Rusk County Groundwater Conservation District

District Management Plan

Adopted – August 15, 2005
Amended – March 3, 2008
Amended – July 19, 2010
Amended – November 8, 2010
Amended and Adopted – August 31, 2015

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SECTION 1. ABOUT THE RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT

1.1 District Mission

The Rusk County Groundwater Conservation District's (RCGCD) mission is to develop and implement a sound groundwater management program to protect and sustain the groundwater resources of the District.

1.2 Purpose of Management Plan

Senate Bill 1 (SB 1) enacted by the 75th Texas Legislature in 1997 requires all groundwater conservation districts to develop a management plan that defines the water needs and supplies within each district and the goals each district will use to manage the groundwater to meet the water needs of the district.

This groundwater management plan fulfills the requirements of the Texas Water Development Board (TWDB) Rules, specifically Texas Administrative Code, Chapter 356 (31 TAC §356). The plan includes the required planning elements, goals, objectives, performance standards, and tracking methods required by the TWDB.

1.3 District Creation and Background

The creation of the RCGCD was authorized in 2003 by the 78th Texas Legislature under HB 3569. The citizens of Rusk County confirmed creation of the District by an election held on June 5, 2004. This revised plan is being submitted within five years of the prior Management Plan, which was adopted on November 8, 2010, as required by Sec. 36.1072 (e) of the Texas Water Code.

The District was formed to protect the groundwater resources for the citizens of Rusk County. Beyond its enabling legislation, the District is governed primarily by the provisions of Chapter 36 of The Texas Water Code. The District has the capability and authority to undertake various studies and promote conservation; to adopt and amend, as needed, a management plan; to adopt rules; to establish a program for the registration and permitting of water wells; and to implement structural facilities and non-structural programs to achieve its statutory mandates. The District has rule-making authority to implement its policies and procedures to manage the groundwater resources.

The current members of the Board of Directors are Bobby Brown - President, David C. Powell - Vice President, Worth Whitehead - Treasurer, Mike Wilhite, Amos Standard, John Langston, Ken Ragle, Harry Hamilton, and Neil Osburn. The District General Manager is Amanda Maloukis.

1.4 District Location and Extent

Rusk County is located in the Piney Woods region of East Texas. The RCGCD maintains

the same boundaries as Rusk County and its jurisdiction includes all the territory located within Rusk County, which encompasses approximately 924 square miles. The County is bordered by Gregg and Harrison counties to the North, Panola and Shelby counties to the East, Nacogdoches County to the South, and Cherokee and Smith counties to the West. Henderson, which is centrally located in the County, is the County seat.

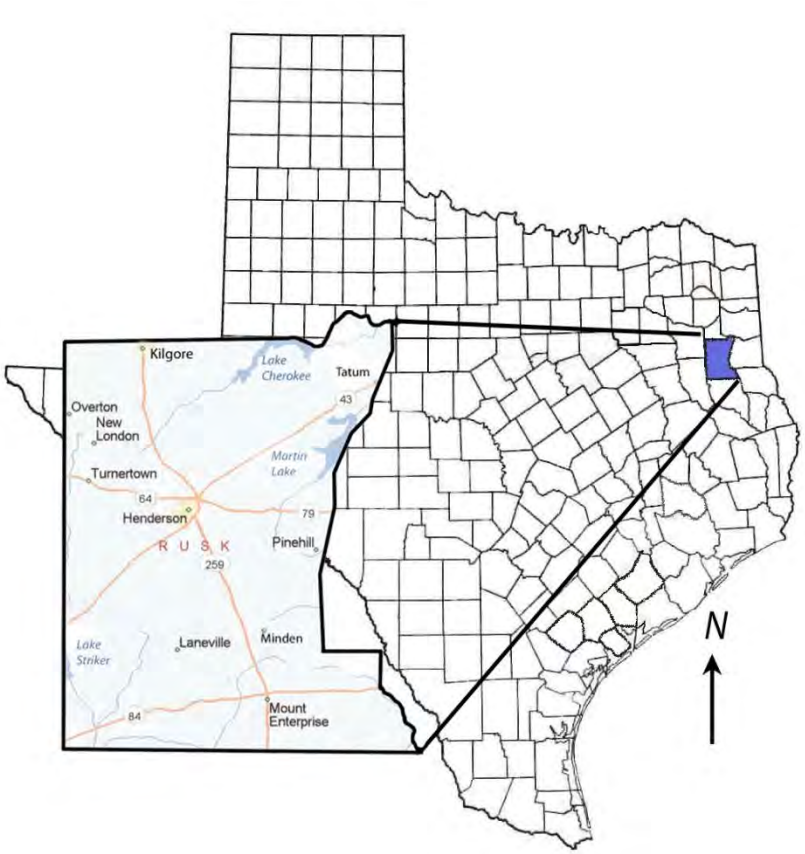

Figure 1. Rusk County Groundwater Conservation District

SECTION 2. RCGCD GEOGRAPHY AND HYDROGEOGRAPHY

2.1 District Setting and Topography

Rusk County is located within the eastern portion of the Interior Coastal Plains sub province of the Gulf Coastal Plains physiographic province (Figure 2). The sub province is comprised of alternating sequences of unconsolidated sands and clays. Erosion of the clay soils has resulted in terrain consisting of sand ridges that generally parallel the coast. In East Texas, the sub province is characterized by pine and hardwood forests and numerous permanent streams. West and northwest of Rusk County, faults associated with salt domes are characteristic of the region.

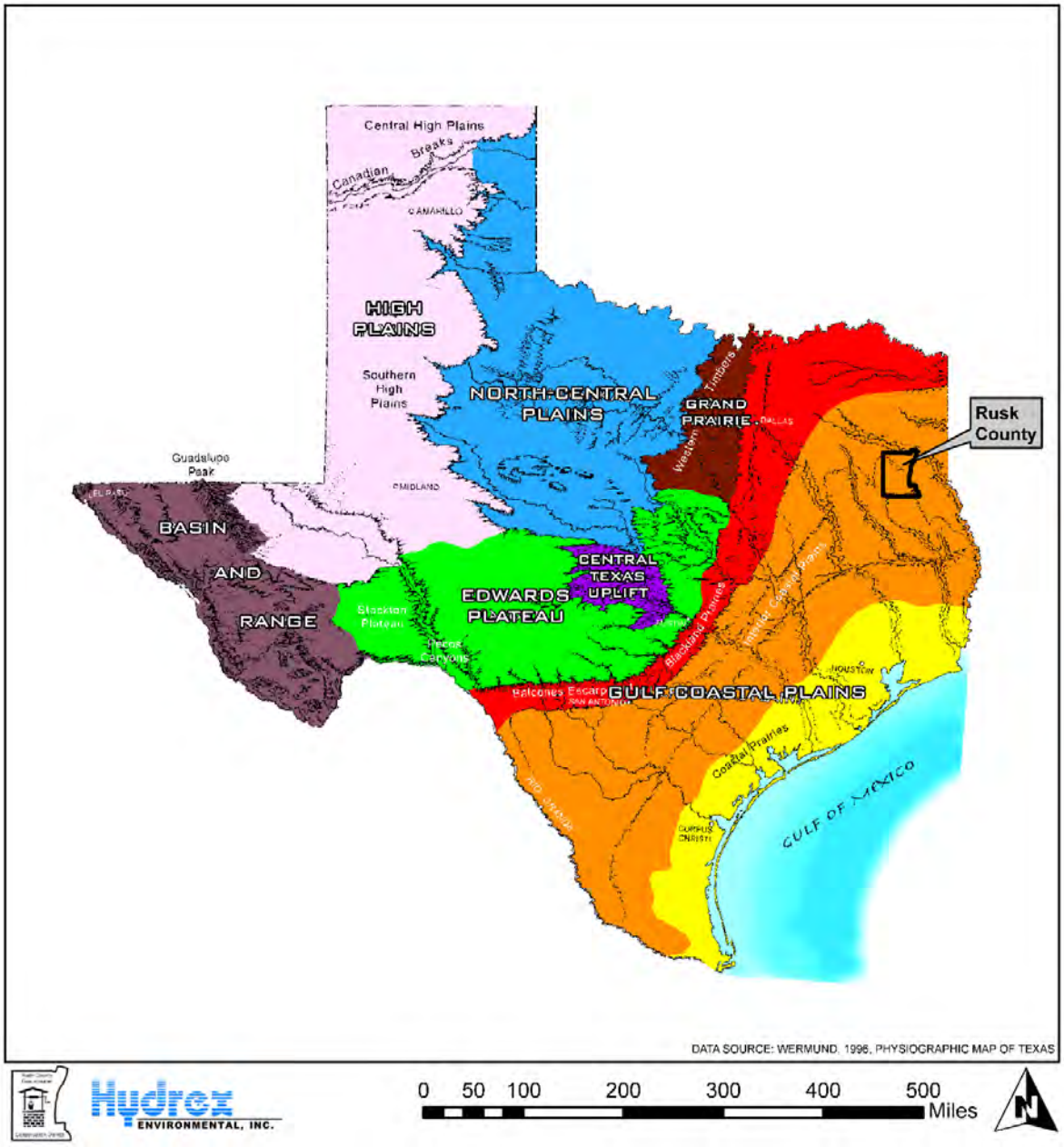

Figure 2. Physiographic Map of Texas identifying Rusk County.

Ecologically, Rusk County is situated in the South Central Plains ecoregion, which stretches across eastern Texas and into northwestern Louisiana and southwestern Arkansas (Figure 3). In eastern Texas, this ecoregion is commonly referred to as the Piney Woods. The Piney Woods region of eastern Texas is considered the western edge of the southern coniferous forest belt. Areas that were once dominated by long-leaf pine (*Pinus palustris*) savannas, are now predominantly classified more as oak-hickory-pine forest. Large areas have been converted to plantations of loblolly pine (*Pinus taeda*) and shortleaf pine (*Pinus echinata*) while some localized areas have been converted to agricultural pastureland.

(Figure 3). In the northeastern portion of the county, surface mining for lignite has occurred in large areas of the Wilcox aquifer outcrop. Upon completion of mining activities, the land is reclaimed with the intent to restore pre-existing conditions, including slope and vegetation.

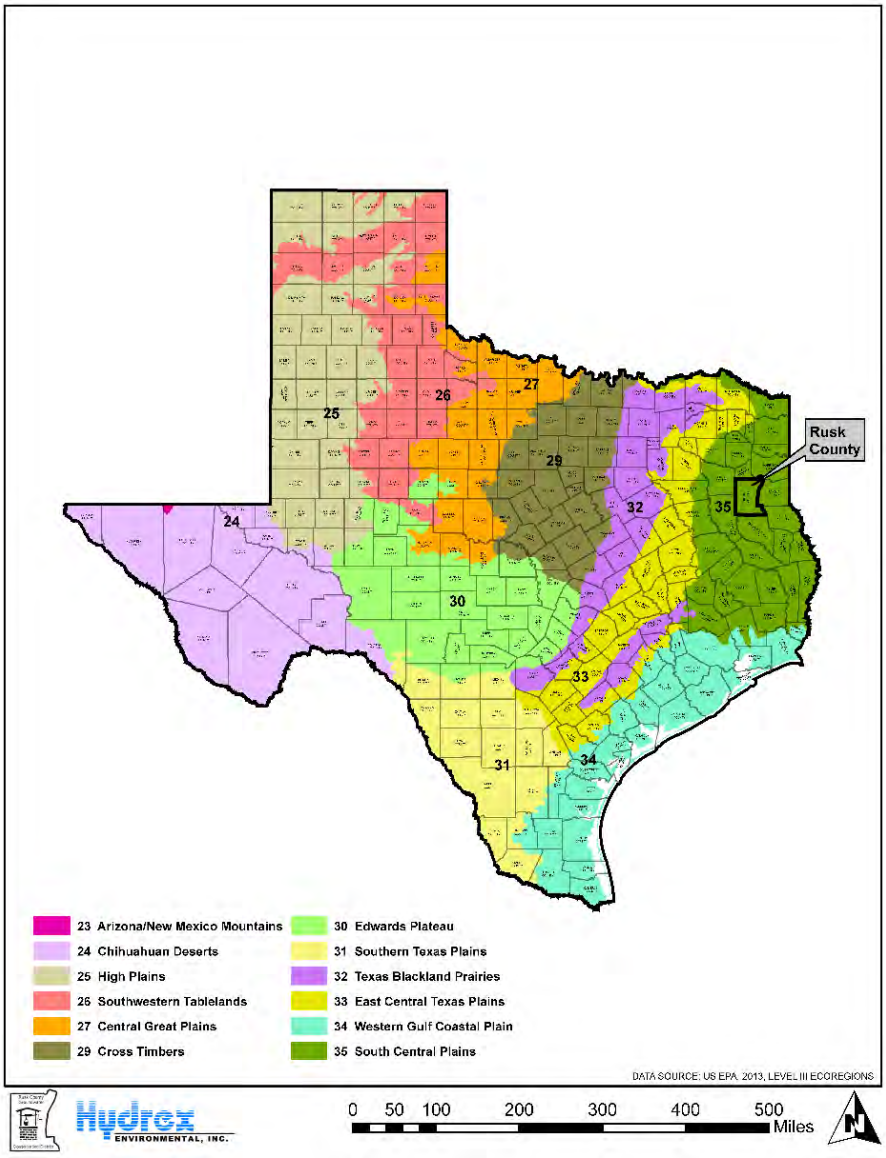

Figure 3. Ecoregions of Texas identifying Rusk County.

Topographically, Rusk County is situated atop a drainage divide that separates the Sabine River drainage basin to the northeast and the Neches River drainage basin to the southwest (Figure 4). The drainage divide generally follows a northwest-southeast trending ridge that extends through the interior of the county from just south of Overton and New London in the northwestern portion of the county to just north of Mt. Enterprise and the community of Caledonia in the southeastern portion of the county.

Higher elevations along the ridge range from 539 feet to 623 feet, relative to mean sea level (MSL). North of the ridge, topography generally slopes downward towards the Sabine River to elevations as low as 211 feet, MSL, in the northeast corner of the county. South of the ridge, topography generally slopes downward towards the Angelina River to elevations as low as 243 feet, MSL, in the southwest corner of the county. Topography along the ridge generally represents the highest elevations in the county, with the exception of areas along the Mt. Enterprise Fault System in the southern portions of the county. Higher elevations along the Mt. Enterprise Fault System range from 575 feet to 719 feet, MSL (Figure 5).

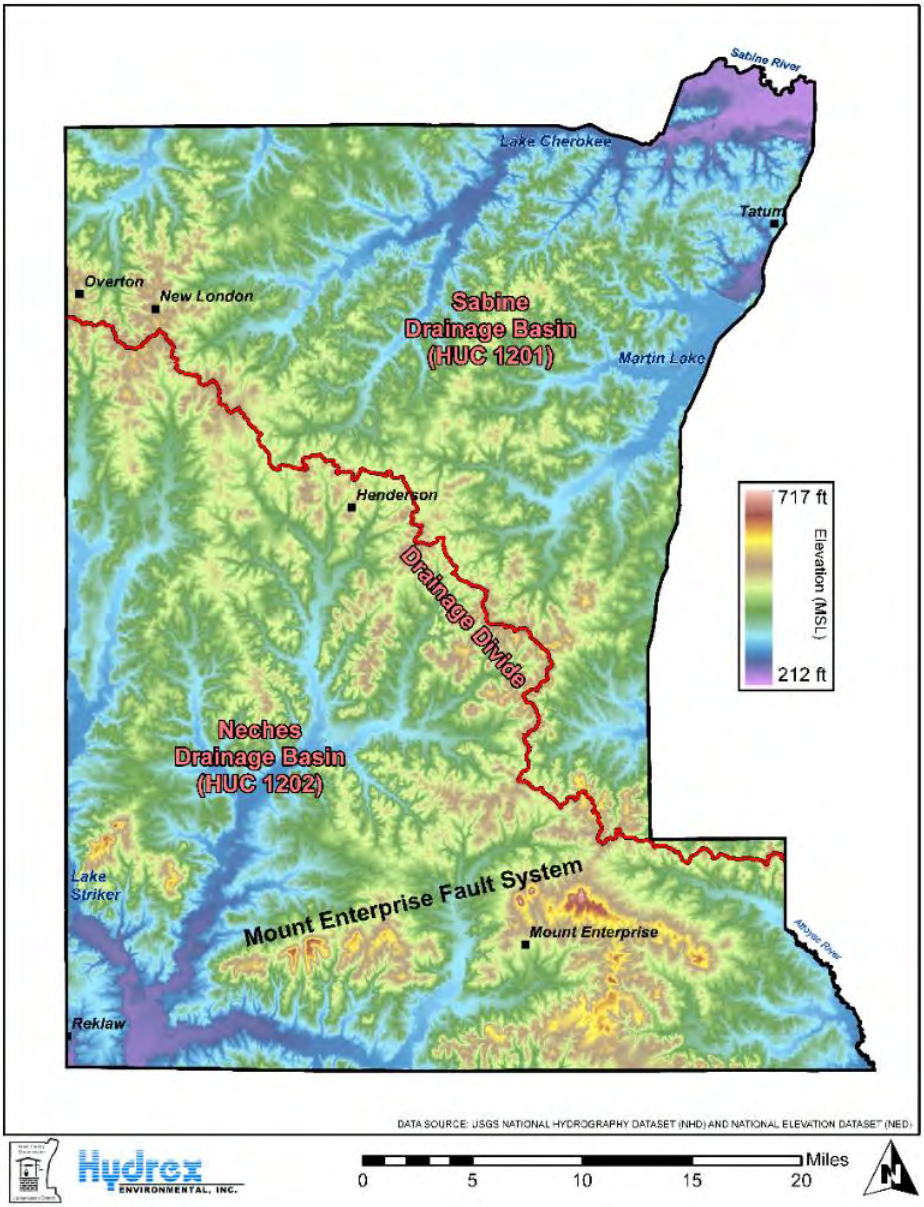

Figure 4. Topography and drainage within Rusk County.

Figure 5. USGS Topographic Map of Rusk County.

The majority of Rusk County, approximately 89 percent, is comprised of gently sloping to moderately steep rolling hills. Soil types throughout this land are predominantly well drained with moderate permeability. Approximately 11 percent of the county is located on nearly level flood plains with moderately slow permeable soils (Figure 6).

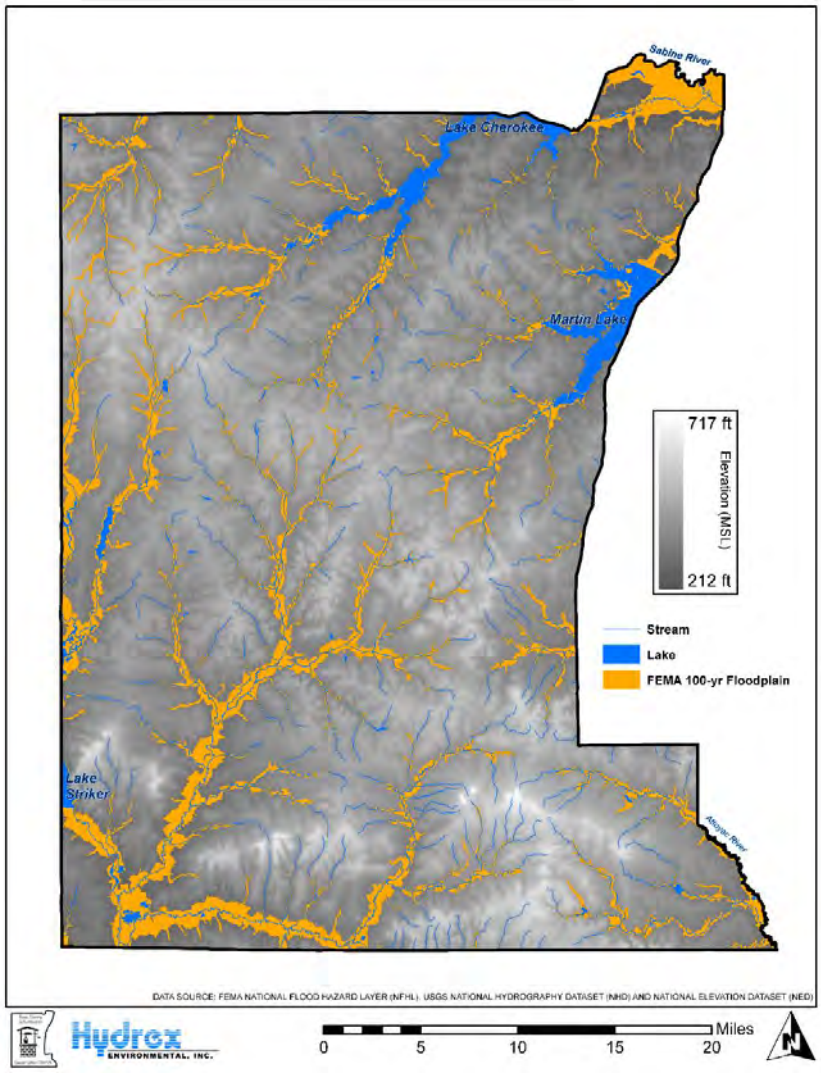

Figure 6. Digital elevation model showing FEMA 100-year floodplains within Rusk County.

2.2 Geology and Hydrogeology of Rusk County

Rusk County lies between the Sabine Uplift on the east and the East Texas Basin on the west (Figure 7). These two prominent structural features resulted from faulting that began in the Triassic Period (200 to 250 million years ago). The axis of the East Texas Basin trends north to south generally along the western boundary of Smith County. The Sabine Uplift, which centers in Panola County, Texas and northwestern Louisiana, forms the eastern boundary of the basin. The development of the two complementary structural features (basin and uplift) contributed to the setting for some of the largest petroleum reservoirs in the world: the East Texas Oil Field and the Carthage Gas Field (Figure 7).

The Mt. Enterprise Fault System trends east-west across the southern part of Rusk County (Figure 7). Movement along the fault system has been variable. Some areas show a maximum vertical displacement of over 200 feet, with beds of the Queen City Sand downdropped against the Carrizo Sand. Strata in northern and central Rusk County show a general dip away from the Sabine Uplift. In the southern part of the county, the gradient increases and becomes more variable in close proximity to the Mt. Enterprise Fault System.

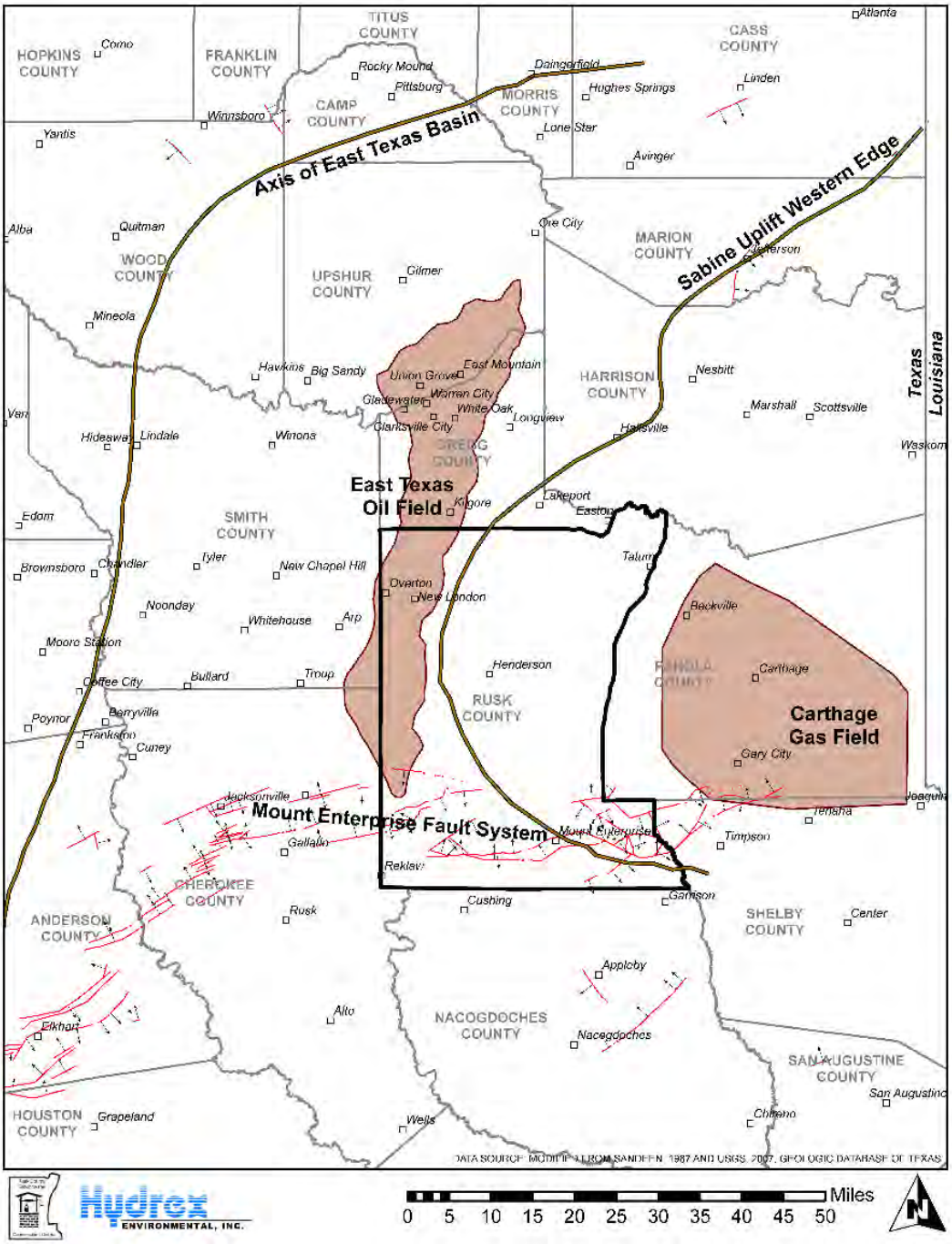

Figure 7. Structural Setting of Rusk County, Texas.

The geology of Rusk County, as it relates to fresh groundwater, is comprised of alternating sequences of continental, deltaic, and marine sediments that are predominantly of Eocene (33.9 to 56 million years ago) to Paleocene (56 to 66 million years ago) age (Figure 8). Continental and deltaic units, composed of quartz sand with varying amounts of silt and clay, contain the fresh groundwater in the area and form the major conduits for its movement. Marine portions of the section, consisting largely of clay or shale with lesser silt and glauconitic sandstone, form the intervening aquitards that restrict the movement of groundwater.

The deepest fresh water aquifer in Rusk County is the Carrizo-Wilcox aquifer, composed of the Wilcox Group and the immediately overlying Carrizo Sand. Excellent aquifer characteristics have made the Carrizo-Wilcox the most productive aquifer in East Texas. Recharge through its outcrop areas in Rusk County contributes significantly to the availability of Carrizo-Wilcox groundwater throughout much of the region.

The Wilcox is underlain by the Midway Group, a predominantly marine and lagoonal shale. No significant fresh groundwater is known to exist in the Midway or deeper strata; therefore, the top of the Midway marks the base of fresh groundwater in Rusk County.

The Midway Group is overlain successively by the Wilcox Group, Carrizo Sand, Reklaw Formation, Queen City Sand, Weches Formation, and Sparta Sand (Figure 9). The Reklaw and Weches have extremely poor water-bearing qualities and are insignificant as aquifers in Rusk County. Sparta and Queen City sediments are preserved on downdropped blocks of the Mt. Enterprise Fault System and on higher elevations in northern Rusk County. However, the limited areal extent of the Sparta and Queen City restricts their use as a water supply to low-yield, shallow wells.

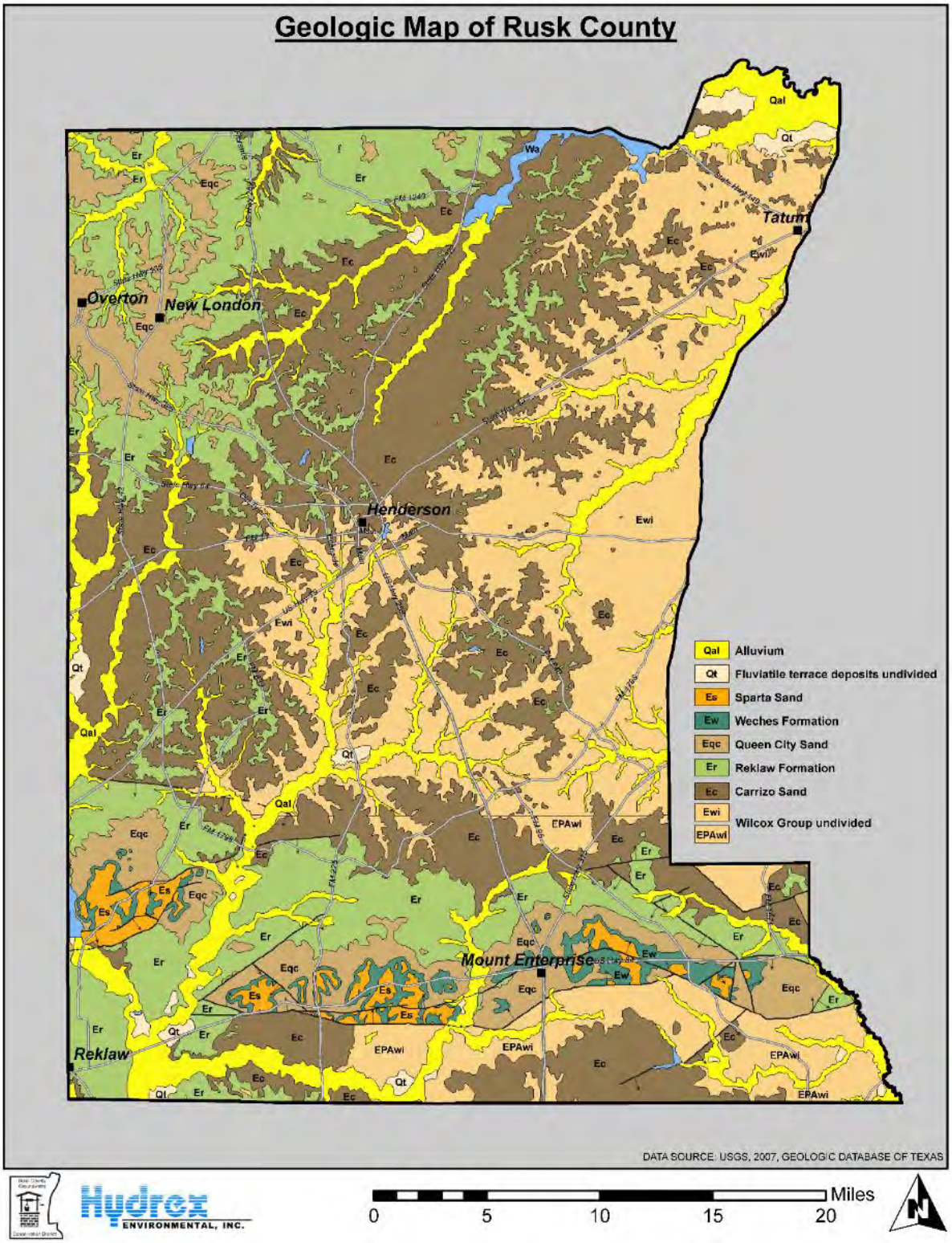

Figure 8. Geologic Map of Rusk County, Texas.

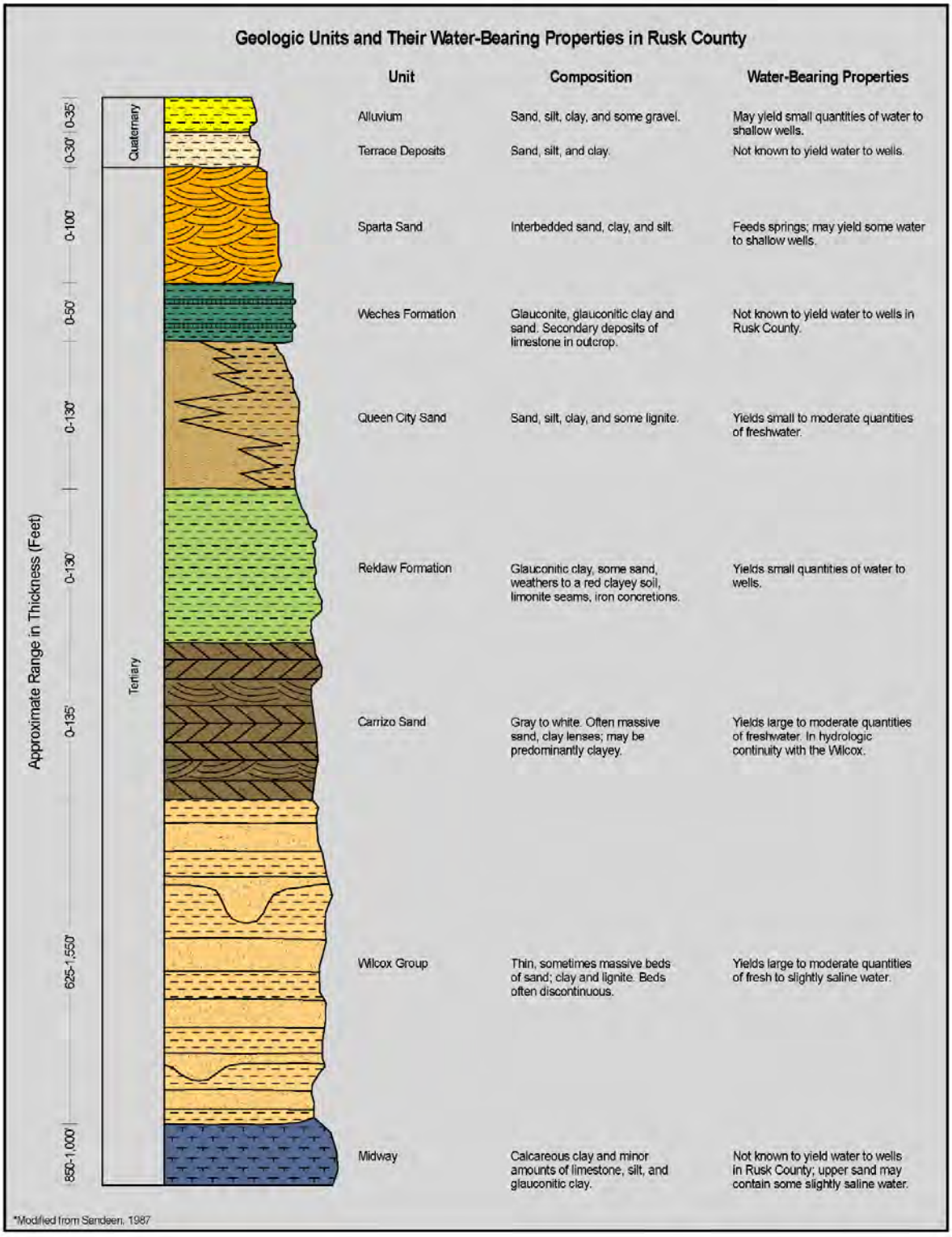

Figure 9. Geologic Units and Their Water-Bearing Properties in Rusk County, Texas.

2.3 Stratigraphy of Rusk County

The top of the Midway Group of Paleocene age marks the base of the extent of fresh groundwater in Rusk County. The Midway group is overlain successively by the Wilcox Group, Carrizo Sand, Reklaw Formation, Queen City Sand, Weches Formation, and Sparta Sand (Figure 9).

In Central Texas, the Wilcox Group of Paleocene to Eocene age, is subdivided into the Hooper, Simsboro, and Calvert Bluff formations, corresponding to deltaic, fluvial, and fluvial-deltaic facies, respectively. However, in East Texas, the Simsboro is no longer identifiable and the Wilcox Group is divided into informal lower and upper units. The lower Wilcox represents the facies equivalent of the Hooper Formation and the upper Wilcox includes both the Simsboro and the Calvert Bluff equivalent fluvial and fluvial-deltaic facies, respectively.

In East Texas and Rusk County, the Wilcox Group consists of beds of sand, silt, and clay, with locally economic amounts of lignite. These Wilcox Group sediments represent multi-facies, fluvial-deltaic systems where channels and associated sand facies form the framework for groundwater movement. The sand bodies are elongated, sinuous, and laterally discontinuous with axes generally oriented north to south consistent with the direction of sediment transport. The elongate sand bodies represent ancient fluvial systems and offer optimal locations for high yield water wells. In western Rusk County, the Wilcox reaches a maximum thickness of approximately 1500 feet. The unit thins toward the uplift and is reduced to slightly over 600 feet thick in its outcrop in the eastern portion of the county.

The Carrizo Sand is a massive, relatively homogenous sand of Eocene age consisting of medium- to fine-grain quartz sand with minor occurrences of interbedded gray clay. The Carrizo Sand is a clastic, near shore deposit with beach, dune, barrier island, and lagoonal facies represented in outcrops throughout East Texas. In Rusk County, where not thinned or entirely removed by erosion, the formation can reach a thickness of over 125 feet.

The Reklaw Formation of Eocene age is a shallow marine shelf deposit that is primarily composed of glauconitic clay and silt. In some locales, the formation commonly contains minor amounts of sand in the basal portion of the formation, near its contact with the underlying Carrizo Sand. In outcrop, the Reklaw forms a red clay soil that typically contains limonite seams and iron concretions. In Rusk County, the Reklaw Formation reaches a maximum thickness of approximately 130 feet and occurs primarily in the northern portion of the county and north of the Mt. Enterprise Fault System in the southern portion of the county.

The Queen City Sand of Eocene age was deposited by an extensive deltaic system and is primarily composed of sand, loosely cemented sandstone, and interbedded clay units with minor occurrences of lignite. In East Texas, sand facies of the Queen City Sand are thickest near the center of the East Texas Basin and generally thin eastward along the strike of the formation, pinching out in the subsurface just west of the Texas-Louisiana border. In Rusk

County, the Queen City Sand occurs in outcrop and subcrop in the northwestern portion of the county and also in the Mount Enterprise Fault System in the southern portion of the county. The formation ranges in thickness up to 130 feet.

The Weches Formation of Eocene age is a shallow marine shelf deposit that is primarily composed of glauconitic clay with only minor amounts of sand. The formation is green in unweathered sections but weathers to red when exposed. Relatively thin sections of the Weches Formation occur in the Mt. Enterprise Fault System in southern Rusk County where it attains a maximum thickness of approximately 50 feet.

The Sparta Sand of Eocene age consists of fine sand and interbedded sandy clay and silt deposited in a deltaic environment similar to the Queen City Sand. In Rusk County, the Sparta Sand only exists as laterally discontinuous units within the Mt. Enterprise Fault System where it attains maximum thicknesses of about 100 feet.

2.4 Groundwater Resources of Rusk County

The Texas Water Development Board recognizes the occurrence of one major aquifer, the Carrizo-Wilcox aquifer, and one minor aquifer, the Queen City aquifer, within Rusk County (Figures 10 and 11). Of these aquifers, the Carrizo-Wilcox aquifer is the most important and productive aquifer in Rusk County, historically supplying most of the groundwater produced within the county.

The Carrizo-Wilcox major aquifer is bound below by the marine deposits of the Midway Group and above by the Reklaw Formation. The marine deposits of the Midway Group represent a lower confining unit for the aquifer throughout its extent while the predominantly glauconitic clay sediments of the overlying Reklaw Formation represent an effective upper confining unit for the aquifer in its subcrop.

In Rusk County, much of the Carrizo-Wilcox aquifer occurs in outcrop (Figure 12). These outcrop areas serve as recharge zones for the downdip deep-lying sands of the aquifer in its subcrop. In its outcrop in the east-central portion of Rusk County, the Carrizo-Wilcox aquifer is often only represented by strata of the Wilcox Group. As the Wilcox sediments are predominantly comprised of fluvial and deltaic sands distributed among lower permeability interchannel silts and muds, the Wilcox portion of the Carrizo-Wilcox aquifer can be characterized as a multi-aquifer system. As opposed to the Carrizo aquifer, which can be characterized as a relatively homogenous, single aquifer system, the complex multi-aquifer system of the Wilcox requires an accurate description of both the arrangement of the various lithofacies (i.e. sand body distributions) and associated hydraulic properties in order for groundwater availability of the aquifer system to be properly modeled and understood.

Although considerably less important in Rusk County than the Carrizo-Wilcox aquifer, the Queen City minor aquifer is an important local source of groundwater primarily in its outcrop in the northwestern portion of Rusk County and in the Mt. Enterprise Fault System

in the southwestern portion of the county (Figure 12). The Queen City aquifer's limited extent and shallow occurrence in Rusk County make it a target for primarily low-yield production. In addition, its generally poorer water quality than the Carrizo-Wilcox aquifer make it a less desirable target for production and use as a primary drinking water source in Rusk County.

Another limited source of fresh groundwater in Rusk County is the Sparta aquifer. The Sparta aquifer provides small amounts of fresh groundwater to shallow, primarily low-yield wells in its outcrop within the Mt. Enterprise Fault System in southern Rusk County. Although the Sparta aquifer is recognized as a minor aquifer in other parts of Texas, the Sparta aquifer is not considered a minor aquifer in Rusk County due to its limited areal extent and its discontinuity with other Sparta Sand sediments outside of the Mt. Enterprise Fault System and Rusk County. As a result, the Sparta aquifer in Rusk County is not considered a significant source of groundwater for purposes of regional water planning and, thus, is not considered during regional-scale groundwater availability modeling.

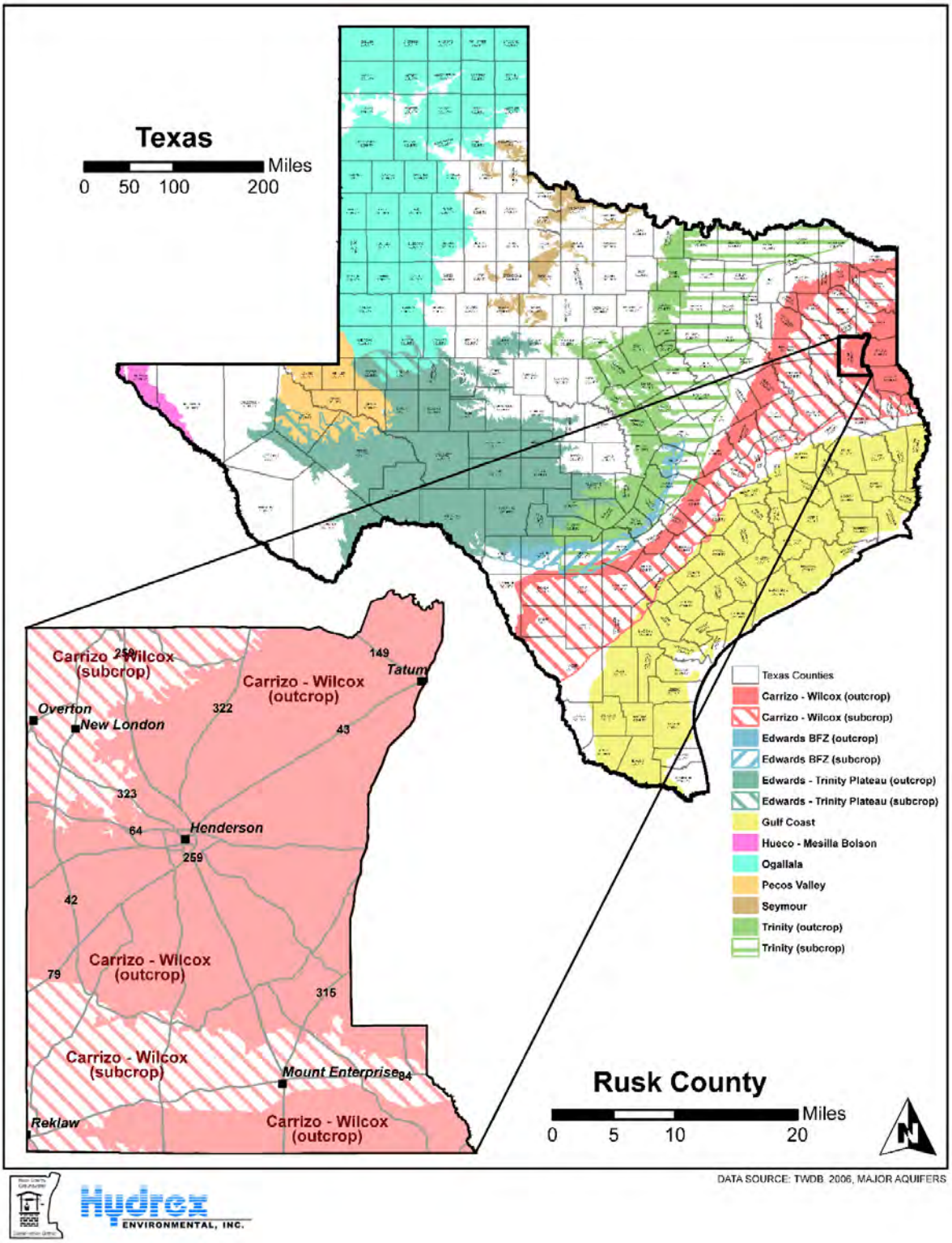

Figure 10. TWDB Major Aquifers of Texas and Rusk County.

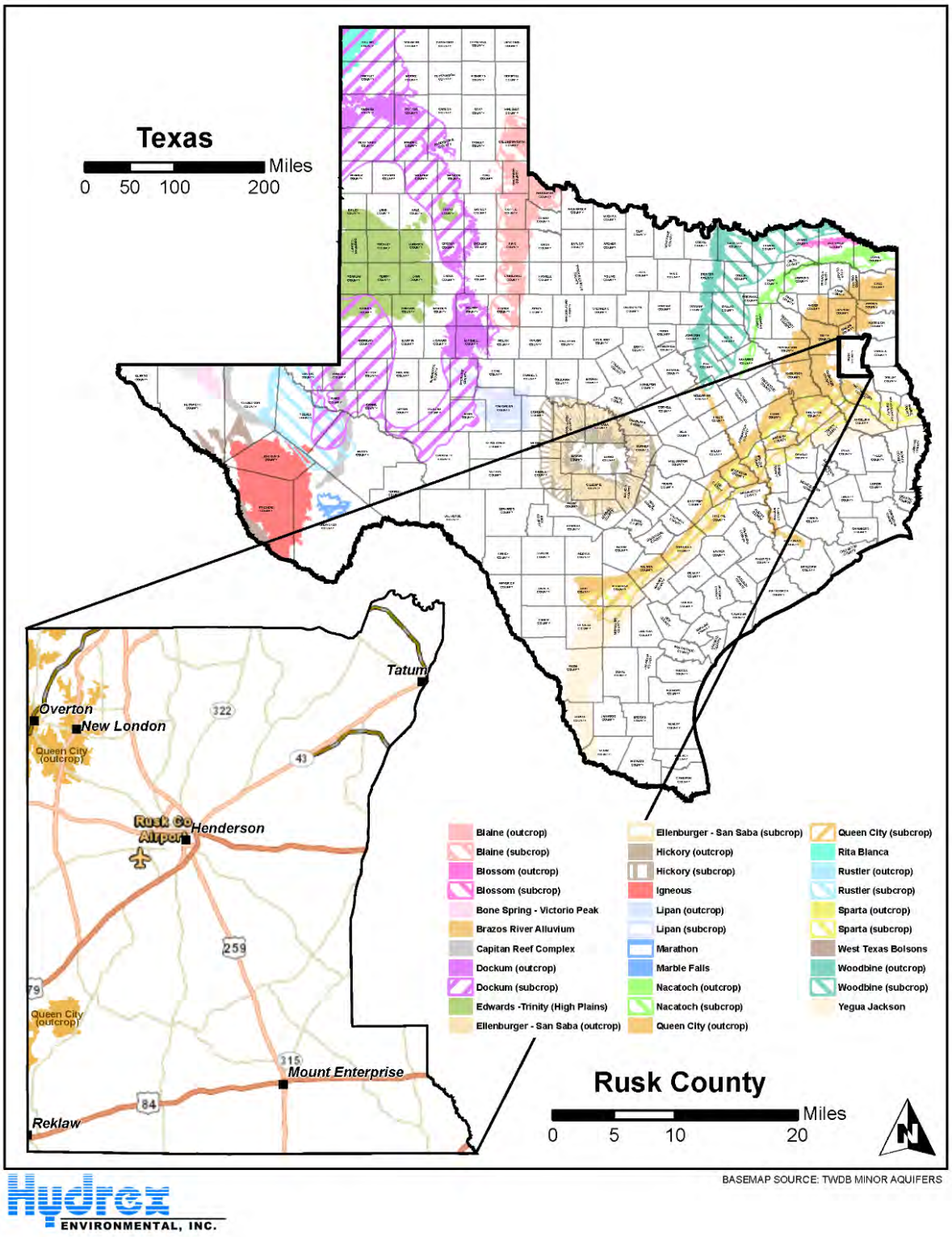

Figure 11. TWDB Minor Aquifers of Texas and Rusk County.

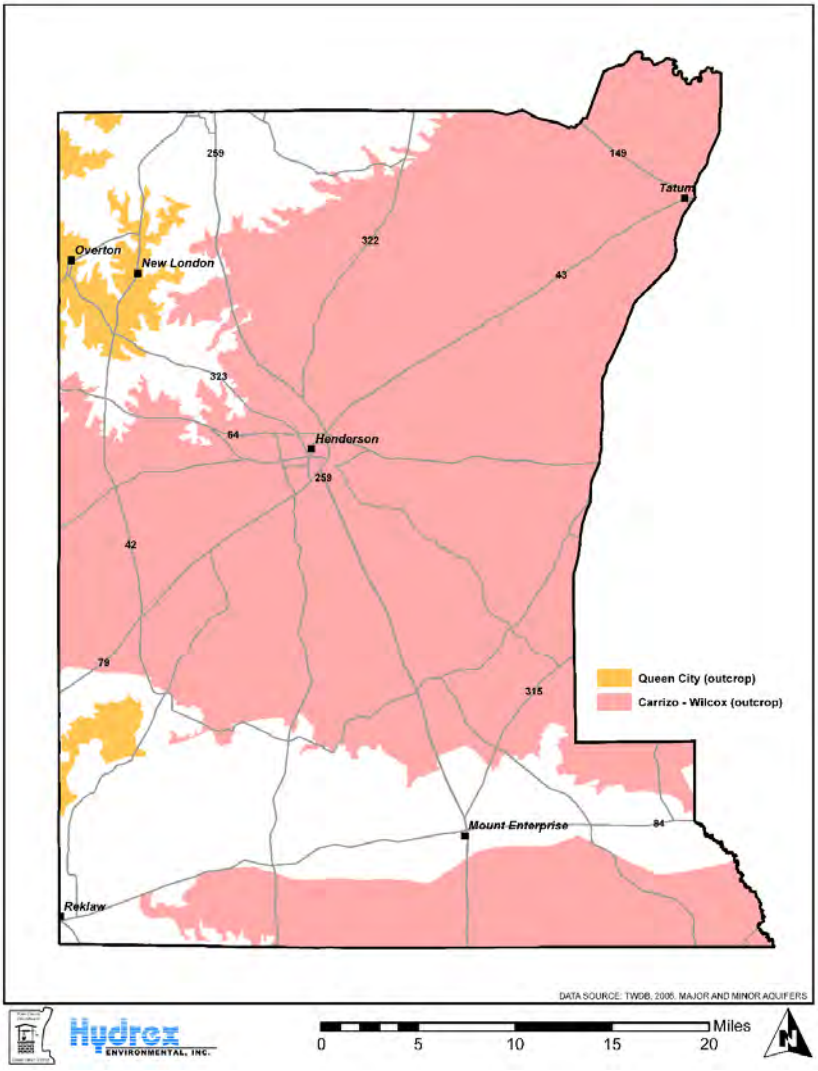

Figure 12. TWDB Major and Minor Aquifer outcrop areas in Rusk County, Texas.

Generally, groundwater movement in the different aquifers within Rusk County is from points of recharge in aquifer outcrop areas to points of discharge. In aquifer outcrops, groundwater movement is primarily downdip towards points of discharge, either along creeks, rivers, and streams or areas of significant groundwater production or withdrawal. In downdip portions of the Carrizo-Wilcox aquifer, groundwater movement is influenced by the regional dip of the Carrizo-Wilcox beds as well as cones of depression that have developed due to significant, prolonged production and/or withdrawal near the cities of Henderson and Tatum in Rusk County and Tyler in Smith County as well as the East Texas Oil Field.

SECTION 3. MODELED AVAILABLE GROUNDWATER

The 79th Texas Legislature enacted HB 1763 in 2005 that requires joint planning among districts that are in the same groundwater management area (GMA). These districts must jointly agree upon and establish the Desired Future Conditions (DFCs) of the aquifers within their respective GMAs. Through this process, the groundwater conservation districts will submit the DFC to the executive administrator of the Texas Water Development Board (TWDB) who, in turn, will provide each district within the GMA with the amount of Managed Available Groundwater (MAG) within each district. The MAG will be based on the DFCs jointly established for each aquifer within the GMA.

According to the Texas Water Code Section 36.001, MAG is defined as "the amount of water that the Executive Administrator (of the TWDB) determines may be produced on an average annual basis to achieve a DFC established under §36.108." The DFC is defined in §36.001 of the Texas Water Code as "a quantitative description, adopted in accordance with §36.108 of the Texas Water Code, of the desired condition of the groundwater resources in a management area at one or more specified future times."
A summary of the MAG in RCGCD is summarized in Table 1, as provided by TWDB, based on the DFCs established under Texas Water Code §36.108 and initially adopted by GMA 11 in 2010. RCGCD will update the MAG in the future, once GMA 11 adopts new DFCs in 2016 and the Texas Water Development Board issues the accompanying MAG.

31 Tex. Admin. Code §356.52(a)(5)(A).

Rusk County MAG Values (acre-feet per year)									
				Year					
Aquifer	County	Regional Water Planning Area	River Basin	2010	2020	2030	2040	2050	2060
Carrizo-Wilcox	Rusk	I	Neches	11,776	11,776	11,766	11,766	11,766	11,747
Carrizo-Wilcox	Rusk	I	Sabine	9,067	9,067	9,067	9,067	9,067	9,067
Queen City	Rusk	I	Neches	40	40	40	40	40	40
Queen City	Rusk	I	Sabine	18	18	18	18	18	18
Sparta	Rusk	I	Neches	4,362	0	0	0	0	0
			Totals	25,263	20,901	20,891	20,891	20,891	20,872

Table 1: Groundwater Management Area 11 – MAG values for Rusk County as documented in TWDB GAM Run 10-016 MAG Version 2. See Appendix E for complete report. Units are in acre-feet per year.

SECTION 4. ANNUAL GROUNDWATER USE

Table 2 displays the amount of groundwater being used within RCGCD on an annual basis, pursuant to the TWDB Water Use Survey Groundwater Pumpage Estimates from 2008-2012.

31 Tex. Admin. Code §356.52(a)(5)(B).

Rusk County Annual Groundwater Use (acre-feet per year)							
Year	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	7,405	13	576	0	358	193	8,545
2012	7,885	15	425	2,377	123	180	11,005
2011	8,954	26	547	1,023	308	223	11,081
2010	7,517	31	1,058	358	0	224	9,188
2009	6,719	219	1,059	183	0	194	8,374

Table 2: Estimated Historical Water Use as documented in the TWDB Estimated Historical Water Use & 2012 State Water Plan Data Set. See Appendix F for complete report. Units are in acre-feet per year.

SECTION 5. GROUNDWATER BUDGET

5.1 Annual Amount of Recharge from Precipitation

Table 3 displays the annual amount of recharge from precipitation, if any, to the groundwater resources within the District, as provided by the TWDB.

31 Tex. Admin. Code §356.52(a)(5)(C).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	70,358
Estimated annual amount of recharge from precipitation to the district	Queen City Aquifer	1,200

Table 3: Precipitation values for Rusk County as documented in TWDB GAM Run 14-011. See Appendix D for complete report. Units are in acre-feet per year.

5.2 Annual Volume Discharges

Table 4 displays the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers in the District, as provided by the TWDB.

31 Tex. Admin. Code §356.52(a)(5)(D).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Carrizo-Wilcox Aquifer	25,743
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Queen City Aquifer	227

Table 4: Discharge values for Rusk County as documented in TWDB GAM Run 14-011. See Appendix D for complete report. Units are in acre-feet per year.

5.3 Annual Volume of Flow throughout Aquifers

Table 5 and 6 displays the annual volume of flow into and out of the District within each aquifer and between aquifers in the District, if a groundwater availability model is available from the TWDB.

31 Tex. Admin. Code §356.52(a)(5)(E).

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	4,016
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	14,269
Estimated net annual volume of flow between each aquifer in the district	To the Carrizo-Wilcox Aquifer from the Reklaw Formation confining unit	2,147

Table 5: Aquifer flow values for Rusk County as documented in TWDB GAM Run 14-011. See Appendix D for complete report. Units are in acre-feet per year.

Management Plan Requirement	Aquifer or Confining Unit	Results
Estimated annual volume of flow into the district within each aquifer in the district	Queen City Aquifer	63
Estimated annual volume of flow out of the district within each aquifer in the district	Queen City Aquifer	62
Estimated net annual volume of flow between each aquifer in the district	From the Queen City Aquifer to the Reklaw Formation confining unit	1,176
	From the Queen City Formation to the Queen City Aquifer	75

Table 6: Aquifer flow values for Rusk County as documented in TWDB GAM Run 14-011. See Appendix D for complete report. Units are in acre-feet per year.

SECTION 6. PROJECTED SURFACE WATER SUPPLY IN RUSK COUNTY

6.1 Surface Water Resources of Rusk County

Rusk County is divided into two major watersheds by a northwest-southeast trending ridge that defines the boundary between the Sabine River drainage basin and the Neches River drainage basin (Figure 15). Both major watersheds are comprised of dendritic drainage systems that contain many large streams. Hydrology is provided by precipitation, surface water runoff, and groundwater discharge. Large streams throughout Rusk County are generally gaining streams, receiving an influx of water from both groundwater discharges as well as surface water run-off (Figure16). On average, Rusk County receives approximately 49.57 inches of precipitation annually.

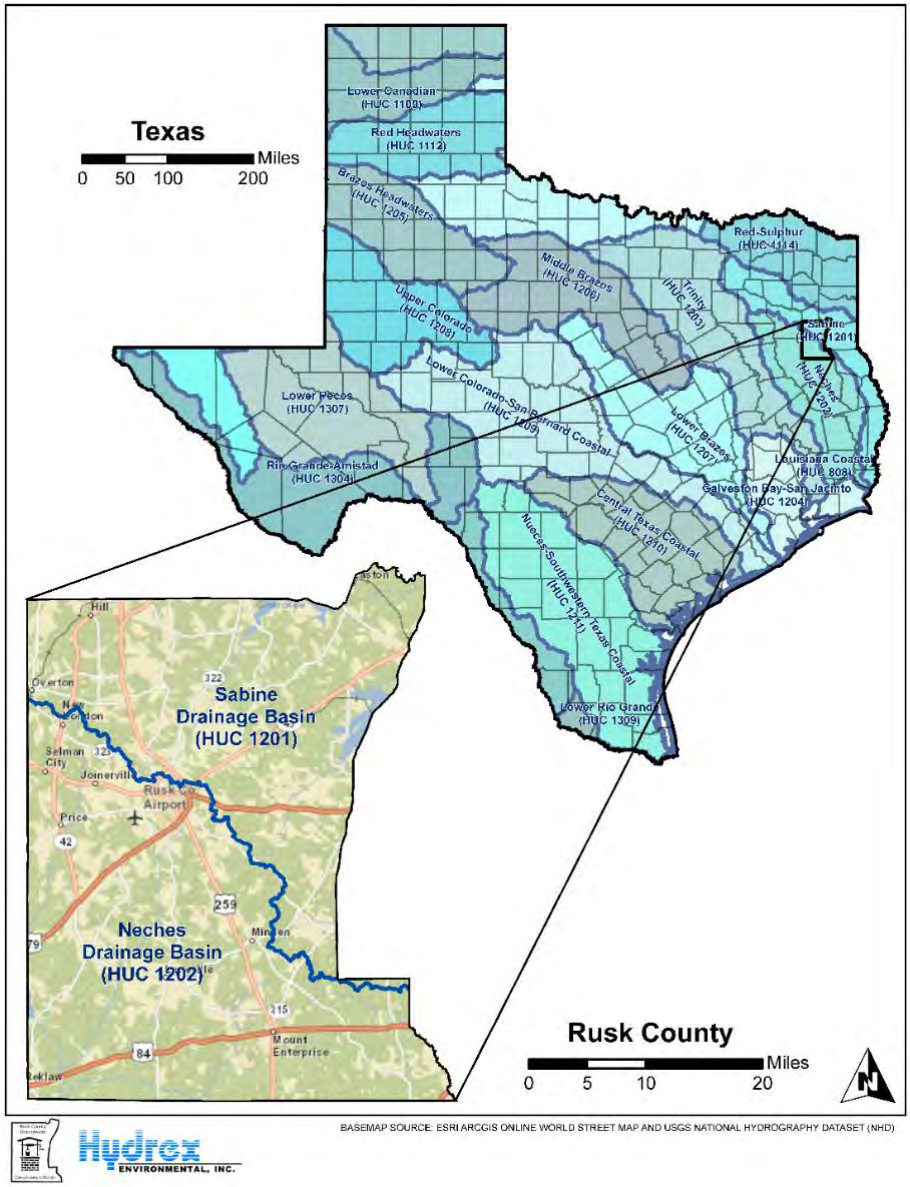

Figure 15. Major drainage basins within Texas and Rusk County.

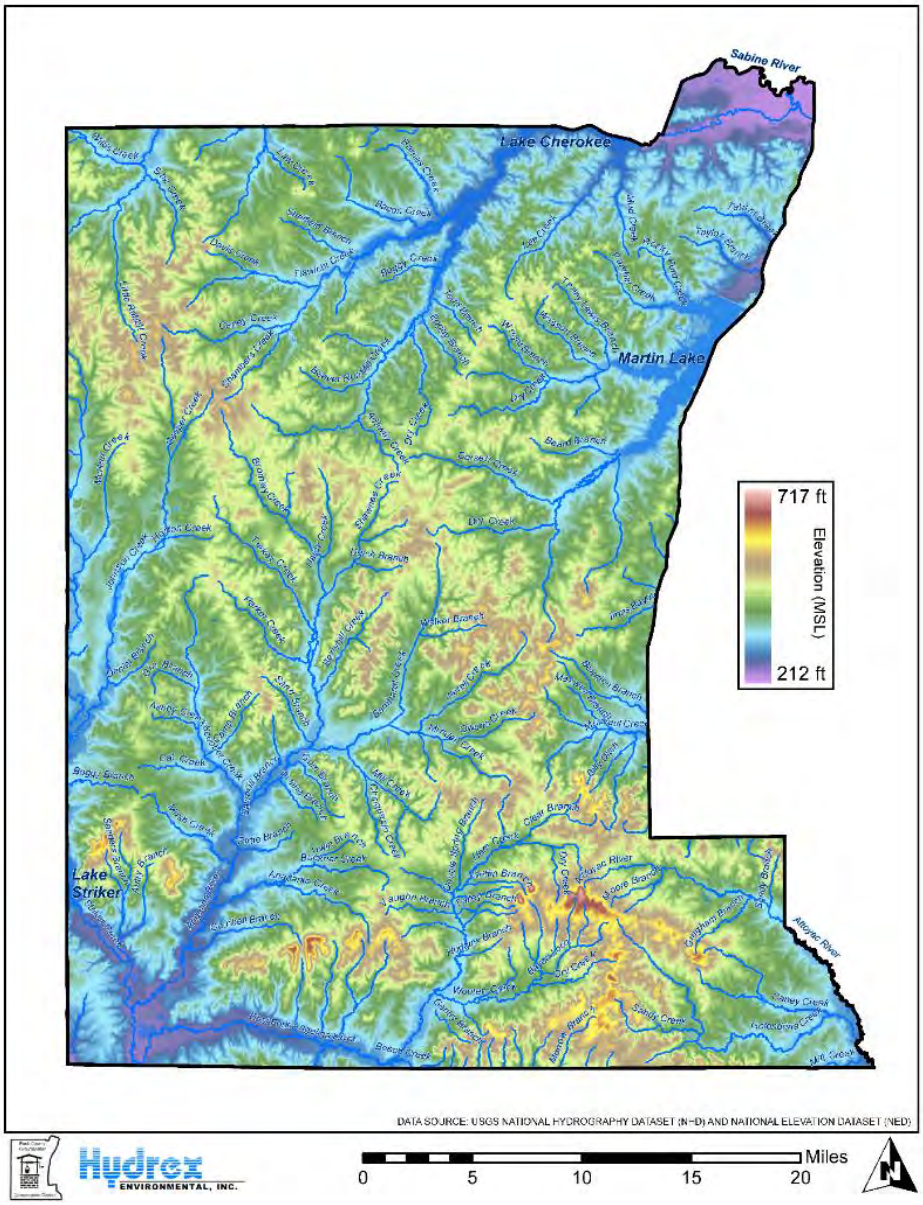

Figure 16. Topography and surface hydrology within Rusk County.

The northwestern, northeastern, and eastern portions of Rusk County lie within the Sabine River drainage basin, hydrologic unit code (HUC) 1201. Surface water in the northwestern and northeastern portions of the county, specifically in the Rabbit Creek-Sabine River (HUC 1201000206), Cherokee Bayou-Sabine River (HUC 1201000207), and Martin Creek (HUC 1201000209) sub-watersheds, generally flows in a northeasterly direction towards the Sabine River. Surface water in the eastern portions, specifically Irons Bayou (HUC 1201000210) and Murvaul Creek-Sabine River (HUC 1201000211) sub-watersheds, generally flows in an easterly direction towards the Sabine River. The Sabine River serves as the county boundary in the extreme northeastern corner of Rusk County (Figure 17).

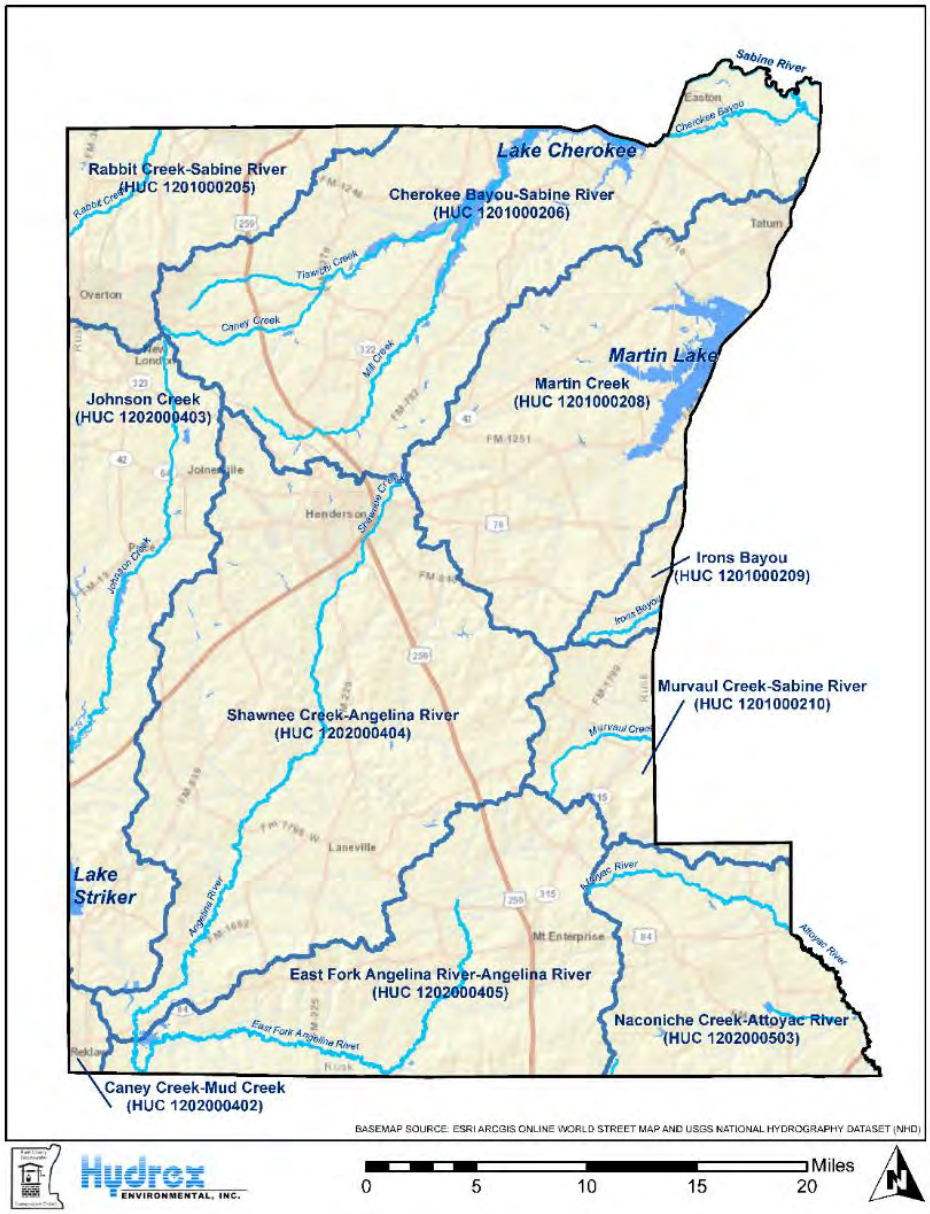

Figure 17. Sub-watersheds within Rusk County.

Lake Cherokee is located along the northern boundary of Rusk County within the Cherokee Bayou-Sabine River sub-watershed (Figure 17). Lake Cherokee, operated by Lake Cherokee Water Company, was constructed in 1948 and is currently used for municipal, industrial, and recreational purposes. The City of Longview diverts water for municipal water supply and Southwestern Power Company diverts water for cooling purposes at the Knox Lee Power Plant. At normal pool elevation of 280 feet, relative to mean sea level, Lake Cherokee yields approximately 3,497 surface acres and has a capacity of approximately 46,737 acre-feet. The drainage area above Lake Cherokee is approximately

158 square-miles. Downstream of Lake Cherokee, Cherokee Bayou converges with the Sabine River in the northeastern portion of Rusk County.

Martin Lake is located along the eastern boundary of Rusk County within the Martin Creek sub-watershed (Figure 17). Martin Lake was constructed in the 1970s for purposes of generating electricity and to serve as a cooling lake for Luminant's Martin Lake power plant. As such, the lake is not currently used as a source for municipal water supply. Martin Lake yields approximately 4,981 surface acres at normal pool elevation of 306 feet, relative to mean sea level, and has a capacity of approximately 75,116 acre-feet. The drainage area above Martin Lake is approximately 130 square-miles. Downstream of Martin Lake, Martin Creek converges with the Sabine River approximately 12.3 miles east of Rusk County.

The western, southwestern, and southeastern portions of Rusk County lie within the Neches River drainage basin, HUC 1201. Surface water in the western and southwestern portions of the county, specifically in the Johnson Creek (HUC 1202000404), Shawnee Creek-Angelina River (HUC 1202000405), East Fork Angelina River-Angelina River (HUC 1202000406), and Caney Creek-Mud Creek (HUC 1202000407) sub-watersheds, generally flows in a southwesterly direction forming the headwaters of the Angelina River (Figure 17). Surface water in the southeastern portion of the county, specifically in the Naconiche Creek-Attoyac River (HUC 1202000504) sub-watershed, generally flows in a southeasterly direction forming the headwaters of the Attoyac Bayou (Figure 17). The Attoyac Bayou converges with the Angelina River at Sam Rayburn Reservoir, approximately 40 miles south of Rusk County. Approximately 14.5 miles downstream of the Sam Rayburn Reservoir dam, the Angelina River discharges into the Neches River.

Lake Striker is located along the western boundary of Rusk County within the Johnson Creek sub-watershed (Figure 17). Lake Striker, owned by the Angelina-Nacogdoches Counties Water Control and Improvement District No. 1, was constructed in 1956 and 1957. The District provides water to Luminant Energy for industrial use at their power plant on the west side of the reservoir and also to Southern Power Company for cooling water at the biomass fired power plant near Sacul in northwestern Nacogdoches County, Texas. The City of Henderson also holds water rights in Lake Striker that may be used in the future. At normal pool elevation of 293 feet, relative to mean sea level, Lake Striker yields approximately 1,920 surface acres and has a capacity of approximately 22,865 acre-feet. The drainage area above Lake Striker is approximately 182 square-miles. Downstream of Lake Striker, Striker Creek converges with the Angelina River in the southwestern portion of Rusk County.

6.2 Projected Surface Water Supplies

Table 7 displays the projected surface water supplies within Rusk County for Water User Groups (WUGs) determined by Region Water Planning Group I.

31 Tex. Admin. Code §356.52(a)(5)(F)

WUG	WUG Type	Source	Rusk County Projected Surface Water Supply (acre-feet per year)					
			2010	2020	2030	2040	2050	2060
EASTON	MUNICIPAL	CHEROKEE LAKE/RESERVOIR	61	83	96	102	120	163
ELDERVILLE WSC	MUNICIPAL	CHEROKEE LAKE/RESERVOIR	286	303	320	337	354	369
HENDERSON	MUNICIPAL	FORK LAKE/RESERVOIR	4,381	4,381	4,381	4,381	4,381	4,380
IRRIGATION	IRRIGATION	RUN-OF-RIVER | SABINE BASIN	127	127	127	127	127	127
KILGORE	MUNICIPAL	RUN-OF-RIVER | SABINE BASIN	303	290	278	266	251	233
LIVESTOCK	LIVESTOCK	LOCAL SURFACE WATER SUPPLY	694	694	694	694	694	694
MANUFAC-TURING	MANUFAC-TURING	RUN-OF-RIVER | NECHES BASIN	2	2	2	2	2	2
MINING	MINING	LOCAL SURFACE WATER SUPPLY	287	287	287	287	287	287
STEAM ELECTRIC POWER	STEAM-ELECTRIC	MARTIN LAKE/RESERVOIR	25,000	25,000	25,000	25,000	25,000	25,000
STEAM ELECTRIC POWER	STEAM-ELECTRIC	TOLEDO BEND LAKE/RESERVOIR	17,922	17,922	17,922	17,922	17,922	17,922
Sum of Projected Surface Water Supplies			49,063	49,089	49,107	49,118	49,138	49,177

Table 7: Projected Surface Water Supplies for Rusk County as documented in the TWDB Estimated Historical Water Use & 2012 State Water Plan Data Set. See Appendix F for complete report.

SECTION 7. PROJECTED WATER DEMANDS

The projected water demands for Rusk County through 2060 are shown in Table 8. All estimates are from the 2012 State Water Plan. As shown in table eight, the total water demand to water user groups (WUGs) in the year 2010 is 34,537 acre-feet and in year 2060 will be 64,034 acre-feet.

31 Tex. Admin. Code §356.52(a)(5)(G).

WUG	WUG Type	Rusk County Projected Water Demand (acre-feet per year)					
		2010	2020	2030	2040	2050	2060
COUNTY-OTHER	MUNICIPAL	2,660	2,733	2,759	2,700	2,787	3,088
EASTON	MUNICIPAL	8	11	12	13	15	21
ELDERVILLE WSC	MUNICIPAL	324	353	369	378	400	456
HENDERSON	MUNICIPAL	2,417	2,396	2,367	2,333	2,320	2,351
IRRIGATION	IRRIGATION	126	126	126	126	126	126
KILGORE	MUNICIPAL	532	520	512	503	500	500
LIVESTOCK	LIVESTOCK	1,171	1,188	1,207	1,231	1,257	1,283
MANUFAC-TURING	MANUFAC-TURING	82	90	97	103	108	116
MINING	MINING	1,540	1,679	1,761	1,841	1,921	1,996
MOUNT ENTERPRISE	MUNICIPAL	71	71	70	68	69	73
NEW LONDON	MUNICIPAL	225	228	230	228	232	248
OVERTON	MUNICIPAL	413	429	434	432	447	491
SOUTHERN UTILITIES COMPANY	MUNICIPAL	71	74	74	75	77	85
STEAM ELECTRIC POWER	STEAM-ELECTRIC	24,760	27,458	32,102	37,762	44,663	53,074
TATUM	MUNICIPAL	122	118	115	112	110	110
WEST GREGG WSC	MUNICIPAL	15	15	15	15	15	16
Sum of Projected Water Demand		34,537	37,489	42,250	47,920	55,047	64,034

Table 8: Projected Water Demand for Rusk County as documented in the TWDB Estimated Historical Water Use & 2012 State Water Plan Data Set. See Appendix F for complete report.

Water User Type	Rusk County Projected Water Demand (acre-feet per year)					
	2010	2020	2030	2040	2050	2060
MUNICIPAL	6,858	6,948	6,957	6,857	6,972	7,439
MANUFACTURING	82	90	97	103	108	116
MINING	1,540	1,679	1,761	1,841	1,921	1,996
STEAM ELECTRIC	24,760	27,458	32,102	37,762	44,663	53,074
LIVESTOCK	1,171	1,188	1,207	1,231	1,257	1,283
IRRIGATION	126	126	126	126	126	126
Total Projected Water Demand	34,537	37,489	42,250	47,920	55,047	64,034

Table 9: Projected Water Demand for Rusk County as documented in the TWDB Estimated Historical Water Use & 2012 State Water Plan Data Set. See Appendix F for complete report.

SECTION 8. PROJECTED WATER MANAGEMENT STRATEGIES

Water management strategies are specific plans to increase water supply or maximize existing water supply to meet a specific need. The Regional Water Planning Group I has several recommendations throughout the planning area. Only three viable strategies were recognized for Rusk County as is displayed in Table 10.

Texas Water Code §36.1071(e)(4).

WUG	Water Management Strategy	Source	Region I Projected Water Management Strategies for Rusk County (acre-feet per year)					
			2010	2020	2030	2040	2050	2060
Mining	New Wells	Carrizo-Wilcox Aquifer	0	0	0	158	158	158
Steam Electric	Purchase from Provider	Lake Columbia/Reservoir	0	0	0	0	0	8,500
Steam Electric	Purchase from Provider	Toledo Bend Lake/Reservoir	0	0	0	0	1,501	1,500
Sum of Projected Water Management Strategies			0	0	0	158	1,659	10,158

Table 10: Projected Water Management Strategies for Rusk County as documented in the TWDB Estimated Historical Water Use & 2012 State Water Plan Data Set. See Appendix F for complete report.

SECTION 9. MANAGEMENT OF GROUNDWATER SUPPLIES

To meet the requirements of 31 Tex. Admin. Code §356.52(a)(4), the RCGCD provides the following details on how it manages groundwater supplies in the District.

Groundwater conservation districts have statutorily been designated as the preferred method of groundwater management in Texas, through the rules developed, adopted, and promulgated by individual groundwater districts, as authorized by Chapter 36 of the Texas Water Code and the individual district's enabling act (Texas Water Code §36.0015). The RCGCD manages groundwater supplies, in part, by regulating the spacing and production of wells, to minimize drawdown of the water table or reduction of artesian pressure, to control subsidence, to prevent interference between wells, to prevent degradation of water quality, and to prevent waste (Texas Water Code § 36.116). The method of groundwater production regulation is based on hydrogeological conditions of aquifers in the District.

The RCGCD, as authorized by law, has adopted the following groundwater management strategies:

A. PUMPING RATE LIMIT

The District regulates groundwater withdrawal through permitting efforts. New non-exempt wells producing water from all RCGCD aquifers will be required to have land legally assigned to the well in an amount to be determined in relationship to the average annual production rate of the well.

B. BENEFICIAL USE

The District regulates groundwater withdrawal by setting production limits on wells based on evidence of beneficial use.

C. WELL SPACING

To minimize as far as practicable the drawdown of the water table and the reduction of artesian pressure, to control subsidence, to prevent interference between wells, to prevent degradation of water quality, and to prevent waste, the District enforces spacing requirements on all new wells in the District.

There are two types of spacing requirements, both of which apply to all new non-exempt wells in the District and water wells that require registration for production activities related to oil and gas exploration and production. The first spacing rule is the distance that the well site must be from the perimeter of the real property that is assigned to that well under Rule 8.1(b). The second spacing rule is the distance that the well site must be from all permitted non-exempt wells and all registered exempt wells.

(a) Spacing of new non-exempt wells completed in the District shall be one-half foot per gallon per minute (½ ft / gpm) of production capacity from the perimeter of the property that is legally assigned to that well.

(b) Spacing of new non-exempt wells completed in the District shall be one foot per one gallon per minute (1 ft / gpm).

The District's Rules are available on the District's website: http://www.rcgcd.org

SECTION 10. ACTIONS, PROCEDURES, PERFORMANCE AND AVOIDANCE FOR PLAN IMPLEMENTATION

To meet the requirements of Texas Water Code §36.107(e)(2), the District will act on the goals and directives established in this District Management Plan. The District will use the objectives and provisions of the Management Plan as a guideline in its policy implementation and decision-making. In both its daily operations and long term planning efforts, the District will continuously strive to comply with the initiatives and standards created by the Management Plan for the District.

The District will amend rules in accordance with Chapter 36 of the Texas Water Code and rules will be followed and enforced. The District may amend the District rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and to ensure the best management of the groundwater within the District. The development and enforcement of the rules of the District will be based on the best scientific and technical evidence available to the District.

The District will encourage public cooperation and coordination in the implementation of the District Management Plan. All operations and activities of the District will be performed in a manner that best encourages cooperation with the appropriate state, regional, and local water entities as well as landowners and the general public. Meetings of the District's Board of Directors will be noticed (announced) and conducted in accordance with the Texas Open Meetings Act. The District will also make available for public inspection all official documents, reports, records, and minutes of the District pursuant with the Texas Public Information Act.

SECTION 11. METHODOLOGY FOR TRACKING DISTRICT PROGRESS IN ACHIEVING MANAGEMENT GOALS

An annual report will be prepared and presented to the Board of Directors on District performance with regard to achieving management goals and objectives. The presentation of this report will occur within the first quarter of the following fiscal year. The Annual Report will be prepared in a format that will be reflective of the performance standards listed following each management objective. The District will maintain the reports on file for public inspection at the District's office upon adoption.

SECTION 12. GOALS, MANAGEMENT OBJECTIVES AND PERFORMANCE STANDARDS

The management goals, objectives, performance standards and tracking methods of the Rusk County Groundwater Conservation District in the emphasis areas defined in 31 TAC §356 as follows.

12.1. Providing the Most Efficient Use of Groundwater

12.1.A. Maintain a Well Registration Process

Objective: The District will require all new and existing exempt water wells, within the boundaries of the District to be registered in accordance with the District Rules.

Performance Standard: The District will issue a registration within 60 days of receiving an administratively complete application, if uncontested. The number of new and existing water wells registered with the District will be provided at the regular District Board meetings and in the District's Annual Report.

12.1.B. Maintain a Well Permitting Process

Objective: The District will require all new non-exempt water wells within the boundaries of the District to be permitted in accordance with the District Rules.

Performance Standard: The District will issue a permit within 60 days of receiving an administratively complete application, if uncontested. All non-exempt wells that do not require a public hearing will be presented at regular District Board meetings and in the District's Annual Report.

12.1.C. Maintain an Electronic Database

Objective: Maintain the District's Groundwater Well Database for registrations, permits, and groundwater production volume. The database shall include information deemed necessary by the District to enable effective monitoring and regulation of groundwater in the District.

Performance Standard: The District will document all new and existing wells in the District's database. All new and existing wells documented will be included in the District's Annual Report.

Performance Standard: The District will document groundwater production estimates and/or production volume. The District will include a summary of the estimated volume of water produced within Rusk County in the District's Annual Report.

12.2. Controlling and Preventing Waste of Groundwater

12.2.A. Disseminate Information on Waste Prevention

Objective: The District will implement a waste prevention program with the purpose of educating the public on elimination, reduction, and prevention of the waste of groundwater. The District will use at least one of the following methods to provide information to the public annually:

a. Distribute literature packets or brochures to the public and local schools;
b. Provide public presentations on groundwater and water issues, including waste prevention;
c. Sponsor an educational program or course;
d. Provide information on the District's web site;
e. Submit an article for publication with local papers;
f. Present displays at public events

Performance Standard: A summary of the District's efforts to disseminate information on waste prevention will be included in the District's Annual Report.

12.2.B. Identify Wasteful Practices

Objective: The District will identify wasteful practices within the boundaries of the District through the following methods:

a. Track water loss for all water utilities within the District;
b. Enforce District Rule 9.2.5 requiring inspection and/or plugging of oil and gas groundwater wells.

Performance Standard: The District will include a summary of the total volume of water loss from water utilities in the District's Annual Report.

Performance Standard: The District will include the total oil and gas groundwater wells inspected and plugged each fiscal year in the District's Annual Report.

12.3. Addressing Conjunctive Surface Water Management Issues

12.3.A. Participating in the Regional Water Planning Process

Objective: The District will attend at least one East Texas Regional Water Planning Group (Region I) and the North East Texas Regional Water Planning Group (Region D) meeting each fiscal year.

Performance Standard: The District will participate in the regional planning process by attending at least one meeting of Region I and Region D meetings each fiscal year. A report will be presented at a regular board meeting of the District on conjunctive surface water issues of the appropriate Regional Water Planning Groups. Attendance of meetings for Region I and Region D will be included in the District's Annual Report

12.4. Addressing Natural Resource Issues

12.4.A. Monitor Water Levels

Objective: The District will manage and maintain its existing water level monitoring program. The District will monitor water levels within the District boundaries at least annually and will be recorded in the District's database.

Performance Standard: A description of the number of wells measured and the monitoring results of the year will be included in the District's Annual Report.

12.4.B. Address Abandoned and Nuisance Wells

Objective: The District will encourage the plugging of abandoned and nuisance groundwater wells. The District will conduct inspections of groundwater wells within the District's boundaries to encourage proper maintenance of groundwater wells and to document abandoned and nuisance groundwater wells that pose a risk to the District's groundwater resources.

Performance Standard: A description of the number of wells inspected, the number of wells in violation, and the number of wells brought into compliance or plugged will be included in the District's Annual Report

12.5. Addressing Drought Conditions

12.5.A. Drought Contingency Plan

Objective: The District will implement its Drought Contingency Plan if conditions meet the criteria listed in the plan. The District will evaluate its Drought Contingency Plan annually to determine if any amendments are necessary and properly respond to drought conditions locally.

Performance Standard: A summary of the evaluation of the District's Drought Contingency Plan and any revisions to the plan for proper response to drought conditions will be included in the District's Annual Report.

12.5.B. Track Drought Conditions

Objective: The District will track drought conditions through the Palmer Drought Severity Index Map.

Performance Standard: A link on the District's web page to the Palmer Drought Severity Map will be made available to the public.

12.6. Addressing Conservation, Recharge Enhancement, and Rainwater Harvesting

12.6.A. Public Education to Emphasize Water Conservation

Objective: In coordination with efforts in waste prevention, the District will implement a conservation program with the purpose of educating the public on ways to conserve water. The District will use at least one of the following methods to provide information to the public annually:

a. Distribute literature packets or brochures to the public and local schools;
b. Provide public presentations on groundwater and water issues, including conservation;
c. Sponsor an educational program or course;
d. Provide information on the District's web site;
e. Submit an article for publication with local papers; and
f. Present displays at public events.

Performance Standard: A summary of the District's efforts to disseminate information on water conservation will be included in the District's Annual Report.

12.6.B. Recharge Enhancement

Objective: The District will provide information relating to recharge enhancement on the District web site at least once annually each fiscal year.

Performance Standard: Information that has been provided on the District web site will be included or summarized in the District's Annual Report.

12.6.C. Rainwater Harvesting

Objective: The District will promote rainwater harvesting by providing information about rainwater harvesting on the District web site.

Performance Standard: Information that has been provided on the District web site will be included or summarized in the District's Annual Report.

12.7. Addressing the Desired Future Conditions of the Groundwater Resources

12.7.A. Manage and Maintain a Water Level Monitoring Program

Objective: The District will manage and maintain its existing water level monitoring program. The District will monitor water levels within the District boundaries at least annually and will be recorded in the District's database. The District will evaluate whether the average change in water levels is in conformance with the DFCs adopted by the District.

Performance Standard: A description of the number of wells measured and the monitoring results of the year will be included in the District Annual Report.

Performance Standard: An annual comparison of water level changes to the District's DFC will be evaluated.

12.7.B. Monitor estimate Annual Production

Objective: The District will estimate total annual groundwater production for each aquifer based on water use reports, estimated exempt use, and other relevant information and compare production estimates to the Managed Available Groundwater (MAG).

Performance Standard: The District will record the total estimated annual production for each aquifer and compare these amounts to the MAG.

12.8. Management Goals Determined Not Applicable

12.8.A. Control and Prevention of Subsidence

The geologic framework of the region precludes significant subsidence from occurring.

12.8.B. Precipitation Enhancement

With the high amount of rainfall in the District, precipitation enhancement does not appear needed. Therefore, this goal is not applicable at this time.

12.8.C. Brush Control

A significant amount of the area of the District is heavily forested with other areas in improved pasture or cultivated land. Brush control as a goal, is not applicable at this time.

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APPENDICES

APPENDIX A

PUBLIC NOTICES FOR ADOPTION OF MANAGEMENT PLAN

APPENDIX B

NOTIFICATION & EVIDENCE OF COORDINATING WITH SURFACE WATER ENTITIES

APPENDIX C

CERTIFIED COPY OF ADOPTED RESOLUTION

APPENDIX D

GAM RUN 14-011

APPENDIX E

GAM RUN 10-016 MAG VERSION 2

APPENDIX F

ESTIMATED HISTORICAL WATER USE
&
2012 STATE WATER PLAN DATASETS

APPENDICES

APPENDIX A

PUBLIC NOTICES FOR ADOPTION OF MANAGEMENT PLAN

Rusk County Groundwater Conservation District

Board of Directors Public Hearing & Special Meeting

DISTRICT OFFICE
Conference Room
500 North High Street, Henderson, Texas 75652
August 31, 2015
4:00 P.M.

Matters to be considered by the Board of Directors and on which the Board of Directors may take official action include:

Public Hearing & Special Meeting Agenda

1. Invocation.
2. Public Comment: Comments are restricted to 3 minutes, limit of one speaker per issue. No action will be taken unless provided on the agenda.
3. Consideration and possible action on minutes of regular board meeting held August 3, 2015.
4. A public hearing to consider the proposed tax rate of $0.0050 per $100.00 of appraised taxable value for FY 2015/2016.
5. Consider a resolution adopting the tax rate for FY 2015/2016.
6. A public hearing to consider the FY 2015/2016 budget as proposed by the Budget Committee.
7. Consider adoption of the FY 2015/2016 Budget and discuss Commitment of Funds.
8. A public hearing to consider adoption of the District's Proposed Management Plan.
9. Consider a resolution adopting the District Management Plan.
10. Consider and discuss FY 2014/2015 Budget amendments and Commitment of Funds.
11. Establish date and time of next meeting.
12. Adjourn.

The Board of Directors may meet in closed session, pursuant to the Texas Open Meetings Act, Texas Government Code §§ 551.071-551.076, to:

(1) consult with an attorney to seek advice about pending or contemplated litigation or a settlement offer;
(2) deliberate regarding the purchase, exchange, lease, or value of real property if deliberation in an open meeting would have a detrimental effect on the position of the District in negotiations with a third person;
(3) deliberate a negotiated contract for a prospective gift or donation to the District if deliberation in an open meeting would have a detrimental effect on the position of the District in negotiations with a third person;
(4) to deliberate the appointment, employment, evaluation, reassignment, duties, discipline or dismissal of a Board member or District employee;
(5) to receive information from employees or question employees, but not deliberate public business or agency policy that affects public business; and
(6) to deliberate the deployment or specific occasions for implementation of security personnel or devices.

The Board may also meet in open session on these matters as required by the Texas Open Meetings Act, Texas Government Code § 551.102.

This notice is posted in accordance with the open meeting act.
Date Posted: August 14, 2015

FILED FOR RECORD

Aug 14,2015 10:42A

TRUDY MCGILL, COUNTY CLERK
RUSK COUNTY, TEXAS

BY:Savannah Sweeney, DEPUTY

Rusk County Groundwater Conservation District
Board of Directors Public Hearing & Special Meeting
August 31, 2015

Public Hearing and a Special meeting of the Rusk County Groundwater Conservation District Board of Directors was held on Monday, August 31, 2015 in the District Conference room located at 500 N. High St., Henderson, Texas 75652.

Board Members Present:

Precinct #1:	Ken Ragle
Precinct #2:	Harry Hamilton
Precinct #3:	John Langston
Precinct #4:	Bobby Brown, Worth Whitehead
At Large:	David Powell

Board Members Absent:

Precinct #1:	Neil Osburn
Precinct #2:	Amos Standard
Precinct #3:	Mike Wilhite

District Staff Present: Amanda Maloukis, General Manager; Diana Martinez, Office Manager

Visitors Present: No visitors present

1. The public hearing to consider the proposed tax rate of $0.0050 per $100.00 of appraised taxable value for FY 15/16, the public hearing to consider the FY 2015/2016 budget, the public hearing to consider the adoption of the District's Proposed Management Plan, and special board meeting was called to order at 4:00 p.m. by Chairman Bobby Brown and followed with invocation.

2. Public Comments: No public comments.

3. After reviewing the August 3, 2015 regular board meeting minutes, a motion was made by Ken Ragle and seconded by Worth Whitehead to accept the minutes as presented. The motion passed unanimously.

4. A public hearing to consider the proposed tax rate of $0.0050 per $100 of appraised taxable value for FY 2015/2016: Chairman Brown presented the proposed tax rate for FY 2015/2016. After discussion and careful consideration a motion was made by Worth Whitehead and seconded by Harry Hamilton to adopt the proposed tax rate of $0.0050 per $100 of appraised value. The motion passed with all approving.

5. Consider a resolution adopting the tax rate for FY 2015/2016: After discussion and adopting the proposed tax rate the board also considered adopting a resolution for the adopted tax rate passing unanimously.

6. A public hearing to consider the FY 2015/2016 budget as proposed by the Budget Committee: The 2015/2016 budget proposed by the budget committee was reviewed and discussed. A motion was made by John Langston and seconded by David Powell to adopt the proposed budget for FY

2015/2016 with an amendment to the payroll line item to include possible salary rate increases. After discussion the motion passed with all approving.

7. Consider and discuss FY 2014/2015 budget amendments: This item was moved in the meeting to keep financial discussions following each other. General Manager Amanda Maloukis presented the FY 2014/2015 budget with proposed amendments. After discussion and careful consideration a motion was made by Harry Hamilton and seconded by Ken Ragle with all approving, to adopt the proposed FY 2014/2015 Budget with amendments and an adjustment or transfer to the commitment of funds in the budget was not necessary and to be removed.

8. A public hearing to consider adoption of the District's Proposed Management Plan: General Manager Amanda Maloukis presented the District's proposed Management Plan and timeline for submission. A motion was made by Worth Whitehead and seconded by John Langston to approve the proposed Management Plan as presented for submission. The motion passed with all approving.

9. Consider a resolution adopting the District Management Plan: It was unanimously agreed to adopt a resolution to submit the Management Plan to the Texas Water Development Board.

10. Establish date and time of next meeting: The boards next meeting will be a regular meeting scheduled for Monday, October 12, 2015 at 4:00 p.m. at the District Office.

11. A motion was made by Ken Ragle and seconded by David Powell to adjourn the meeting with all approving.

(An audio recording of the August 31, 2015 board meeting is on file at the District Office)

Minutes approved by: _____
Bobby Brown – Board President

SUNDAY
AUGUST 16, 2015
Vol. 86, No. 127

PUBLIC NOTICE

The Rusk County Groundwater Conservation District (District) in compliance with Chapter 36 of the Texas Water Code and its Rules, will receive public comment on the proposed adoption of the Management Plan of the District at a public hearing at the District Office, located at 500 N. High St., Henderson, Texas, 75652 on Monday, August 31, 2015 at 4:00 pm. The District Board, at the conclusion of the public hearing, will discuss comments received and consider possible adoption of the Management Plan. Written comments may be submitted to the General Manager before the date of the public hearing. A complete copy of the current Management Plan of the District and proposed Management Plan are available at the District website http://rcgcd.org/Documents.htm and the District office, 500 North High Street, Henderson, Texas, 75652; 903.657.1900.

AFFIDAVIT OF PUBLICATION

THE STATE OF TEXAS
COUNTY OF RUSK
CITY OF HENDERSON

BEFORE ME, a notary public in and for the State of Texas, on this day personally appeared the person whose name is subscribed below, who, having duly sworn says upon oath that he or she is duly authorized officer or employee of the

HENDERSON DAILY NEWS

which is a newspaper of general circulation in the above named city and county; and certifies the amount charged was the lowest rate and that a true and correct copy of the said notice, a clipping of which is attached to this affidavit, was published in said newspaper on this date:

August 16th ,2015

Renee Sims

AUTHORIZED EMPLOYEE

SUBSCRIBED AND SWORN TO BEFORE ME

on the 17 day of August 2015

Nancy Harris

Notary Public

NANCY HARRIS
Notary Public
STATE OF TEXAS
My Comm. Exp. 04-26-2019

APPENDIX B

NOTIFICATION & EVIDENCE OF COORDINATING WITH SURFACE WATER ENTITIES

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 97 | Henderson, TX 75653
Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Angelina & Neches River Authority
Mr. Kelley Holcomb, General Manager
P.O. Box 387
Lufkin, TX 75902

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Holcomb,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 97 | Henderson, TX 75653
Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

City of Henderson
Tim Kelty, City Manager
400 West Main St.
Henderson, TX 75654

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Kelty,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

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September 16, 2015

City of Kilgore
Josh Selleck, City Manager
815 N. Kilgore St.
Kilgore, TX 75662

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Selleck,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

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Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Crossroads SUD
Scott Mason
P.O. Box 1001
Kilgore, TX 75663-1001

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Mason,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 97 | Henderson, TX 75653
Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Elderville WSC
Shane Gaskin
P.O. Box 7344
Longview, TX 75607-7344

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Gaskin,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

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Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Lake Cherokee Water Company
Martin Pessink
Nk20 Lake Cherokee
Longview, TX 75603

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Pessink,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 97 | Henderson, TX 75653
Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Sabine River Authority
Mr. David Montagne, General Manager
P.O. Box 579
Orange, TX 77631-0579

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Montagne,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 97 | Henderson, TX 75653
Office (903)657-1900 | Fax (903)657-1922
www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Southern Utilities
Royce Wisenbaker
218 N. Broadway Ave.
Tyler, TX 75702-5707

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Wisenbaker,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

RUSK COUNTY
GROUNDWATER CONSERVATION DISTRICT

P.O. BOX 97 | Henderson, TX 75653
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www.rcgcd.org | rcgcd@suddenlinkmail.com

September 16, 2015

Luminant
Rick Jeanes
Director of Environmental Regulatory & Strategy
1601 Bryan Street
Dallas, TX 75201

Re: Letter Coordinating Development of Rusk County Groundwater Conservation District's Management Plan with Surface Water Management Entities

Dear Mr. Jeanes,

The Rusk County Groundwater Conservation District (District) adopted its most recent Management Plan August 31, 2015 after public hearing by the District's Board of Directors.

In accordance with 31 TAC §356.51 and TWC §36.1071(a), the District is providing a digital copy of the Management Plan for your review. The Management Plan can also be viewed at the District's website, www.rcgcd.org located in the 'Documents' tab. The District recognizes your company is not a political subdivision as defined by the Texas Water Code but decided it would be a benefit to you to receive the District's Management Plan.

If you would like to provide any comments or have any concerns, please contact the District Office, (903)657-1900.

Sincerely,

Amanda Maloukis
General Manager
Rusk County Groundwater Conservation District

Enc: District Management Plan

APPENDIX C

CERTIFIED COPY OF ADOPTED RESOLUTION

RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT

CERTIFICATE FOR RESOLUTION

Resolution 2015-02

STATE OF TEXAS
COUNTY OF RUSK

I, the undersigned officer of the Board of Directors of the Rusk County Groundwater Conservation District, do hereby certify as follows:

1. The Board of Directors of the Rusk County Groundwater Conservation District convened in public session on the 31st day of August, 2015, inside the boundaries of the District, and the roll was called of the duly constituted officers and member of the Board, to-wit:

Bobby Brown	Worth Whitehead
Harry Hamilton	David C Powell
John Langston	Neil Osburn
Mike Wilhite	Ken Ragle
Amos Standard	

and the following persons were present. Bobby Brown, Worth Whitehead, David Powell, Harry Hamilton, Ken Ragle, and John Langston, thus constituting a quorum. Whereupon, among other business, the following was transacted at the meeting: a written

RESOLUTION OF THE RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT ADOPTING ITS UPDATED MANAGEMENT PLAN FOR SUBMITTAL TO THE TEXAS WATER DEVOLOPMENT BOARD FOR CERTIFICATION

WHEREAS, the Rusk County Groundwater Conservation District ("District") is charged by the Texas Legislature with providing for the conservation, preservation, protection, and prevention of waste of groundwater, and of groundwater resources in Rusk County, Texas, under §36.0015, Tex. Water Code;

WHEREAS, the District is authorized to make and enforce fair and impartial rules to manage groundwater resources as scientifically necessary to conserve and protect groundwater resources in the area under §36.101, Tex. Water Code;

WHEREAS, pursuant to §§36.1071 and 36.1072, Tex. Water Code, following notice and hearing, the District developed a comprehensive management plan that addresses the required management goals, as applicable, and shall submit the updated Management Plan to the Texas Water Development Board as provided under §§36.1071, 36.1072, and 36.1073 Tex. Water Code; and

WHEREAS, the District initially submitted its Management Plan to the Texas Water Development Board in June of 2015 for pre-review, made revisions requested by the Texas Water Development Board staff and received their preliminary approval.

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF DIRECTORS OF THE RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT THAT

The District adopts the Rusk County Groundwater Conservation District updated Management Plan and submits it to the Texas Water Development Board for review and approval.

PASSED AND APPROVED this the 31st day of August 2015

SIGNED AND SEALED the 31st day of August 2015

Bobby Brown, President

ATTESTED BY: Worth W Whitehead

Worth Whitehead, Secretary/Treasurer

APPENDIX D

GAM RUN 14-011

GAM Run 14-011: Rusk County Groundwater Conservation District Management Plan

by Rohit R. Goswami, Ph.D.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-0495
June 2, 2014

Cynthia K. Ridgeway is the Manager of the Groundwater Availability Modeling Section and is responsible for oversight of work performed by Rohit Raj Goswami under her direct supervision. The seal appearing on this document was authorized by Cynthia K. Ridgeway, P.G. 471 on June 2, 2014

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GAM RUN 14-011: RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Rohit R. Goswami, Ph.D.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-095
June 2, 2014

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2011), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the executive administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the executive administrator. Information derived from groundwater availability models that shall be included in the groundwater management plan includes:

- the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
- for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
- the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

This report—Part 2 of a two-part package of information from the TWDB to Rusk County Groundwater Conservation District—fulfills the requirements noted above. Part 1 of the two-part package is the Historical Water Use/State Water Plan data report. The district will receive the Historical Water Use/State Water Plan data report from the TWDB Groundwater Technical Assistance Section. Questions about the data report can be directed to Mr. Stephen Allen, stephen.allen@twdb.texas.gov, (512) 463-7317.

The groundwater management plan for Rusk County Groundwater Conservation District should be adopted by the district on or before September 15, 2015 and submitted to the executive administrator of the TWDB on or before October 15, 2015. The current management plan for Rusk County Groundwater Conservation District expires on December 14, 2015.

This report discusses the methods, assumptions, and results from a model run using the groundwater availability model for the Carrizo-Wilcox, Queen City and Sparta aquifers. This model run replaces the results of GAM Run 09-020 (Aschenbach, 2009). GAM Run 14-011 meets current standards set after the release of GAM Run 09-020 including use of the official aquifer boundaries within the district rather than the entire active area of the model within the district. Rusk County Groundwater Conservation District does not contain the Sparta Aquifer. Tables 1 and 2 summarize the groundwater availability model data required by statute, and Figures 1 and 2 show the area of the model from which the values in the tables were extracted. If after review of the figures, Rusk County Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB immediately.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability model for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers was run for this analysis. Water budgets for Rusk County Groundwater Conservation District were extracted for the historical model period (1980-1999) using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The average annual water budget values for recharge, surface water outflow, inflow to the district, outflow from the district, net inter-aquifer flow (upper), and net inter-aquifer flow (lower) for the portion of each aquifer located within the district is summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Carrizo-Wilcox, Queen City, and Sparta aquifers

- We used version 2.01 of the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers. See Fryar and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta aquifers.

- This groundwater availability model includes eight layers which generally represent the Sparta Aquifer (Layer 1), the Weches Formation confining unit (Layer 2), the Queen City Aquifer (Layer 3), the Reklaw Formation confining unit (Layer 4), the Carrizo Formation (Layer 5), the Calvert Bluff Formation (Layer 6), the Simsboro Formation (Layer 7), and the Hooper Formation (Layer 8). Individual water budgets for the district were determined for the the Queen City Aquifer (Layer 3) and the Carrizo-Wilcox Aquifer (Layer 5 through Layer 8, collectively).

- Groundwater in the Carrizo-Wilcox and Queen City aquifers ranges from fresh to brackish in composition (Kelley and others, 2004). Groundwater with total dissolved solids of less than 1,000 milligrams per liter are considered fresh and total dissolved solids of 1,000 to 10,000 milligrams per liter are considered brackish.

- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the model results for the respective aquifers located within the district and averaged over the duration of the calibration and verification portion of the model run in the district, as shown in Tables 1 and 2.

- Precipitation recharge—The areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers—where the aquifer is exposed at land surface—within the district.

- Surface water outflow—The total water discharging from the aquifer (outflow) to surface water features such as streams, reservoirs, and drains (springs).

- Flow into and out of district—The lateral flow within the aquifer between the district and adjacent counties.

- Flow between aquifers—The net vertical flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs. “Inflow” to an aquifer from an

overlying or underlying aquifer will always equal the "Outflow" from the other aquifer.

The information needed for the district's management plan is summarized in Tables 1 and 2. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located (Figures 1 and 2).

TABLE 1: SUMMARIZED INFORMATION FOR THE CARRIZO-WILCOX AQUIFER THAT IS NEEDED FOR RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Carrizo-Wilcox Aquifer	70,358
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Carrizo-Wilcox Aquifer	25,743
Estimated annual volume of flow into the district within each aquifer in the district	Carrizo-Wilcox Aquifer	4,016
Estimated annual volume of flow out of the district within each aquifer in the district	Carrizo-Wilcox Aquifer	14,269
Estimated net annual volume of flow between each aquifer in the district	To the Carrizo-Wilcox Aquifer from the Reklaw Formation confining unit	2,147

gcd boundary date = 09.25.13, county boundary date = 02.02.11, qcsp_n model grid date = 05.01.14

FIGURE 1: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE QUEEN CITY, SPARTA, AND CARRIZO-WILCOX AQUIFERS FROM WHICH THE INFORMATION IN TABLE 1 WAS EXTRACTED (THE CARRIZO-WILCOX AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

TABLE 2: SUMMARIZED INFORMATION FOR THE QUEEN CITY AQUIFER THAT IS NEEDED FOR RUSK COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE REPORTED IN ACRE-FEET PER YEAR AND ROUNDED TO THE NEAREST 1 ACRE-FOOT.

Management Plan requirement	Aquifer or confining unit	Results
Estimated annual amount of recharge from precipitation to the district	Queen City Aquifer	1,200
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Queen City Aquifer	227
Estimated annual volume of flow into the district within each aquifer in the district	Queen City Aquifer	63
Estimated annual volume of flow out of the district within each aquifer in the district	Queen City Aquifer	62
Estimated net annual volume of flow between each aquifer in the district	From the Queen City Aquifer to the Reklaw Formation confining unit	1,176
	From the Queen City Formation to the Queen City Aquifer	75

gcd boundary date = 09.25.13, county boundary date = 02.02.11, qcsp_n model grid date = 05.01.14

FIGURE 2: AREA OF THE GROUNDWATER AVAILABILITY MODEL FOR THE NORTHERN PORTION OF THE QUEEN CITY, SPARTA, AND CARRIZO-WILCOX AQUIFERS FROM WHICH THE INFORMATION IN TABLE 2 WAS EXTRACTED (THE QUEEN CITY AQUIFER EXTENT WITHIN THE DISTRICT BOUNDARY).

LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and interaction with streams are specific to particular historic time periods.

Because the application of the groundwater models was designed to address regional-scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Aschenbach, E., 2009, GAM Run 09-020: Texas Water Development Board, GAM Run 09-020 Report, 6 p., http://www.twdb.texas.gov/groundwater/docs/GAMruns/GR09-20.pdf.

Fryar, D., Senger, R., Deeds, N., Pickens, J., Jones, T., Whallon, A. J., and Dean, K. E., 2003, Groundwater Availability Model for the Northern Carrizo-Wilcox Aquifer: contract report to the Texas Water Development Board, 529 p., http://www.twdb.texas.gov/groundwater/models/gam/czwx_n/CZWX_N_Full_Report.pdf

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

Harbaugh, A. W., and McDonald, M. G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference ground-water flow model: U.S. Geological Survey Open-File Report 96–485, 56 p.

Kelley, V. A., Deeds, N. E., Fryar, D. G., and Nicot, J. P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: Contract report to the Texas Water Development Board, 867 p., http://www.twdb.texas.gov/groundwater/models/gam/qcsp/qcsp.asp.

National Research Council, 2007, Models in Environmental Regulatory Decision Making Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

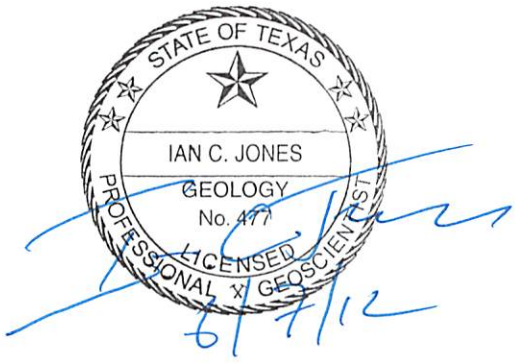
Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf

APPENDIX E

GAM RUN 10-016 MAG VERSION 2

GAM Run 10-016 MAG (Version 2): Model Run for the Yegua-Jackson, Sparta, Queen City, and Carrizo-Wilcox Aquifers in Groundwater Management Area 11

by Ian C. Jones, Ph.D., P.G., Jerry Shi, Ph.D., P.G., and Oliver Wade, P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
(512) 463-6641
June 7, 2012



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GAM RUN 10-016 MAG (VERSION 2): MODEL RUN FOR THE YEGUA-JACKSON, SPARTA, QUEEN CITY, AND CARRIZO-WILCOX AQUIFERS IN GROUNDWATER MANAGEMENT AREA 11

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June 7, 2012

EXECUTIVE SUMMARY:

The modeled available groundwater for Groundwater Management Area 11 is summarized for the Carrizo-Wilcox (Table 1), Queen City (Table 2), Sparta (Table 3), and Yegua-Jackson (Table 4) aquifers. Modeled available groundwater values for these aquifers are also summarized by county (Table 5), regional planning area (Table 6), river basin (Table 7), and groundwater conservation district (Table 8). The pumping estimates are based on Groundwater Availability Modeling Task 10-009. This previously completed model simulation meets the desired future condition adopted by the members of Groundwater Management Area 11 of an overall average drawdown of 17 feet.

The modeled available groundwater within the groundwater conservation districts that reflects the desired future conditions adopted by Groundwater Management Area 11 declines from approximately 195,000 acre-feet per year in 2010 to 189,000 acre-feet per year in 2060 (Table 8). When areas outside of groundwater conservation districts are considered, the modeled available groundwater is approximately 559,000 acre-feet per year in 2010 and declines to 543,000 acre-feet per year in 2060.

The total modeled available groundwater for each aquifer in Groundwater Management Area 11, including areas outside a groundwater conservation district, is also summarized by groundwater conservation district for each decade between 2010 and 2060 (Tables 9 through 15).

REQUESTOR:

Ms. Monique Norman, General Counsel, and Mr. Len Luscomb, General Manager, of Rusk County Groundwater Conservation District on behalf of Groundwater Management Area 11.

DESCRIPTION OF REQUEST:

In a letter dated May 4th, 2010 and received by the Texas Water Development Board (TWDB) on May 6th, 2010, Ms. Norman and Mr. Luscomb provided the Texas Water Development Board (TWDB) with the desired future condition (DFC) of the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers within Groundwater Management Area 11. The desired future condition for the aquifers, as described in Resolution No. 1 and adopted April 13, 2010 by the groundwater conservation districts (GCDs) within Groundwater Management Area 11, is described below:

> *The Desired Future Condition is defined as allowing up to an average draw down of 17 feet that applies throughout [Groundwater Management Area] 11. … The Desired Future Condition of 17 feet average drawdown is based on 178 individual drawdowns by aquifer and county.*

METHODS:

The aquifers referred to above are covered by two groundwater availability models: one for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers (Fryar and others, 2003; Kelley and others, 2004) and one for the Yegua-Jackson Aquifer (Deeds and others, 2010). The aquifers covered by each of the groundwater availability models are shown in Figures 1 and 2.

In the previously completed Groundwater Availability Modeling Task 10-009, both of these models were run and achieved the above desired future condition (Oliver, 2010). The pumping results for Groundwater Management Area 11 presented here, taken directly from the simulations documented in Oliver (2010), have been divided by county, regional water planning area, river basin, and groundwater conservation district. These areas are shown in Figure 3. See Oliver (2010) for a full description of the methods, assumptions, and results for the groundwater availability model run.

The model results presented in this report were extracted from all areas of the model representing the units of the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers. This includes some areas outside the "official" boundaries of the aquifers shown in the 2007 State Water Plan (TWDB, 2007). For this reason, the area over which the average drawdown that meets the desired future condition was calculated may reflect water of quality ranging from fresh to brackish and saline.

PARAMETERS AND ASSUMPTIONS:

Northern Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

The parameters and assumptions for the groundwater availability model run for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers are described below:

- Version 2.01 of the groundwater availability model for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers was used for this analysis. See Fryar and others (2003) and Kelley and others (2004) for assumptions and limitations of the groundwater availability model for the northern part of the Carrizo-Wilcox, Queen City, and Sparta Aquifers.
- The model includes eight layers, representing:
    1. Sparta Aquifer (Layer 1)
    2. Weches confining unit (Layer 2)
    3. Queen City Aquifer (Layer 3)
    4. Reklaw confining unit (Layer 4)
    5. Carrizo Aquifer (Layer 5)
    6. Upper Wilcox Aquifer (Layer 6)
    7. Middle Wilcox Aquifer (Layer 7)
    8. Lower Wilcox Aquifer (Layer 8)
- In the Sabine Uplift area, a portion of Layer 8, though active in the model, is outside the extent of the Lower Wilcox unit of the Carrizo-Wilcox Aquifer as described in Kelley and others (2004). Because of this, results for Layer 8 in

this area were not included when determining the average drawdown over Groundwater Management Area 11.

- Cells were assigned to individual counties and groundwater conservation districts as shown in the September 14, 2009 version of the cell assignment model grid for the northern portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
- Recharge rates are based on average (1961 to 1990) precipitation (Kelley and others, 2004).

Yegua-Jackson Aquifer

The parameters and assumptions for the model run using the groundwater availability model for the Yegua-Jackson Aquifer are described below:

- Version 1.01 of the groundwater availability model for the Yegua-Jackson Aquifer was used for this analysis. See Deeds and others (2010) for assumptions and limitations of the groundwater availability model.
- The model includes five layers representing the Yegua-Jackson Aquifer and the overlying Catahoula unit.
- Cells were assigned to individual counties and groundwater conservation districts as shown in the March 23, 2010 version of the cell assignment model grid for the Yegua-Jackson Aquifer.
- The recharge used for the model run represents average recharge as described in Deeds and others (2010).

MODELED AVAILABLE GROUNDWATER AND PERMITTING:

As defined in Chapter 36 of the Texas Water Code, "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. This is distinct from "managed available groundwater", which was a permitting value and accounted for the estimated use of the aquifer exempt from permitting. This change was made to reflect changes in statute by the 82nd Texas Legislature, effective September 1, 2011.

Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits in order to

manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits. The estimated amount of pumping exempt from permitting, which the TWDB is now required to develop after soliciting input from applicable groundwater conservation districts, will be provided in a separate report.

RESULTS:

The modeled available groundwater in Groundwater Management Area 11 from the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers that achieves the desired future condition declines from approximately 559,000 acre-feet per year in 2010 to 543,000 acre-feet per year in 2060. Tables 1 through 4 contain the estimates of total pumping for the Carrizo-Wilcox, Queen City, Sparta, and Yegua-Jackson aquifers, respectively. In these tables, results have been subdivided by county, regional water planning area, and river basin for use in the regional water planning process.

Tables 5 through 7 show the modeled available groundwater for all aquifers summarized by county, regional water planning area, and river basin, respectively, within Groundwater Management Area 11. The modeled available groundwater for all aquifers within and outside the groundwater conservation districts in Groundwater Management Area 11 are presented in Table 8. Tables 9 through 15 show the modeled available groundwater for each model layer—Lower Wilcox Formation, Middle Wilcox Formation, Upper Wilcox Formation, Carrizo Formation, Queen City Aquifer, Sparta Aquifer, and Yegua-Jackson Aquifer— within and outside the groundwater conservation districts in Groundwater Management Area 11.

LIMITATIONS:

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objective(s). To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision-making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Deeds, N.E., Yan, T., Singh, A., Jones, T.L., Kelley, V.A., Knox, P.R., Young, S.C., 2010, Groundwater availability model for the Yegua-Jackson Aquifer: Final report prepared for the Texas Water Development Board by INTERA, Inc., 582 p.

Fryar, D., Senger, R., Deeds, N., Pickens, J., Jones, T., Whallon, A. J., and Dean, K. E., 2003, Groundwater Availability Model for the Northern Carrizo-Wilcox Aquifer: contract report to the Texas Water Development Board, 529 p.

Kelley, V. A., Deeds, N. E., Fryar, D. G., and Nicot, J. P., 2004, Groundwater availability models for the Queen City and Sparta aquifers: contract report to the Texas Water Development Board, 867 p.

National Research Council, 2007, Models in Environmental Regulatory Decision Making. Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p.

Oliver, W., 2010, Texas Water Development Board, GAM Task 10-009 Model Run Report, 11 p.

Texas Water Development Board, 2007, Water for Texas – 2007—Volumes I-III; Texas Water Development Board Document No. GP-8-1, 392 p.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Anderson	I	Neches	4,393	4,393	4,393	4,393	4,393	4,393
		Trinity	5,684	5,684	5,684	5,684	5,684	5,684
Angelina	I	Neches	26,414	26,414	26,414	26,414	26,414	26,414
Bowie	D	Sulphur	11,126	8,216	7,976	7,533	7,533	7,083
Camp	D	Cypress	4,041	4,041	4,041	4,041	4,041	4,041
Cass	D	Cypress	2,955	2,955	2,955	2,955	2,955	2,955
		Sulphur	578	578	578	578	578	578
Cherokee	I	Neches	11,222	11,222	11,222	11,222	11,222	11,222
Franklin	D	Cypress	7,794	7,736	7,736	7,736	7,736	7,736
		Sulphur	1,952	1,748	1,748	1,748	1,748	1,748
Gregg	D	Cypress	820	820	820	820	820	820
		Sabine	6,829	6,829	6,829	6,829	6,829	6,829
Harrison	D	Cypress	4,892	4,873	4,839	4,787	4,772	4,728
		Sabine	4,019	3,964	3,947	3,911	3,911	3,911
Henderson	C	Trinity	5,254	5,187	5,187	5,187	5,187	5,187
	I	Neches	3,999	3,999	3,999	3,999	3,999	3,999
Hopkins	D	Cypress	253	253	253	253	253	253
		Sabine	2,043	2,001	2,001	2,001	2,001	2,001
		Sulphur	1,137	1,137	1,137	1,137	1,137	1,137
Houston	I	Neches	1,924	1,924	1,924	1,924	1,924	1,924
		Trinity	3,432	3,432	3,432	3,432	3,432	3,432
Marion	D	Cypress	2,077	2,077	2,077	2,077	2,077	2,077
Morris	D	Cypress	2,196	2,196	2,174	2,174	2,174	2,174
		Sulphur	420	420	384	384	384	384
Nacogdoches	I	Neches	21,385	21,385	21,385	21,385	21,385	21,385
Panola	I	Cypress	6	6	6	6	6	6
		Sabine	9,091	8,221	8,221	8,063	8,063	8,063
Rains	D	Sabine	1,703	1,703	1,620	1,620	1,620	1,583
Red River	D	Sulphur	0	0	0	0	0	0
Rusk	I	Neches	11,776	11,776	11,766	11,766	11,766	11,747
		Sabine	9,067	9,067	9,067	9,067	9,067	9,067
Sabine	I	Neches	1,254	1,254	1,254	1,254	1,254	1,254
		Sabine	5,612	5,604	5,604	5,604	5,604	5,604
San Augustine	I	Neches	1,490	1,490	1,490	1,490	1,490	1,490
		Sabine	291	291	291	291	291	291
Shelby	I	Neches	2,900	2,736	2,578	2,288	2,152	2,019
		Sabine	9,144	8,481	8,323	8,159	8,159	7,710
Smith	D	Sabine	12,245	12,245	12,245	12,235	12,221	12,221
	I	Neches	21,004	21,004	21,004	21,004	21,004	21,004

TABLE 1. CONTINUED.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Titus	D	Cypress	8,051	7,516	7,214	7,063	6,833	6,833
		Sulphur	2,805	2,805	2,805	2,805	2,805	2,805
Trinity	H	Trinity	1,101	1,101	1,101	1,101	1,101	1,101
	I	Neches	1,114	1,114	1,114	1,114	1,114	1,114
Upshur	D	Cypress	5,426	5,426	5,426	5,426	5,426	5,426
		Sabine	1,689	1,689	1,689	1,689	1,689	1,689
Van Zandt	D	Neches	4,288	4,288	4,288	4,288	4,288	4,288
		Sabine	4,942	4,611	4,611	4,611	4,611	4,379
		Trinity	1,384	1,384	1,384	1,384	1,384	1,384
Wood	D	Cypress	2,053	2,053	2,053	2,053	2,053	2,053
		Sabine	19,663	19,486	19,398	19,355	19,280	19,258
Total			**274,938**	**268,835**	**267,687**	**266,340**	**265,870**	**264,484**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Anderson	I	Neches	9,762	9,762	9,762	9,762	9,762	9,762
		Trinity	9,039	9,039	9,039	9,039	9,039	9,039
Angelina	I	Neches	1,093	1,093	1,093	1,093	1,093	1,093
Camp	D	Cypress	3,705	3,542	3,542	3,542	3,542	3,542
Cass	D	Cypress	35,970	35,970	35,970	35,970	35,970	35,970
		Sulphur	3,223	3,223	3,223	3,223	3,223	3,223
Cherokee	I	Neches	22,396	22,396	22,396	22,396	22,396	22,396
Gregg	D	Cypress	1,359	1,359	1,359	1,359	1,359	1,359
		Sabine	6,214	6,214	6,214	6,214	6,214	6,214
Harrison	D	Cypress	7,890	7,890	7,890	7,890	7,890	7,890
		Sabine	2,483	2,483	2,483	2,483	2,483	2,483
Henderson	C	Trinity	3,533	3,533	3,533	3,533	3,533	3,533
	I	Neches	12,316	12,316	12,316	12,316	12,316	12,316
Houston	I	Neches	131	131	131	131	131	131
		Trinity	279	279	279	279	279	279
Marion	D	Cypress	15,549	15,549	15,549	15,549	15,549	15,549
Morris	D	Cypress	9,652	9,652	9,652	9,652	9,537	9,537
Nacogdoches	I	Neches	5,002	5,002	5,002	5,002	5,002	5,002
Panola	I	Sabine	0	0	0	0	0	0
Rusk	I	Neches	40	40	40	40	40	40
		Sabine	18	18	18	18	18	18
Sabine	I	Neches	0	0	0	0	0	0
		Sabine	0	0	0	0	0	0
San Augustine	I	Neches	7	7	7	7	7	7
		Sabine	0	0	0	0	0	0
Shelby	I	Sabine	0	0	0	0	0	0
Smith	D	Sabine	25,994	25,994	25,994	25,994	25,994	25,994
	I	Neches	28,259	28,259	28,259	28,259	28,259	28,259
Titus	D	Cypress	138	138	138	138	138	138
Trinity	H	Trinity	0	0	0	0	0	0
	I	Neches	0	0	0	0	0	0
Upshur	D	Cypress	18,324	18,324	18,324	18,324	18,143	18,143
		Sabine	7,246	7,246	7,246	7,246	7,246	7,246
Van Zandt	D	Neches	3,814	3,814	3,814	3,814	3,814	3,814
Wood	D	Cypress	1,009	1,009	1,009	1,009	1,009	1,009
		Sabine	9,103	9,103	9,103	9,103	9,103	9,103
Total			**243,548**	**243,385**	**243,385**	**243,385**	**243,089**	**243,089**

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Anderson	I	Neches	344	344	344	344	344	344
		Trinity	272	272	272	272	272	272
Angelina	I	Neches	689	689	689	689	689	689
Cherokee	I	Neches	359	359	359	359	359	359
Houston	I	Neches	302	302	302	302	302	302
		Trinity	594	594	594	594	594	594
Nacogdoches	I	Neches	409	409	409	409	409	409
Rusk	I	Neches	4,362	0	0	0	0	0
Sabine	I	Neches	61	61	61	61	61	61
		Sabine	235	235	235	235	235	235
San Augustine	I	Neches	202	202	202	202	202	202
		Sabine	3	3	3	3	3	3
Smith	I	Neches	0	0	0	0	0	0
	D	Sabine	0	0	0	0	0	0
Trinity	I	Neches	313	313	313	313	313	313
	H	Trinity	302	302	302	302	302	302
Upshur	D	Sabine	0	0	0	0	0	0
Wood	D	Sabine	0	0	0	0	0	0
Total			**8,447**	**4,085**	**4,085**	**4,085**	**4,085**	**4,085**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER IN GROUNDWATER MANAGEMENT AREA 11. RESULTS ARE IN ACRE-FEET PER YEAR AND ARE DIVIDED BY COUNTY, REGIONAL WATER PLANNING AREA, AND RIVER BASIN.

County	Region	Basin	Year					
			2010	2020	2030	2040	2050	2060
Angelina	I	Neches	16,890	16,890	16,890	16,890	16,890	16,507
Houston	I	Neches	1,324	1,324	1,324	1,324	1,324	1,324
		Trinity	4,061	4,061	4,061	4,061	4,061	4,061
Nacogdoches	I	Neches	235	235	235	235	235	235
Sabine	I	Neches	3,724	3,724	3,724	3,724	3,724	3,724
		Sabine	575	575	575	575	575	575
San Augustine	I	Neches	2,102	2,102	2,102	2,102	2,102	2,102
		Sabine	9	9	9	9	9	9
Trinity	H	Trinity	2,191	2,191	2,191	2,191	2,191	2,191
	I	Neches	700	700	700	700	700	700
Total			**31,811**	**31,811**	**31,811**	**31,811**	**31,811**	**31,428**

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

County	Year					
	2010	2020	2030	2040	2050	2060
Anderson	29,494	29,494	29,494	29,494	29,494	29,494
Angelina	45,086	45,086	45,086	45,086	45,086	44,703
Bowie	11,126	8,216	7,976	7,533	7,533	7,083
Camp	7,746	7,583	7,583	7,583	7,583	7,583
Cass	42,726	42,726	42,726	42,726	42,726	42,726
Cherokee	33,977	33,977	33,977	33,977	33,977	33,977
Franklin	9,746	9,484	9,484	9,484	9,484	9,484
Gregg	15,222	15,222	15,222	15,222	15,222	15,222
Harrison	19,284	19,210	19,159	19,071	19,056	19,012
Henderson	25,102	25,035	25,035	25,035	25,035	25,035
Hopkins	3,433	3,391	3,391	3,391	3,391	3,391
Houston	12,047	12,047	12,047	12,047	12,047	12,047
Marion	17,626	17,626	17,626	17,626	17,626	17,626
Morris	12,268	12,268	12,210	12,210	12,095	12,095
Nacogdoches	27,031	27,031	27,031	27,031	27,031	27,031
Panola	9,097	8,227	8,227	8,069	8,069	8,069
Rains	1,703	1,703	1,620	1,620	1,620	1,583
Red River	0	0	0	0	0	0
Rusk	25,263	20,901	20,891	20,891	20,891	20,872
Sabine	11,461	11,453	11,453	11,453	11,453	11,453
San Augustine	4,104	4,104	4,104	4,104	4,104	4,104
Shelby	12,044	11,217	10,901	10,447	10,311	9,729
Smith	87,502	87,502	87,502	87,492	87,478	87,478
Titus	10,994	10,459	10,157	10,006	9,776	9,776
Trinity	5,721	5,721	5,721	5,721	5,721	5,721
Upshur	32,685	32,685	32,685	32,685	32,504	32,504
Van Zandt	14,428	14,097	14,097	14,097	14,097	13,865
Wood	31,828	31,651	31,563	31,520	31,445	31,423
Total	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY REGIONAL WATER PLANNING AREA FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Region	Year					
	2010	2020	2030	2040	2050	2060
C	8,787	8,720	8,720	8,720	8,720	8,720
D	269,054	264,560	263,738	263,003	262,373	261,588
H	3,594	3,594	3,594	3,594	3,594	3,594
I	277,309	271,242	270,916	270,304	270,168	269,184
Total	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY RIVER BASIN FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR.

Basin	Year					
	2010	2020	2030	2040	2050	2060
Cypress	134,160	133,385	133,027	132,824	132,283	132,239
Neches	227,999	223,473	223,305	223,015	222,879	222,344
Sabine	138,218	136,072	135,726	135,315	135,226	134,486
Sulphur	21,241	18,127	17,851	17,408	17,408	16,958
Trinity	37,126	37,059	37,059	37,059	37,059	37,059
Total	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO-WILCOX, QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	2020	2030	2040	2050	2060
Anderson County UWCD	1,361	1,361	1,361	1,361	1,361	1,361
Neches & Trinity Valleys GCD	87,212	87,145	87,145	87,145	87,145	87,145
Panola GCD	9,097	8,227	8,227	8,069	8,069	8,069
Pineywoods GCD	72,117	72,117	72,117	72,117	72,117	71,734
Rusk County GCD	25,263	20,901	20,891	20,891	20,891	20,872
Total (excluding non-district areas)	**195,050**	**189,751**	**189,741**	**189,583**	**189,583**	**189,181**
No District	363,694	358,365	357,227	356,038	355,272	353,905
Total (including non-district areas)	**558,744**	**548,116**	**546,968**	**545,621**	**544,855**	**543,086**

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE LOWER WILCOX FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	7	7	7	7	7	7
Neches & Trinity Valleys GCD	1,886	1,886	1,886	1,886	1,886	1,886
Panola GCD	725	725	725	725	725	725
Pineywoods GCD	0	0	0	0	0	0
Rusk County GCD	0	0	0	0	0	0
Total (excluding non-district areas)	**2,618**	**2,618**	**2,618**	**2,618**	**2,618**	**2,618**
No District	2,717	2,717	2,717	2,717	2,717	2,717
Total (including non-district areas)	**5,335**	**5,335**	**5,335**	**5,335**	**5,335**	**5,335**

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE MIDDLE WILCOX FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	15	15	15	15	15	15
Neches & Trinity Valleys GCD	1,719	1,719	1,719	1,719	1,719	1,719
Panola GCD	5,764	5,764	5,764	5,764	5,764	5,764
Pineywoods GCD	678	678	678	678	678	678
Rusk County GCD	8,731	8,731	8,731	8,731	8,731	8,731
Total (excluding non-district areas)	**16,907**	**16,907**	**16,907**	**16,907**	**16,907**	**16,907**
No District	44,427	44,223	44,194	44,179	44,179	44,165
Total (including non-district areas)	**61,334**	**61,130**	**61,101**	**61,086**	**61,086**	**61,072**

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE UPPER WILCOX FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	107	107	107	107	107	107
Neches & Trinity Valleys GCD	9,652	9,652	9,652	9,652	9,652	9,652
Panola GCD	770	770	770	770	770	770
Pineywoods GCD	12,581	12,581	12,581	12,581	12,581	12,581
Rusk County GCD	5,156	5,156	5,156	5,156	5,156	5,156
Total (excluding non-district areas)	**28,266**	**28,266**	**28,266**	**28,266**	**28,266**	**28,266**
No District	45,600	42,690	42,396	41,968	41,968	41,495
Total (including non-district areas)	**73,866**	**70,956**	**70,662**	**70,234**	**70,234**	**69,761**

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE CARRIZO FORMATION BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	281	281	281	281	281	281
Neches & Trinity Valleys GCD	16,885	16,818	16,818	16,818	16,818	16,818
Panola GCD	1,838	968	968	810	810	810
Pineywoods GCD	34,540	34,540	34,540	34,540	34,540	34,540
Rusk County GCD	6,956	6,956	6,946	6,946	6,946	6,927
Total (excluding non-district areas)	**60,500**	**59,563**	**59,553**	**59,395**	**59,395**	**59,376**
No District	73,903	71,851	71,036	70,290	69,820	68,940
Total (including non-district areas)	**134,403**	**131,414**	**130,589**	**129,685**	**129,215**	**128,316**

TABLE 13. MODELED AVAILABLE GROUNDWATER FOR THE QUEEN CITY AQUIFER BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	951	951	951	951	951	951
Neches & Trinity Valleys GCD	56,095	56,095	56,095	56,095	56,095	56,095
Panola GCD	0	0	0	0	0	0
Pineywoods GCD	6,095	6,095	6,095	6,095	6,095	6,095
Rusk County GCD	58	58	58	58	58	58
Total (excluding non-district areas)	**63,199**	**63,199**	**63,199**	**63,199**	**63,199**	**63,199**
No District	180,349	180,186	180,186	180,186	179,890	179,890
Total (including non-district areas)	**243,548**	**243,385**	**243,385**	**243,385**	**243,089**	**243,089**

TABLE 14. MODELED AVAILABLE GROUNDWATER FOR THE SPARTA AQUIFER BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	0	0	0	0	0	0
Neches & Trinity Valleys GCD	975	975	975	975	975	975
Panola GCD	0	0	0	0	0	0
Pineywoods GCD	1,098	1,098	1,098	1,098	1,098	1,098
Rusk County GCD	4,362	0	0	0	0	0
Total (excluding non-district areas)	**6,435**	**2,073**	**2,073**	**2,073**	**2,073**	**2,073**
No District	2,012	2,012	2,012	2,012	2,012	2,012
Total (including non-district areas)	**8,447**	**4,085**	**4,085**	**4,085**	**4,085**	**4,085**

TABLE 15. MODELED AVAILABLE GROUNDWATER FOR THE YEGUA-JACKSON AQUIFER BY GROUNDWATER CONSERVATION DISTRICT (GCD) FOR EACH DECADE BETWEEN 2010 AND 2060. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD REFERS TO UNDERGROUND WATER CONSERVATION DISTRICT.

District	Year					
	2010	**2020**	**2030**	**2040**	**2050**	**2060**
Anderson County UWCD	0	0	0	0	0	0
Neches & Trinity Valleys GCD	0	0	0	0	0	0
Panola GCD	0	0	0	0	0	0
Pineywoods GCD	17,125	17,125	17,125	17,125	17,125	16,742
Rusk County GCD	0	0	0	0	0	0
Total (excluding non-district areas)	**17,125**	**17,125**	**17,125**	**17,125**	**17,125**	**16,742**
No District	14,686	14,686	14,686	14,686	14,686	14,686
Total (including non-district areas)	**31,811**	**31,811**	**31,811**	**31,811**	**31,811**	**31,428**

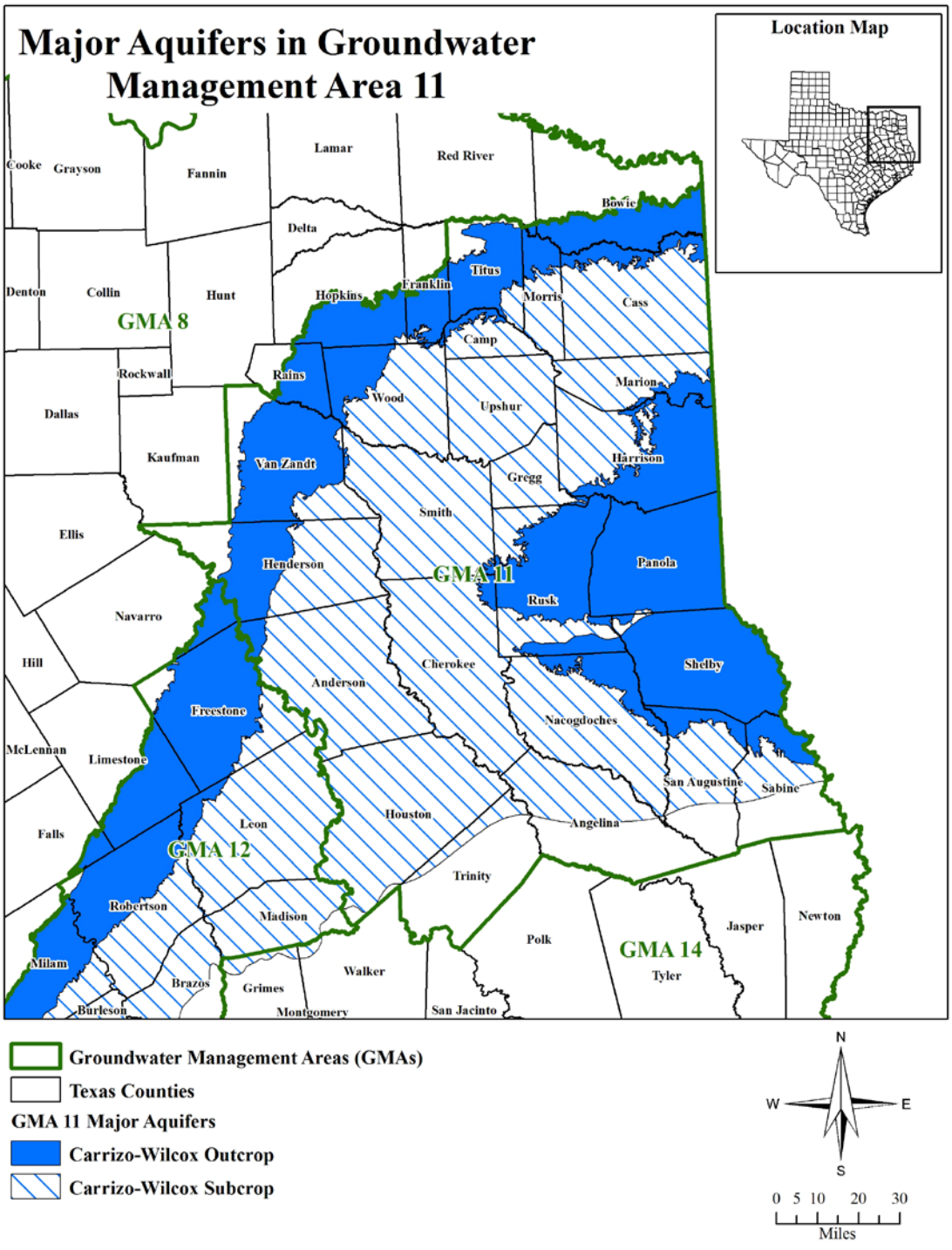

FIGURE 1. MAP SHOWING THE BOUNDARY OF THE CARRIZO-WILCOX AQUIFER ACCORDING TO THE 2007 STATE WATER PLAN (TWDB, 2007).

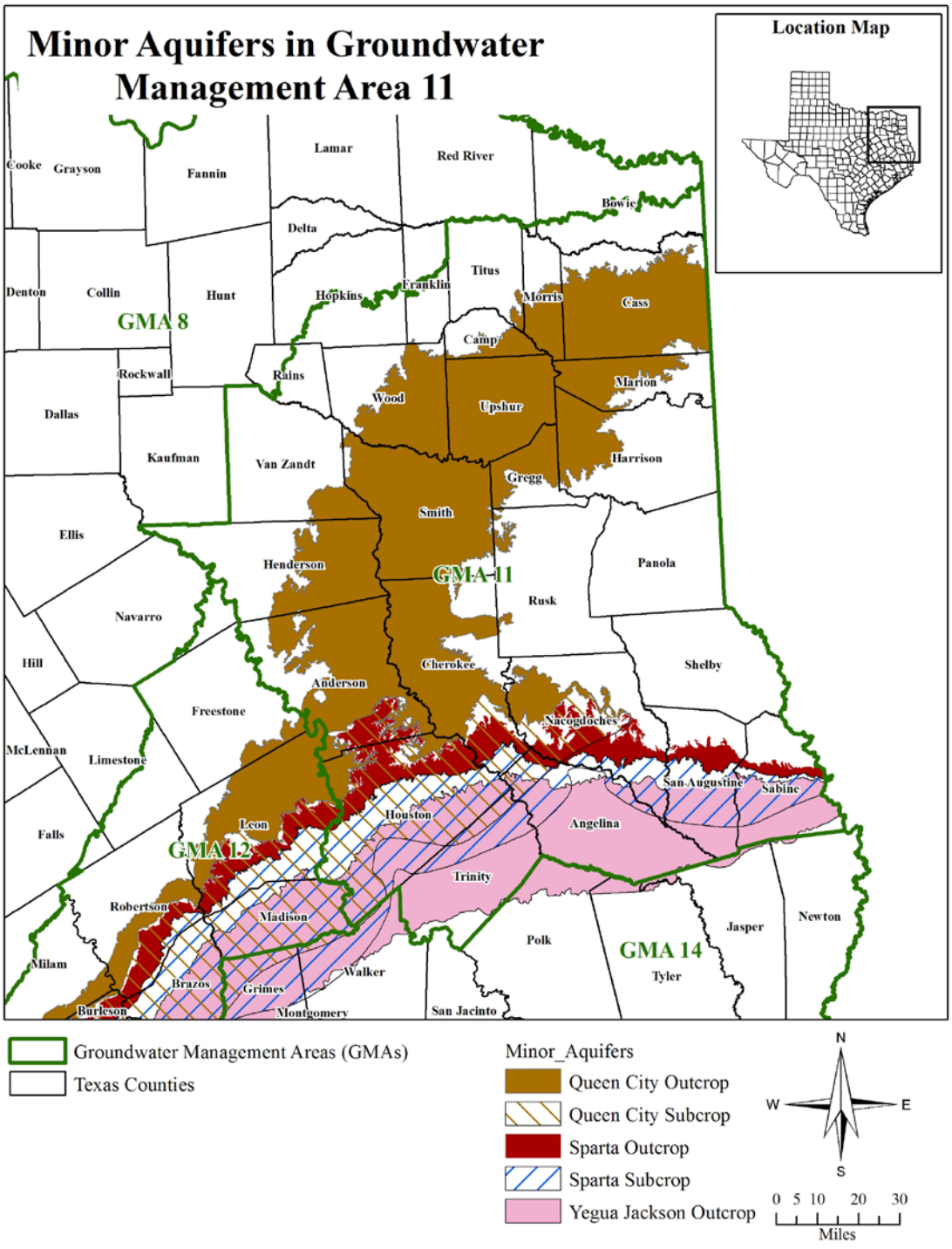

FIGURE 2. MAP SHOWING THE BOUNDARIES OF THE QUEEN CITY, SPARTA, AND YEGUA-JACKSON AQUIFERS ACCORDING TO THE 2007 STATE WATER PLAN (TWDB, 2007).

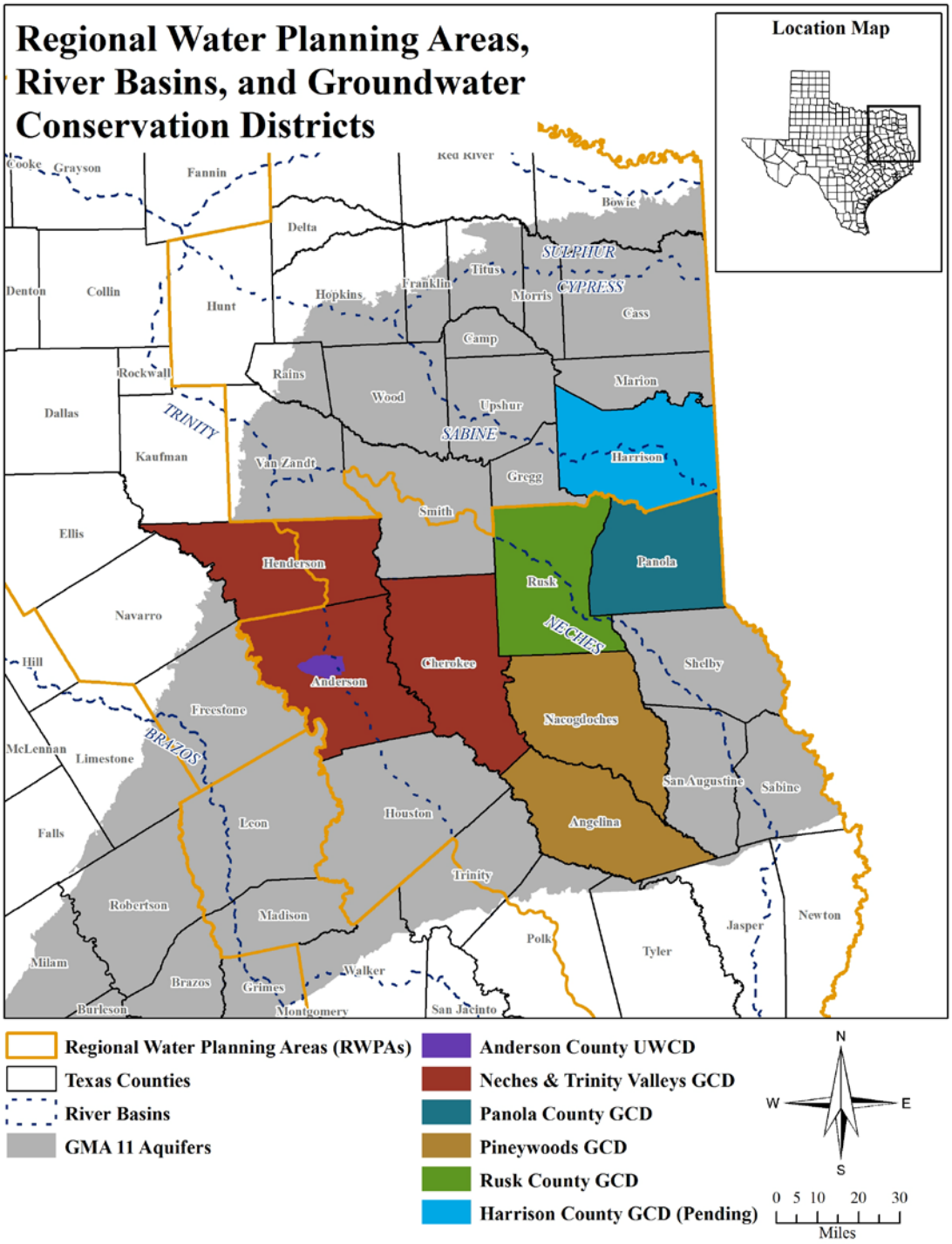

FIGURE 3. MAP SHOWING REGIONAL WATER PLANNING AREAS, GROUNDWATER CONSERVATION DISTRICTS, COUNTIES, AND RIVER BASINS IN AND NEIGHBORING OF GROUNDWATER MANAGEMENT AREA 11.

Appendix

TABLE A1. AVERAGE DRAWDOWN OVER THE 51-YEAR PREDICTIVE GROUNDWATER AVAILABILITY MODEL RUN IN GROUNDWATER MANAGEMENT AREA 11 FOR THE CARRIZO-WILCOX, QUEEN CITY, AND SPARTA AQUIFERS AND WECHES AND REKLAW CONFINING UNITS. ALL VALUES ARE IN FEET. "ANDERSON (ACUWCD)" REFERS TO THE ANDERSON COUNTY UNDERGROUND WATER CONSERVATION DISTRICT WITHIN ANDERSON COUNTY. "ANDERSON (NTVGCD)" REFERS TO THE PORTION OF NECHES AND TRINITY VALLEYS GROUNDWATER CONSERVATION DISTRICT IN ANDERSON COUNTY. NEGATIVE VALUES INDICATE A RISE IN WATER LEVELS.

County	Sparta	Weches (CU)	Queen City	Reklaw (CU)	Carrizo	Upper Wilcox	Middle Wilcox	Lower Wilcox	Overall
Anderson (ACUWCD)			1	12	35	26	12	5	15
Anderson (NTVGCD)	-2	1	7	15	36	26	11	4	16
Angelina	10	11	16	22	42	5	-18	-3	11
Bowie						21	0	0	1
Camp			12	0	18	17	39	0	19
Cass			8	6	10	7	7	0	8
Cherokee	7	14	11	11	32	32	15	10	18
Franklin				-16	-3	7	19	0	11
Gregg			7	11	42	49	56	79	35
Harrison			0	2	24	13	5	4	9
Henderson			4	15	41	32	27	15	23
Hopkins				-22	-12	-15	-28	0	-26
Houston	2	1	2	15	35	12	2	-2	8
Marion			17	11	21	15	15	0	16
Morris			13	10	29	25	23	0	21
Nacogdoches	3	3	11	10	14	11	-10	-6	4
Panola			-11	-19	11	2	1	4	2
Rains						7	-10	-5	-8
Rusk	0	-46	-15	-2	6	6	23	21	12
Sabine	5	5	7	15	24	13	6	5	10
San Augustine	-4	-4	-3	11	20	9	-3	-2	3
Shelby			-18	-19	23	-3	3	1	1
Smith	-5	-5	11	34	103	118	92	76	68
Titus			-1	-3	31	14	5	0	9
Trinity	5	4	4	12	33	-3	-7	-1	6
Upshur	-5	-5	5	17	56	66	66	97	44
Van Zandt			7	11	31	13	17	11	14
Wood	-5	-7	-2	36	110	83	55	114	59
Total	**3**	**4**	**7**	**15**	**38**	**26**	**15**	**11**	**17**

APPENDIX F

ESTIMATED HISTORICAL WATER USE
&
2012 STATE WATER PLAN DATASETS

Estimated Historical Water Use And 2012 State Water Plan Datasets:

Rusk County Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Resources Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
July 27, 2015

GROUNDWATER MANAGEMENT PLAN DATA:

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

http://www.twdb.texas.gov/groundwater/docs/GCD/GMPChecklist0113.pdf

The five reports included in part 1 are:

1. Estimated Historical Water Use (checklist Item 2)

   from the TWDB Historical Water Use Survey (WUS)

2. Projected Surface Water Supplies (checklist Item 6)
3. Projected Water Demands (checklist Item 7)
4. Projected Water Supply Needs (checklist Item 8)
5. Projected Water Management Strategies (checklist Item 9)

   reports 2-5 are from the 2012 Texas State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report. The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2012 SWP data available as of 7/27/2015. Although it does not happen frequently, neither of these datasets are static so they are subject to change pending the availability of more accurate WUS data or an amendment to the 2012 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/

The 2012 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317) or Rima Petrossian (rima.petrossian@twdb.texas.gov or 512-936-2420).

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2014. TWDB staff anticipates the calculation and posting of these estimates at a later date.

RUSK COUNTY

All values are in acre-fee/year

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2013	GW	7,405	13	576	0	358	193	8,545
	SW	1,248	0	639	28,292	0	775	30,954
2012	GW	7,885	15	425	2,377	123	180	11,005
	SW	1,399	0	603	38,434	150	721	41,307
2011	GW	8,954	26	547	1,023	308	223	11,081
	SW	1,688	1	984	32,947	0	893	36,513
2010	GW	7,517	31	1,058	358	0	224	9,188
	SW	1,525	1	1,258	21,129	0	894	24,807
2009	GW	6,719	219	1,059	183	0	194	8,374
	SW	1,639	386	655	21,535	0	776	24,991
2008	GW	7,071	177	1,233	147	29	209	8,866
	SW	1,705	1	763	25,771	0	838	29,078
2007	GW	6,778	172	0	356	25	216	7,547
	SW	1,675	9	0	24,366	0	866	26,916
2006	GW	6,973	293	0	287	100	202	7,855
	SW	1,379	55	0	24,872	0	806	27,112
2005	GW	6,751	233	3	0	92	231	7,310
	SW	1,231	407	0	17,008	0	924	19,570
2004	GW	7,180	192	6	113	92	221	7,804
	SW	464	24	0	6,982	0	872	8,342
2003	GW	7,168	200	6	99	73	215	7,761
	SW	491	3	0	7,574	0	844	8,912
2002	GW	7,097	203	6	97	49	231	7,683
	SW	477	2	0	10,794	210	911	12,394
2001	GW	6,857	243	8	12	49	236	7,405
	SW	208	55	0	15,222	210	931	16,626
2000	GW	7,493	66	38	11	18	462	8,088
	SW	647	565	0	16,523	75	694	18,504

Projected Surface Water Supplies
TWDB 2012 State Water Plan Data

RUSK COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	Source Name	2010	2020	2030	2040	2050	2060
I	EASTON	SABINE	CHEROKEE LAKE/RESERVOIR	61	83	96	102	120	163
I	ELDERVILLE WSC	SABINE	CHEROKEE LAKE/RESERVOIR	286	303	320	337	354	369
I	HENDERSON	NECHES	FORK LAKE/RESERVOIR	3,922	3,922	3,922	3,921	3,922	3,922
I	HENDERSON	SABINE	FORK LAKE/RESERVOIR	459	459	459	460	459	458
I	IRRIGATION	SABINE	SABINE RIVER COMBINED RUN-OF-RIVER IRRIGATION	127	127	127	127	127	127
I	KILGORE	SABINE	SABINE RIVER RUN-OF-RIVER	303	290	278	266	251	233
I	LIVESTOCK	NECHES	LIVESTOCK LOCAL SUPPLY	386	386	386	386	386	386
I	LIVESTOCK	SABINE	LIVESTOCK LOCAL SUPPLY	308	308	308	308	308	308
I	MANUFACTURING	NECHES	NECHES RIVER COMBINED RUN-OF-RIVER MANUFACTURING	2	2	2	2	2	2
I	MINING	SABINE	OTHER LOCAL SUPPLY	287	287	287	287	287	287
I	STEAM ELECTRIC POWER	SABINE	MARTIN LAKE/RESERVOIR	25,000	25,000	25,000	25,000	25,000	25,000
I	STEAM ELECTRIC POWER	SABINE	TOLEDO BEND LAKE/RESERVOIR	17,922	17,922	17,922	17,922	17,922	17,922
	Sum of Projected Surface Water Supplies (acre-feet/year)			**49,063**	**49,089**	**49,107**	**49,118**	**49,138**	**49,177**

Projected Water Demands
TWDB 2012 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

RUSK COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
I	MOUNT ENTERPRISE	NECHES	71	71	70	68	69	73
I	MINING	NECHES	961	1,048	1,099	1,149	1,199	1,246
I	LIVESTOCK	NECHES	655	665	676	689	704	718
I	MANUFACTURING	NECHES	78	86	93	99	103	111
I	COUNTY-OTHER	NECHES	1,225	1,258	1,270	1,243	1,283	1,422
I	HENDERSON	NECHES	2,164	2,145	2,119	2,088	2,077	2,105
I	OVERTON	NECHES	44	46	46	46	48	52
I	IRRIGATION	NECHES	19	19	19	19	19	19
I	NEW LONDON	NECHES	117	119	120	119	121	129
I	SOUTHERN UTILITIES COMPANY	NECHES	71	74	74	75	77	85
I	WEST GREGG WSC	SABINE	15	15	15	15	15	16
I	KILGORE	SABINE	532	520	512	503	500	500
I	EASTON	SABINE	8	11	12	13	15	21
I	ELDERVILLE WSC	SABINE	324	353	369	378	400	456
I	STEAM ELECTRIC POWER	SABINE	24,760	27,458	32,102	37,762	44,663	53,074
I	IRRIGATION	SABINE	107	107	107	107	107	107
I	LIVESTOCK	SABINE	516	523	531	542	553	565
I	COUNTY-OTHER	SABINE	1,435	1,475	1,489	1,457	1,504	1,666
I	NEW LONDON	SABINE	108	109	110	109	111	119
I	MANUFACTURING	SABINE	4	4	4	4	5	5
I	MINING	SABINE	579	631	662	692	722	750
I	TATUM	SABINE	122	118	115	112	110	110
I	HENDERSON	SABINE	253	251	248	245	243	246
I	OVERTON	SABINE	369	383	388	386	399	439
	Sum of Projected Water Demands (acre-feet/year)		**34,537**	**37,489**	**42,250**	**47,920**	**55,047**	**64,034**

Projected Water Supply Needs
TWDB 2012 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

RUSK COUNTY

All values are in acre-feet/year

RWPG	WUG	WUG Basin	2010	2020	2030	2040	2050	2060
I	COUNTY-OTHER	NECHES	294	261	249	276	236	97
I	COUNTY-OTHER	SABINE	265	225	211	243	196	34
I	EASTON	SABINE	53	72	84	89	105	142
I	ELDERVILLE WSC	SABINE	69	57	58	66	61	20
I	HENDERSON	NECHES	4,190	4,209	4,235	4,265	4,277	4,249
I	HENDERSON	SABINE	511	513	516	520	521	517
I	IRRIGATION	NECHES	74	74	74	74	74	74
I	IRRIGATION	SABINE	116	116	116	116	116	116
I	KILGORE	SABINE	231	211	189	167	133	87
I	LIVESTOCK	NECHES	89	79	68	55	40	26
I	LIVESTOCK	SABINE	78	71	63	52	41	29
I	MANUFACTURING	NECHES	45	37	30	24	20	12
I	MANUFACTURING	SABINE	6	6	6	6	5	5
I	MINING	NECHES	293	206	155	105	55	8
I	MINING	SABINE	83	31	0	-30	-60	-88
I	MOUNT ENTERPRISE	NECHES	300	300	301	303	302	298
I	NEW LONDON	NECHES	317	317	316	317	314	305
I	NEW LONDON	SABINE	293	290	289	290	289	282
I	OVERTON	NECHES	24	23	22	22	21	16
I	OVERTON	SABINE	179	164	160	160	145	104
I	SOUTHERN UTILITIES COMPANY	NECHES	24	21	21	20	18	10
I	STEAM ELECTRIC POWER	SABINE	18,402	15,704	11,060	5,400	-1,501	-9,912
I	TATUM	SABINE	252	256	259	262	264	264
I	WEST GREGG WSC	SABINE	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet/year)		**0**	**0**	**0**	**-30**	**-1,561**	**-10,000**

Projected Water Management Strategies
TWDB 2012 State Water Plan Data

RUSK COUNTY

WUG, Basin (RWPG)

All values are in acre-feet/year

Water Management Strategy	Source Name [Origin]	2010	2020	2030	2040	2050	2060
MINING, SABINE (I)							
NEW WELLS - CARRIZO WILCOX AQUIFER	CARRIZO-WILCOX AQUIFER [RUSK]	0	0	0	158	158	158
STEAM ELECTRIC POWER, SABINE (I)							
PURCHASE WATER FROM PROVIDER (2)	COLUMBIA LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	0	8,500
PURCHASE WATER FROM PROVIDER (2)	TOLEDO BEND LAKE/RESERVOIR [RESERVOIR]	0	0	0	0	1,501	1,500
Sum of Projected Water Management Strategies (acre-feet/year)		**0**	**0**	**0**	**158**	**1,659**	**10,158**