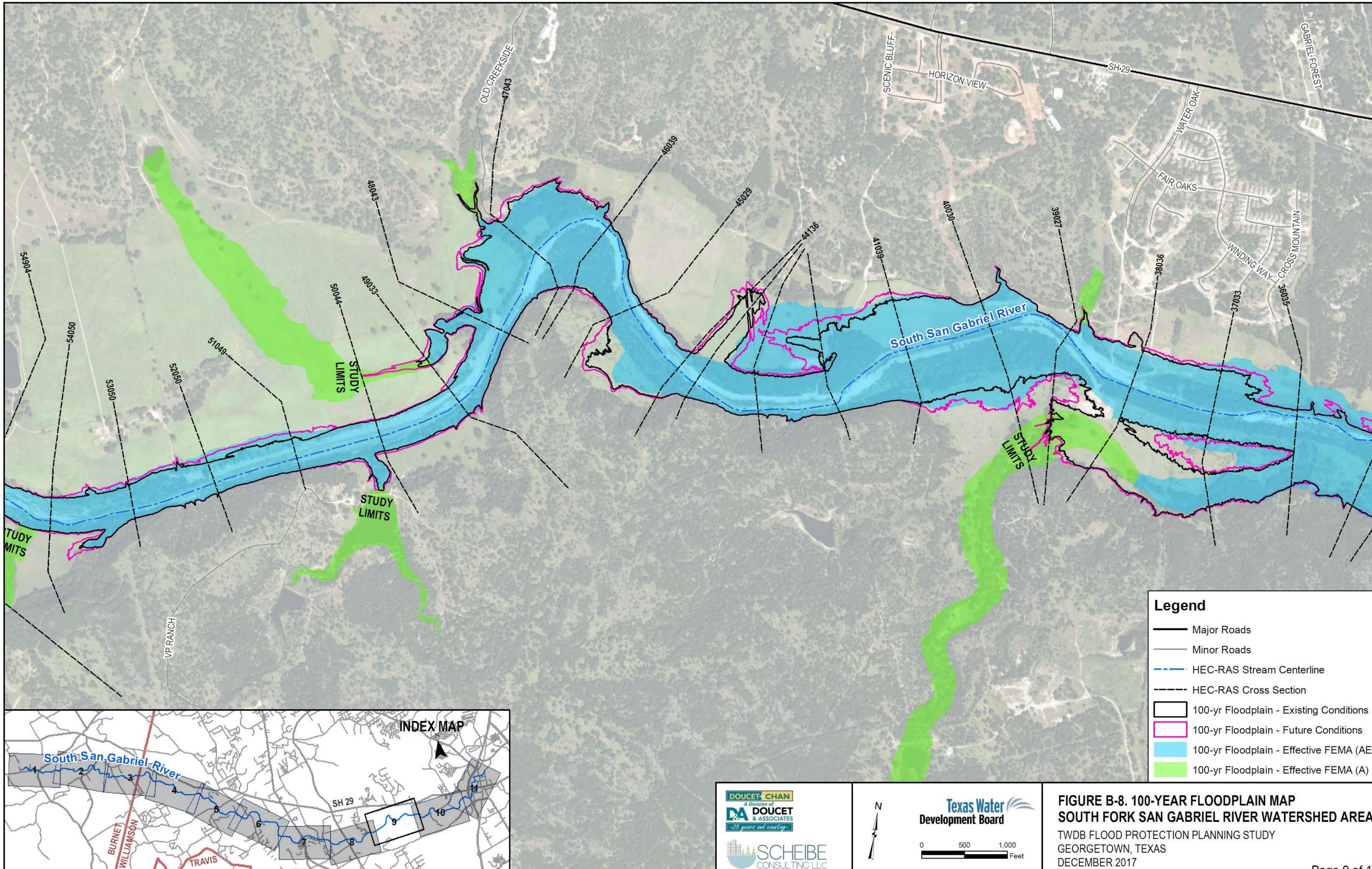

FIGURE B-8. 100-YEAR FLOODPLAIN MAP
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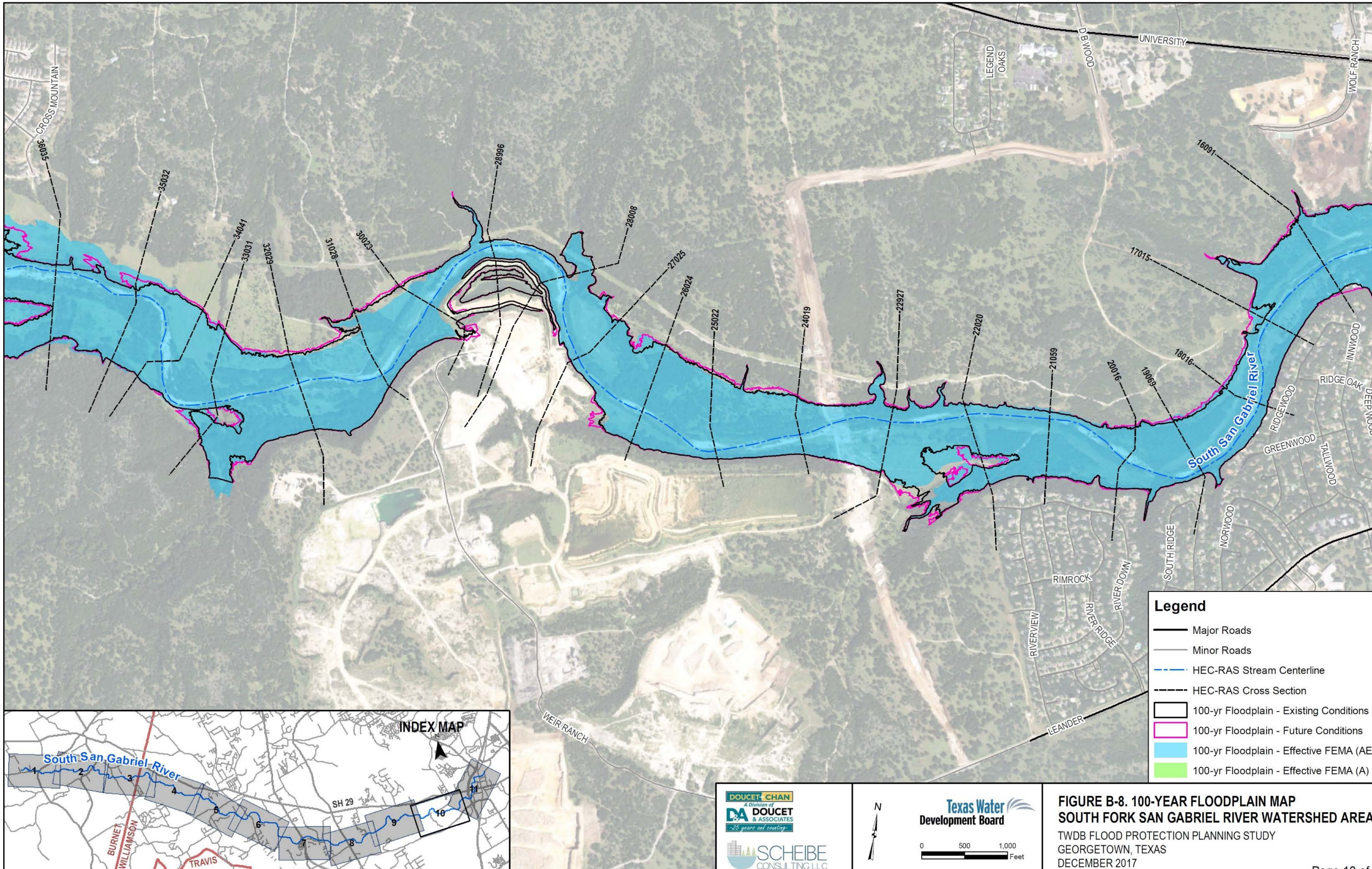

FIGURE B-8. 100-YEAR FLOODPLAIN MAP
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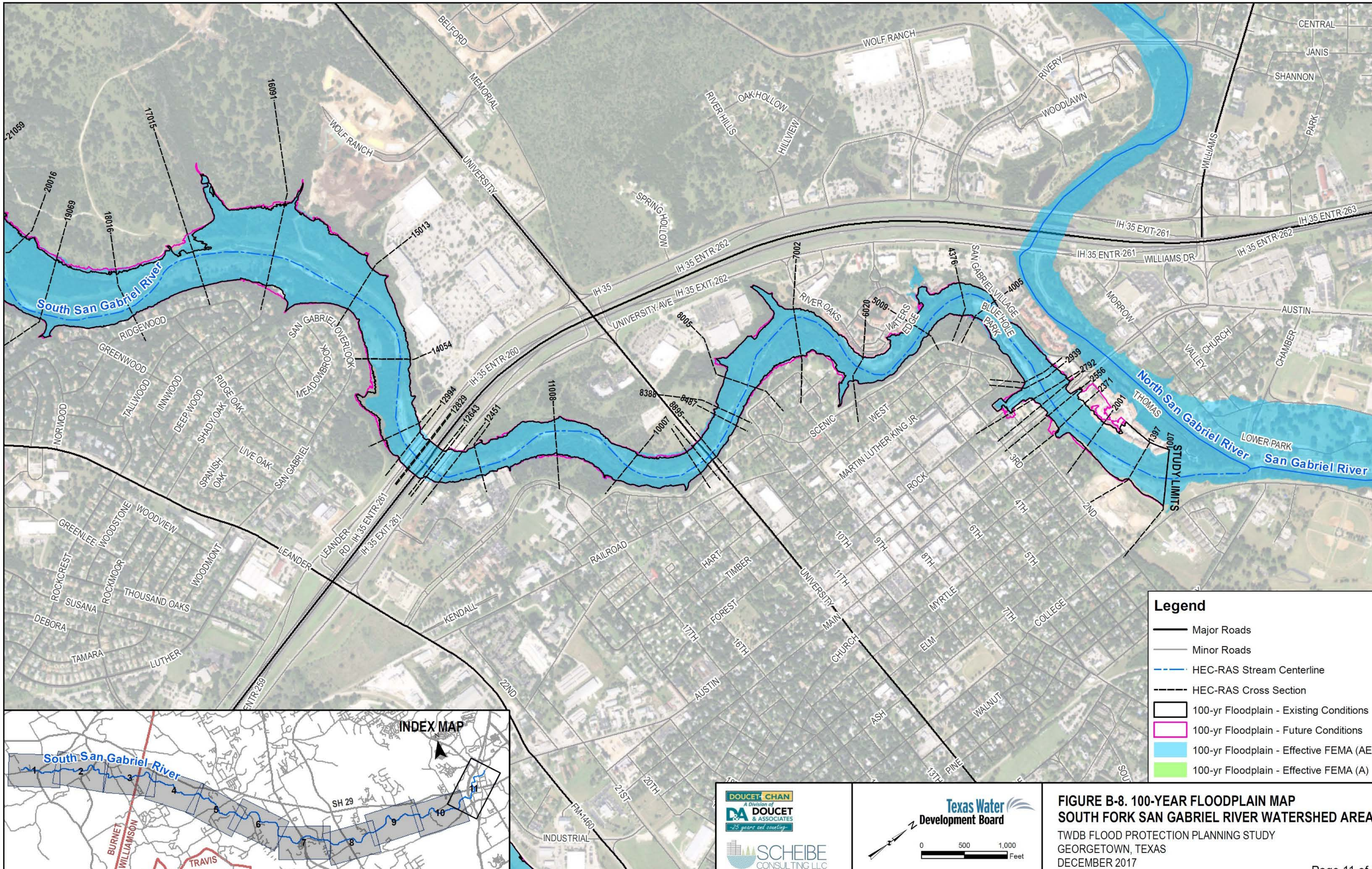
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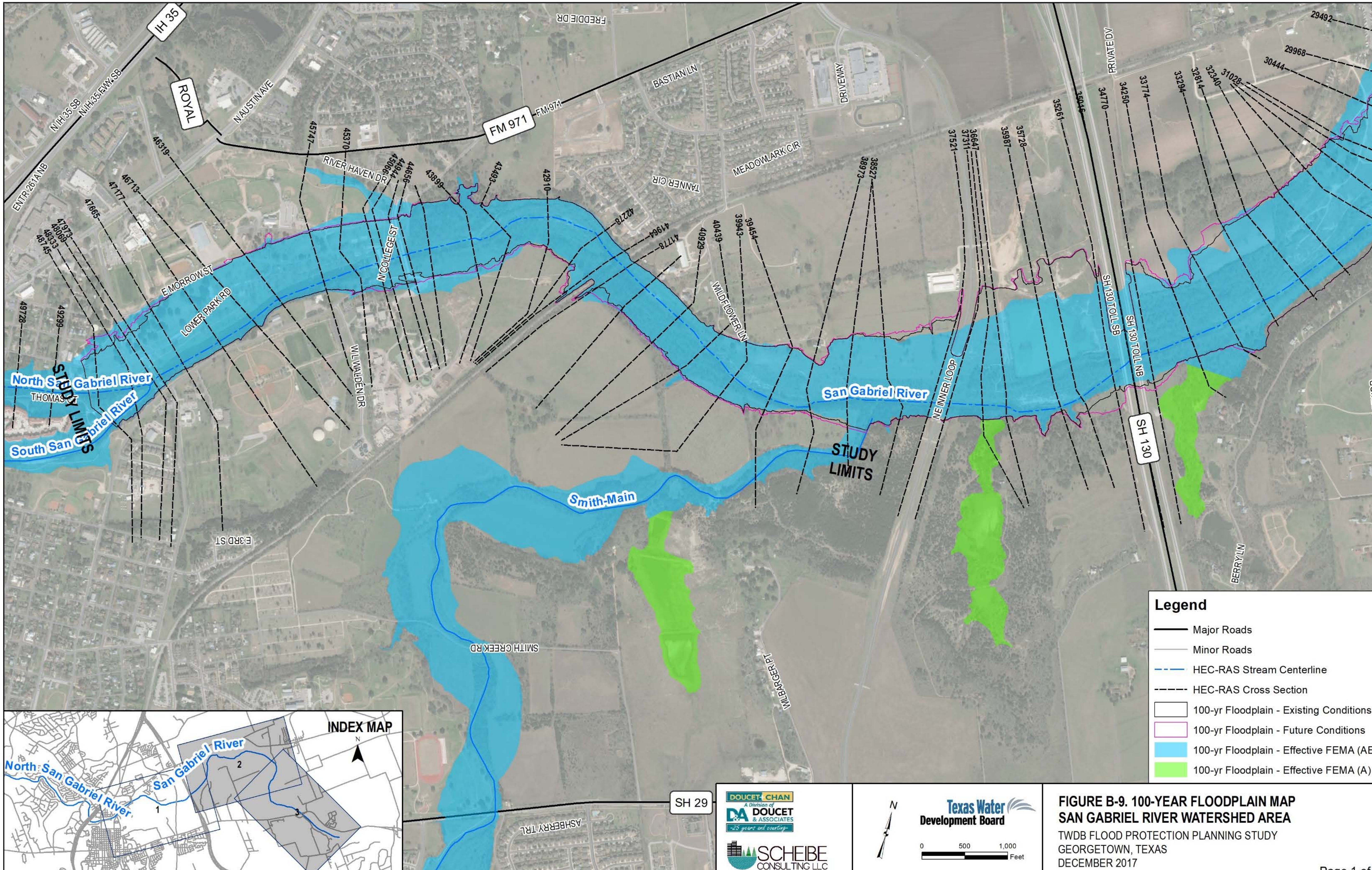
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SH 29
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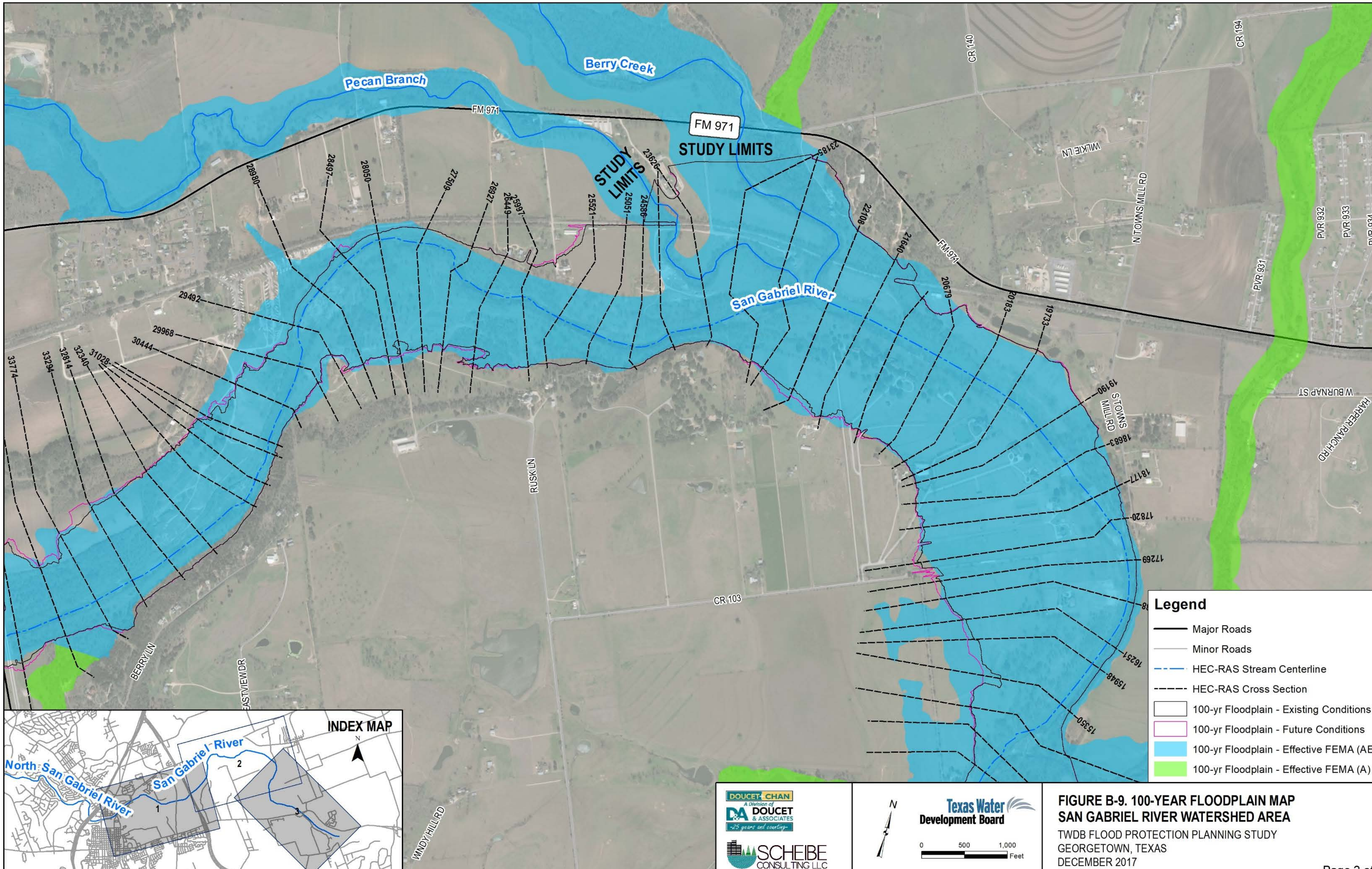
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Berry Creek
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San Gabriel River
CR 140
CR 194
WILKIE LN
N TOWNS MILL RD
S TOWNS MILL RD
PVR 931
PVR 932
PVR 933
PVR 934
W BURNAP ST
HARPER RANCH RD
RUSK LN
CR 103
BERRY LN
EASTVIEW DR
WINDY HILL RD
33774
33294
32814
32340
31028
30444
29968
29492
28980
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27509
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25997
25521
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24586
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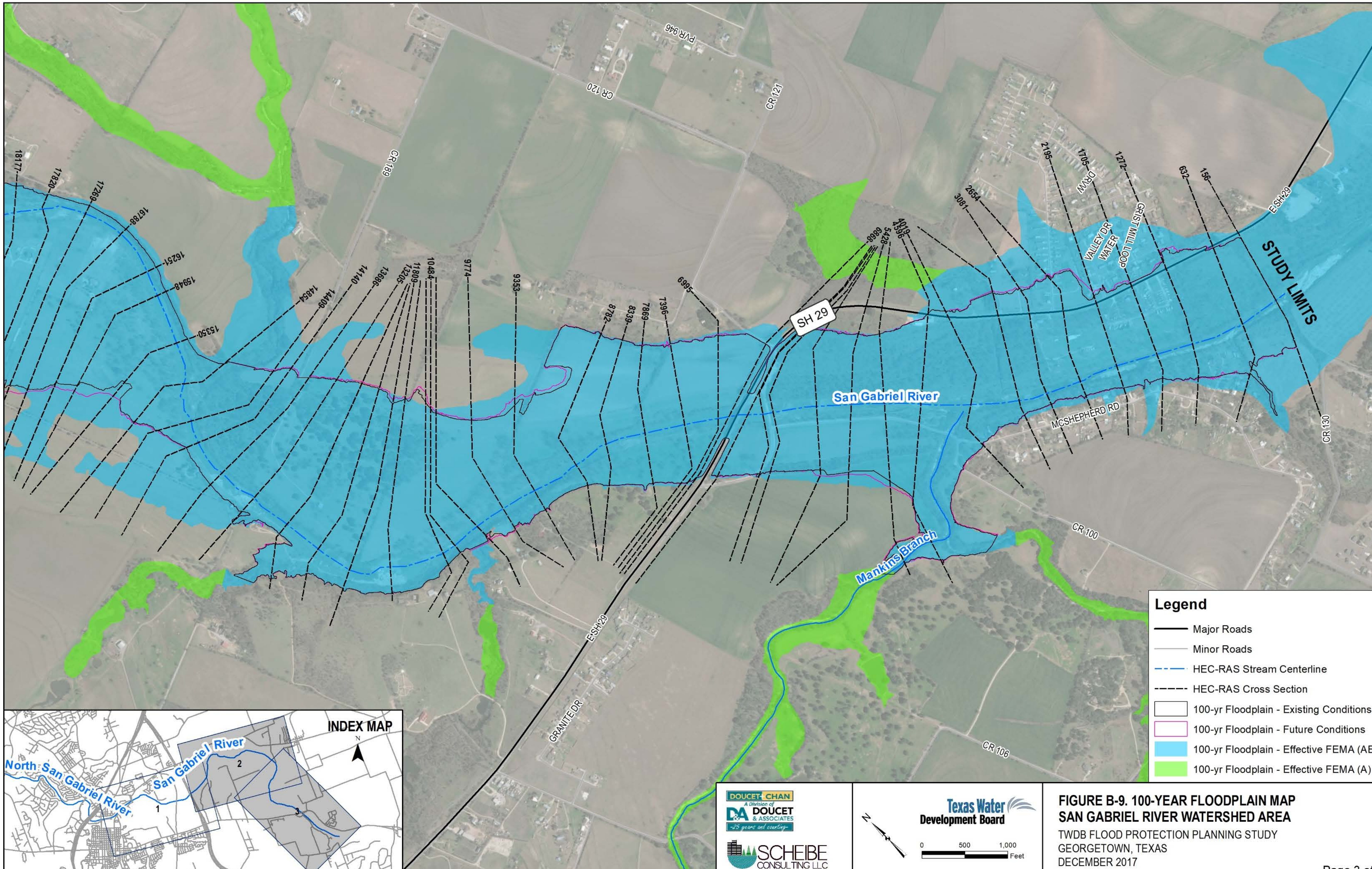
San Gabriel River
Mankins Branch
SH 29
E SH 29
CR 100
CR 106
CR 120
CR 121
CR 130
CR 189
PVR 946
MCSHEPHERD RD
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APPENDIX C
PROJECT ALTERNATIVES
EVALUATION AND SELECTION

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TABLE OF CONTENTS

LIST OF TABLES

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C.1.0 Background

An assessment was performed to identify and prioritize mitigation alternatives to address flood hazards within the study areas identified in the two Georgetown-San Gabriel Flood Protection Study (FPPS) grant applications to the Texas Water Development Board (TWDB). The assessment of the flood mitigation alternatives consisted of the following primary steps:

- Flood hazard areas, including flooded residential and commercial structures (Problem Areas) and flooded roadway crossings that were identified using the FPPS floodplain modeling and mapping efforts (see Appendices A and B);
- Flood Problem areas were assessed to define the extent of structural flooding and to develop flood hazard mitigation improvements to lower the existing conditions 100-year flood elevation to be at least one foot below a defined structures' Finished Floor Elevations (FFEs);
- Flooded roadway crossings were assigned an initial flood severity index to identify road crossings that were candidates for further assessment, the depth and frequency of road crossing flooding was determined, and flood hazard mitigation improvements were developed to prevent overtopping of the crossings and their roadway approaches, based upon the hydrologic and hydraulic design criteria of the governing jurisdiction;
- Opinions of probable cost were developed for each flood hazard mitigation improvement, including construction cost, contingency cost, and engineering/permitting/administrative cost;
- The proposed flood hazard mitigation improvements were sorted by overall priority into Tier I (highest priority) and Tier II (lower priority) for the City of Georgetown & ETJ. The Tier I improvement projects were then ranked from highest to lowest priority. Only Tier I was applied to all other jurisdictions due to the small number of projects remaining in those jurisdictions.

Detailed descriptions of the methods, assumptions and results of the assessment and prioritization of the flood hazard mitigation improvements are presented in this Appendix C Report. Summaries of pertinent data and tables are located at the end of this appendix. Figures of the Problems Areas, flooded road crossings, and proposed flood hazard mitigation improvements are presented in Chapter 6 of the Main Report.

C.2.0 Identification of Flood Hazard Areas

Flood hazard areas were identified for flooded residential and commercial structures and for flooded roadways crossing the studied streams. This section discusses the process for identification of the flood hazard areas.

C.2.1 Problem Areas

Problems Areas are defined as containing at least 5 residential and/or commercial structures within an area shown to flood during the existing conditions 100-year event floodplain. The process for defining the Problem Areas included the following steps:

- Identification of building footprints of existing structures located partially or completely within the existing conditions 100-year event, using the HEC-RAS models developed for this FPPS (see Appendix B Report) and floodplain mapping;
- Grouping of a minimum of 5 structure footprints within the existing conditions 100-year floodplain to define each Problem Area;
- Assignment of Finished Floor Elevation (FFE) to each flooded structure footprint assuming the FFE to be 6 inches above the highest LiDAR mapping elevation within the structure's footprint indicative of highest adjacent grade;
- Assessment of frequency of flooding of each structure's footprint for existing conditions 5-year through the 500-year events, using the mapped floodplains from the HEC-RAS model developed for this FPPS (see Appendix B Report) to define the severity of flooding within that Problem Area (see Section C.5.0 for discussion of Flood Severity Index).

Problem areas are discussed and mapped as provided in Section 5 of the Main Report. Table C-3 summarizes the flooded structures within each Problem Area.

C.2.2 Flooded Roadway Crossings

Flooded road crossings are defined as stream road crossings, including roadway approaches, whose depth of flooding at the design flood event exceeds that governmental jurisdiction's criteria, as follows:

- City of Georgetown Incorporated Limits and Extraterritorial Jurisdiction (ETJ): 6-inch maximum depth of inundation under existing conditions 100-year event. However, due to the hydraulic modeling assumption of debris blocking the crossing's railings, it was assumed that any inundation of the crossing under existing conditions 100-year event (25-year storm with less than 12-inch inundation for "local" roadways) would not comply with the City of Georgetown's hydraulic design criteria;
- All other Study Areas outside City of Georgetown Jurisdiction (Williamson County, City of Leander, City of Liberty Hill, Burnet County): convey the existing conditions 25-year event without overtopping the crossing or roadway approaches.

The process for defining the flooded roadway crossings included the following steps:

- Assess depth and frequency of flooding of each existing road crossing, for the existing conditions 5-year through 100-year events, and define the most frequent (smallest) flood event that overtops each road crossing;
- Assign a Flood Severity Index for each flooded road crossing to determine the road crossings that were candidates for further assessments for flood hazard improvement (see Section C.5.0 for discussion of Flood Severity Index).

Table C-2 summarizes the flooding condition of each existing road crossing and its severity index.

C.3.0 Flood Hazard Mitigation Improvement Concept Designs

After the flood hazard areas were defined (see Section C.2.0), flood hazard mitigation improvements were assessed for each flood hazard area. This section discusses the process for assessing flood hazard mitigation improvements.

C.3.1 Problem Areas

C.3.1.1 Methodology

The two primary goals of developing flood hazard mitigation improvements for the Problem Areas are:

- Wherever possible, lower the existing conditions 100-year event water surface elevations (WSELs) along the Problem Area such that the resulting 100-year WSELs are at least one foot lower than the assumed Finished Floor Elevations (FFEs) of the flooded structures within the Problem Areas; and/or
- Raise ground levels (construct berms/levees) between the flood event within the stream channels and the structures to physically prevent floodwaters from reaching and flooding the structures.

The primary flood hazard mitigation improvement strategies considered for Problem Area flood hazard mitigation included the following:

- Channel widening: where the existing channel lacked the ability to fully convey the existing conditions 100-year event such that the threshold limits were not exceeded, channel excavation was used to provide additional conveyance. The additional conveyance was accomplished by excavating sections of the main channel, primarily downstream and/or adjacent to the identified flooded structures. HEC-RAS hydraulic model cross-section data was modified to simulate channel excavation and provide additional conveyance within the channel to lower the WSEL to the desired levels;
- Protective berms: In some situations, berms were used to contain or limit flooding along with the channel excavation improvements. The berms were used in cases where channel excavation did not provide sufficient flood protection for structures along the channel. Berm design was a basic design consisting of 3:1 side slopes, 3-foot top width, and a height of approximately 3-4 feet above the existing conditions 100-year WSEL. Outside of the berms (structure side), small swales were used to convey local runoff downstream and back to the main channel.
- Detention ponds: In some situations, a detention pond was used upstream of the problem area to reduce existing conditions 100-year event peak flows within the channel in order to reduce the WSEL at the structures. HEC-HMS hydrologic modeling was used to size the detention structures.
- Improved channel maintenance: In some situations, improved channel maintenance was employed and modeled hydraulically by assuming improved maintenance reduces flow impedance within the channels (i.e. lowering Manning’s “n” friction values), thereby lowering the existing conditions 100-year event WSELs.

In the case of channel improvements (widening and improved maintenance), flow conditions were reviewed to assess whether the channel improvements resulted in higher peak flow rates downstream of the proposed channel improvements. This assessment would need to be updated when/if final improvements are proposed for an area.

C.3.1.2 Results

The dimensions and characteristics of the proposed flood hazard mitigation improvements for each Problem Area are summarized in Table C-3. Locations of the proposed Problem Area improvements are shown on the Chapter 6 figures of the Main Report.

C.3.2 Flooded Road Crossings

C.3.2.1 Methodology

The primary goal of developing flood hazard mitigation improvements for the flooded road crossings was to improve the crossing structure and/or roadway approach to meet hydraulic design criteria at the hydraulic design event (see Section C.2.2 for discussion of hydraulic design criteria). The primary flood hazard mitigation improvement strategies considered for road crossing flood hazard mitigation included the following:

- Expansion of existing bridge opening lengths to provide added capacity without raising the existing bridge deck level where practical;
- Raising flooded approach road grades where the crossing structure is not flooded but the roadway approach is flooded;
- Replacement of existing crossing structures with new box culverts or clear-span bridges and construction of new roadway approaches at raised grades.

The HEC-RAS hydraulic model with existing road crossing configurations (used in the assessment of flooding of the existing road crossings) was modified using a combination of the mitigation strategies discussed above to develop crossing configurations that complied with the governmental jurisdiction’s hydrological and hydraulic design criteria. Flooded roadway crossings that were considered “local” with an alternate emergency access route were excluded from the final list of flooded crossings.

C.3.2.2 Results

The dimensions and characteristics of the proposed flood hazard mitigation improvements for each flooded road crossing are shown in Table C-2. Locations of the proposed road crossing improvements are shown on the Chapter 6 figures of the Main Report.

C.4.0 Flood Hazard Mitigation Improvement Cost Estimations

After the flood hazard mitigation improvements were assessed (see Section C.3.0), a conceptual opinion of probable construction cost was developed for each proposed flood hazard mitigation improvement. This section discusses the process for development of the conceptual opinions of probable costs.

C.4.1 Methodology

The conceptual opinions of probable construction costs included the following primary elements:

- Construction cost;
- Construction contingency cost;
- Engineering, permitting, management cost.

The primary sources of unit costs for cost estimations were recent bid tabulations from the Texas Department of Transportation (TxDOT) and City of Austin, Texas (COA). Table C-1 summarizes the construction unit price assumptions. Construction contingency costs were assumed to be 25% of the construction costs. Engineering, permitting, and management costs were assumed to be 25% of the construction costs for problem areas, and 30% of the construction costs for crossings.

Land acquisition for drainage construction easements and for rights-of-ways was not included in the cost opinions at the request of the City of Georgetown. The City's recent experience with land acquisition has been that land costs are extremely volatile and are difficult to estimate without a formal survey and appraisal.

For the purpose of this planning study, aggregate unit costs were developed for the following key project elements:

Channel Improvements

- Channel preparation (including clearing, grubbing, and removal of any other miscellaneous item)
- Channel Excavation (includes excavation, topsoil, seedbed preparation, seeding, and turf reinforcement mats)
- Cofferdams and Dewatering

Roadway Crossing Improvements

- Bridge Deck, Piers, Foundation
- Channel Improvements
- Approach Fill, Retaining Walls, Utility Relocation, HMAC Pavement
- Environmental Controls
- Water Quality Treatment for Edwards Aquifer (if applicable)
- Traffic Control

Flood Detention

- Tree Removal
- Excavation
- Embankment
- Outlet Structures

C.4.2 Problem Area Cost Estimation Results

The conceptual cost estimates of all proposed Problem Area flood hazard mitigation improvements are summarized on Table C-3.

C.4.3 Flooded Road Crossing Cost Estimation Results

The conceptual cost estimates of all proposed road crossing flood hazard mitigation improvements are summarized on Table C-2.

C.5.0 Flood Hazard Mitigation Prioritization

Shown in Tables C-2 and C-3, the Georgetown-San Gabriel Flood Protection Planning Study (FPPS) identified flood hazard mitigation improvements for 13 Problem Areas and 33 flooded road crossings, totaling 46 projects overall and approximately $350,000,000 of total construction costs across all study areas and jurisdictions. After the flood hazard mitigation improvement costs were assessed (see Section C.4.0), the proposed flood hazard mitigation improvements were prioritized. This section discusses the prioritization of the flood hazard mitigation improvements.

C.5.1 Methodology

The prioritization of the proposed flood hazard mitigation improvements included the following primary process steps:

- A Flood Severity Index ranking matrix was developed for the proposed Problem Area flood hazard mitigation improvement projects;
- A Flood Severity index ranking matrix was developed for the proposed road crossing flood hazard mitigation improvement projects;
- The proposed flood hazard mitigation improvement projects for the Problem Areas and the Road Crossings were combined into one ranking matrix for Tier I higher priority projects and for Tier II lower priority projects for the City of Georgetown & ETJ. Only Tier I is applied for all other jurisdictions.

C.5.2 Flood Severity Index Factors

Flood Severity Index factors were developed for the two major groupings of proposed flood hazard mitigation improvements:

Problem Areas (Flooded Structures)

- Public Safety: This factor considers if there are alternate evacuation routes available from the Problem Area in the event of 100-year event flooding and whether improvements to flooded evacuation routes will benefit the overall transportation system of the area.
- Flood Significance: This factor considers the number of structures flooded by the 100-year event and the frequency of structure flooding at the more frequent events (i.e. 10-year and 25-year events).
- Dependence on Other Projects: This factor considers if the effectiveness of the proposed improvement will depend on the development of other projects.
- Environment: This factor considers the environmental impact of the proposed improvement and the degree of environmental constraints on the development of the proposed improvement.
- Easement/O&M: This factor considers the impact of the relative costs and requirements of easement acquisition and of operations/maintenance of the proposed improvement.
- Benefit/Cost Ratio: This factor considers the ratio of benefit of the proposed improvement (i.e. reduction in flood damage costs) and the improvement costs as outlined in Section 4 of the main report.

Flooded Roadway Crossings

- Public Safety: This factor considers the functionality of the roadway and its impact on the transportation system (i.e. Local, Collector, Arterial) and if there is an alternative route if the roadway is flooded at the crossing.
- Flood Significance: This factor considers the frequency of the storm event at which the roadway crossing begins to be flooded and the number of structures flooded due to the insufficient channel conveyance at the crossing.
- Dependence on Other Projects: This factor considers if the effectiveness of the proposed improvement will depend on the development of other projects.
- Environment: This factor considers the environmental impact of the proposed improvement and the degree of environmental constraints on the development of the proposed improvement.
- Project Cost: This factor considers the total estimated cost of the project (excluding land acquisition cost).

These factors were assigned point values weighted based on the relative significance of each factor that were summed together based on the characteristics of each improvement. Tables C-4 and C-5 present each element and its respective point assignments.

C.5.3 Flood Severity Index and Priority Rankings

The Flood Severity Index was calculated for each proposed flood hazard mitigation improvement project, and based upon the resulting values, the proposed improvement projects were ranked in the order of highest to lowest priority. Table C-4 summarizes the Flood Severity Index point values and rankings for the Problem Area improvement projects, and Table C-5 summarizes the Flood Severity Index point values for the flooded roadway crossing improvement projects.

C.5.4 Tier I and Tier II Priority Rankings

The final step of ranking the priorities of the proposed flood hazard mitigation improvement projects involved combining all proposed improvement projects (both Problem Area projects and flooded roadway crossing projects) into a Tier I group and a Tier II group as outlined below.

C.5.4.1 Tier I Group

The Tier I group consists of the highest priority improvement projects per the jurisdictional areas below. All proposed Tier I projects are ranked from highest priority to lowest priority based upon the Flood Severity Index point values.

City of Georgetown

A total of 10 improvement projects (7 Problem Area improvement projects and 3 flooded roadway crossing improvement projects) for an estimated total cost of $20,000,000 are summarized on Table 7-1.

City of Leander

A total of 1 non-structural alternative (buy-outs within 1 Problem Area) for an estimated total cost of $2,385,000 was evaluated. However, due to low cost-effectiveness, this alternative is not recommended.

Williamson County
A total of 1 improvement project (1 flooded roadway crossing improvement project) for an estimated total cost of $4,900,000 is summarized on Table 7-1.

Burnet County
A total of 3 improvement projects (3 flooded roadway crossing improvement projects) for an estimated total cost of $10,200,000 are summarized on Table 7-1.

City of Liberty Hill
A total of 3 improvement projects (2 Problem Area improvement projects and 1 flooded roadway crossing improvement project) for an estimated total cost of $47,200,00 are summarized on Table 7-1.

C.5.4.2 Tier II Group

The Tier II group consists of all City of Georgetown jurisdiction projects that are not Tier I projects, which includes a total of 5 improvement projects (5 flooded roadway crossing improvement projects) for an estimated total cost of $30,800,000. Table 7-1 summarizes the Tier II proposed flood hazard mitigation improvement projects.

TABLES

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Table C-1. Summary of Significant Cost Factors/Unit Costs

Item	Unit	Unit Cost	Source	Notes
Channel Improvements				
Channel Preparation	AC	$5,500.00	TxDOT & City of Austin Bid Tabs	Includes clearing, grubbing, misc. concrete removal & demo
Channel Excavation, Plan Quantity	CY	$15.00	TxDOT & City of Austin Bid Tabs	Includes excavation, topsoil, seedbed preparation, seeding, and turf reinforcement mats
Class A Select Borrow, Plan Quantity	CY	$42.00	TxDOT & City of Austin Bid Tabs	If borrow is required
Embankment	CY	$25.00	TxDOT & City of Austin Bid Tabs	Placement/compaction (excludes borrow), topsoil, seedbed preparation, seeding, and turf reinforcement mats
Cofferdams & Dewatering	LS	$32,000.00	TxDOT & City of Austin Bid Tabs	
Angular Limestone Block Wall (w/o footing)	CY	$510.00	TxDOT & City of Austin Bid Tabs	Serves as floodwall and to be placed outside of residential lot property boundaries
Dry Rock Riprap (D50=24")	CY	$160.00	TxDOT & City of Austin Bid Tabs	Grade control structure or other erosion protection measures, assumed 1 for each channel improvement at downstream end of improvements
Limestone Block Footing	LF	$280.00	TxDOT & City of Austin Bid Tabs	Footing/pad for angular limestone block wall, includes swale adjacent to footing to convey localized runoff
Temporary Erosion Controls	LS	3% of construction subtotal	TxDOT & City of Austin Bid Tabs	Includes temporary erosion control measures, tree protection, stabilized construction entrance, and SWPPP; Approx. 3% of construction subtotal before mobilization costs
Permanent Erosion Control & Revegetation	SY	$14.00	TxDOT & City of Austin Bid Tabs	
Total Mobilization	LS	5% of construction subtotal	TxDOT & City of Austin Bid Tabs	Approx. 5% of construction subtotal with temporary erosion controls costs included
Barricades, Signs, & Traffic Control	LS	$10,000.00	TxDOT & City of Austin Bid Tabs	
Temporary Access Routes & Ramps	LS	$60,000.00	TxDOT & City of Austin Bid Tabs	
Contingencies	LS	25% of construction subtotal		
Engineering, Permitting, Administrative	LS	25% of construction subtotal		
Clear Span Bridge Improvements				
Bridge Deck, Piers, Foundations, Channel Improvements	SF	$86.10	TxDOT & City of Austin Bid Tabs	Bridge Deck Surface Area
Approach Fill, Retaining Walls, Utility Adjustments, HMAC Pavement	SF	$43.70	TxDOT & City of Austin Bid Tabs	HMAC Surface Area
Environmental Controls	SF	$3.05	TxDOT & City of Austin Bid Tabs	HMAC + Bridge Deck Impervious Cover Surface Area
Water Quality Treatment for Edwards Aquifer	SF	$0.95	TxDOT & City of Austin Bid Tabs	HMAC + Bridge Deck Impervious Cover Surface Area; In Recharge Zone
Traffic Controls	SF	$0.74	TxDOT & City of Austin Bid Tabs	HMAC + Bridge Deck Impervious Cover Surface Area
Mobilization/Demobilization	LS	5% of construction subtotal		5% of all construction costs excluding Mobilization/Demobilization
Contingencies	LS	25% of construction subtotal		
Engineering, Permitting, Administrative	LS	30% of construction subtotal		30% of all construction costs
Culvert Crossing Improvements				
Box Culvert (varies on size)	LF	Size Varying	TxDOT & City of Austin Bid Tabs	$70 per Perimeter Length x Number of Culverts x Width Span of Culverts
Approach Fill, Retaining Walls, Utility Adjustments, HMAC Pavement	SF	$27.90	TxDOT & City of Austin Bid Tabs	HMAC Surface Area
Environmental Controls	SF	$3.05	TxDOT & City of Austin Bid Tabs	HMAC + Bridge Deck Impervious Cover Surface Area
Water Quality Treatment for Edwards Aquifer	SF	$0.95	TxDOT & City of Austin Bid Tabs	HMAC + Bridge Deck Impervious Cover Surface Area; In Recharge Zone
Traffic Controls	SF	$0.74	TxDOT & City of Austin Bid Tabs	HMAC + Bridge Deck Impervious Cover Surface Area
Mobilization/Demobilization	LS	5% of construction subtotal		5% of all construction costs excluding Mobilization/Demobilization
Contingencies	LS	25% of construction subtotal		
Engineering, Permitting, Administrative	LS	30% of construction subtotal		30% of all construction costs

Table C-2. Summary of Crossing Concept Designs

Project ID	Jurisdiction	Existing Crossing	Improvement	Construction Cost	Total Cost
Berry Creek					
FM 971	Georgetown	300-ft Length Bridge	New Bridge: 490-ft Length x 72-ft Width with 2060-ft x 60-ft Wide Roadway	$12,065,000	$14,960,000
CR 245	Georgetown ETJ	180-ft Length Bridge	New Bridge: 800-ft Length x 72-ft Width with 1700-ft x 60-ft Wide Roadway	$13,155,000	$16,310,000
CR 241	Georgetown ETJ	155-ft Length Bridge	New Bridge: 700-ft Length x 72-ft Width with 1500-ft x 60-ft Wide Roadway	$11,555,000	$14,330,000
CR 152	Georgetown	200-ft Length Bridge	New Bridge: 700-ft Length x 72-ft Width with 400-ft x 60-ft Wide Roadway	$7,535,000	$9,345,000
CR 143 @ Dry Berry	Georgetown	Five 12-ft x 6-ft Culverts	New Bridge: 800-ft Length x 72-ft Width with 900-ft x 60-ft Wide Roadway	$10,300,000	$12,775,000
CR 234 @ Dry Berry	Georgetown ETJ	Eight 7-ft Arch Culverts	New Bridge: 450-ft Length x 72-ft Width with 710-ft x 60-ft Wide Roadway	$6,570,000	$8,150,000
Live Oak Trails @ Dry Berry	Georgetown ETJ	Four 8-ft x 4-ft Culverts	New Bridge: 400-ft Length x 72-ft Width with 75-ft x 60-ft Wide Roadway	$3,720,000	$4,615,000
CR 152 @ Dry Berry	Georgetown ETJ	400-ft Length Bridge	Existing Approach: Raise 600-ft x 60-ft Wide Roadway	$1,545,000	$1,915,000
CR 245 @ Cowan	Georgetown ETJ	Two 8-ft x 4-ft & Two 3-ft Arch Culverts	New Bridge: 350-ft Length x 72-ft Width with 800-ft x 60-ft Wide Roadway	$7,795,000	$9,665,000
Andice Road/RM 2338 @ Cowan	Georgetown ETJ	Eight 9-ft x 5-ft Culverts	New Culverts: Seven 9-ft x 7-ft Culverts with 113-ft x 60-ft Wide Roadway	$1,995,000	$2,475,000
Mankins Branch					
McShepherd Road/CR 100	Georgetown ETJ	Three 4-ft Arch Culverts	New Bridge: 200-ft Length x 72-ft Width with 550-ft x 60-ft Wide Roadway	$3,755,000	$4,655,000
Bell Gin Road/CR 104	Georgetown ETJ	One 48-in Dia. Culvert	New Culverts: Four 4-ft x 5-ft Culverts with 125-ft x 60-ft Wide Roadway	$860,000	$1,065,000
Hutto Road	Georgetown ETJ	Four 4.5-ft Arch Culverts	New Culverts: Four 5-ft x 4-ft Culverts with 272-ft x 60-ft Wide Roadway	$1,240,000	$1,540,000
Pecan Branch					
West Sequoia Spur	Georgetown ETJ	One 48-in Dia. Culvert	New Culverts: Four 5-ft Dia. Culverts with 175-ft x 60-ft Wide Roadway	$775,000	$1,305,000
Esperada Drive	Georgetown ETJ	One 3.25-ft & Three 5-ft Arch Culverts	New Culverts: Five 10-ft x 6-ft Box Culverts with 390-ft x 60-ft Wide Roadway	$1,650,000	$2,770,000
Serenada Drive	Georgetown ETJ	Two 3-ft & Three 5-ft Arch Culverts	New Culverts: Five 10-ft x 6-ft Box Culverts with 175-ft x 60-ft Wide Roadway	$1,205,000	$2,030,000
West Shady Hollow Drive	Georgetown ETJ	Four 4-ft Arch Culverts	New Culverts: Seven 10-ft x 6-ft Box Culverts with 255-ft x 60-ft Wide Roadway	$1,100,000	$1,850,000
West Golden Oaks Road	Georgetown ETJ	Three 5-ft Arch Culverts	New Culverts: Seven 10-ft x 6-ft Box Culverts with 390-ft x 60-ft Wide Roadway	$1,460,000	$2,455,000
North Austin Avenue	Georgetown	Three 8-ft x 8-ft Box Culvert	New (Added) Culverts: Six 8-ft x 8-ft Box Culverts with 675-ft x 60-ft Wide Roadway	$2,405,000	$4,040,000
CR 151	Georgetown	Five 6.4-ft Arch Culverts	New Culverts: Ten 10-ft x 8-ft Box Culverts with 825-ft x 60-ft Wide Roadway	$3,600,000	$6,050,000
NE Inner Loop	Georgetown	Six 6.4-ft Arch Culverts	New Culverts: Ten 10-ft x 6-ft Box Culverts with 360-ft x 60-ft Wide Roadway	$2,125,000	$3,570,000
CR 152	Georgetown	One 1.6-ft Arch Culvert	New Culverts: Ten 10-ft x 6-ft Box Culverts with 570-ft x 60-ft Wide Roadway	$2,865,000	$4,815,000
FM 971	Georgetown ETJ	Five 8-ft x 5-ft Box Culvert	New Culverts: Fifteen 10-ft x 10-ft Box Culverts with 850-ft x 60-ft Wide Roadway	$4,925,000	$8,270,000
Smith Branch					
CR 166	Georgetown ETJ	Two 3.2-ft Arch Culvert	New Culverts: Four 5-ft x 5-ft Box Culverts with 115-ft x 60-ft Wide Roadway	$395,000	$660,000
Madison Oaks Avenue	Georgetown	Four 10-ft x 6-ft Box Culverts	Existing Approach: Raise 290-ft x 60-ft Wide Roadway	$400,000	$670,000
S. Austin Avenue	Georgetown	Four 9-ft x 7-ft Box Culverts	Existing Approach: Raise 900-ft x 60-ft Wide Roadway	$1,835,000	$3,085,000
E. University Avenue	Georgetown	118-ft Length Bridge	New Bridge: 150-ft Length x 72-ft Width with 210-ft x 60-ft Wide Roadway	$1,635,000	$2,750,000
Smith Creek Road	Georgetown	4.6-ft x 8.1-ft Box Culvert	New Bridge: 150-ft Length x 72-ft Width with 1300-ft x 60-ft Wide Roadway	$4,945,000	$8,305,000

Table C-2. Summary of Crossing Concept Designs (continued)

Project ID	Jurisdiction	Existing Crossing	Improvement	Construction Cost	Total Cost
North Fork San Gabriel River					
CR 257	Williamson County	175-ft Length Bridge	New Bridge: 200-ft Length x 72-ft Width with 230-ft x 60-ft Wide Roadway	$2,560,000	$3,175,000
FM 2340	Burnet County	36-ft Length Bridge	New Culverts: Eight 9-ft x 7-ft Culverts with 372-ft x 60-ft Wide Roadway	$2,920,000	$3,625,000
CR 202	Burnet County	Two 24-in Dia. Culverts	New Bridge: 200-ft Length x 72-ft Width with 1100-ft x 60-ft Wide Roadway	$5,815,000	$7,210,000
FM 243	Burnet County	200-ft Length Bridge	New Bridge: 300-ft Length x 72-ft Width with 1600-ft x 60-ft Wide Roadway	$8,535,000	$10,580,000
CR 200	Burnet County	140-ft Length Bridge	New Bridge: 300-ft Length x 72-ft Width with 700-ft x 60-ft Wide Roadway	$5,165,000	$6,405,000
CR 203	Burnet County	One 9-in Dia. Culvert	New Bridge: 200-ft Length x 72-ft Width with 1025-ft x 60-ft Wide Roadway	$5,535,000	$6,860,000
RM 1174	Burnet County	250-ft Length Bridge	New Bridge: 300-ft Length x 72-ft Width with 600-ft x 60-ft Wide Roadway	$3,670,000	$4,550,000
RM 963	Burnet County	100-ft Length Bridge	New Bridge: 250-ft Length x 72-ft Width with 350-ft x 60-ft Wide Roadway	$3,435,000	$4,255,000
CR 258	Georgetown ETJ	70-ft Length Bridge	New Bridge: 200-ft Length x 72-ft Width with 1000-ft x 60-ft Wide Roadway	$5,440,000	$6,745,000
Middle Fork San Gabriel River					
Cedar Hollow Road	Georgetown ETJ	Four 4-ft Arch Culverts	New Culverts: Nine 12-ft x 10-ft Culverts with 690-ft x 60-ft Wide Roadway	$4,785,000	$5,930,000
Rancho Bueno Drive	Georgetown ETJ	Six 48-in Dia. Culverts	New Bridge: 90-ft Length x 72-ft Width with 230-ft x 60-ft Wide Roadway	$3,360,000	$4,165,000
Cross Creek Road	Georgetown ETJ	Four 60-in Dia. Culverts	New Bridge: 550-ft Length x 72-ft Width with 700-ft x 60-ft Wide Roadway	$7,390,000	$9,165,000
South Fork San Gabriel River					
CR 330B	Burnet County	Two 4-ft Dia. Culverts	New Bridge: 50-ft Length x 72-ft Width with 860-ft x 60-ft Wide Roadway	$1,565,000	$2,630,000
CR 323	Burnet County	60-ft Length Bridge	New Bridge: 100-ft Length x 72-ft Width with 560-ft x 60-ft Wide Roadway	$2,325,000	$3,910,000
FM 1869	Williamson County	210-ft Length Bridge	New Bridge: 300-ft Length x 72-ft Width with 315-ft x 60-ft Wide Roadway	$2,930,000	$4,920,000

Table C-3. Summary of Problem Area Mitigation Projects

Project ID	Jurisdiction	Issue to be Addressed	Description of Improvements	Type of Improvement			Estimated Benefit (Flood Risk Reduction)	Estimated Total Cost	Benefit / Cost Ratio
				Crossing	Channel	Detention			
Berry Creek									
BC01 (Cowan)	Georgetown	This problem area is located near Independence Creek Lane on Cowan Creek. Approximately 10 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 7,070 cubic yards of channel excavation. Overall the improvement extends 1,275 feet along Cowan Creek, a tributary to Berry Creek. It is anticipated that this specific project will remove all flooded structures from the 100-year floodplain.		X		$865,000	$935,000	0.92
BC02 (Berry)	Georgetown	The problem area is located along Berry Creek in between Dove Hollow Trail and Dawson Trail. Approximately 14 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 48,000 cubic yards of channel excavation. Overall the improvement extends 1,350 feet along Berry Creek. It is anticipated that this project will remove all flooded structures from the 100-year floodplain.		X		$9,725,000	$2,310,000	4.21
BC03 (Berry)	Georgetown	This problem area is located near Painted Bunting Lane and Great Frontier Drive along Berry Creek. Approximately 18 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 24,500 cubic yards of channel excavation. Overall the improvement extends 1,300 feet along Berry Creek with an additional 2,000 feet of berm. It is anticipated that this project will remove all flooded structures from the 100-year floodplain.		X		$6,735,000	$3,650,000	1.84
BC04 (Berry)	Georgetown	The problem area is located along Berry Creek near Crystal Springs Drive. Approximately 24 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 90,300 cubic yards of channel excavation. Overall the improvement extends 3,350 feet along Berry Creek. It is anticipated that the project will remove 19 flooded structures from the 100-year floodplain.		X		$3,120,000	$4,015,000	0.80
BC05 (Berry)	Georgetown	The problem area is located along Berry Creek near Trail Rider Way. Approximately 23 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 105,300 cubic yards of channel excavation. Overall the improvement extends 1,580 feet along Berry Creek. It is anticipated that the project will remove 17 flooded structures from the 100-year floodplain.		X		$3,910,000	$4,115,000	0.95
Pecan Branch									
PB01 (Pecan)	Georgetown ETJ	This problem area is located within the Golden Oaks Subdivision on Pecan Branch. Approximately 8 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves constructing a 100 ac-ft peak-shaving detention pond including an earthen lateral weir to divert flows into the detention pond and an outlet pipe with a flap gate to prevent low-flows from entering the pond. The purpose of the pond is to significantly reduce downstream peak flow rates within the Golden Oaks Subdivision during events greater than the 25-year storm event.			X	$565,000	$8,900,000	0.06

Table C-3. Summary of Problem Area Mitigation Projects (continued)

Project ID	Jurisdiction	Issue to be Addressed	Description of Improvements	Type of Improvement			Estimated Benefit (Flood Risk Reduction)	Estimated Total Cost	Benefit / Cost Ratio
				Crossing	Channel	Detention			
PB02 (Pecan)	Georgetown	The existing crossings at the I.H. 35 Southbound Frontage (3 - 10-ft x 8-ft box culverts) and Main Lanes (3 - 10-ft x 8-ft box culverts) do not fully convey the Existing Conditions 100-year storm event without flow overtopping the roadway. In the past, this flooded crossing has resulted in loss of life, and therefore, is considered a significant flood problem area.	This project would upgrade the existing Main Lanes I.H. 35 crossing to convey the Existing Conditions 100-year storm event without overtopping the roadway. The proposed improvement would upgrade the South Bound crossing (5 - 10-ft x 8-ft reinforced box culverts) and the Main Lane crossing (6 - 10-ft x 8-ft reinforced box culverts). In order to prevent downstream hydrologic impacts, this alternative would require mitigation of lost flood volume storage upstream of the improved crossing. Therefore, the 100 ac-ft peak shaving detention pond included in PB01 is proposed as part of this alternative	X		X	$1,135,000	$10,825,000	0.10
PB03 (Pecan)	Georgetown ETJ	This problem area is located within the Serenada Subdivision on Pecan Branch. Approximately 8 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves channel clearing and maintenance for a 75 ft wide, 3,550 ft long section of Pecan Branch between Val Verde Drive and Serenda Drive. The purpose of this improvement is to provide improved channel capacity and flood protection thereby reducing flooding of residential structures along the channel. While this project is listed as a high-priority project, permanent easement requirements within residential lots and potential environmental impacts may make this project less desirable.		X		$5,755,000	$410,000	14.04*
PB04 (Pecan)	Georgetown	This problem area is located within the Reata Trails Subdivision between Canyon Road and Pecan Branch. Approximately 13 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves 1,200 feet of channel improvements including 8,175 cubic yards of excavation along the west bank of Pecan Branch behind Canyon Road. The purpose of this improvement is to provide sufficient channel capacity and flood protection for the design 100-year Existing Conditions flood event to be conveyed through the channel in this area without flooding the residential structures.		X		$5,085,000	$815,000	6.24
PB05 (Pecan)	Georgetown	This problem area is located along Lonnie Thomas Road on Pecan Branch. Approximately 4 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves channel clearing and maintenance for a 10-acre area south of Lonnie Thomas Road and west of CR 152. Permanent easements within existing residential properties must be obtained in order to maintain the efficiency and improved hydraulic capacity of the channel. The purpose of this improvement is to provide improved channel capacity and flood protection thereby reducing flooding of residential structures along the channel.		X		$120,000	$295,000	0.41

Table C-3. Summary of Problem Area Mitigation Projects (continued)

Project ID	Jurisdiction	Issue to be Addressed	Description of Improvements	Type of Improvement			Estimated Benefit (Flood Risk Reduction)	Estimated Total Cost	Benefit / Cost Ratio
				Crossing	Channel	Detention			
Smith Branch									
SB01 (Smith)	Georgetown	This problem area is located near the West Fork confluence with Smith Branch, primarily along Quail Valley Drive. Approximately 6 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves channel improvements including 14,500 cubic yards of excavation near the West Fork confluence of Smith Branch and the addition of four (4) 10' x 4' concrete box culverts at the Quail Valley Drive crossing. The purpose of this project is to improve channel capacity and hydraulic efficiency of the West Fork confluence to minimize overtopping and flooding of residential structures in the area.	X	X		$1,905,000	$1,885,000	1.01
SB02 (Smith)	Georgetown ETJ	This problem area is located within the Rabbit Hollow Subdivision along the main stem of Smith Branch. Approximately 6 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves the buy-out of flood prone structures within the low-lying problem area. No cost-effective structural alternatives were identified in this study; however, potential structural alternatives associated with removal of the existing FM1460 crossing that may benefit Rabbit Hollow and the WCJDC located a half-mile downstream should be evaluated in the future.				$2,615,000	$765,000	3.42
North Fork San Gabriel River									
NF01 (North Fork)	Liberty Hill	The problem area is located along the North Fork San Gabriel River near River Road. Approximately 12 structures are flooded along this reach in the Existing Conditions 100-year floodplain.	The project includes approximately 731,950 cubic yards of channel excavation. Overall the improvement extends 4,580 feet along the North Fork River. It is anticipated that the project will remove 11 flooded structures from the 100-year floodplain.		X		$1,195,000	$21,775,000	0.05
NF02, NF03 (North Fork)	Liberty Hill	The problem area is located along the North Fork San Gabriel River near the CR 256 and CR 257 intersection. There are two areas within the project area that contain approximately 10 flooded structures in the Existing Conditions 100-year storm event.	This project is a combined project (NF02 & NF03) that will address flooding issues for the two problem areas. The project includes approximately 820,330 cubic yards of channel excavation. Overall the improvement extends 3,090 feet along the North Fork River. It is anticipated that the project will remove 5 flooded structures from the 100-year floodplain.		X		$635,000	$22,275,000	0.03
South Fork San Gabriel River									
SFSG01 (South Fork)	Leander ETJ	This problem area is located within the High Gabriel & South San Gabriel Ranches Subdivisions along the South Fork San Gabriel River. Approximately 9 structures are flooded along this reach in the Existing Conditions 100-year storm event.	This project involves the buy-out of flood prone structures within the low-lying problem area. No cost-effective structural alternatives were identified in this study.				$800,000	$2,385,000	0.34

Table C-3. Summary of Problem Area Mitigation Projects (continued)

Project ID	Jurisdiction	Issue to be Addressed	Description of Improvements	Type of Improvement			Estimated Benefit (Flood Risk Reduction)	Estimated Total Cost	Benefit / Cost Ratio
				Crossing	Channel	Detention			
San Gabriel River									
SG01 (San Gabriel)	Georgetown ETJ	The problem area is located along the San Gabriel River at CR 103. Approximately 4 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 227,570 cubic yards of channel excavation. Overall the improvement would extend 5,310 feet along the San Gabriel. It is anticipated that the project will remove 0 flooded structures from the 100-year floodplain.		**X**		$3,810,000	$8,795,000	0.43
SG02 (San Gabriel)	Georgetown ETJ	The problem area is located along the San Gabriel River between McShepherd Road and SH 29. Approximately 13 structures are flooded along this reach in the Existing Conditions 100-year storm event.	The project includes approximately 279,670 cubic yards of channel excavation. Overall the improvement extends 4,070 feet along the San Gabriel. It is anticipated that the project will remove 6 flooded structures from the 100-year floodplain.		**X**		$3,020,000	$11,470,000	0.26

**Easement and O&M costs are not included in total project cost and may significantly affect Benefit/Cost Ration and overall feasibility of project. Additional cost analysis is recommended as part of future studies.*

Table C-4. Flood Severity Index – Problem Areas (Berry Creek)

	Elements	Description	Points		Berry Creek at Painted Bunting Lane	Berry Creek at Trail Rider Way	Berry Creek at Dove Hollow Trail/Dawson Trail	Berry Creek at Crystal Spring Drive	Cowan Creek at Independence Creek Lane
					BC03	BC05	BC02	BC04	BC01
1.	Public Safety	a) All evacuation routes impassible due to flooding during 100-year fully developed conditions event	Yes	10 points	0	0	0	0	0
			No (streets are passible)	0 point					
		b) At least one evacuation street impassible due to flooding during 100-year fully developed conditions event	Yes	5 point	5	5	5	5	5
			No (streets are passible)	0 points					
		c) Improvements of flooded streets would benefit overall transportation system of the area	Yes	5 points	0	0	0	0	0
			No	0 point					
2.	Flood Significance	a) Number of structures flooded from the 100-year existing conditions event	Each structure within 100-year floodplain.	1 point	15	11	14	8	6
		b) Structure flooding frequencies	10-year fully developed	10 points	0	0	0	0	0
			25-year fully developed	5 points					
			100-year fully developed	0 point					
3.	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10	10	10	10
			No	10 points					
4.	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5	5	5
			Medium	5 points					
			Low	10 points					
5.	Easement/O&M	Easement and O&M costs and requirements associated with project	Less than 1 acre	10 points	-10	-20	-10	-20	0
			Less than 5 acres	-0 points					
			Less than 10 acres	-10 points					
			More than 10 acres	-20 points					
6.	Benefit/Cost Ratio	Ratio of benefit (damage reduction) and project costs	$BCR^{0.2}$ x 30 points		34	30	40	29	30
			Total Severity Index		**59**	**41**	**64**	**37**	**56**

Footnotes:
*Number of structures does not include RV Trailers in the mobile home park.
**Potentially one or two business structures are in this problem area.
***Benefit/Cost Ratio based on recommended non-structural alternative.
1) Manufactured homes are considered as permanent structures, but Mobile Homes/RV Trailers are not considered as permanent structures.

Table C-4. Flood Severity Index – Problem Areas (Pecan Branch)

	Elements	Description	Points		Golden Oaks Subdivision at Pecan Branch	IH35 at Pecan Branch	Serenada Subdivision at Pecan Branch	Canyon Rd at Pecan Branch	Lonnie Thomas Dr at Pecan Branch
					PB01	PB02	PB03	PB04	PB05
1.	Public Safety	a) All evacuation routes impassible due to flooding during 100-year fully developed conditions event	Yes	10 points	10	10	0	0	0
			No (streets are passible)	0 point					
		b) At least one evacuation street impassible due to flooding during 100-year fully developed conditions event	Yes	5 point	5	5	0	0	5
			No (streets are passible)	0 points					
		c) Improvements of flooded streets would benefit overall transportation system of the area	Yes	5 points	5	5	0	0	0
			No	0 point					
2.	Flood Significance	a) Number of structures flooded from the 100-year existing conditions event	Each structure within 100-year floodplain.	1 point	8	0	8	13	4
		b) Structure flooding frequencies	10-year fully developed	10 points	10	0	5	10	10
			25-year fully developed	5 points					
			100-year fully developed	0 point					
3.	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10	10	10	10
			No	10 points					
4.	Environment	Environmental Impact of the proposed improvements	High	0 points	0	5	0	0	5
			Medium	5 points					
			Low	10 points					
5.	Easement/O&M	Easement and O&M costs and requirements associated with project	Less than 1 acre	10 points	-20	-20	-20	0	-20
			Less than 5 acres	-0 points					
			Less than 10 acres	-10 points					
			More than 10 acres	-20 points					
6.	Benefit/Cost Ratio	Ratio of benefit (damage reduction) and project costs	$BCR^{0.2}$ x 30 points		17	19	51	43	25
				Total Severity Indez	**45**	**34**	**54**	**76**	**39**

Footnotes:
*Number of structures does not include RV Trailers in the mobile home park.
**Potentially one or two business structures are in this problem area.
***Benefit/Cost Ratio based on recommended non-structural alternative.
1) Manufactured homes are considered as permanent structures, but Mobile Homes/RV Trailers are not considered as permanent structures.

Table C-4. Flood Severity Index – Problem Areas (Smith Branch)

Elements		Description	Points		West Fork Confluence at Smith Branch	Rabbit Hollow Subdivision at Smith Branch
					SB01	SB02
1.	Public Safety	a) All evacuation routes impassible due to flooding during 100-year fully developed conditions event	Yes	10 points	0	0
			No (streets are passible)	0 point		
		b) At least one evacuation street impassible due to flooding during 100-year fully developed conditions event	Yes	5 point	5	5
			No (streets are passible)	0 points		
		c) Improvements of flooded streets would benefit overall transportation system of the area	Yes	5 points	5	0
			No	0 point		
2.	Flood Significance	a) Number of structures flooded from the 100-year existing conditions event	Each structure within 100-year floodplain.	1 point	6	6
		b) Structure flooding frequencies	10-year fully developed	10 points	5	5
			25-year fully developed	5 points		
			100-year fully developed	0 point		
3.	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10
			No	10 points		
4.	Environment	Environmental Impact of the proposed improvements	High	0 points	5	10
			Medium	5 points		
			Low	10 points		
5.	Easement/O&M	Easement and O&M costs and requirements associated with project	Less than 1 acre	10 points	10	-20
			Less than 5 acres	-0 points		
			Less than 10 acres	-10 points		
			More than 10 acres	-20 points		
6.	Benefit/Cost Ratio	Ratio of benefit (damage reduction) and project costs	$BCR^{0.2}$ x 30 points		30	38
				Total Severity Index	**76**	**54**

Footnotes:
*Number of structures does not include RV Trailers in the mobile home park.
**Potentially one or two business structures are in this problem area.
***Benefit/Cost Ratio based on recommended non-structural alternative.
1) Manufactured homes are considered as permanent structures, but Mobile Homes/RV Trailers are not considered as permanent structures.

Table C-4. Flood Severity Index – Problem Areas
(North Fork San Gabriel River)

	Elements	Description	Points		North Fork at River Road	North Fork at CR 256/CR 257
					NF01	NF02
1.	Public Safety	a) All evacuation routes impassible due to flooding during 100-year fully developed conditions event	Yes	10 points	0	0
			No (streets are passible)	0 point		
		b) At least one evacuation street impassible due to flooding during 100-year fully developed conditions event	Yes	5 point	5	0
			No (streets are passible)	0 points		
		c) Improvements of flooded streets would benefit overall transportation system of the area	Yes	5 points	0	5
			No	0 point		
2.	Flood Significance	a) Number of structures flooded from the 100-year existing conditions event	Each structure within 100-year floodplain.	1 point	9	6
		b) Structure flooding frequencies	10-year fully developed	10 points	0	0
			25-year fully developed	5 points		
			100-year fully developed	0 point		
3.	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10
			No	10 points		
4.	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5
			Medium	5 points		
			Low	10 points		
5.	Easement/O&M	Easement and O&M costs and requirements associated with project	Less than 1 acre	10 points	-20	-20
			Less than 5 acres	-0 points		
			Less than 10 acres	-10 points		
			More than 10 acres	-20 points		
6.	Benefit/Cost Ratio	Ratio of benefit (damage reduction) and project costs	$BCR^{0.2}$ x 30 points		21	21
				Total Severity Index	**30**	**27**

Footnotes:
*Number of structures does not include RV Trailers in the mobile home park.
**Potentially one or two business structures are in this problem area.
***Benefit/Cost Ratio based on recommended non-structural alternative.
1) Manufactured homes are considered as permanent structures, but Mobile Homes/RV Trailers are not considered as permanent structures.

Table C-4. Flood Severity Index – Problem Areas
(South Fork San Gabriel River)

	Elements	Description	Points		High Gabriel / S. San Gabriel Ranches at South Fork San Gabriel
					SFSG01
1.	Public Safety	a) All evacuation routes impassible due to flooding during 100-year fully developed conditions event	Yes	10 points	0
			No (streets are passible)	0 point	
		b) At least one evacuation street impassible due to flooding during 100-year fully developed conditions event	Yes	5 point	0
			No (streets are passible)	0 points	
		c) Improvements of flooded streets would benefit overall transportation system of the area	Yes	5 points	0
			No	0 point	
2.	Flood Significance	a) Number of structures flooded from the 100-year existing conditions event	Each structure within 100-year floodplain.	1 point	9
		b) Structure flooding frequencies	10-year fully developed	10 points	0
			25-year fully developed	5 points	
			100-year fully developed	0 point	
3.	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10
			No	10 points	
4.	Environment	Environmental Impact of the proposed improvements	High	0 points	10
			Medium	5 points	
			Low	10 points	
5.	Easement/O&M	Easement and O&M costs and requirements associated with project	Less than 1 acre	10 points	-20
			Less than 5 acres	-0 points	
			Less than 10 acres	-10 points	
			More than 10 acres	-20 points	
6.	Benefit/Cost Ratio	Ratio of benefit (damage reduction) and project costs	$BCR^{0.2}$ x 30 points		24
				Total Severity Index	**33**

Footnotes:
*Number of structures does not include RV Trailers in the mobile home park.
**Potentially one or two business structures are in this problem area.
***Benefit/Cost Ratio based on recommended non-structural alternative.
1) Manufactured homes are considered as permanent structures, but Mobile Homes/RV Trailers are not considered as permanent structures.

Table C-4. Flood Severity Index – Problem Areas
(San Gabriel River)

	Elements	Description	Points		San Gabriel River at CR 103	San Gabriel River at McShepherd Road
					SG01	SG02
1.	Public Safety	a) All evacuation routes impassible due to flooding during 100-year fully developed conditions event	Yes	10 points	0	0
			No (streets are passible)	0 point		
		b) At least one evacuation street impassible due to flooding during 100-year fully developed conditions event	Yes	5 point	0	5
			No (streets are passible)	0 points		
		c) Improvements of flooded streets would benefit overall transportation system of the area	Yes	5 points	0	0
			No	0 point		
2.	Flood Significance	a) Number of structures flooded from the 100-year existing conditions event	Each structure within 100-year floodplain.	1 point	10	16
		b) Structure flooding frequencies	10-year fully developed	10 points	5	0
			25-year fully developed	5 points		
			100-year fully developed	0 point		
3.	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10
			No	10 points		
4.	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5
			Medium	5 points		
			Low	10 points		
5.	Easement/O&M	Easement and O&M costs and requirements associated with project	Less than 1 acre	10 points	-20	-20
			Less than 5 acres	-0 points		
			Less than 10 acres	-10 points		
			More than 10 acres	-20 points		
6.	Benefit/Cost Ratio	Ratio of benefit (damage reduction) and project costs	$BCR^{0.2}$ x 30 points		25	24
				Total Severity Index	**35**	**40**

Footnotes:
*Number of structures does not include RV Trailers in the mobile home park.
**Potentially one or two business structures are in this problem area.
***Benefit/Cost Ratio based on recommended non-structural alternative.
1) Manufactured homes are considered as permanent structures, but Mobile Homes/RV Trailers are not considered as permanent structures.

Table C-5. Flood Severity Index – Roadway Crossings
(Berry Creek)

	Elements	Description	Points		FM 971 @ Berry Creek	CR 152 @ Berry Creek	CR 245 @ Berry Creek	CR 241 @ Berry Creek	CR 152 @ Dry Berry Creek	CR 143 @ Dry Berry Creek	CR 234 @ Dry Berry Creek	Live Oak Trl. @ Dry Berry Creek	CR 245 @ Cowan Creek	Andice Rd./RM 2338 @ Cowan Creek
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	20	10	10	10	10	10	10	0	10	10
			Collector	10 points										
			Arterial	20 points										
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	10	0	10	10	0	10	10	10	0	0
			No	10 points										
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	10	20	20	20	0	20	20	20	20	5
			10-year fully developed	10 points										
			25-year fully developed	5 points										
			100-year fully developed	0 points										
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	0	0	0	0	0	0	12	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	0	10	10	0	10	10	10	10	0
			No	10 points										
4	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5	5	5	5	5	5	5	5
			Medium	5 points										
			Low	10 points										
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	-10	-10	-10	-10	10	-10	-10	0	-10	10
			Medium (>$3M)	0 points										
			Low (<$3M)	10 points										
				Total Points	45	25	45	45	25	45	45	57	35	30
				Total Cost	$14,960,000	$9,345,000	$16,310,000	$14,330,000	$1,915,000	$12,775,000	$8,150,000	$4,615,000	$9,665,000	$2,475,000

Table C-5. Flood Severity Index – Roadway Crossings (Mankins Branch)

	Elements	Description	Points		McShepherd Rd./CR 100 @ Mankins Branch	Bell Gin Rd./CR 104 @ Mankins Branch	Hutto Road @ Mankins Branch
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	0	10	10
			Collector	10 points			
			Arterial	20 points			
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	10	0	0
			No	10 points			
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	20	20	20
			10-year fully developed	10 points			
			25-year fully developed	5 points			
			100-year fully developed	0 points			
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	0	0
			No	10 points			
4	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5
			Medium	5 points			
			Low	10 points			
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	0	10	10
			Medium (>$3M)	0 points			
			Low (<$3M)	10 points			
				Total Points	45	45	45
				Total Cost	$4,655,000	$1,065,000	$1,535,000

Table C-5. Flood Severity Index – Roadway Crossings (Pecan Branch)

	Elements	Description	Points		W Sequoia Spur @ Pecan Branch	Esperada Dr. @ Pecan Branch	Serenada Dr. @ Pecan Branch	W Shady Hollow Dr. @ Pecan Branch	W Golden Oaks Rd. @ Pecan Branch	N Austin Ave. @ Pecan Branch	CR 151 @ Pecan Branch	NE Inner Loop @ Pecan Branch	CR 152 @ Pecan Branch	FM 971 @ Pecan Branch
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	10	10	10	0	0	20	10	20	10	20
			Collector	10 points										
			Arterial	20 points										
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	0	0	0	10	10	0	0	0	0	10
			No	10 points										
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	20	20	20	20	20	20	20	5	20	20
			10-year fully developed	10 points										
			25-year fully developed	5 points										
			100-year fully developed	0 points										
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	4	8	0	0	0	0	0	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	0	0	0	0	0	10	10	10	10	10
			No	10 points										
4	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5	5	5	5	5	5	5	5
			Medium	5 points										
			Low	10 points										
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	10	10	10	10	10	0	-10	0	0	-10
			Medium (>$3M)	0 points										
			Low (<$3M)	10 points										
				Total Points	45	49	53	45	45	55	35	40	45	55
				Total Cost	$1,305,000	$2,770,000	$2,030,000	$1,850,000	$2,455,000	$4,040,000	$6,050,000	$3,570,000	$4,815,000	$8,270,000

Table C-5. Flood Severity Index – Roadway Crossings (Smith Branch)

	Elements	Description	Points		CR 166 @ Smith Branch	University/SH 29 @ Smith Branch	Smith Creek Rd. @ Smith Branch	Madison Oaks Ave. @ Smith Branch	S Austin Ave. @ Smith Branch
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	0	20	10	0	20
			Collector	10 points					
			Arterial	20 points					
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	10	0	0	10	0
			No	10 points					
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	20	5	20	10	5
			10-year fully developed	10 points					
			25-year fully developed	5 points					
			100-year fully developed	0 points					
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	0	0	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10	10	10	10
			No	10 points					
4	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5	5	5
			Medium	5 points					
			Low	10 points					
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	10	10	0	10	-10
			Medium (>$3M)	0 points					
			Low (<$3M)	10 points					
				Total Points	55	50	45	45	30
				Total Cost	$660,000	$670,000	$3,085,000	$2,750,000	$8,305,000

Table C-5. Flood Severity Index – Roadway Crossings (North Fork San Gabriel River)

	Elements	Description	Points		CR 258 @ North Fork	CR 257 @ North Fork	FM 243 @ North Fork	CR 200 @ North Fork	RM 1174 @ North Fork	RM 963 @ North Fork	CR 202 @ North Fork	CR 203 @ North Fork	FM 2340 @ North Fork
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	0	10	10	0	10	10	0	0	10
			Collector	10 points									
			Arterial	20 points									
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	0	10	10	10	10	10	10	10	10
			No	10 points									
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	20	10	10	20	5	5	20	20	20
			10-year fully developed	10 points									
			25-year fully developed	5 points									
			100-year fully developed	0 points									
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	28	0	0	0	0	3	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	0	10	10	10	10	0	10	10	10
			No	10 points									
4	Environment	Environmental Impact of the proposed improvements	High	0 points	0	5	5	5	5	5	5	5	5
			Medium	5 points									
			Low	10 points									
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	-10	0	-10	-10	0	0	-10	-10	0
			Medium (>$3M)	0 points									
			Low (<$3M)	10 points									
				Total Points	10	73	35	35	40	30	38	35	55
				Total Cost	$6,745,000	$3,175,000	$10,580,000	$6,405,000	$4,550,000	$4,255,000	$7,210,000	$6,860,000	$3,625,000

Table C-5. Flood Severity Index – Roadway Crossings (Middle Fork San Gabriel River)

	Elements	Description	Points		Rancho Bueno Dr. @ Middle Fork	Cedar Hollow Rd. @ Middle Fork	Cross Creek Rd. @ Middle Fork
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	0	0	0
			Collector	10 points			
			Arterial	20 points			
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	10	10	10
			No	10 points			
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	20	20	20
			10-year fully developed	10 points			
			25-year fully developed	5 points			
			100-year fully developed	0 points			
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10	10
			No	10 points			
4	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5
			Medium	5 points			
			Low	10 points			
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	0	-10	-10
			Medium (>$3M)	0 points			
			Low (<$3M)	10 points			
				Total Points	45	35	35
				Total Cost	$4,165,000	$5,930,000	$9,165,000

Table C-5. Flood Severity Index – Roadway Crossings (South Fork San Gabriel River)

	Elements	Description	Points		CR 330B @ South Fork	CR 323 @ South Fork	FM 1869 @ South Fork
1	Public Safety	a. Flooded Street Classifications (effects on transportation system)	Local	0 points	0	10	20
			Collector	10 points			
			Arterial	20 points			
		b. Is alternative route to go around flooded creek crossing readily available?	Yes	0 points	10	0	0
			No	10 points			
2	Flood Significance	a. Roadway flooding frequencies (overtops roadway)	5-year fully developed	20 points	20	20	20
			10-year fully developed	10 points			
			25-year fully developed	5 points			
			100-year fully developed	0 points			
		b. Number of structures flooded due to roadway crossing inadequacy	Each Structure within 100-year fully developed condition floodplain	1 point	0	0	0
3	Dependence on Other Projects	Improvements depend on other projects to be fully effective	Yes	0 points	10	10	10
			No	10 points			
4	Environment	Environmental Impact of the proposed improvements	High	0 points	5	5	5
			Medium	5 points			
			Low	10 points			
5	Project Cost	Total Cost of Project including Construction, Eng, and Admin	High (>$5M)	-10 points	10	0	0
			Medium (>$3M)	0 points			
			Low (<$3M)	10 points			
				Total Points	55	45	55
				Total Cost	$2,630,000	$3,910,000	$4,920,000

APPENDIX D
ENVIRONMENTAL CONSTRAINTS

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Tables

Figures

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Tables

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Table D1 Environmental Constraints

	Resource / Regulating Entity (or Policy)	Database Findings	Applicable Regulations & Following Steps	Associated Figure(s) / Attachments	Crossings or Proposed Project Locations Details[1]
Water Resources	**Edwards Aquifer** / Texas Commission on Environmental Quality (TCEQ)	TCEQ Edwards Aquifer digital files were reviewed. Portions of the Study Area are within the Edwards Aquifer Contributing, Edwards Aquifer Recharge, and Edwards Aquifer Transition Zones. The western and eastern most Study Area extents are outside of the Edwards Aquifer Zones.	• TCEQ regulates activities that have the potential to pollute within the Edwards Aquifer. • Comply with TCEQ Edwards Aquifer Rules and if deemed necessary, perform a Geological Assessment and Edwards Aquifer Protection Plan. • Comply with local city ordinances if applicable: ➢ City of Georgetown Environmental Protection Provisions for Impervious Cover (Chapter 11 of the Unified Development Code). ➢ Comply with City of Georgetown Edwards Aquifer Recharge Zone Water Quality Ordinance (2013-59).	Edwards Aquifer Map	The following are located within the Edwards Aquifer Contributing Zone: D7, D8, D9, D10, D18, D19, S24, CI-7, and CI-8. The following are located within the Edwards Aquifer Recharge Zone: D1, D2, D3, D4, D5, D6, D15, D16, D17, S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S14, S15, S16, S17, S18, S19, and S20. The following are located within the Edwards Aquifer Transition Zone: D12, D13, D14. The following are not located within any mapped Edwards Aquifer zone: D11, D20, D21, D22, D23, D24, D25, D26, S21, S22, S23, CI-9, CI-10, CI-11, and CI-12.
	Jurisdictional Waters of the U.S. / U.S. Army Corps of Engineers (USACE)	Data from the National Hydrography Dataset (NHD) and the Texas Water Development Board (TWDB) were reviewed to identify surface waters within the study area. The major streams consist of: • Berry Creek • North Fork San Gabriel River • Middle Fork San Gabriel River • South Fork San Gabriel River • San Gabriel River mainstem. Tributaries of Berry Creek include: • Cowan Creek, • Dry Berry Creek, • Jennings Branch, and • Pecan Branch. Tributaries of the San Gabriel River mainstem include: • Mankins Branch • Smith Branch • West Fork Smith Branch	• The USACE regulates activities within jurisdictional waters, such as streams, rivers, and lakes. • Conduct a site survey to identify any USACE regulated water features, and delineate boundaries. • Follow USACE permitting procedures under Section 404 of the Clean Water Act (CWA), if applicable. • Depending on the nature of activity, activities that result in the placement of fill within waters of the U.S. under ½-acre or below 300 linear feet are generally authorized under a nationwide permit. A pre-construction notification and compensatory mitigation may be required. Impacts to waters of the U.S. above these thresholds may require an individual permit.	Water Feature & FEMA Floodplain Map	All Doucet crossing improvement locations, Doucet channel improvement locations, Scheibe problem crossings, and Scheibe mitigation alternative locations will be subject to Section 404 regulations if work is proposed within the ordinary high water mark (OHWM) of waters of the United States.
	Floodplains / Federal Emergency Management Agency (FEMA)	Digital data derived from FEMA Flood Insurance Rate Maps (FIRM) were reviewed. Floodplains are mapped along nearly all of the named tributaries as well as numerous unnamed tributaries.	• Comply with FEMA floodplain regulations and local ordinances, and coordinate with the local floodplain administrator.	Water Feature & FEMA Floodplain Map	Nearly all Doucet crossing improvement locations, Doucet channel improvement locations, Scheibe problem crossings, and Scheibe mitigation alternative locations are located within the 100-year floodplain (Zone A or Zone AE), with the exception of Doucet crossing improvements D13 and D14.

	Wetlands / USACE, Texas Parks & Wildlife Department (TPWD), U.S. Fish & Wildlife Service (USFWS)	The USFWS National Wetland Inventory (NWI) was utilized to identify mapped wetlands. The Study Area contains wetlands located primarily along surface waters and in floodplains. The NWI is utilized only as a general guide to the potential location of wetlands and does not substitute for site surveys to identify and delineate wetlands regulated under Section 404.	• The USACE regulates activities within jurisdictional waters, including wetlands. • Conduct a site survey to identify any USACE regulated wetlands, and delineate boundaries. • Follow USACE permitting procedures under Section 404 of the CWA, if applicable.	Water Feature & FEMA Floodplain Map	The following locations are located within or within 1,500 feet of a mapped feature on the NWI map: D18, D21, D23, S23, S24, CI-5, CI-9, CI-10, CI-12, PB02, PB04, and PB05.
	Navigable Waters / Sections 9 & 10 of the Rivers and Harbors Act per United States Coast Guard (USCG) and USACE.	The USACE list of *Navigable Waters of the United States in the Fort Worth, Albuquerque, and Tulsa Districts within the State of Texas* (1999) was reviewed. No navigable waters are located within the Study Area.	No applicable regulations or following steps.	None	None
	Impaired Assessment Units / Section 303(d) of the Clean Water Act (CWA)	The *2014 Texas Integrated Report - 303(d) List* on surface water quality was reviewed in conjunction with the 2014 TCEQ geospatial data to determine if any impaired assessment units occur within the Study Area. The North Fork of the San Gabriel River, Segment ID 1248, is listed with *Category 5b* and *5c* status. The listed parameters are chloride and total dissolved solids. Mankins Branch, Segment ID 1248C, is listed as a *Category 5b* segment. The listed parameter is bacteria.	• Comply with Sections 303(d) of the CWA. • Issuance of permits to discharge into 303(d)-listed water bodies is described in the TCEQ regulatory guidance document *Procedures to Implement the Texas Surface Water Quality Standards* (January 2003, RG-194).	None	The following are located directly on an impaired stream segment: D11, CI-9, CI-10, CI-11, and CI-12.
Species	**Karst Zone /** USFWS	The USFWS karst zone data were utilized to determine if the Study Area is within one of the four karst zones. The USFWS karst zones are used to determine the likelihood of an area to contain rare cave fauna: ➢ Zone 1: Areas known to contain rare cave fauna. ➢ Zone 2: Areas with a high probability of containing rare cave fauna. ➢ Zone 3: Areas that probably do not contain rare cave fauna. ➢ Zone 4: Areas which do not contain rare cave fauna. A significant portion of the Study Area is located within Zones 1 and 2, centered around the western part of the City of Georgetown. Two portions of the project, east of IH-35 and a western portion of the Study Area in Burnet County, are not within Zones 1 through 4.	• The Endangered Species Act (ESA) regulates for the protection of habitat and species. • Based on the report findings and a review of aerial photography, there is a potential for Golden-cheeked Warbler and Black-capped Vireo habitat. • A site visit, conducted by a qualified biologist, should occur to determine if habitat for listed birds is present. • In Williamson County, the RHCP provides umbrella authorization for activities that may affect the black-capped vireo and golden-cheeked warbler under an incidental take permit, provided that certain conservation and management actions are implemented. • A Geological Assessment and/or habitat survey may be necessary to determine whether or not habitat for listed species is present and to determine if karst invertebrates are present within the Study Area. • In Williamson County, the RHCP provides umbrella authorization for activities under an incidental take permit, provided that certain conservation and management actions are implemented. This authorized take applies to the Bone Cave Harvestman, and Coffin Cave Mold Beetle. The incidental take permit does	USFWS Karst Zone Map	The following are located within Karst Zone 1 (areas known to contain rare cave fauna): D15, D17, S1, S2, S3, S4, S6, S16, CI-1, CI-2, CI-3, CI-5, CI-6, PB01, PB03, and PB04. The following is located within Karst Zone 2 (areas with a high probability of containing rare cave fauna): D16. The following are located within Karst Zone 3 (areas that probably do not contain rare cave fauna): D5, D6, D7, D8, D9, S15, S17, S18, S20, CI-4, SB01a, SB01b, SB01c, and SB03. The following are located within Karst Zone 4 (areas which do not contain rare cave fauna) or are located outside of the mapped karst zones: D1, D2, D3, D4, D10, D11, D12, D13, D14, D18, D19, D20, D21, D22, D23, D24, D25, D26, CI-7, CI-8, CI-9, CI-10, CI-11, CI-12, S7, S8, S9, S10, S11, S12, S14, S19, S21, S22, S23, S24, PB02, and PB05.
	Protected Species: Birds / USFWS	USFWS IPaC (Information for Planning and Consultation) Trust Resource Reports were generated for Burnet & Williamson Counties. According to data in the reports, three bird species are listed as either threatened or endangered: Black-capped Vireo (*Vireo atricapilla*), Golden-cheeked Warbler (*Dendroica chrysoparia*), and the Whooping Crane (*Grus americana*). According to an USFWS online critical habitat mapper, no critical habitat for the whooping crane occurs within the Study Area. The Williamson County Conservation Foundation's (WCCF) Regional Habitat Conservation Plan (RHCP) was reviewed for potential habitat.		None	The following are located within or within 1,500 feet of potential habitat for the Golden-cheeked Warbler and/or the Black-capped Vireo: D9, D10, S16, CI-5, CI-6, C-7, CI-8, CI-5, CI-6, CI-7, CI-8, PB01 and PB02.

		Potential habitat for the Golden-cheeked Warbler and the Black-capped Vireo exists within the Study Area. No critical habitat has been established for the Black-capped Vireo or the Golden-cheeked Warbler.	not authorize take of the Tooth Cave ground beetle; therefore, any actions that would impact this species would need to be authorized separately by the USFWS.		
	Protected Species: Karst Invertebrates / USFWS, TPWD Texas Natural Diversity Database (TXNDD)	USFWS IPaC Trust Resource Reports were generated for Burnet and Williamson Counties. According to USFWS, the Bee Creek Cave Harvestman (*Texella reddelli*) is listed as endangered within Burnet County. The Bone Cave Harvestman (*Texella reyesi*), Coffin Cave Mold Beetle (*Batrisodes texanus*), and Tooth Cave Ground Beetle (*Rhadine persephone*) are listed as endangered within Williamson County. The WCCF RHCP was reviewed. The Study Area is within the North Williamson County and Georgetown Karst Fauna Regions. Listed species are present within the Study Area. While not appearing in the IPaC report for Williamson County, the Kretschmarr Cave Mold Beetle (*Texamaurops reddelli*) is listed as endangered by the USFWS wherever found.	• In 2015, the USFWS issued a final 4(d) rule which states that take of the Georgetown salamander will not be a violation of Section 9 of the ESA if the activity occurs on non-federal lands and is consistent with the water quality protection measures in Georgetown's development code. • Comply with City of Georgetown Edwards Aquifer Recharge Zone Water Quality Ordinance (2015-14). • The Texas Parks and Wildlife (TPW) Code and Texas Administrative Code (TAC) protect state-listed species and prohibit take of state-listed species.	USFWS Karst Zone Map; Texas Natural Diversity Database Map	The following are located within Karst Zone 1 (areas known to contain rare cave fauna) or Karst Zone 2 (areas with a high probability of containing rare cave fauna): D15, D16, D17, S1, S2, S3, S4, S6, S16, CI-1, CI-2, CI-3, CI-5, CI-6, PB01, PB03, and PB04 The Doucet crossing improvement locations D7 and D8 are located within a TXNDD element occurrence record area for the Krestchmarr Cave Mold Beetle. The Scheibe problem crossings S2 and S3 are located within 1,500 feet of a karst invertebrate cave. The Scheibe problem crossings S16 and S17 are located within the element occurrence record area for the Bone Cave Harvestman. The Scheibe problem crossing S18 is within 1,500 feet of the element occurrence record area for the Bone Cave Harvestman. The Scheibe mitigation alternative area PB03 is located within 1,500 feet of a karst invertebrate cave.
	Protected Species: Salamanders / USFWS	USFWS IPaC Trust Resource Reports were generated for Burnet and Williamson Counties. According to the Burnet County report, no salamanders are listed as endangered. However, three species are listed as threatened in Williamson County: Georgetown Salamander (*Eurycea naufragia*), Jollyville Plateau Salamander (*Eurycea tonkawae*), and Salado Springs Salamander (*Eurycea chisholmensis*).		USFWS Critical Habitat Map, Texas Natural Diversity Database Map	The Doucet channel improvement locations CI-1 is located within 1,500 feet of a TXNDD element occurrence record area for the Salado Springs Salamander.
	Protected Species: Mollusks / USFWS, TPWD	USFWS IPaC Trust Resource Reports were generated for Burnet and Williamson Counties. According to data for both counties, the Smooth Pimpleback (*Quadrula houstonensis*), Texas Fawnsfoot (*Truncilla macrodon*), Texas Fatmucket (*Lampsilis bracteata*), Texas Pimpleback (*Quadrula petrina*) are all federal candidate species. TPWD lists all of these species as state-threatened, with the addition of the False Spike Mussel (*Quadrula mitchelli*).		None	No occurrence records for mussels were found in the TXNDD database; however, there is potential for mussel species to occur in perennial or intermittent streams.
	Critical Habitat / USFWS	Critical habitat is located in Williamson County for the Georgetown Salamander (*Eurycea naufragia*). The critical habitat consists of 14 locations which are springs or caves located in the Edwards Aquifer Recharge Zone. The critical habitat consists of both surface and subsurface zones. No critical habitat has been established for the Black-capped Vireo or the Golden-cheeked Warbler.	• Critical habitat designations affect only federal agency actions or federally funded or permitted activities. Critical habitat designations do not affect activities by private landowners if there is no Federal "nexus"—that is, no Federal funding or authorization. Federal agencies are required to avoid "destruction" or "adverse modification" of designated critical habitat.	USFWS Critical Habitat Map	The Doucet channel improvement location CI-1 is located adjacent to designated critical habitat for the Georgetown Salamander.

	Texas Listed Rare, Threatened, & Endangered Species / TPWD	The TPWD's rare, threatened and endangered species by county lists were utilized for Burnet and Williamson Counties. TPWD Texas Natural Diversity Database data were obtained for all intersecting USGS quadrangles within the Study Area. Representative Element of Occurrence Records (EOR) within the Study Area include: • Ashe Juniper - Oak series (*Juniperus ashei – Quercus* spp.) • Bat roost • Bee Creek Cave Harvestman/Reddell Harvestman • Black-capped Vireo • Bone Cave Harvestman • Cave Myotis Bat (*Myotis velifer*) • Cedar Elm - Sugarberry series (*Ulmus americana – Celtis laevigata*) • Fountain Darter (*Etheostoma fonticola*) • Georgetown Salamander • Golden-cheeked Warbler • Gravelbar Brickellbush (*Brickellia cylindracea*) • Guadalupe Bass (*Micropterus treculii*) • Jollyville Plateau Salamander • Karst Invertebrate Cave • Kretschmarr Cave Mold Beetle • Plateau Loosestrife (*Lythrum ovalifolium*) • Salado Springs Salamander • Sycamore-leaf Snowbell (*Styrax platanifolius*) • Texas Almond (*Prunus minutiflora*) • Texas Oak series (*Quercus buckleyi*) • Texas Shiner (*Notropis amabilis*)	• Comply with Texas Parks and Wildlife Code and the Texas Administrative Code for laws and regulations pertaining to endangered or threatened species. • A site visit, conducted by a qualified biologist, should occur to determine if habitat or species are present.	Texas Natural Diversity Database Map	D3 and D11 are located within an EOR for the Guadalupe Bass. D12 is located within 1,500 feet of the EOR for the Guadalupe Bass. D13 and D14 are located within 1,500 feet of the EOR for Vertisol Blackland Prairie. D18 is located within 1,500 feet of the EOR for Plateau loosestrife. Crossings S2 and S3 are located within 1,500 feet of a karst invertebrate cave. Crossings S8 and S9 are located within 1,500 feet of a Cave Myotis Bat EOR and a bat roost. Crossing S14 is located within an EOR for the Guadalupe Bass. Crossing S16 is located within 1,500 feet of the EOR for the Coffin Cave Mold Beetle and the Bone Cave Harvestman. Crossings S16 and S17 are located within the EOR for the Bone Cave Harvestman. Crossing S18 is located within 1,500 feet of the EOR for the Bone Cave Harvestman. Crossings S17 and S17 are located within the EOR for the Gravelbar Brickellbush. Crossing S16 located within 1,500 feet of the EOR for the Gravelbar Brickellbush. CI-1 is located within 1,500 feet of the EOR for the Salado Springs Salamander. CI-9, CI-10, and CI-11 are located within 1,500 feet of the EOR for the Guadalupe Bass. PB02 is located within 1,500 feet of a Cave Myotis Bat EOR and a bat roost. PB03 is adjacent to the EOR for a karst invertebrate cave.
	Management Areas / TPWD	The TPWD's wildlife management areas (WMA) were reviewed. No WMAs occur within the Study Area.	No applicable regulations or following steps.	None	None
Cultural	**Archeological Resources** / Texas Historical Commission (THC)	Digital data from THC of previously conducted archeological surveys were reviewed. Many surveys have occurred within the Study Area. The Study Area contains numerous water features and per aerial photography, portions of the Study Area are undeveloped. There is a potential for cultural resources to occur within the Study Area.	• Many factors go into determining the level of effort required for cultural resources. For example, if a USACE permit is required, then these resources will need to be investigated per Section 106 of the National Historic Preservation Act of 1966 and coordinated with the THC.	None	The following are located within or within 1500 feet of previously surveyed archeological studies: D1, D2, D3, D12, D13, D14, D15, D18, D19, D22, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, CI-7, PB-01, PB-02, PB04, PB05, SB01a, SB01b, SB01c, and SB03.

	Historical Resources / THC	The Texas Historic Sites Atlas data was reviewed for locations of historical markers, State Antiquities Landmarks, National Register Historic Districts, and listed & eligible historic bridges. The Study Area contains 60 historical markers and 67 known cemeteries.	• Per the Texas Antiquities Code, notification to the THC would be required prior to project commencement for counties, municipalities, and other local government agencies for any project on public land if one of the following occurs: 5 or more acres of ground disturbance; 5,000 or more cubic yards of earth moving; will occur in a historic district or other designated historic site; or will affect a recorded archeological site. • Compliance with local ordinances is also necessary. • It is recommended that a Texas Archeological Research Laboratory (TARL) records search be conducted for each project area.	Texas Historical Sites Atlas Results Map	The following are located within or within 1500 feet of historic resources: D3, D5, D8, D13, D14, D18, D21, D22, S11, S12, S16, S19, CI-7, PB05, and SB03.
Other	**Farmland** / Farmland Protection Policy Act (FPPA)	2016 National Agriculture Imagery Program (NAIP) aerials were reviewed to preliminarily assess vegetation. The Study Area has the potential to contain farmlands. The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) website was utilized to generate a soil report for the Study Area. There are mapped prime farmlands within the Study Area.	• Comply with the Farmland Protection Policy Act.	None	The following are located within areas mapped as prime farmland: D5, D9, D10, D12, D13, D17, D20, D22, D23, D24, D25, D26, S6, S7, S8, S9, S10, S11, S12, S13, S17, S20, CI-2, CI-3, CI-4, CI-7, CI-8, CI-11, CI-12, PB01, PB02, PB05, and SB03.
	Significant Trees / City of Bertram	2014 NAIP aerials were reviewed to preliminarily assess vegetation. The Study Area has the potential to contain significant trees.	• Comply with the City of Bertram's Ordinance No. 20-99 regarding development regulations and Ordinance No. 26-2001 regarding Zoning. • Conduct a tree survey if the refined project area has the potential to remove trees within the City of Bertram.	None	None of the Doucet crossing improvement locations, Doucet channel improvement locations, Scheibe problem crossings, and Scheibe mitigation alternative locations are located within the boundaries of the City of Bertram or its extraterritorial jurisdiction (ETJ).
	Protected & Heritage Trees / City of Georgetown	2016 NAIP aerials were reviewed to preliminarily assess vegetation. The Study Area has the potential to contain protected and/or heritage trees.	• Comply with the City of Georgetown's Tree Preservation Ordinance. • Conduct a tree survey if the refined project area has the potential to remove trees within the City of Georgetown.	None	The following are located within the City of Georgetown boundary or ETJ: D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16, D17, and D18. The following are located within the City of Georgetown boundary or ETJ: CI-1, CI-2, CI-3, CI-4, CI-5, CI-6, CI-10, and CI-12. The following crossings are located within the City of Georgetown boundary or ETJ: S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, and S20. The following are located within the City of Georgetown boundary or ETJ: PB01, PB02, PB03, PB04, PB05, SB01a, SB01b, SB01c, and SB03.
	Significant Trees / City of Leander	2016 NAIP aerials were reviewed to preliminarily assess vegetation. The Study Area has the potential to contain significant trees.	• Comply with the City of Leander's ordinances regulating significant trees. • Conduct a tree survey if the refined project area has the potential to remove trees within the City of Leander.	None	None of the Doucet crossing improvement locations, Doucet channel improvement locations, Scheibe problem crossings, or Scheibe mitigation alternative locations are located within the boundaries of the City of Leander or its extraterritorial jurisdiction (ETJ).
	Protected Trees / City of Liberty Hill	2016 NAIP aerials were reviewed to preliminarily assess vegetation. The Study Area has the potential to contain protected and/or heritage trees.	• Comply with the City of Liberty Hill's Tree Inventory and Protection Ordinance.	None	The Scheibe problem crossing S24 is located within the City of Liberty Hill's ETJ. None of the other Doucet crossing improvement locations, Doucet channel improvement

			• Conduct a tree survey if the refined project area has the potential to remove trees within the City of Liberty Hill.		locations, Scheibe problem crossings, and Scheibe mitigation alternative locations are located within the boundaries of the City of Liberty Hill or its extraterritorial jurisdiction (ETJ).
	Hazardous Materials / TCEQ	The TCEQ hazardous materials digital data were reviewed for features that include: municipal setting designation (MSD), municipal solid waste (MSW) sites, radioactive sites, Superfund sites, registered petroleum storage tanks (PST), wastewater outfalls, and leaking petroleum storage tanks (LPST).	• Due diligence/Phase I Environmental Site Assessments (ESA) are typically required by leading agencies if a property transaction occurs, if structures are demolished, or if extensive excavation is conducted as part of the project. Determine if Phase I ESA is required by lending agency. • Perform Phase I ESA site visit and prepare report.	Hazardous Materials Map	Scheibe problem crossing S10 is located within 1,500 feet of a LPST. Scheibe problem crossing S11 is located within 1,500 feet of a PST. Scheibe problem crossings S17 and S18 are located within 1,500 feet of a LPST. Scheibe problem crossing S17 is located within 1,500 feet of a PST. Doucet channel improvement CI-3 is located within 1,500 feet of a PST. Doucet channel improvement CI-9 is located within 1,500 feet of a LPST. Scheibe mitigation alternative location PB05 is located within 1,500 feet of a PST.
	Community Impacts / Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations)	Limited English Proficiency, poverty, and minority data were reviewed for the general Study Area using select census tracts as a representative area. Approximately 12.4% of the population in sampled tracts in Burnet County and 7.6% of the population in sampled tracts in Williamson County is below the poverty level per 2010-2014 American Community Survey 5-Year Estimates. Minority populations occur within the generalized Study Area, and populations that speak English less than very well also occur within the sampled census tracts of Burnet and Williamson Counties per U.S. Census Bureau American Fact Finder data.	• If federal funding is utilized, comply with Executive Order (EO) 12898. This EO mandates that federal agencies identify and address, as appropriate, disproportionately high & adverse human health or environmental effects of their programs, policies, and activities on minority/low-income populations.	None	Results of the U.S. Census Bureau data analysis are generalized to the county level and not analyzed for each individual crossing.
	Parks and Wildlife Code, Chapter 26 Protected Property / TPWD; Williamson County	A review of Williamson County listed parks and open spaces found that the following occur within the Study Area: 84 Lumber Park, Berry Creek Park, Berry Creek Section 5 Park, Berry Springs Parkland Preserve, Blue Hole Park, Cedar Breaks Park, Chandler Park, Chautauqua Park, Churchill Farms Park, Cobbs Cavern KFA (Karst Fauna Area), Coffin Cave Preserve, Crystal Knoll Park, Dove Springs Park, Edwards Park, Emerald Springs Park, Founders Park, Fountainwood Linear Park, Garey Park, Geneva Park, Georgetown Tennis Center, Heritage Gardens, Karankawa KFA, Katy Crossing Trail Park, Kelley Park, Lake Overlook Park, Lyndoch Park, McMaster Athletic Complex, Meadows of Georgetown Park, Newland Park, Old Oak Park, Pecan Branch Linear Greenbelt, Pecan Branch Park, Pickett Trail, Pinnacle Park, Priscilla's Well, Rain Tree Park, River Chase Park, River Chase Trail Easement, River Ridge Pool, River Road Park and Trail, Rivery Park and Trail, San Gabriel Park & Pool, San Gabriel River Frontage San Gabriel Village Open Space, San Jose Park, Shadow Canyon, Linear Park, Shadow Canyon Preserve, Smith Branch Trail, Summer Crest Park, Tejas Camp, Twin Springs Reserve, University Park, VFW Park, Village II Park, Village Pool and Parks, Windridge Village Park, Wolf Ranch Park, Woodlake Park, and Woodland Park Preserve.	• Comply with Parks and Wildlife Code, Chapter 26: A department, agency, political subdivision, county, or municipality of this state may not approve any program or project that requires the use or taking of any public land designated and used prior to the arrangement of the program or project as a park, recreation area, scientific area, wildlife refuge, or historic site, unless the department, agency, political subdivision, county, or municipality, acting through its duly authorized governing body or officer, determines that: 1) there is no feasible and prudent alternative to the use or taking of such land; 2) and the program or project includes all reasonable planning to minimize harm to the land, as a park, recreation area, scientific area, wildlife refuge, or historic site, resulting from the use or taking. • Once the project location(s) is/are refined, review local data to determine if any of the aforementioned sites are within the project.	Parks and Open Spaces Map	Locations D1 and D2 are located within 1,500 feet of Berry Springs Park and Preserve. D3 is located within 1,500 feet of Pecan Branch Park. D18 is located within 1,500 feet of Tejas Camp. S1 is located within 1,500 feet of Village II Park. S3 is located within 1,500 feet of Emerald Springs Park. S12 is located within 1,500 feet of Pecan Branch Linear Greenbelt. S13 is located within 1,500 feet of Heritage Gardens, Smith Branch Trail, University Park, and Rain Tree Park. S14 is located within 1,500 feet of Pecan Branch Park. S17 and S18 are located within 1,500 feet of 84 Lumber Park. S19 is located within 1,500 feet of IOOF Cemetery. S20 is located within 1,500 feet of Smith Branch Trail and Summer Crest Park. PB04 is located within 1,500 feet of a City of Georgetown park. PB05 is located within 1,500 feet of the Pecan Branch Linear Greenbelt. SB01a, SB01b, and SB01c are partially located within Smith Branch Trail Park. SB03 is located within 1,500 feet of Geneva Park, Heritage Gardens, and Smith Branch Trail Park.

	Federal Lands / USFWS & USACE	A review of data depicting federal lands found two locations within the Study Area: Balcones Canyonlands National Wildlife Refuge (NWR)(USFWS) and Lake Georgetown Recreational Area (USACE). The Lake Georgetown Recreational Area includes the following parks: Bootys Crossing Park, Walnut Spring Park, Sawyer Park, Cedar Breaks Park, Lake Overlook Park, Russell Park, Jim Hogg Park, Tejas Camp, and Texas Traditions Park	• The primary purpose of the Balcones Canyonlands NWR is to protect the nesting habitat of the golden-cheeked warbler and the black-capped vireo. The Administration of national wildlife refuges is governed by various federal statutes, as well as by regulations and Presidential executive orders. Rules and regulations for the most recent fiscal year are found at 50 CFR 25-35, 43 CFR 3103.2, and 3120.3-3. For Rights-of-Way General Regulations see 50 CFR 29.21; 34 FR 19907 (1969). • Lake Georgetown and surrounding lands are managed by the USACE for water supply, flood control, and recreation. Rules and regulations governing public use of USACE water resources development projects are found at Title 36 CFR, Chapter 111, Part 327. • Comply with Section 4(f) regulations, which govern the use of land from publicly owned parks, recreation areas, wildlife and waterfowl refuges, and public or private historic sites for federal highway projects.	Parks and Open Spaces Map	None of the Doucet crossing improvement locations, Doucet channel improvement locations, Scheibe problem crossings, or Scheibe mitigation alternative locations are located within the boundary or within 2 miles of the Balcones Canyonlands NWR. The Doucet crossing improvement location D18 is located within the boundary of the USACE Lake Georgetown parks property, near Tejas Camp.

Notes:
[1] The Doucet crossing improvement locations are indicated as Map ID D1 - D26.
The Doucet channel improvement locations are indicated as Map ID CI-1 – CI-12.
The Scheibe problem crossings are indicated as S1 – S24.
The Scheibe mitigation alternative locations consists of the following Map IDs: PB01, PB02, PB03, PB04, PB05, SB01a, SB01b, SB01c, and SB03.

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Table D2 Environmental Constraints Matrix – Water Resources and Protected Species

			WATER RESOURCES						PROTECTED SPECIES							
	RESOURCE		Edwards Aquifer	Waters of the US	Flood plains	Wetlands	Navigable Waters	Impaired Assessment Units	Karst Zone	Birds	Karst Invertebrates	Salamanders	Clams	Critical Habitat	Texas Listed Species & SOC	Management Areas
	AGENCY/REGULATING ENTITY		TCEQ	USACE	FEMA	USFWS	USCG, USACE	CWA, TCEQ	USFWS	USFWS	USFWS	USFWS	USFWS	USFWS	TPWD	TPWD
DOUCET CROSSING IMPROVEMENTS	**AFFECTED STREAM**	**MAP ID**														
CR 152 IMPROVEMENT 400' OPENING	Dry Berry Creek	D1	X	X	X	O	O	O	O	O	O	O	***	O	O	O
CR 152 IMPROVEMENT 700' OPENING	Berry Creek	D2	X	X	X	O	O	O	O	O	O	O	***	O	O	O
FM 971 IMPROVEMENT 500' OPENING	Berry Creek	D3	X	X	X	O	O	O	O	O	O	O	***	O	X	O
CR 143 IMPROVEMENT 1400' OPENING	Dry Berry Creek	D4	X	X	X	O	O	O	O	O	O	O	***	O	O	O
CR 234 IMPROVEMENT 900' OPENING	Dry Berry Creek	D5	X	X	X	O	O	O	X	O	O	O	***	O	O	O
LIVE OAK TRAILS IMPROVEMENT 400' OPENING	Dry Berry Creek	D6	X	X	X	O	O	O	X	O	O	O	***	O	O	O
CR 241 IMPROVEMENT 500' OPENING	Berry Creek	D7	X	X	X	O	O	O	X	O	X	O	***	O	O	O
CR 245 IMPROVEMENT 800' OPENING	Berry Creek	D8	X	X	X	O	O	O	X	O	X	O	***	O	O	O
RM 2338 IMPROVEMENT 8 - 9X7' RBP	Jennings Branch	D9	X	X	X	O	O	O	X	#	O	O	***	O	O	O
CR 245 IMPROVEMENT 575' OPENING	Jennings Branch	D10	X	X	X	O	O	O	O	#	O	O	***	O	O	O
CR 100/ MCSHEPHERD RD IMPROVEMENT 200' OPENING	Mankins Branch	D11	O	X	X	O	O	X	O	O	O	O	***	O	X	O
CR 104/PATRIOT WAY IMPROVEMENT 50' OPENING	Mankins Branch	D12	X	X	X	O	O	X	O	O	O	O	***	O	#	O
BELL GIN RD IMPROVEMENT 5 - 4'X5' RBP	Unnamed Tributary to Mankins Branch	D13	X	X	O	O	O	O	O	O	O	O	***	O	#	O
CR 110/HUTTO RD IMPROVEMENT 4 - 5'X5' RBP	Unnamed Tributary to Mankins Branch	D14	X	X	O	O	O	O	O	O	O	O	***	O	#	O
CEDAR HOLLOW RD IMPROVEMENT 9 - 12'X10' RBP	Middle Fork San Gabriel River	D15	X	X	X	O	O	O	X	O	*	O	***	O	O	O
RANCHO BUENO DR IMPROVEMENT 300' OPENING	Middle Fork San Gabriel River	D16	X	X	X	O	O	O	X	O	*	O	***	O	O	O
CROSS CREEK RD IMPROVEMENT 550' OPENING	Middle Fork San Gabriel River	D17	X	X	X	O	O	O	X	O	*	O	***	O	O	O
CR 258 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D18	X	X	X	X	O	O	O	#	O	O	***	O	#	O
CR 257 IMPROVEMENT 200' OPENING	North Fork San Gabriel River	D19	X	X	X	O	O	O	O	#	O	O	***	O	O	O
FM 243 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D20	O	X	X	O	O	O	O	O	O	O	***	O	O	O
CR 200 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D21	O	X	X	X	O	O	O	O	O	O	***	O	O	O
RM 1174 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D22	O	X	X	O	O	O	O	O	O	O	***	O	O	O
RM 963 IMPROVEMENT 250' OPENING	North Fork San Gabriel River	D23	O	X	X	X	O	O	O	O	O	O	***	O	O	O
CR 203 IMPROVEMENT 200' OPENING	North Fork San Gabriel River	D24	O	X	X	O	O	O	O	O	O	O	***	O	O	O
CR 202 IMPROVEMENT 200' OPENING	North Fork San Gabriel River	D25	O	X	X	O	O	O	O	O	O	O	***	O	O	O
FM 2340 IMPROVEMENT 8 - 9'X7' RBP	North Fork San Gabriel River	D26	O	X	X	O	O	O	O	O	O	O	***	O	O	O

Table D2 Environmental Constraints Matrix – Water Resources and Protected Species (continued)

			WATER RESOURCES						PROTECTED SPECIES							
	RESOURCE		**Edwards Aquifer**	**Waters of the US**	**Flood plains**	**Wetlands**	**Navigable Waters**	**Impaired Assessment Units**	**Karst Zone**	**Birds**	**Karst Invertebrates**	**Salamanders**	**Clams**	**Critical Habitat**	**Texas Listed Species & SOC**	**Management Areas**
	AGENCY/REGULATING ENTITY		TCEQ	USACE	FEMA	USFWS	USCG, USACE	CWA, TCEQ	USFWS	USFWS	USFWS	USFWS	USFWS	USFWS	TPWD	TPWD
SCHEIBE PROBLEM CROSSINGS		**MAP ID**														
300' Upgrade to (4) 5' Dia RCP	Pecan Branch	S1	X	X	X	O	O	###	X	O	O	O	***	O	O	O
Upgrade to (5) 10'X6' RBC & Upgrade Road Elevation to 733.0	Pecan Branch	S2	X	X	X	O	O	###	X	O	#*	O	***	O	#	O
Upgrade to (5) 10'X6' RBC & Upgrade Road Elevation to 762.50	Pecan Branch	S3	X	X	X	O	O	###	X	O	#*	O	***	O	#	O
Upgrade to (7) 10'X6' RBC & Upgrade Road Elevation to 732.70	Pecan Branch	S4	X	X	X	O	O	###	X	O	*	O	***	O	O	O
Upgrade to (7) 10'X6' RBC & Upgrade Road Elevation to 730.50	Pecan Branch	S5	X	X	X	O	O	###	X	O	O	O	***	O	O	O
not specified	Pecan Branch	S6	X	X	X	O	O	###	X	O	*	O	***	O	O	O
not specified	Pecan Branch	S7	X	X	X	O	O	###	O	O	O	O	***	O	O	O
not specified	Pecan Branch	S8	X	X	X	O	O	###	O	O	O	O	***	O	#	O
Upgrade to (9) 8'X8' RBC & Upgrade Road Elevation to 712.75'	Pecan Branch	S9	X	X	X	O	O	###	O	O	O	O	***	O	#	O
Upgrade to (10) 10'X8' RBC & Upgrade Road Elevation to 709.20'	Pecan Branch	S10	X	X	X	O	O	###	O	O	O	O	***	O	O	O
Upgrade to (10) 10'X6' RBC & Upgrade Road Elevation to 696.50'	Pecan Branch	S11	X	X	X	O	O	###	O	O	O	O	***	O	O	O
Upgrade to (10) 10'X6' RBC & Upgrade Road Elevation to 689.00'	Pecan Branch	S12	X	X	X	O	O	###	O	O	O	O	***	O	O	O
not specified	West Fork Smith Branch	S13	X	X	X	O	O	###	X	O	O	O	***	O	O	O
Upgrade to (15) 10'X10' RBC & Upgrade Road Elevation to 645.45'	Pecan Branch	S14	X	X	X	O	O	###	O	O	O	O	***	O	#	O
Upgrade to (4) 5'X5' RBC	Smith Branch	S15	X	X	X	O	O	###	X	O	O	O	***	O	O	O
not specified	West Fork Smith Branch	S16	X	X	X	O	O	###	X	#	X*	O	***	O	X	O
Raise Road 1.5'	West Fork Smith Branch	S17	X	X	X	O	O	###	X	O	X	O	***	O	X	O
Raise Road 1.0'	West Fork Smith Branch	S18	X	X	X	O	O	###	X	O	#	O	***	O	X	O
150' Span Bridge	Smith Branch	S19	X	X	X	O	O	###	O	O	O	O	***	O	O	O
150' Span Bridge	Smith Branch	S20	X	X	X	O	O	###	X	O	O	O	***	O	O	O
50' Span Bridge	South Fork San Gabriel	S21	O	X	X	O	O	O	O	O	O	O	***	O	O	O
125' Span Bridge	South Fork San Gabriel	S22	O	X	X	O	O	O	O	O	O	O	***	O	O	O
100' Span Bridge	South Fork San Gabriel	S23	O	X	X	X	O	O	O	O	O	O	***	O	O	O
300' Span Bridge & Upgrade to (8) Rows of 1' Piers	South Fork San Gabriel	S24	X	X	X	X	O	O	O	O	O	O	***	O	O	O

Table D2 Environmental Constraints Matrix – Water Resources and Protected Species (continued)

			WATER RESOURCES						PROTECTED SPECIES							
		RESOURCE	Edwards Aquifer	Waters of the US	Flood plains	Wetlands	Navigable Waters	Impaired Assessment Units	Karst Zone	Birds	Karst Invertebrates	Salamanders	Clams	Critical Habitat	Texas Listed Species & SOC	Management Areas
		AGENCY/REGULATING ENTITY	TCEQ	USACE	FEMA	USFWS	USCG, USACE	CWA, TCEQ	USFWS	USFWS	USFWS	USFWS	USFWS	USFWS	TPWD	TPWD
DOUCET CHANNEL IMPROVEMENTS		**MAP ID**														
Crystal Springs Drive @ Berry Creek	Berry Creek	CI-1	X	##	X	O	O	O	X	O	*	#	***	X	X	O
Dove Hollow Trail & Dawson Trail @ Berry Creek	Berry Creek	CI-2	X	##	X	O	O	O	X	O	*	O	***	O	O	O
Dove Hollow Trail & Dawson Trail @ Berry Creek	Berry Creek	CI-3	X	##	X	O	O	O	X	O	*	O	***	O	O	O
Painted Bunting Lane & Great Frontier Drive @ Berry Creek	Berry Creek	CI-4	X	##	X	O	O	O	X	O	O	O	***	O	O	O
Trail Rider Way @ Berry Creek	Berry Creek	CI-5	X	##	X	X	O	O	X	#	*	O	***	O	O	O
Independence Creek Lane @ Cowan Creek	Cowan Creek	CI-6	X	##	X	O	O	O	X	#	*	O	***	O	O	O
CR 256 & CR 257 @ North Fork San Gabriel River	North Fork San Gabriel River	CI-7	X	##	X	O	O	O	O	X	O	O	***	O	O	O
River Road @ North Fork San Gabriel River	North Fork San Gabriel River	CI-8	X	##	X	O	O	O	O	#	O	O	***	O	O	O
CR 103 @ San Gabriel River	San Gabriel River	CI-9	O	##	X	X	O	X	O	O	O	O	***	O	#	O
CR 103 @ San Gabriel River	San Gabriel River	CI-10	O	##	X	X	O	X	O	O	O	O	***	O	#	O
McShepherd Road & SH 29 @ San Gabriel River	San Gabriel River	CI-11	O	##	X	O	O	X	O	O	O	O	***	O	#	O
McShepherd Road & SH 29 @ San Gabriel River	San Gabriel River	CI-12	O	##	X	X	O	X	O	O	O	O	***	O	O	O
SCHEIBE MITIGATION ALTERNATIVES		**MAP ID**														
100 ac-ft Peak Shaving Pond	Pecan Branch	PB01	X	##	X	O	O	###	X	O	*	O	***	O	O	O
Upgrade SB to (5) 10'X8' RBC	Pecan Branch	PB02	X	X	X	#	O	###	#	#	O	O	***	O	#	O
3,550 LF Channel Clearing & Maintenance	Pecan Branch	PB03	X	X	X	O	O	###	X	O	#*	O	***	O	#	O
1,200 LF Channel Improvements & 8,175 CY Excavation	Pecan Branch	PB04	X	##	X	#	O	###	X	O	*	O	***	O	O	O
1,050 LF Channel Clearing & Maintenance	Pecan Branch	PB05	X	X	X	#	O	###	O	O	O	O	***	O	O	O
Upgrade to (6) 8'X4' & (4) 10'X4' RBC	West Fork Smith Branch	SB01a	X	X	X	O	O	###	X	O	O	O	***	O	O	O
Channel Improvements	West Fork Smith Branch	SB01b	X	X	X	O	O	###	X	O	O	O	***	O	O	O
750 LF Channel Improvements & 14,500 CY Excavation	Smith Branch	SB01c	X	X	X	O	O	###	X	O	O	O	***	O	O	O
Detention/Channel Improvements	Smith Branch	SB03	X	X	X	O	O	###	X	O	O	O	***	O	O	O

KEY
X - Identified feature in the location of the crossing or proposed work location.
O - No identified feature in the location of the crossing or proposed work location.
- Identified feature within 1500-foot radius of centerpoint of crossing.
- To avoid Section 404 permitting, no fill material shall be placed within the boundary of the OHWM of the stream or within wetland boundaries.
- Crossing is not located on an imparied stream segment, but the stream segment does drain into an impaired segment within a short distance.
* - Crossing or proposed work location is located within USFWS Karst Zone 1 (areas known to contain rare cave fauna) or Karst Zone 2 (areas with a high probability of containing rare cave fauna).
** - Results of analysis are generalized to the county level and not anyalzed for each individual crossing.

Table D2 Environmental Constraints Matrix – Cultural and Other Resources

			CULTURAL		OTHER RESOURCES								
		RESOURCE	**Archeological Resources**	**Historical Resources**	**Farmland**	**Significant Trees**	**Protected & Heritage Trees**	**Significant Trees**	**Protected Trees**	**Hazardous Materials**	**Community Impacts**	**Parks & Wildlife Code, Ch 26, Protected Property**	**Federal Lands**
		AGENCY/REGULATING ENTITY	THC	THC	FPPA	City of Bertram	City of Georgetown	City of Leander	City of Liberty Hill	TCEQ	EO 12898	Williamson County, TPWD	USFWS, USACE
DOUCET CROSSING IMPROVEMENTS	**AFFECTED STREAM**	**MAP ID**											
CR 152 IMPROVEMENT 400' OPENING	Dry Berry Creek	D1	#	O	O	O	X	O	O	O	**	#	O
CR 152 IMPROVEMENT 700' OPENING	Berry Creek	D2	#	O	O	O	X	O	O	O	**	#	O
FM 971 IMPROVEMENT 500' OPENING	Berry Creek	D3	#	#	O	O	X	O	O	O	**	#	O
CR 143 IMPROVEMENT 1400' OPENING	Dry Berry Creek	D4	O	O	O	O	X	O	O	O	**	O	O
CR 234 IMPROVEMENT 900' OPENING	Dry Berry Creek	D5	O	#	X	O	X	O	O	O	**	O	O
LIVE OAK TRAILS IMPROVEMENT 400' OPENING	Dry Berry Creek	D6	O	O	O	O	X	O	O	O	**	O	O
CR 241 IMPROVEMENT 500' OPENING	Berry Creek	D7	O	O	O	O	X	O	O	O	**	O	O
CR 245 IMPROVEMENT 800' OPENING	Berry Creek	D8	O	#	O	O	X	O	O	O	**	O	O
RM 2338 IMPROVEMENT 8 - 9X7' RBP	Jennings Branch	D9	O	O	X	O	X	O	O	O	**	O	O
CR 245 IMPROVEMENT 575' OPENING	Jennings Branch	D10	O	O	X	O	X	O	O	O	**	O	O
CR 100/ MCSHEPHERD RD IMPROVEMENT 200' OPENING	Mankins Branch	D11	O	O	O	O	X	O	O	O	**	O	O
CR 104/PATRIOT WAY IMPROVEMENT 50' OPENING	Mankins Branch	D12	X	O	X	O	X	O	O	O	**	O	O
BELL GIN RD IMPROVEMENT 5 - 4'X5' RBP	Unnamed Tributary to Mankins Branch	D13	X	#	X	O	X	O	O	O	**	O	O
CR 110/HUTTO RD IMPROVEMENT 4 - 5'X5' RBP	Unnamed Tributary to Mankins Branch	D14	#	#	X	O	X	O	O	O	**	O	O
CEDAR HOLLOW RD IMPROVEMENT 9 - 12'X10' RBP	Middle Fork San Gabriel River	D15	#	O	O	O	X	O	O	O	**	O	O
RANCHO BUENO DR IMPROVEMENT 300' OPENING	Middle Fork San Gabriel River	D16	O	O	O	O	X	O	O	O	**	O	O
CROSS CREEK RD IMPROVEMENT 550' OPENING	Middle Fork San Gabriel River	D17	O	O	X	O	X	O	O	O	**	O	O
CR 258 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D18	X	#	O	O	X	O	O	O	**	#	#
CR 257 IMPROVEMENT 200' OPENING	North Fork San Gabriel River	D19	X	O	O	O	O	O	O	O	**	O	O
FM 243 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D20	O	O	X	O	O	O	O	O	**	O	O
CR 200 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D21	O	#	O	O	O	O	O	O	**	O	O
RM 1174 IMPROVEMENT 300' OPENING	North Fork San Gabriel River	D22	X	#	X	O	O	O	O	O	**	O	O
RM 963 IMPROVEMENT 250' OPENING	North Fork San Gabriel River	D23	O	O	X	O	O	O	O	O	**	O	O
CR 203 IMPROVEMENT 200' OPENING	North Fork San Gabriel River	D24	O	O	X	O	O	O	O	O	**	O	O
CR 202 IMPROVEMENT 200' OPENING	North Fork San Gabriel River	D25	O	O	X	O	O	O	O	O	**	O	O
FM 2340 IMPROVEMENT 8 - 9'X7' RBP	North Fork San Gabriel River	D26	O	O	X	O	O	O	O	O	**	O	O

Table D2 Environmental Constraints Matrix – Cultural and Other Resources (continued)

			CULTURAL		OTHER RESOURCES								
	RESOURCE		**Archeological Resources**	**Historical Resources**	**Farmland**	**Significant Trees**	**Protected & Heritage Trees**	**Significant Trees**	**Protected Trees**	**Hazardous Materials**	**Community Impacts**	**Parks & Wildlife Code, Ch 26, Protected Property**	**Federal Lands**
	AGENCY/REGULATING ENTITY		THC	THC	FPPA	City of Bertram	City of Georgetown	City of Leander	City of Liberty Hill	TCEQ	EO 12898	Williamson County, TPWD	USFWS, USACE
SCHEIBE PROBLEM CROSSINGS		**MAP ID**											
300' Upgrade to (4) 5' Dia RCP	Pecan Branch	S1	O	O	O	O	X	O	O	O	**	#	O
Upgrade to (5) 10'X6' RBC & Upgrade Road Elevation to 733.0	Pecan Branch	S2	O	O	O	O	X	O	O	O	**	O	O
Upgrade to (5) 10'X6' RBC & Upgrade Road Elevation to 762.50	Pecan Branch	S3	O	O	O	O	X	O	O	O	**	#	O
Upgrade to (7) 10'X6' RBC & Upgrade Road Elevation to 732.70	Pecan Branch	S4	#	O	O	O	X	O	O	O	**	O	O
Upgrade to (7) 10'X6' RBC & Upgrade Road Elevation to 730.50	Pecan Branch	S5	#	O	O	O	X	O	O	O	**	O	O
not specified	Pecan Branch	S6	X	O	X	O	X	O	O	O	**	O	O
not specified	Pecan Branch	S7	#	O	X	O	X	O	O	O	**	O	O
not specified	Pecan Branch	S8	#	O	X	O	X	O	O	O	**	O	O
Upgrade to (9) 8'X8' RBC & Upgrade Road Elevation to 712.75'	Pecan Branch	S9	#	O	X	O	X	O	O	O	**	O	O
Upgrade to (10) 10'X8' RBC & Upgrade Road Elevation to 709.20'	Pecan Branch	S10	#	O	X	O	X	O	O	#	**	O	O
Upgrade to (10) 10'X6' RBC & Upgrade Road Elevation to 696.50'	Pecan Branch	S11	#	#	X	O	X	O	O	#	**	O	O
Upgrade to (10) 10'X6' RBC & Upgrade Road Elevation to 689.00'	Pecan Branch	S12	#	#	X	O	X	O	O	O	**	#	O
not specified	West Fork Smith Branch	S13	#	O	X	O	X	O	O	O	**	#	O
Upgrade to (15) 10'X10' RBC & Upgrade Road Elevation to 645.45'	Pecan Branch	S14	X	O	O	O	X	O	O	O	**	#	O
Upgrade to (4) 5'X5' RBC	Smith Branch	S15	#	O	O	O	X	O	O	O	**	O	O
not specified	West Fork Smith Branch	S16	#	X	O	O	X	O	O	O	**	O	O
Raise Road 1.5'	West Fork Smith Branch	S17	O	O	X	O	X	O	O	#	**	#	O
Raise Road 1.0'	West Fork Smith Branch	S18	O	O	O	O	X	O	O	#	**	#	O
150' Span Bridge	Smith Branch	S19	O	#	O	O	X	O	O	O	**	#	O
150' Span Bridge	Smith Branch	S20	O	O	X	O	X	O	O	O	**	#	O
50' Span Bridge	South Fork San Gabriel	S21	O	O	O	O	O	O	O	O	**	O	O
125' Span Bridge	South Fork San Gabriel	S22	O	O	O	O	O	O	O	O	**	O	O
100' Span Bridge	South Fork San Gabriel	S23	O	O	O	O	O	O	O	O	**	O	O
300' Span Bridge & Upgrade to (8) Rows of 1' Piers	South Fork San Gabriel	S24	O	O	O	O	O	O	X	O	**	O	O

Table D2 Environmental Constraints Matrix – Cultural and Other Resources (continued)

			CULTURAL		OTHER RESOURCES								
	RESOURCE		**Archeological Resources**	**Historical Resources**	**Farmland**	**Significant Trees**	**Protected & Heritage Trees**	**Significant Trees**	**Protected Trees**	**Hazardous Materials**	**Community Impacts**	**Parks & Wildlife Code, Ch 26, Protected Property**	**Federal Lands**
	AGENCY/REGULATING ENTITY		THC	THC	FPPA	City of Bertram	City of Georgetown	City of Leander	City of Liberty Hill	TCEQ	EO 12898	Williamson County, TPWD	USFWS, USACE
DOUCET CHANNEL IMPROVEMENTS		**MAP ID**											
Crystal Springs Drive @ Berry Creek	Berry Creek	CI-1	O	O	O	O	X	O	O	O	**	O	O
Dove Hollow Trail & Dawson Trail @ Berry Creek	Berry Creek	CI-2	O	O	X	O	X	O	O	O	**	O	O
Dove Hollow Trail & Dawson Trail @ Berry Creek	Berry Creek	CI-3	O	O	X	O	X	O	O	#	**	O	O
Painted Bunting Lane & Great Frontier Drive @ Berry Creek	Berry Creek	CI-4	O	O	X	O	X	O	O	O	**	O	O
Trail Rider Way @ Berry Creek	Berry Creek	CI-5	O	O	O	O	X	O	O	O	**	O	O
Independence Creek Lane @ Cowan Creek	Cowan Creek	CI-6	O	O	O	O	X	O	O	O	**	O	O
CR 256 & CR 257 @ North Fork San Gabriel River	North Fork San Gabriel River	CI-7	X	#	X	O	O	O	O	O	**	O	O
River Road @ North Fork San Gabriel River	North Fork San Gabriel River	CI-8	O	O	X	O	O	O	O	O	**	O	O
CR 103 @ San Gabriel River	San Gabriel River	CI-9	O	O	O	O	O	O	O	#	**	O	O
CR 103 @ San Gabriel River	San Gabriel River	CI-10	O	O	O	O	X	O	O	O	**	O	O
McShepherd Road & SH 29 @ San Gabriel River	San Gabriel River	CI-11	O	O	X	O	O	O	O	O	**	O	O
McShepherd Road & SH 29 @ San Gabriel River	San Gabriel River	CI-12	O	O	X	O	X	O	O	O	**	O	O

SCHEIBE MITIGATION ALTERNATIVES		**MAP ID**											
100 ac-ft Peak Shaving Pond	Pecan Branch	PB01	X	O	X	O	X	O	O	O	**	O	O
Upgrade SB to (5) 10'X8' RBC	Pecan Branch	PB02	X	O	X	O	X	O	O	O	**	O	O
3,550 LF Channel Clearing & Maintenance	Pecan Branch	PB03	O	O	O	O	X	O	O	O	**	O	O
1,200 LF Channel Improvements & 8,175 CY Excavation	Pecan Branch	PB04	#	O	O	O	X	O	O	O	**	#	O
1,050 LF Channel Clearing & Maintenance	Pecan Branch	PB05	X	#	X	O	X	O	O	X	**	#	O
Upgrade to (6) 8'X4' & (4) 10'X4' RBC	West Fork Smith Branch	SB01a	#	O	O	O	X	O	O	O	**	X	O
Channel Improvements	West Fork Smith Branch	SB01b	X	O	O	O	X	O	O	O	**	X	O
750 LF Channel Improvements & 14,500 CY Excavation	Smith Branch	SB01c	X	O	O	O	X	O	O	O	**	X	O
Detention/Channel Improvements	Smith Branch	SB03	X	X	X	O	X	O	O	O	**	#	O

KEY
X - Identified feature in the location of the crossing or proposed work location.
O - No identified feature in the location of the crossing or proposed work location.
- Identified feature within 1500-foot radius of centerpoint of crossing.
- To avoid Section 404 permitting, no fill material shall be placed within the boundary of the OHWM of the stream or within wetland boundaries.
- Crossing is not located on an imparied stream segment, but the stream segment does drain into an impaired segment within a short distance.
* - Crossing or proposed work location is located within USFWS Karst Zone 1 (areas known to contain rare cave fauna) or Karst Zone 2 (areas with a high probability of containing rare cave fauna).
** - Results of analysis are generalized to the county level and not anyalzed for each individual crossing.

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Figures

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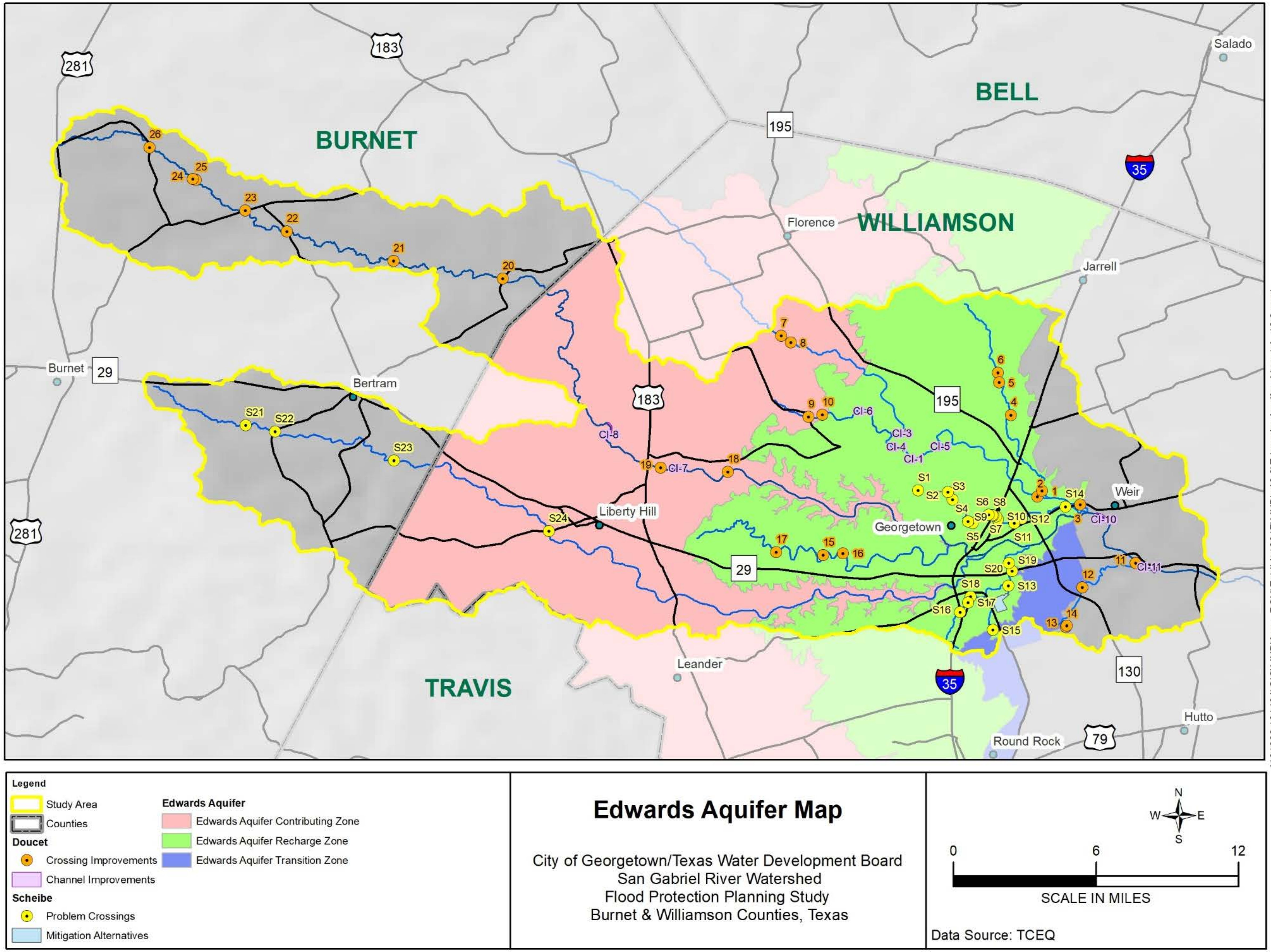
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Round Rock
Hutto
Legend
Study Area
Counties
Doucet
Crossing Improvements
Channel Improvements
Scheibe
Problem Crossings
Mitigation Alternatives
Edwards Aquifer
Edwards Aquifer Contributing Zone
Edwards Aquifer Recharge Zone
Edwards Aquifer Transition Zone
Edwards Aquifer Map
City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas
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SCALE IN MILES
Data Source: TCEQ
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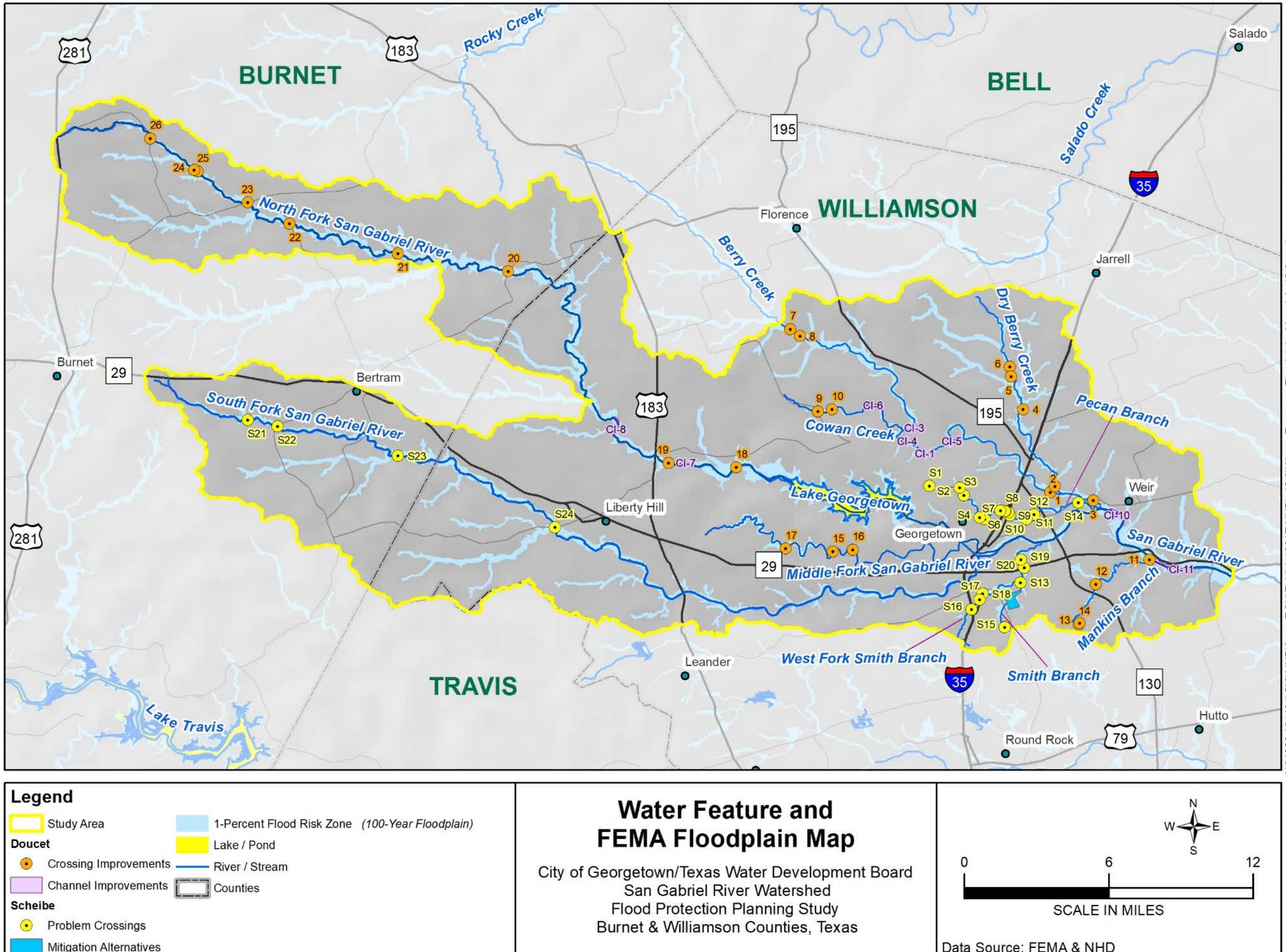
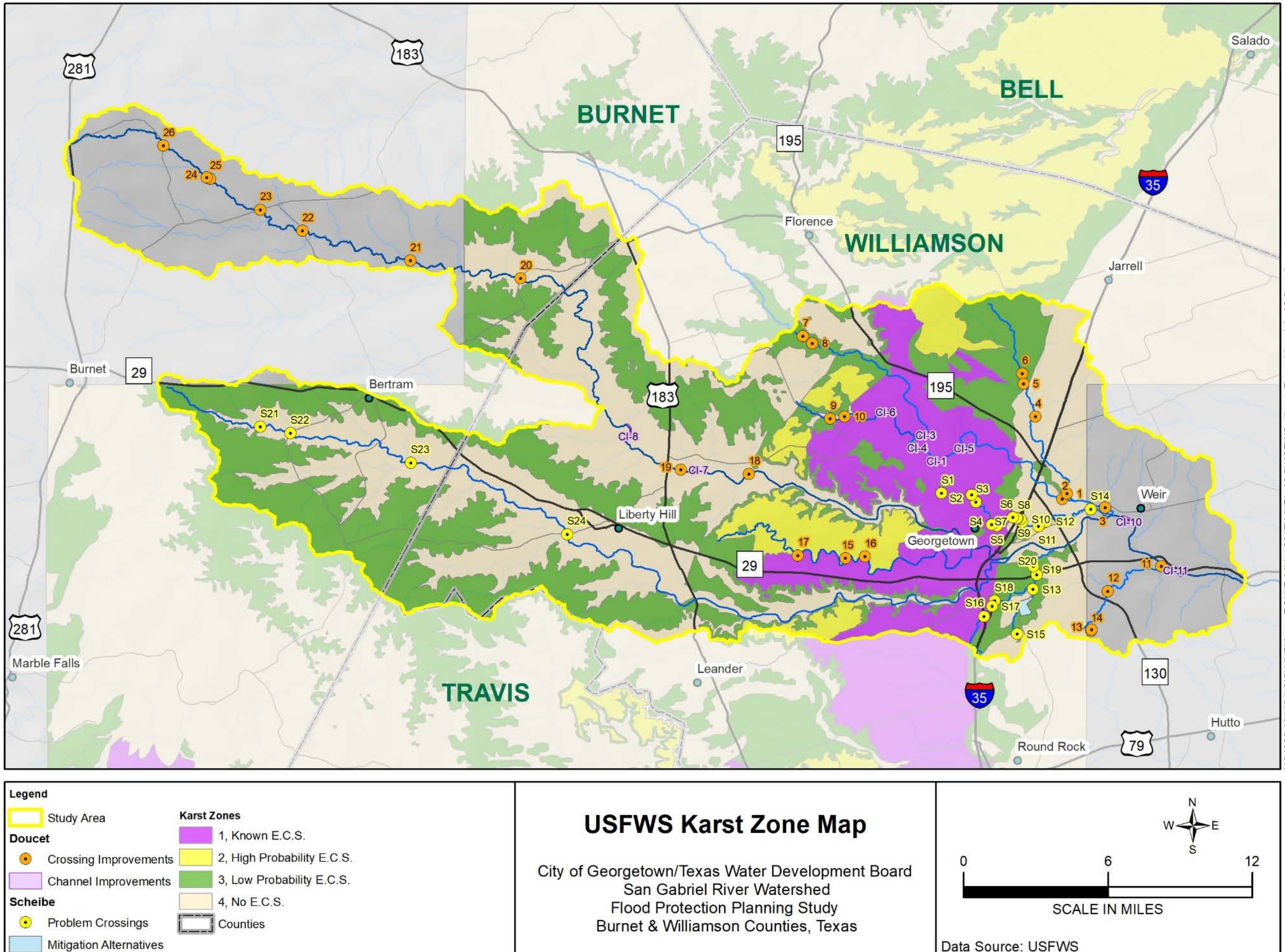


Water Feature and FEMA Floodplain Map

City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas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Legend
Study Area
Doucet
Crossing Improvements
Channel Improvements
Scheibe
Problem Crossings
Mitigation Alternatives
Karst Zones
1, Known E.C.S.
2, High Probability E.C.S.
3, Low Probability E.C.S.
4, No E.C.S.
Counties
USFWS Karst Zone Map
City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas
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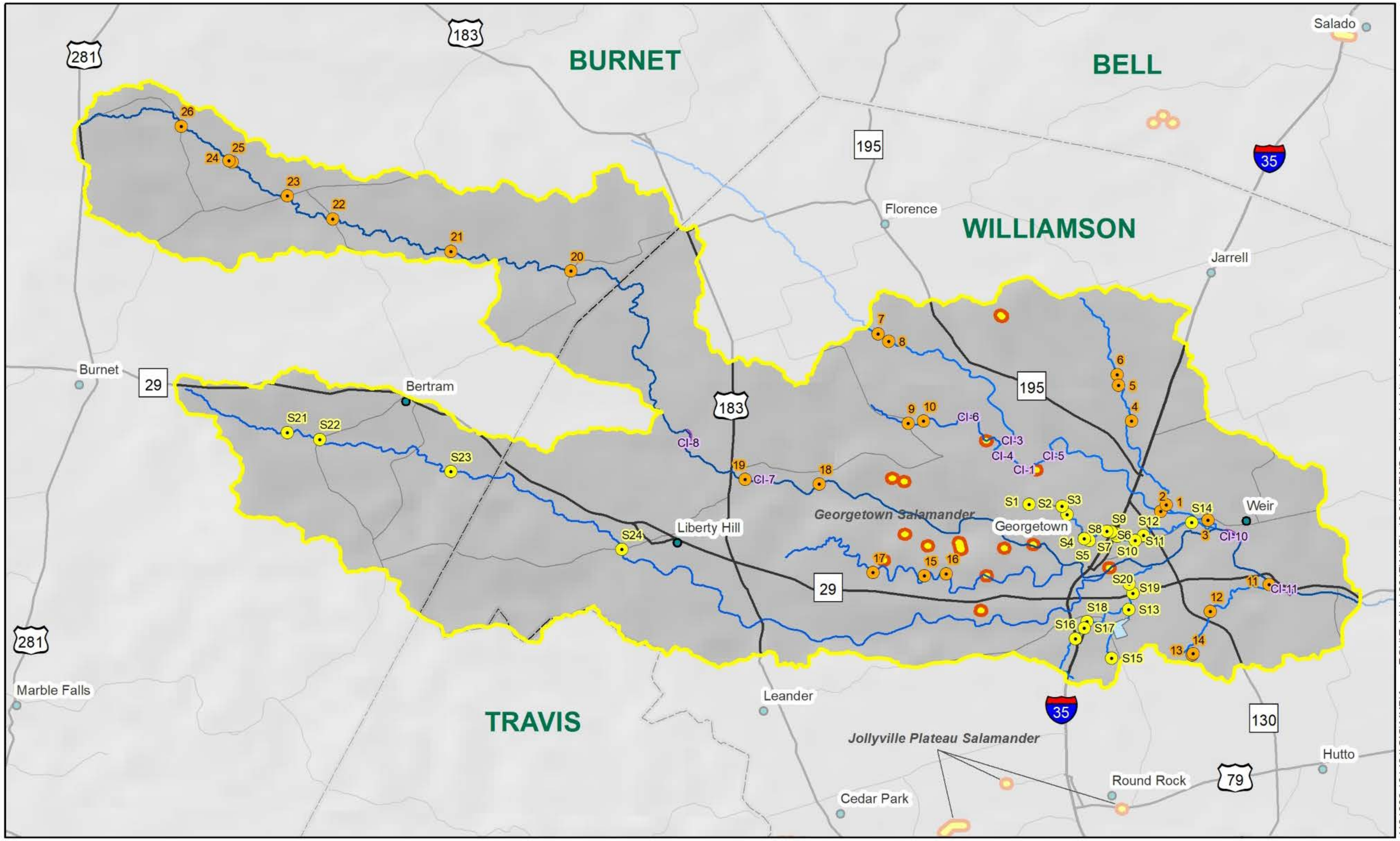

Legend

- Study Area
- Critical Habitat
- Counties

Doucet

- Crossing Improvements
- Channel Improvements

Scheibe

- Problem Crossings
- Mitigation Alternatives

USFWS Critical Habitat Map

City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas

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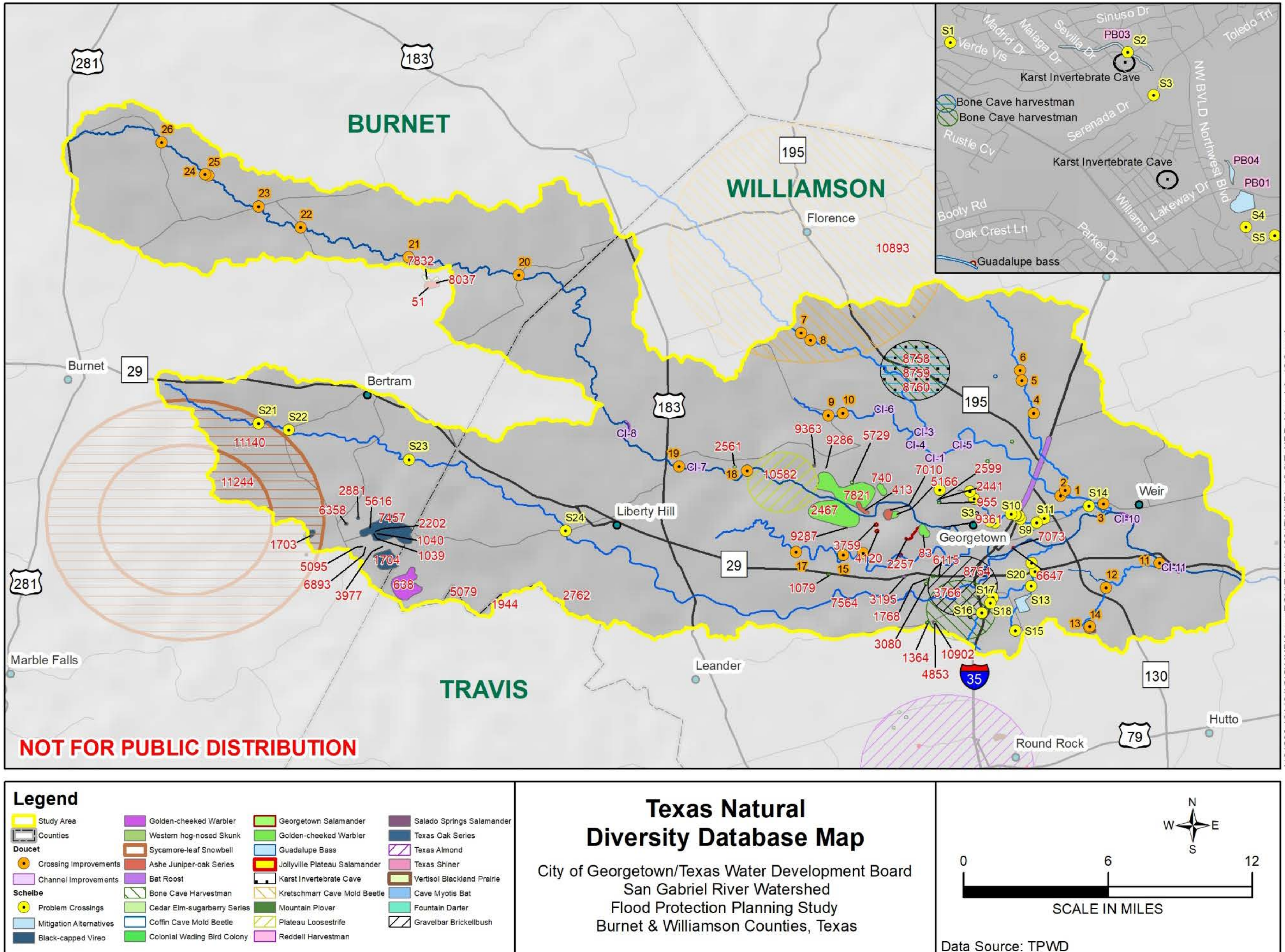
Data Source: USFWS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Florence
Bertram
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Liberty Hill
Georgetown
Weir
Leander
Marble Falls
Round Rock
Hutto
NOT FOR PUBLIC DISTRIBUTION
Karst Invertebrate Cave
Bone Cave harvestman
Guadalupe bass
Legend
Study Area
Counties
Doucet
Crossing Improvements
Channel Improvements
Scheibe
Problem Crossings
Mitigation Alternatives
Black-capped Vireo
Golden-cheeked Warbler
Western hog-nosed Skunk
Sycamore-leaf Snowbell
Ashe Juniper-oak Series
Bat Roost
Bone Cave Harvestman
Cedar Elm-sugarberry Series
Coffin Cave Mold Beetle
Colonial Wading Bird Colony
Georgetown Salamander
Golden-cheeked Warbler
Guadalupe Bass
Jollyville Plateau Salamander
Karst Invertebrate Cave
Kretschmarr Cave Mold Beetle
Mountain Plover
Plateau Loosestrife
Reddell Harvestman
Salado Springs Salamander
Texas Oak Series
Texas Almond
Texas Shiner
Vertisol Blackland Prairie
Cave Myotis Bat
Fountain Darter
Gravelbar Brickellbush
Texas Natural
Diversity Database Map
City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas
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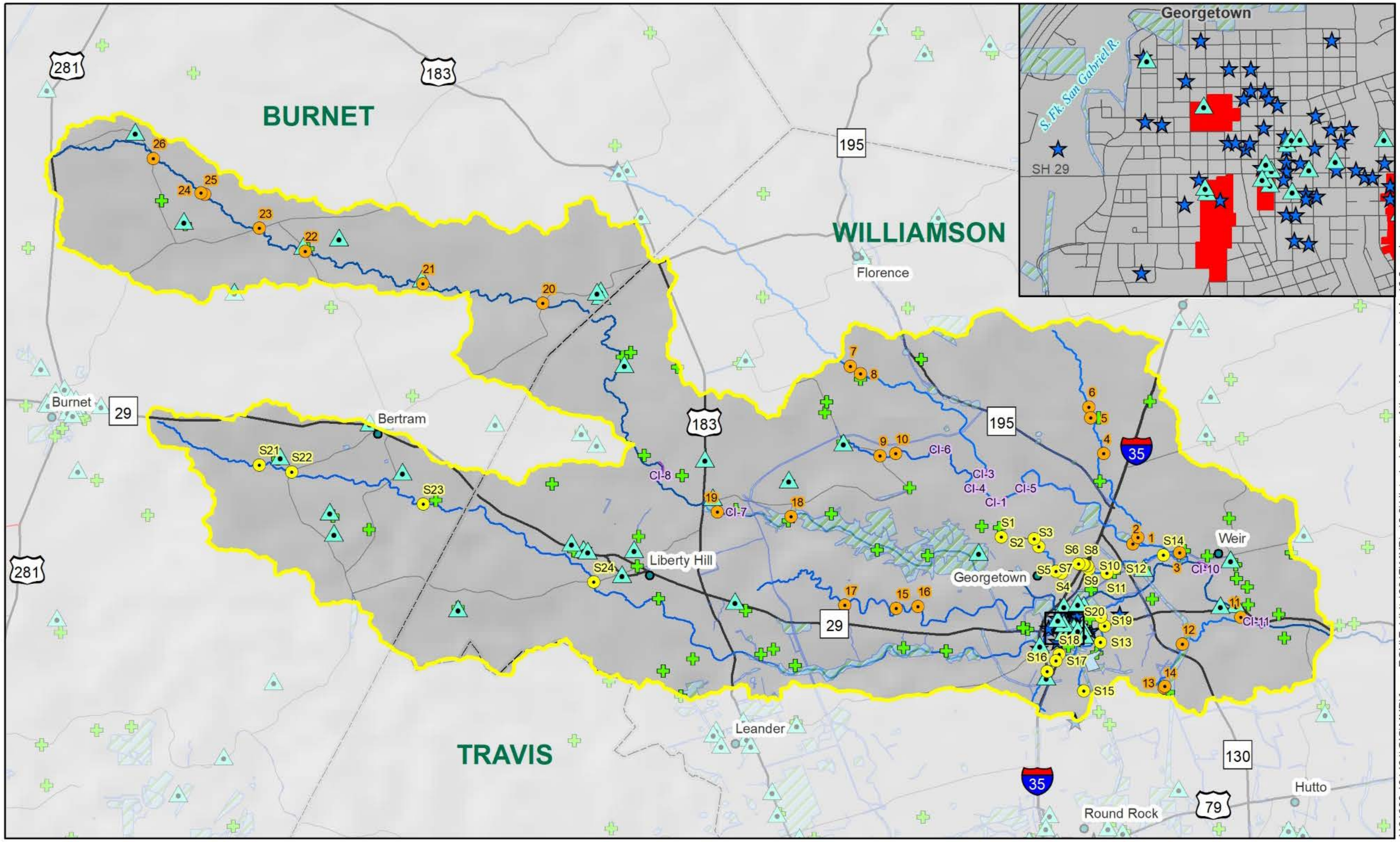

Legend

- Study Area
- **Doucet**
  - Crossing Improvements
  - Channel Improvements
- **Scheibe**
  - Problem Crossings
  - Mitigation Alternatives
- HistoricMarkers
- Cemeteries
- NRHP- Listed Property
- Archeological Project Area
- NRHP-Listed Historic District
- Counties

Texas Historical Sites Atlas Map

City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas

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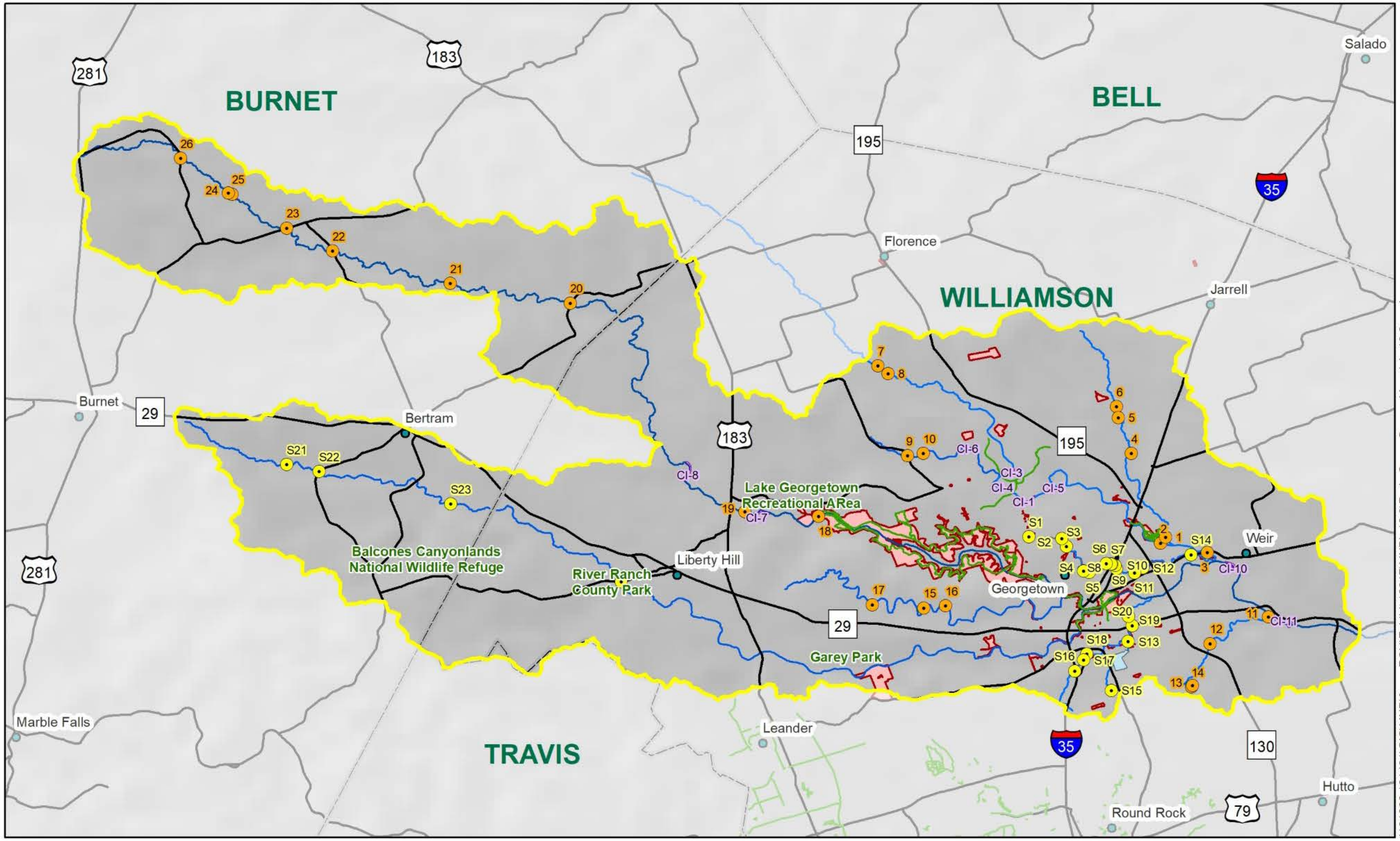
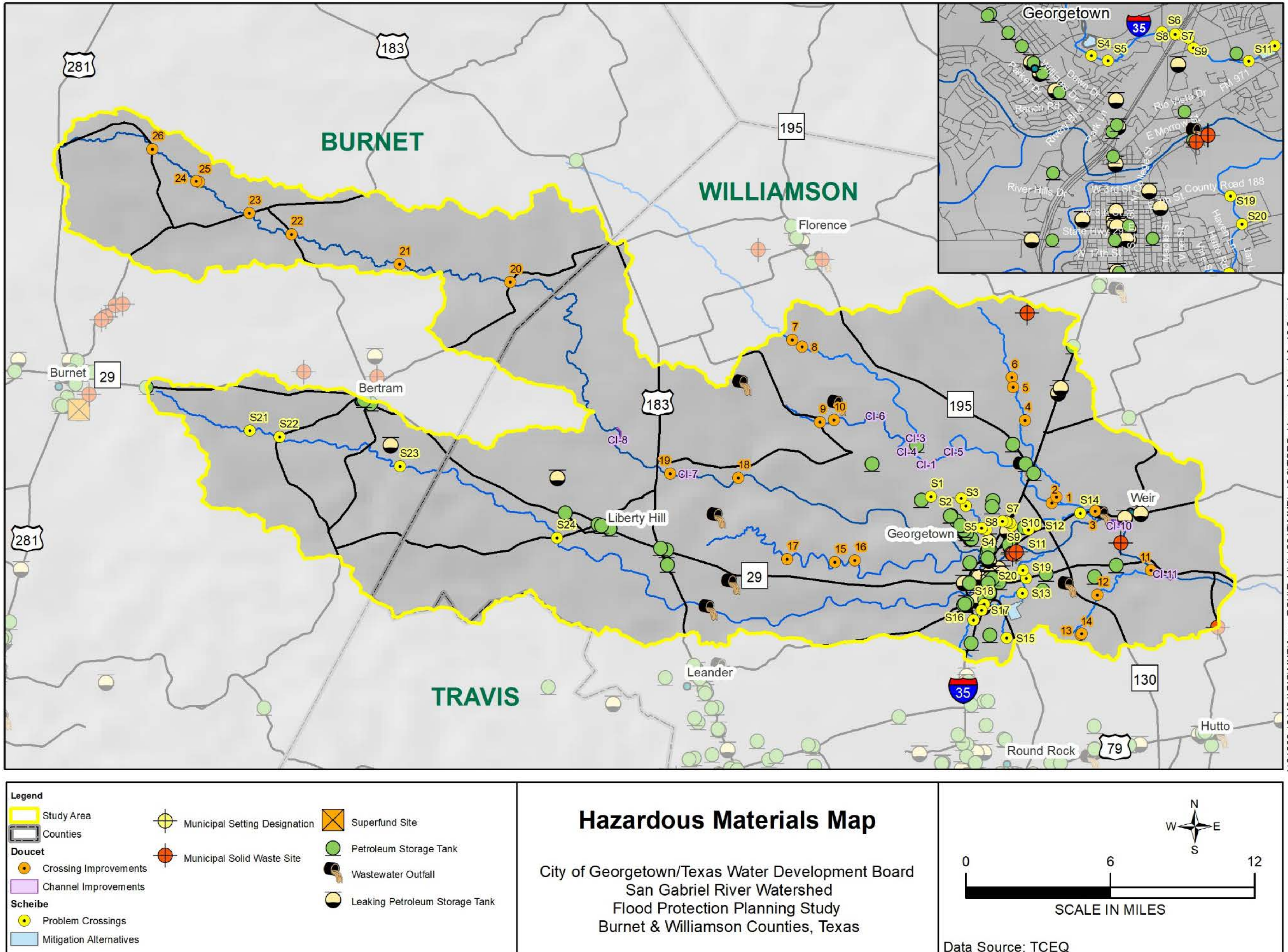


Parks and Open Spaces Map

City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas

Data Source: CAPCOG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Weir
Round Rock
Hutto
Legend
Study Area
Counties
Doucet
Crossing Improvements
Channel Improvements
Scheibe
Problem Crossings
Mitigation Alternatives
Municipal Setting Designation
Municipal Solid Waste Site
Superfund Site
Petroleum Storage Tank
Wastewater Outfall
Leaking Petroleum Storage Tank
Hazardous Materials Map
City of Georgetown/Texas Water Development Board
San Gabriel River Watershed
Flood Protection Planning Study
Burnet & Williamson Counties, Texas
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SCALE IN MILES
Data Source: TCEQ