Evaluation of Projected Population and Water Demands in Fort Bend County

Final Report

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LIST OF ABBREVIATIONS

ACS	American Community Survey
Area A	Fort Bend Subsidence District Regulatory Area A
Area B	Fort Bend Subsidence District Regulatory Area B
CDP	Census-Designated Place
DRP	Fort Bend Subsidence District Regulatory Plan (2013)
FBC	Fort Bend County
FBSD	Fort Bend Subsidence District
FWSD	Fresh Water Supply District
GPCD	Gallons Per Capita Daily
GRP	Groundwater Reduction Plan
HGAC	Houston-Galveston Area Council
MGD	Millions of Gallons per Day
MUD	Municipal Utility District
NFBWA	North Fort Bend Water Authority
NOAA	National Oceanic and Atmospheric Administration
PDI	Palmer Drought Index
PMDI	Palmer Modified Drought Index
PWS	Public Water System
RGUP	Regional Groundwater Update Project
TCEQ	Texas Commission on Environmental Quality
TDC	Texas Demographic Center
TDWW	Texas Drinking Water Watch
TWDB	Texas Water Development Board
UD	Utility District
WCID	Water Control and Improvement District
WSC	Water Supply Corporation
WUS	Water Use Survey

EXECUTIVE SUMMARY

The Fort Bend Subsidence District (FBSD) revised its District Regulatory Plan (DRP) in 2013 based on population and water demand projections, which were developed as part of a Regional Groundwater Update Project (RGUP) completed in 2013. The RGUP was jointly supported by the Harris-Galveston Subsidence District, the Fort Bend Subsidence District, and the Lone Star Groundwater Conservation District. Population projections were developed at the census block level for each decade from 2010 to 2070 using the 2010 U.S. Census as a population baseline. Water demands were projected for individual water supply systems based on average per capita demands observed from 2000 to 2008.

In order to evaluate the performance of the projection methodology which informed the 2013 DRP, the short-term projections from the RGUP have been evaluated against recent estimates of population and water demand from multiple sources at various geographic scales. Based on this analysis, recommendations have been developed to refine the methodology used in the next regional update project to further improve the next iteration of the regulatory plan.

METHODOLOGY

The RGUP projected population on a decadal basis for each census block in Fort Bend County. In order to evaluate the performance of projections from 2010 to present, these decadal values were interpolated to annual values. The interpolated populations were then aggregated spatially to census tract, city, and water system scales for a year-to-year comparison to recent population estimates from various data sources.

Water demand projections were based on a constant per capita demand for each water system applied to the projected population in a given year, so no interpolation of demands was necessary. Because the intention of the RGUP was to estimate average water demands on a long-term basis, this study focused on comparing the average per capita demand from recent data to the per capita demand applied in the projections. The average per capita demand for each water system during the period 2010 – 2017 was estimated using water use records from FBSD and the Texas Water Development Board (TWDB) Water Use Survey (WUS). The RGUP population projection (rather than other recent population estimates) was used to estimate a per capita demand from water use data to maintain consistency when comparing with the RGUP demands. The average annual value for per capita water use from 2010 to 2017 was then

compared to the projected per capita demand. Water demand projections were also compared on a year-to-year total demand basis.

PERFORMANCES OF POPULATION PROJECTIONS

Overall, the RGUP slightly overpredicted total population growth in Fort Bend County; projections deviated from estimates by the Texas Demographic Center (TDC) by less than 5% through 2016 and by 6.1% in 2017. However, analysis at more detailed geographic scales (census tracts, cities, and public water systems) suggested that the spatial distribution of the deviation in the projections is not uniform. In fact, some portions of the county may have experienced growth that outpaced the increase predicted by the RGUP. Estimates from the TDC and the Houston-Galveston Area Council (HGAC) differed slightly, and in some parts of the county, the RGUP projection was lower than one source's estimate but higher than the other. The RGUP underpredicted population for 31 of the 76 census tracts (41%) in Fort Bend County in 2015, all of which of are located within Regulatory Area A, as shown in Figure ES 1.

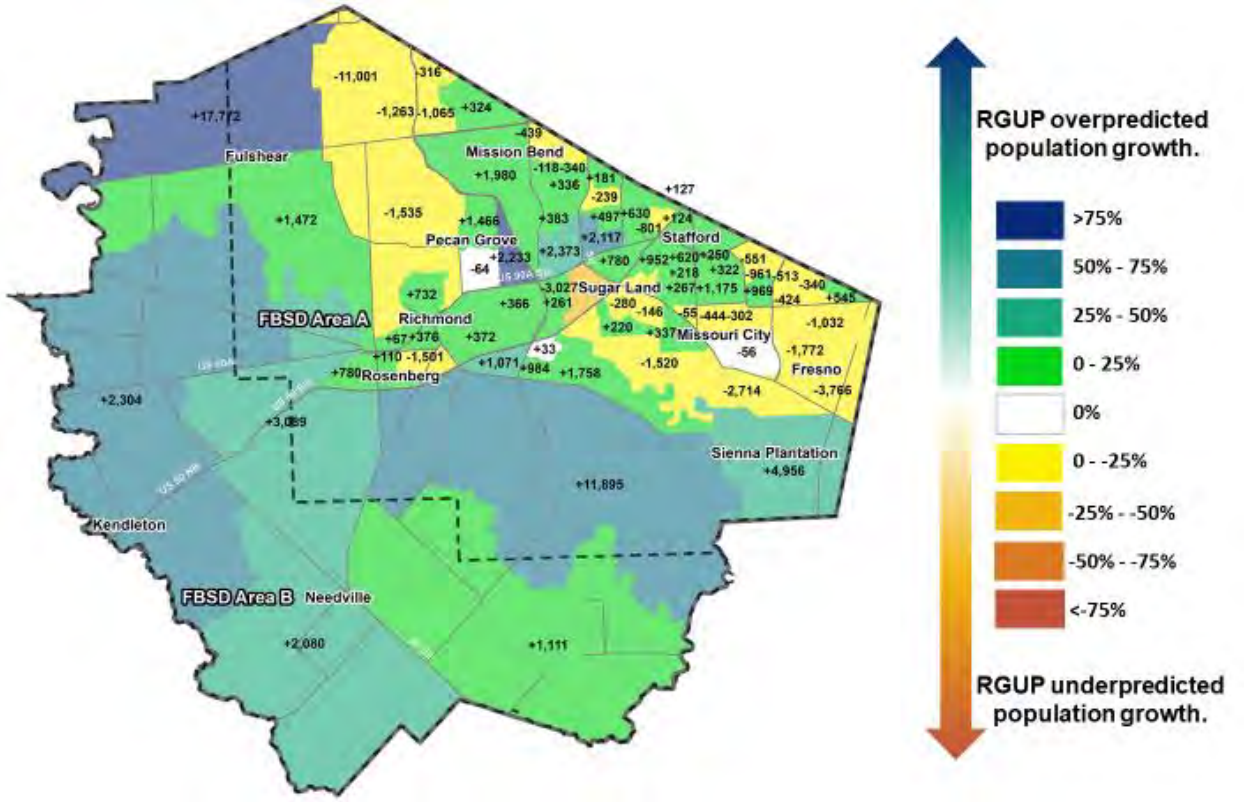


Figure ES 1. Percent Deviation in RGUP Population Projection from Houston-Galveston Area Council Estimate at the Census Tract Scale (2015)
(Labels on map denote magnitude of deviation.)

Population projections were also evaluated against reported estimates at the public water system (PWS) scale. However, PWS-scale populations prior to 2018 are only available from the TWDB WUS. The populations reported in the WUS in 2010 differed significantly from the 2010 U.S. Census, so differences between the RGUP and the WUS should not be considered as a proof of error in the projections.

PERFORMANCE OF WATER DEMAND PROJECTIONS

Water demands projected by the RGUP were based on a projected average value for per capita demand within a public water system. This projected average was compared to the average demand per person in each water system from 2010 to 2017. The comparison was repeated for two datasets of recently observed water use: FBSD records and the TWDB WUS. For about 60% of the water systems that were evaluated, the projected value was lower than recent observations.

The RGUP projection methodology assumed that the average per capita water demand would remain constant throughout the projection period, so that total municipal water use would increase at the same rate as population. While this method neglected any potential conservation, the assumption proved to be fairly reasonable for near-term projections. Although demand in individual systems was often over- or underpredicted by sometimes large percentages, the average water use in Fort Bend County was within 3% of the projected average use (based on water systems for which FBSD had available data, as shown in Figure ES 2). Total demand was overpredicted in wet years and underpredicted in dry years, which is consistent with the intention of the average-GPCD methodology.

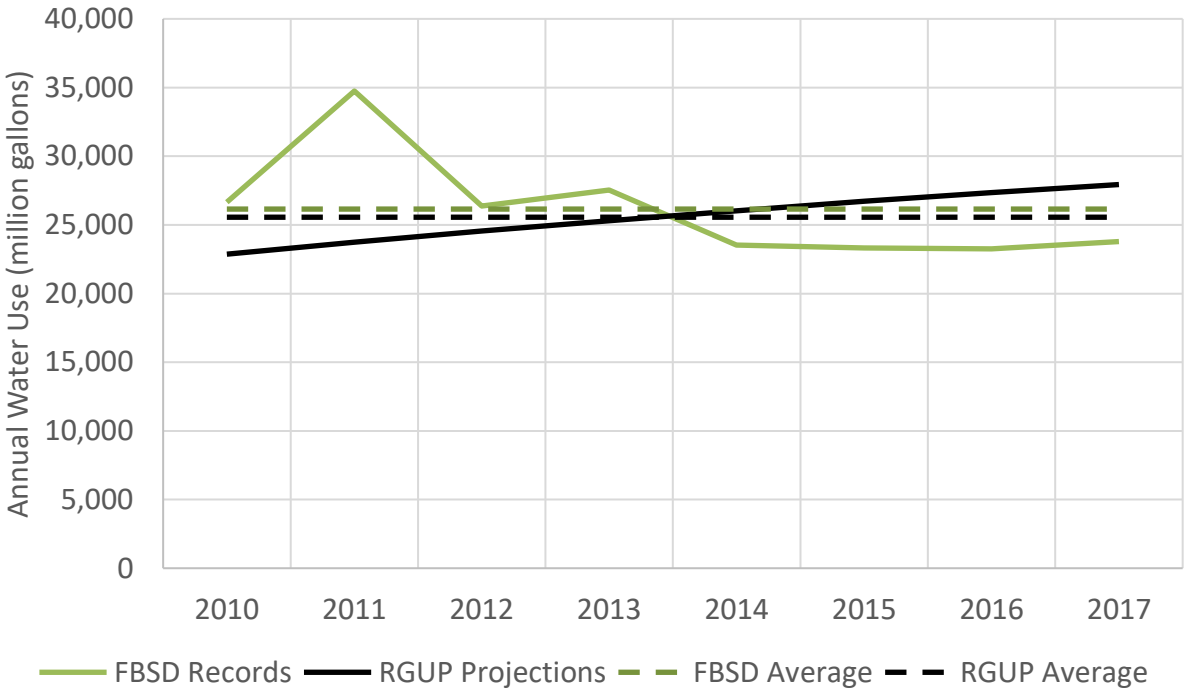


Figure ES 2. Evaluation of RGUP Projected Total Water Use for 63 Water Systems, compared to FBSD Water Use Records

SUMMARY

The evaluation of population projections at various scales suggested that the projections utilized in the 2013 DRP may have underpredicted growth in some developed areas although overall county populations were overpredicted by about 5%. Additionally, water demand projections for the county as a whole were fairly consistent with recent records, but projections underpredicted per capita demands for the majority of individual utilities. Performance of the projections from the 2013 RGUP varies depending on the specific location. However, at the county level, this evaluation indicates that there has been no significant departure from the projected development upon which the current DRP was based. This study identified focus areas for the next regional groundwater update study, as well as general recommendations for refinement of the projection methodology. No data from this study suggests a need for the near-term realignment of current regulatory boundaries.

1.0 INTRODUCTION

The Fort Bend Subsidence District (FBSD) revised its District Regulatory Plan (DRP) in 2013 based on population and water demand projections developed as part of a Regional Groundwater Update Project (RGUP) completed in 2013. The RGUP was jointly supported by the Harris-Galveston Subsidence District, the Fort Bend Subsidence District, and the Lone Star Groundwater Conservation District. Population projections at the census block level and water demand projections for individual water supply systems were developed for each decade from 2010 to 2070.

This report describes a comparison of the short-term projections from the RGUP for Fort Bend County to recent data from various sources in order to evaluate the performance of the projection methodology which informed the 2013 DRP. Both population and water demand projections were assessed at various geographic scales. Based on this analysis, recommendations have been developed to refine the methodology used in the next regional update project to further improve the next iteration of the regulatory plan.

2.0 METHODOLOGY

2.1 INTERPOLATION OF DECADAL PROJECTIONS FOR SHORT-TERM EVALUATION

The RGUP projected population on a decadal basis. As this project focused on the performance of projections from 2010 to present, these decadal values had to be interpolated to assess performance on a year-to-year basis. Water demand projections were based on a constant per capita demand for each water system applied to the projected population in a given year, so no interpolation of demands was necessary. Population projections were developed at the census tract level and were further disaggregated to the census block level. This detailed level was used as the basis of the performance evaluation. Population projections were also reported as a result of the RGUP at the city and water system level. However, these summary numbers were not used in this analysis, as they do not reflect more recent updates to city and system boundaries due to annexations or changes in service area.

For each census block in Fort Bend County, one of two interpolation techniques was applied to determine annual populations from the decadal projections. A linear interpolation between the 2010 census population and 2020 projection was applied most frequently. For areas in which growth projections were extremely non-linear, a spline interpolation using all seven decadal points was applied instead. Other interpolation techniques were also considered. Polynomial regression techniques (2nd-order and 6th-order) were discarded due to a tendency to create unrealistic growth curves. Exponential growth was also considered and discarded; although this type of growth may be suitable for a few years in a high-growth area, it does not typically reflect growth and migration patterns.

Interpolation was done at the census block level in order to maintain the greatest possible degree of detail from the projections, so that differing rates of growth even within a census tract would still be maintained. Once annual projections were developed for each block, the block projections were aggregated into three different geographic scales – census tracts, census-designated places (CDP) and public water systems (PWS). Boundaries from the 2010 Census were used for tracts and CDPs; updated PWS boundaries were obtained from the Texas Water Service Boundary Viewer maintained by the Texas Water Development Board (TWDB).

2.2 DATA SOURCES FOR PROJECTION COMPARISON

Population estimates at various spatial scales and estimates of municipal water use by public water systems were obtained from multiple sources, as shown in Table 1. The 2010 U.S. Census was used as the

baseline for RGUP population projections. For each year starting in 2011, projections were compared to available data from FBSD, the Texas Demographic Center (TDC), Houston-Galveston Area Council (HGAC), American Community Survey (ACS, distributed by the U.S. Census Bureau), Texas Drinking Water Watch (TDWW, maintained by the Texas Commission on Environmental Quality), and the TWDB Water Use Survey (WUS).

The TDC and ACS produce population estimates on a yearly basis; these were compared year-by-year to RGUP projections through 2017. The HGAC publishes a regional growth forecast each year that includes a recent population estimate as well as an additional set of long-term projections. For this study, the 2017 HGAC Regional Growth Forecast was used, which included projections for 2020 through 2045 and an estimate of 2015 populations by census tract; the 2015 estimate was used for evaluations of RGUP projections at the census tract scale. The TWDB WUS collects population estimates and annual water use as self-reported by water systems. Self-reported population from the WUS as well as the TDWW are typically based on the number of connections and a system-wide assumption of persons per connection. Populations reported in the WUS and TDWW are the only available sources of population estimates for individual water systems and thus were used to assess the projections on a water system scale; however, because these are not based directly on population counts, the uncertainty of the reported estimates must be considered when evaluating the results of this comparison.

Water use records from FBSD and the WUS were each compared separately to the RGUP-projected water demands in Fort Bend County for individual water systems and the county as a whole. As the methodology for estimating population or collecting water use information varies between each of these datasets, no single source is considered to be absolutely accurate. The RGUP projections were compared to each of the available sources to determine overall trends in performance.

Table 1. Data Sources for Projection Comparison

Dataset	Type and Scale of Comparison					
	Population Estimates				Water Use Estimates	
	County	Cities	Water Systems	Census Tracts	Permittees	Water Systems
FBSD Pumpage and Usage Records					✓	
Houston-Galveston Area Council Projections	✓	✓		✓		
Texas Demographic Center Estimates	✓	✓				
American Community Survey Estimates	✓					
Texas Drinking Water Watch			✓			
TWDB Water Use Survey			✓			✓

2.3 APPLICATION OF WATER USE DATA

Water use data from FBSD and TWDB were available on an annual basis as the total amount of water used for public supply by a FBSD permittee or a PWS. In the RGUP, populations were projected for each decade, and a constant water demand per capita was applied to the population in each water system to estimate. For many PWS, the projected per capita demand was developed from TWDB WUS data for 2000 to 2008 as the average annual value of demand per person within a public water system. However, data obtained directly from PWS and regional water authorities from as late as 2011 were used where available. Because the intention of the RGUP was to estimate average water demands on a long-term basis, this study focused on comparing the average per capita demand from recent data to the per capita demand applied in the projections. The RGUP population projection (rather than other population estimates) was used to estimate a per capita demand from water use data to maintain consistency when comparing with the RGUP demands. The average annual value for per capita water use from 2010 to 2017 was then compared to the projected per capita demand.

Some utilities also sell water to other PWS, such as Municipal Utility District (MUD) 106 in the Greatwood development in Sugar Land (prior to annexation) or Cinco MUD 1 in Cinco Ranch. The WUS records for these systems were reviewed individually to avoid double-counting, as some of the master MUDs

reported sold water as part of their own demand, which was then reported again as demand by the customer systems. In these cases, total use was considered for the master MUD and customers together. Table 2 describes the water systems for which this approach was used. Depending on how water use was reported, master MUDs and customers may have been grouped together only for the analysis of one dataset or both. Similarly, water use reported by Fort Bend County MUD 169 (Cross Creek Ranch) was included as part of the total use by the City of Fulshear, as MUD 169 is within Fulshear's water service area.

Table 2. Water System Groups and Associated Master MUDs

Development	Master MUD	PWS in Development Treated as a Group?	
		FBSD Records	TWDB WUS
Cinco Ranch	Cinco MUD 1	✓	✓
Cinco Ranch Southwest	Cinco Southwest MUD 1	✓	✓
City of Sugar Land – Greatwood	FBC MUD 106		✓
City of Sugar Land – New Territory	FBC MUD 112	✓	✓
Grand Lakes	Grand Lakes MUD 4	✓	
Grand Mission	Grand Mission MUD 1	✓	

2.3.1 FBSD Data by Permittee

FBSD groundwater pumping records were available for each permittee of FBSD. In order to determine per capita demand, only records for permittees that are also a PWS for which a population projection was available were included in the analysis. In some cases, multiple PWS were associated with a single permittee. For example, wells permitted under Fort Bend County Water Control and Improvement District 2 (WCID 2) included three wells owned by the City of Meadows Place. While the City of Meadows Place is a participant in the WCID 2 Groundwater Reduction Plan, it functions as an independent water system and self-supplies groundwater. Thus, the pumping records for wells owned by the City were attributed to its own water system rather than to WCID 2. Conversely, the City of Stafford, while listed as a separate permittee, is served by WCID 2, so pumping from the City of Stafford well was included in the total use by WCID 2. Alternative use records included surface water and/or reuse for seven public water

systems: City of Richmond, City of Rosenberg, City of Sugar Land, Fort Bend County MUD 25, Fort Bend County WCID 2, Pecan Grove MUD, and Quail Valley Utility District (UD). Both groundwater and alternative water use records were used to estimate the total use for public supply by a given water system.

2.3.2 TWDB Data by Public Water System

The TWDB Municipal Water Use Survey provides reported municipal water use by a PWS from groundwater, surface water, and reuse sources. All sources of water were included in this analysis to determine the total use by a system.

2.3.3 Treatment of Outliers

Due to inconsistency in reporting, the water use for each PWS was not reliable in all years. A typical assumption for minimum indoor use is 60 GPCD (gallons per capita daily), with outdoor use increasing municipal demands to 200 or 300 GPCD. Based on this, any year for a given PWS with a calculated per capita demand of less than 40 GPCD was assumed to be unrealistic and was excluded from the analysis. Larger per capita values of more than 1,000 GPCD were also seen for a few PWS. These were also considered unreasonable, but the application of an arbitrary cut-off value risked excluding accurate data for high-use systems. Instead, a methodology was developed to cap demands at a maximum GPCD value based on the climate conditions in a given year. This methodology is described in more detail in Appendix A.

3.0 STUDY RESULTS

The following sections describe the results of the comparison of RGUP projections in Fort Bend County to recently observed population and water use estimates.

3.1 PERFORMANCE OF POPULATION PROJECTIONS

Population projections for each census block were spatially aggregated to project populations for each census tract, census-designated place, and public water system in Fort Bend County. Population estimates from the sources listed in Table 1 were then used to evaluate how well these projections have performed since 2010.

3.1.1 Population Across Fort Bend County

County-wide population estimates from 2011 to 2017 were consistent across data sources, with a difference of no more than 3,000 persons in all years but 2017. By comparison, the RGUP overpredicted total population in the county by less than 5% in most years, as shown in Table 3 and Figure 1.

Table 3. Evaluation of RGUP Projections at the County Level

Dataset	Fort Bend County Total Population						
	2011	2012	2013	2014	2015	2016	2017
RGUP Projection	620,935	654,969	687,609	718,721	748,988	777,296	804,780
TDC Estimate	607,995	624,831	650,693	686,187	716,491	744,199	758,287
HGAC Projection					715,529		
	Deviation of RGUP Projection from Other Data Sources						
	2011	2012	2013	2014	2015	2016	2017
% Deviation (compared to TDC)	+2.1%	+4.8%	+5.7%	+4.7%	+4.5%	+4.4%	+6.1%
% Deviation (compared to HGAC)					+4.7%		

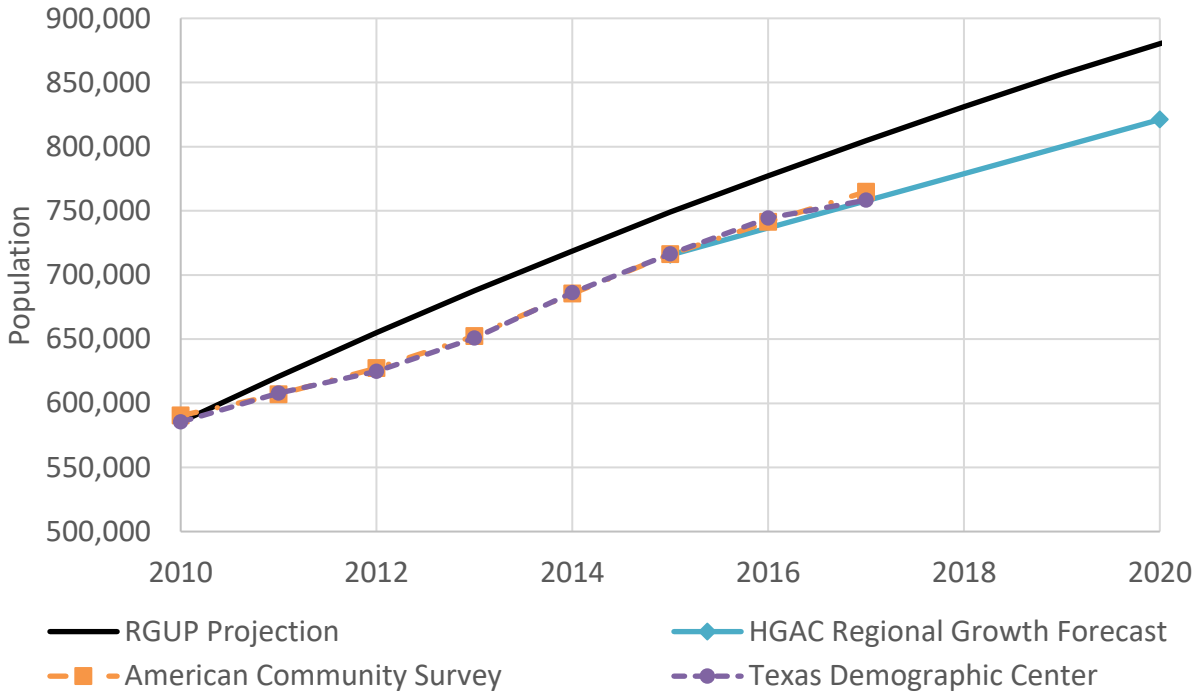


Figure 1. Evaluation of RGUP Projections at the County Level

Population projections from HGAC were available at the census tract level for 2015. For most tracts, the RGUP projection deviated from HGAC's projection by no more than +/- 25% (Figure 2[1]). The RGUP underpredicted population growth in 31 of the 76 census tracts within Fort Bend County; all of the underpredicted tracts were within Regulatory Area A ("Area A"), which is subject to groundwater pumpage restrictions under the 2013 DRP. Area A also encompasses most of the urban and suburban development in the county. In the mostly rural Regulatory Area B ("Area B"), the RGUP consistently overpredicted short-term growth. In particular, census tract 6755 in the southeastern part of the county was overpredicted by 11,895 persons. In 2010, the U.S. Census counted a population of 11,151 in tract 6755, which was projected in the RGUP to grow to 28,023 by 2015 and 41,326 by 2020. However, HGAC estimated a population of only 16,128 in 2015 and projects a 2020 population of 30,096. Similarly, census

1) Detailed alternate versions of key figures are provided in Appendix B.

tract 6732 in north Fort Bend County was projected to have a population of 36,833 by 2015, compared to an estimate by HGAC of only 19,061 (deviation of 17,772). This tract is split between Areas A and B and includes part of the rapidly growing community of Fulshear, which is discussed in greater detail in Section 4.3.

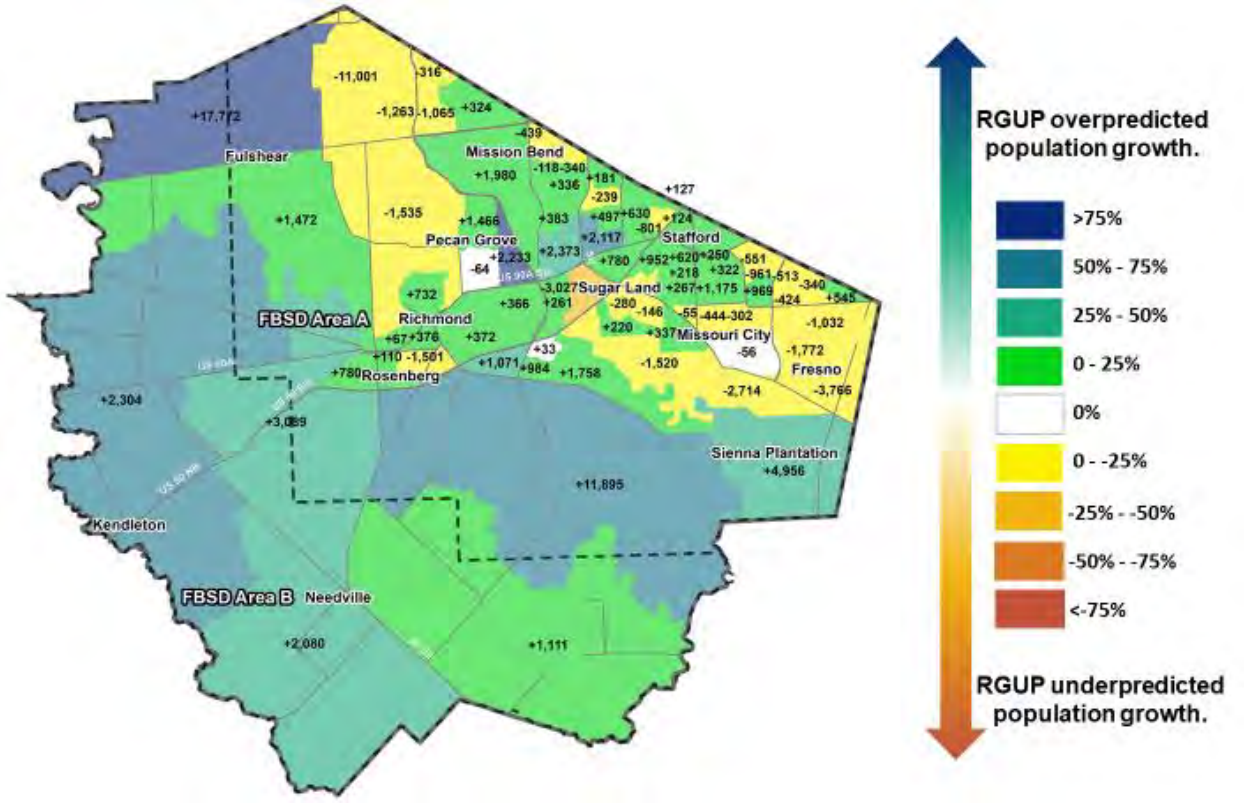


Figure 2. Percent Deviation in RGUP Population Projection from HGAC Estimate at the Census Tract Scale (2015)
(Labels on map denote magnitude of deviation.)

3.1.2 Cities and Census-Designated Places

The TDC provides annual estimates of population for 30 cities and census-designated places (CDP) that are at least partly in Fort Bend County. When compared to the TDC estimates, the RGUP typically underpredicts population except in Pecan Grove, Cumings, and Fulshear. Similar to the census tract-level comparison, this implies that while the RGUP overpredicted population for the county as a whole, growth in more developed areas was underpredicted. However, HGAC estimates for 2015 are also available for 10 of these places, 6 of which are entirely within Fort Bend County. The deviations shown in Figure 3 demonstrate that the 2015 RGUP projection fell between HGAC and TDC estimates for Missouri City,

Richmond, Rosenberg, Stafford, and Sugar Land. Due to the differing methodologies between the data sources, this could imply that the RGUP appropriately projected growth in the county's largest cities, and apparent over- or underpredictions are simply artifacts of estimation techniques. Both sources agree that the RGUP likely underpredicted growth in Meadows Place, while significantly overpredicting growth in Fulshear.

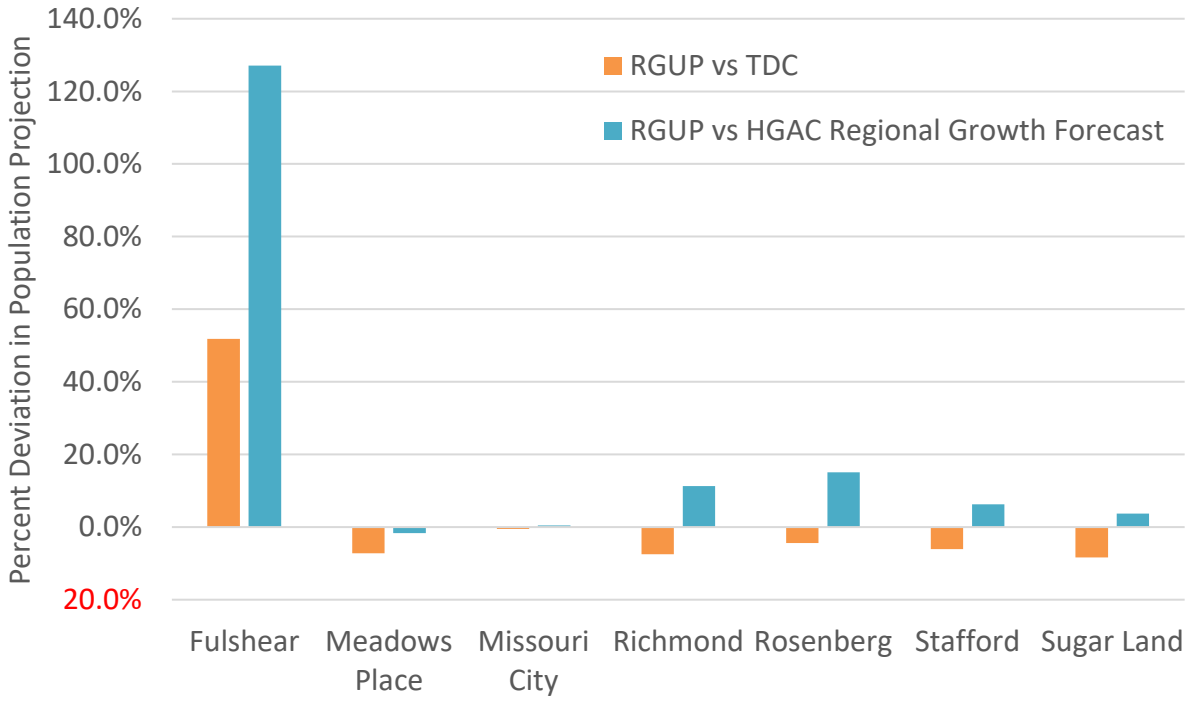


Figure 3. Percent Deviation in RGUP Population Projection at the Census-Designated Place Scale (2015)

3.1.3 Public Water Systems

The TWDB Water Use Survey provides population estimates for each PWS in Texas based on a system's number of connections in a given year and an estimated number of persons per connection – typically about 3 persons. Because the estimate is based on number of utility connections rather than an actual person count, the reported values often do not align with census counts. The RGUP was compared with these PWS populations, but results must be considered with an expectation of bias in the PWS data. Figure 4 illustrates this inherent error in the WUS population estimates by showing the deviation of 2010 census counts from the 2010 WUS reported population. The RGUP used census counts as the baseline population in 2010, so the deviations shown in Figure 4 demonstrate the apparent "error" in the RGUP 2010 projections as though the WUS data were accurate. The percent deviation from WUS populations

in 2015 is shown in Figure 5. This indicates that many of the trends seen in the 2015 data are similar to pre-existing deviations illustrated in the 2010 data against the Census baseline, prior to the introduction of any potential projection error.

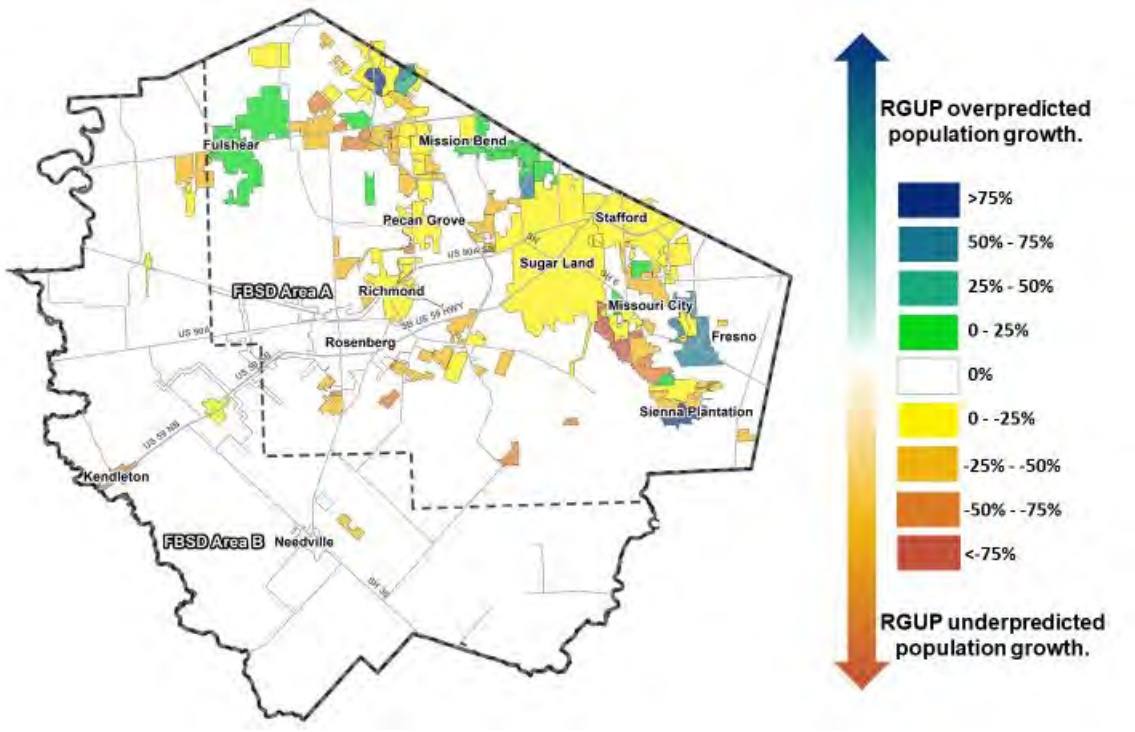


Figure 4. Percent Deviation in RGUP Population Projection (Equal to 2010 U.S. Census Population) from TWDB Water Use Survey Records at the Water System Scale (2010)

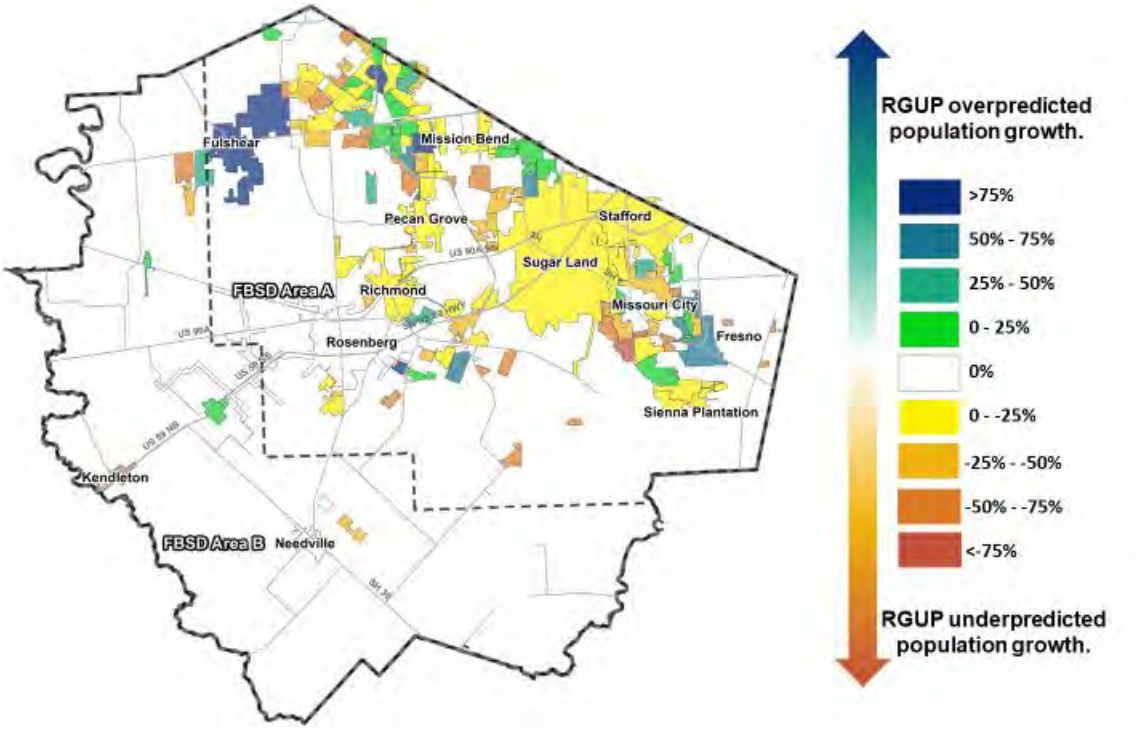


Figure 5. Percent Deviation in RGUP Population Projection from TWDB Water Use Survey Records at the Water System Scale (2015)

3.1.4 Trends in Performance of Population Projections

Differences between datasets, and particularly between the WUS data and the 2010 Census, make it clear that no single data source is likely to provide a perfectly accurate representation of population in Fort Bend County since 2010. However, when considered together, trends in the RGUP's performance become apparent. Overall, the RGUP slightly over-predicted total population in Fort Bend County, although the exact spatial distribution of error varies depending on the data source used for comparison. The RGUP underpredicted the percent of population concentrated in developed areas with Regulatory Area A, while rural areas have not developed as quickly as was projected.

3.2 PERFORMANCE OF MUNICIPAL WATER DEMAND PROJECTIONS

As projected water demands were derived from a single average per capita demand value for each water system, the primary analysis of water demands compared the projected average value to the average annual water use per person observed since 2010. The annual demands based on projected population were also compared to total annual water use on a year-to-year basis.

3.2.1 Average Per Capita Demand by Water System

The RGUP-projected per capita water demand was evaluated for each water system against the average annual value of per capita water demand from 2010 to 2017. Municipal water demand and population projections were available for only 63 water systems using FBSD permittee records and for 116 systems using the TWDB Water Use survey. Figure 6 depicts the frequency of underpredictions and overpredictions in average demand, compared to both source datasets. As with population, the results showed a mix of both over- and underpredictions, with underpredictions occurring in more than 50% of PWS in both record sets. As shown in Figure 7 and Figure 8, both datasets suggest that per capita demands were overestimated in Fulshear and Fort Bend County WCID 2, but were underestimated in Sugar Land, Richmond, and Rosenberg. The RGUP projection for 22 water systems were in between the recent estimates from TWDB and FBSD data, and the projection for several more systems were within +/-20% of recent demand.

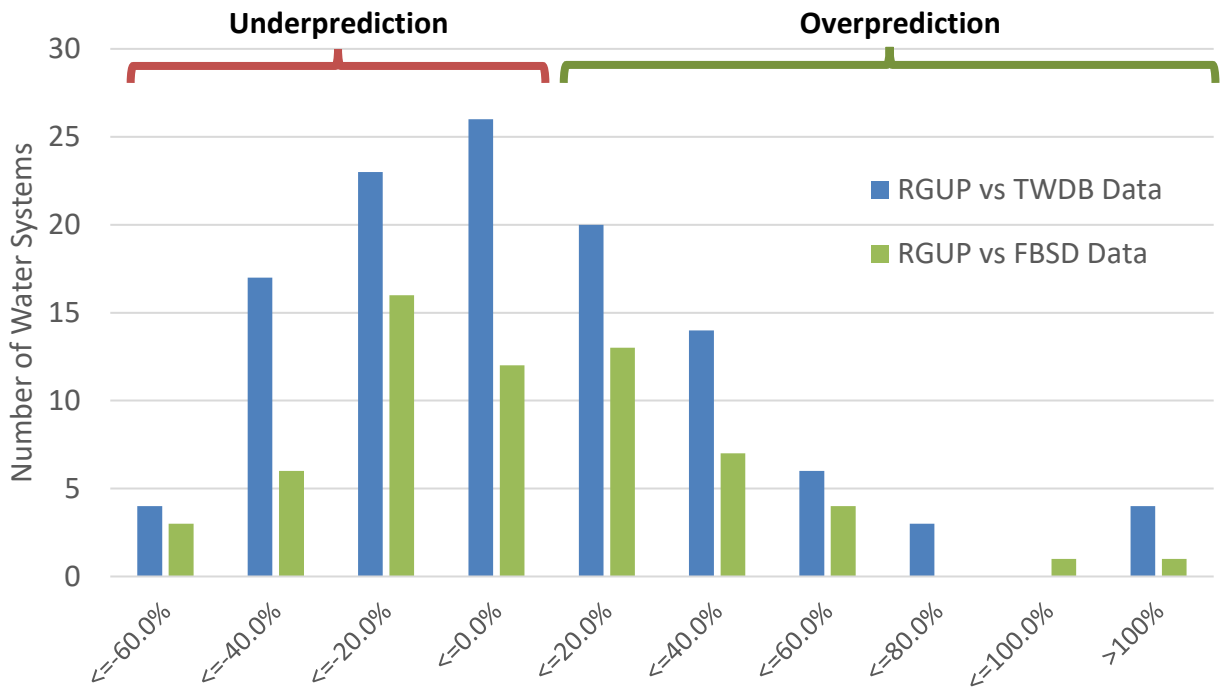


Figure 6. Histogram of Percent Deviation in RGUP Projected Average Per Capita Demand (2010-2017)

Changes in service area boundaries may have contributed to underpredictions for utilities that are still expanding. Otherwise, some of the deviations in the projections may be caused by changes in demand due to different kinds of development within a utility's service area in recent years than has been seen historically. For example, the historically small and rural community of Fulshear is now the center of development for numerous master-planned communities. No correlation was identified between the size of the water system (based on population and average water demand) and the deviation between projected and observed per capita demands. Inconsistent data, both from FBSD and TWDB, contributes to the uncertainty of the analysis, as several PWS had at least one year of data adjusted or removed due to high or low outlier values.

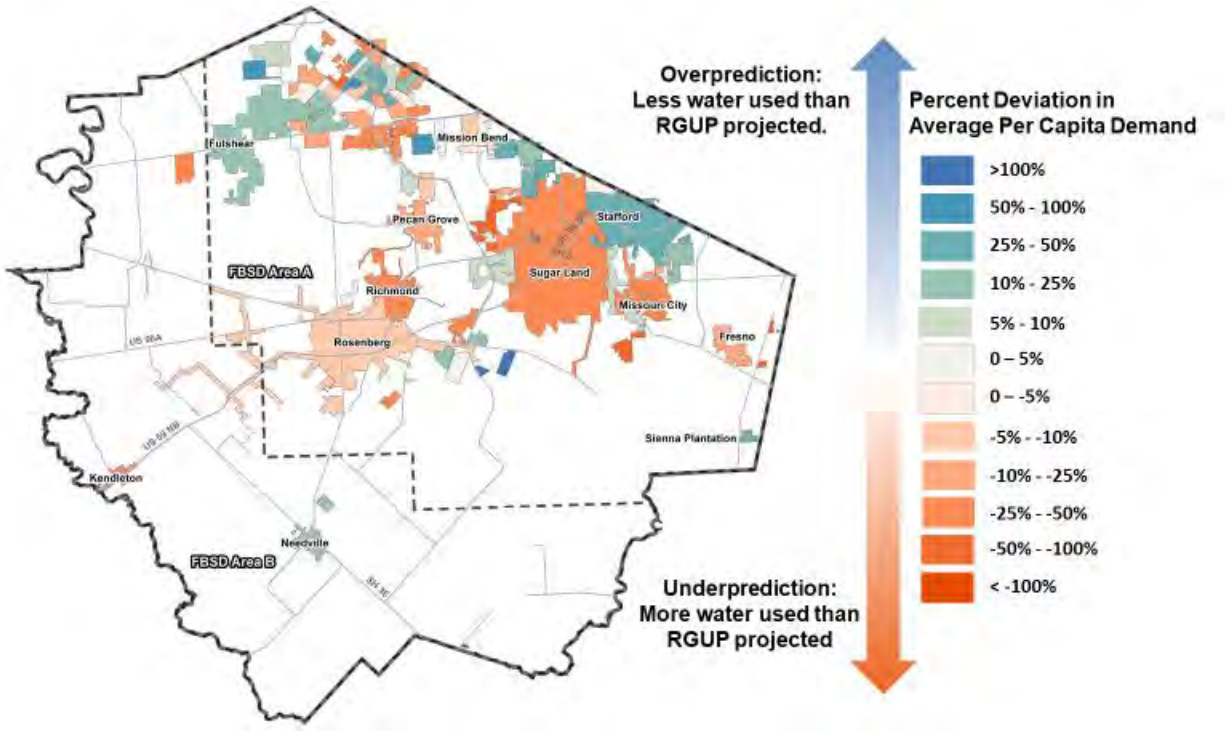


Figure 7. Percent Deviation in RGUP Projected Average Per Capita Demand, Compared to 2010-17 Average Annual Water Use (FBSD data)

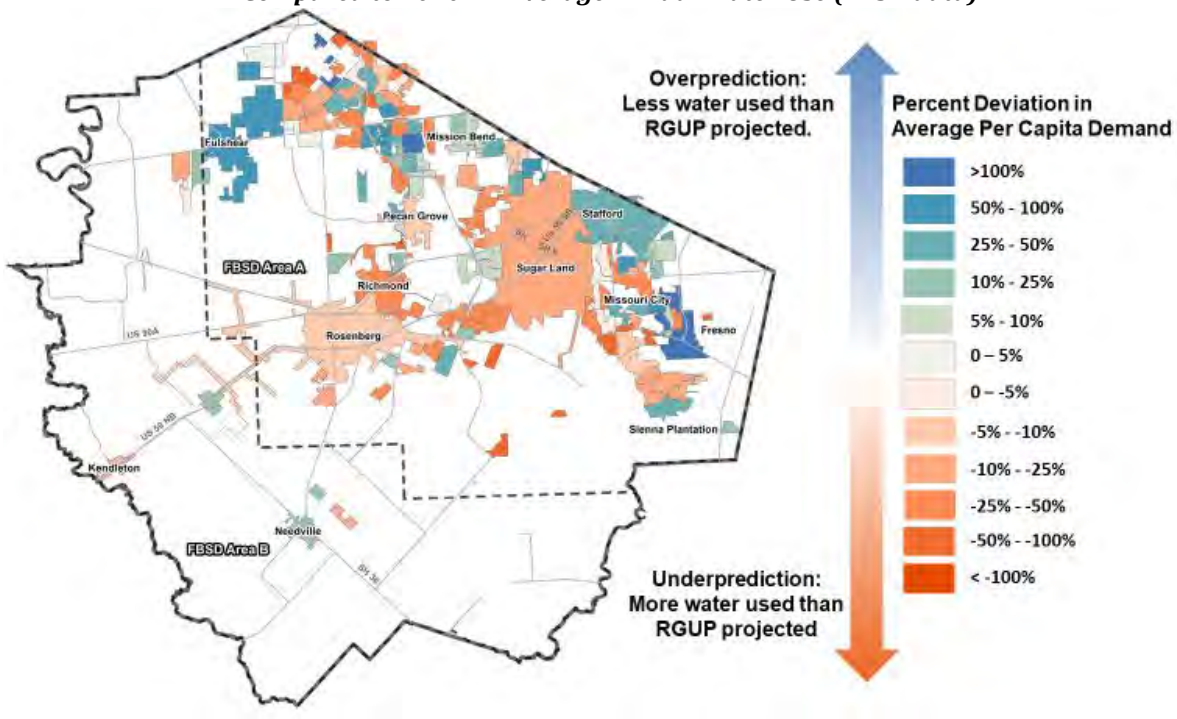


Figure 8. Percent Deviation in RGUP Projected Average Per Capita Demand, Compared to 2010-17 Average Annual Water Use (TWDB data)

3.2.2 Trends in Fort Bend County Municipal Water Demand

In addition to comparing average per capita demand, total water use was also evaluated on a year-by-year basis. By applying the projected average per capita demand to the projected population, demand projections could be compared directly to reported water use each year. As underprediction in demand was indicated for many water systems on an average per capita basis, the year-to-year total demands were also underpredicted more often than overpredicted. However, Figure 9 demonstrates that on average between 2010 and 2017, total projected demand among water systems in the county followed the reported demand fairly closely. Only the 63 water systems for which projections and recent use records were both available are included in Figure 9. Total demand was overpredicted in wet years and underpredicted in dry years, which is consistent with the intention of the average-GPCD methodology. Similarly, Figure 10 and Figure 11 demonstrate the spatial distribution of deviations in total projected water use.

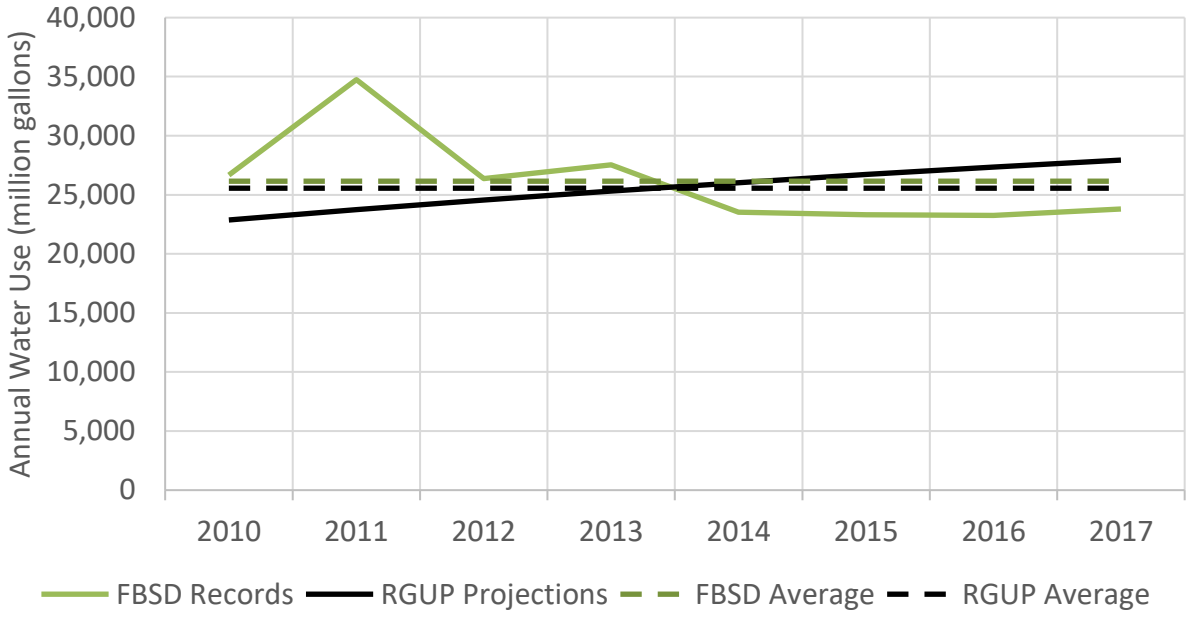


Figure 9. Evaluation of RGUP Projected Total Water Use for 63 Water Systems, compared to FBSD Water Use Records

The application of a constant GPCD value for each water system over the projection period appears to be reasonable, as water use in each system has approximately followed growth in population, rather than increasing or decreasing significantly over the sample period. However, data from both FBSD and TWDB was inconsistent year-to-year, making the evaluation results uncertain.

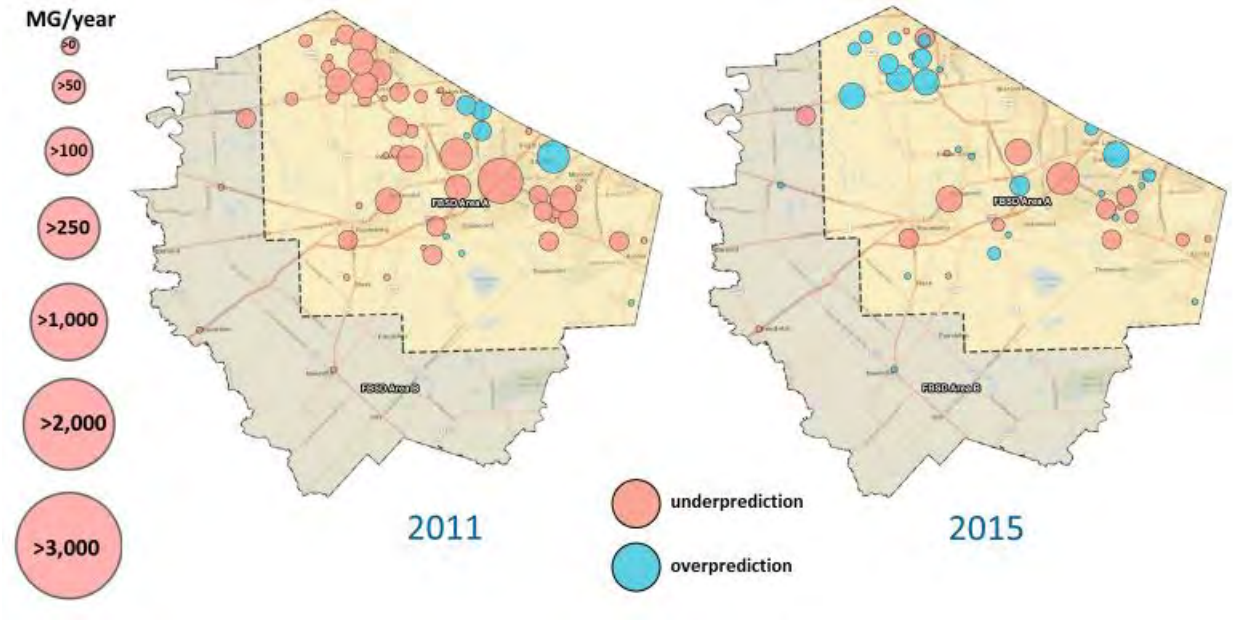


Figure 10. Deviation of RGUP Projection from Total Water Use (FBSD Data)

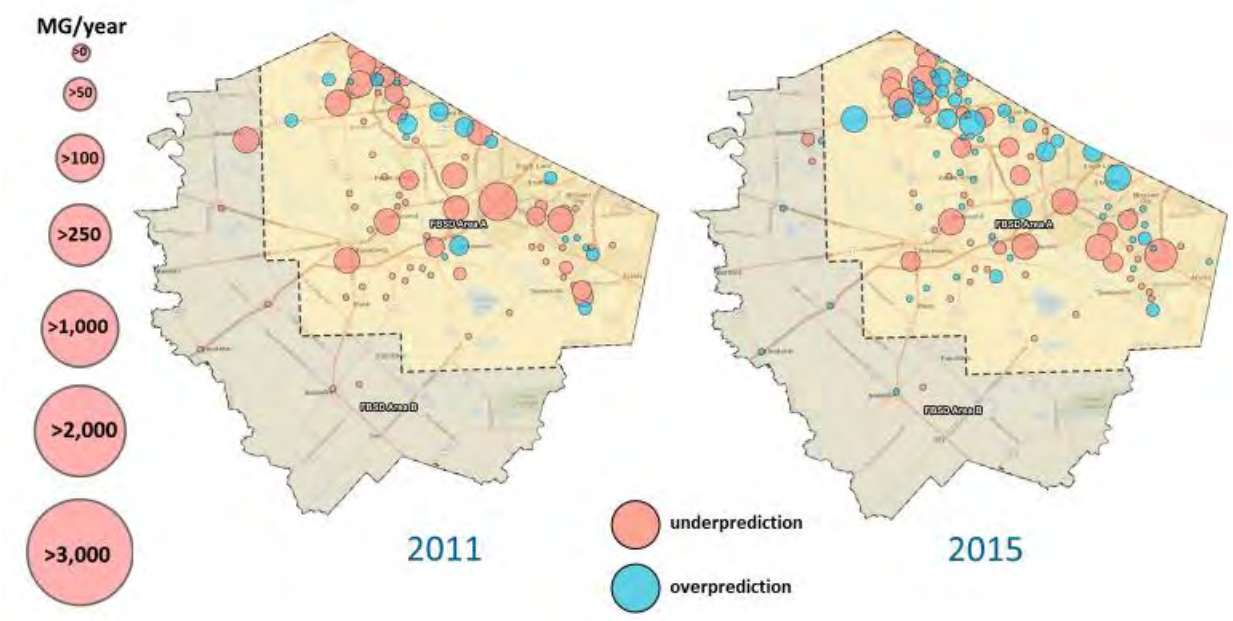


Figure 11. Deviation of RGUP Projection from Total Water Use (TWDB Data)

3.3 TRENDS IN TOTAL FORT BEND COUNTY WATER DEMAND

This evaluation focused on the comparison of projected and reported municipal demands – water used for public supply, which includes commercial and irrigation uses served by a public utility. FBSD also collects groundwater pumpage and surface water use from wholesale water suppliers, industrial users, and agricultural irrigators. While municipal water use has increased in step with population growth, total water use has increased more slowly over the last 16 years, following a steep decline in agricultural irrigation between 2000 and 2003 (Figure 12). Overall, this means that the average municipal water use per person has stayed approximately constant, while other uses of water in the county appear to be decreasing on a per-person basis (Figure 13). The sharp decline in the early 2000s can be attributed to a decrease in the amount of surface water reported to FBSD as being used for agricultural irrigation in the Brazos River Basin.

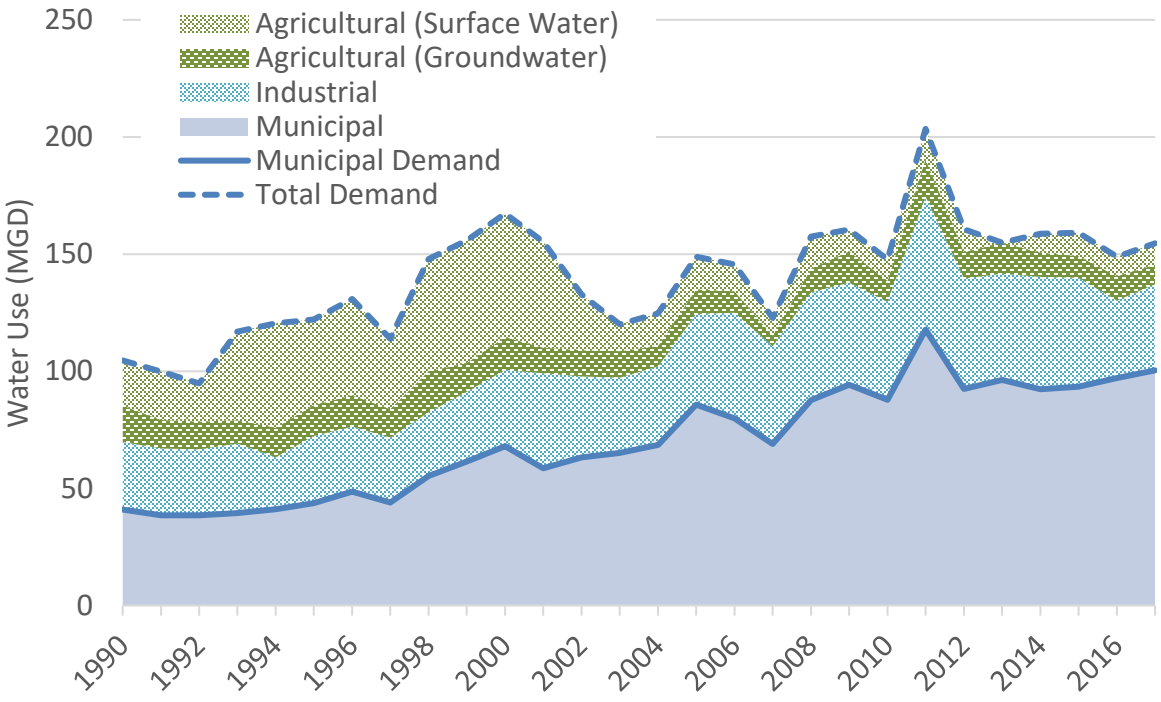


Figure 12. Historical Water Use in Fort Bend County by Use Type

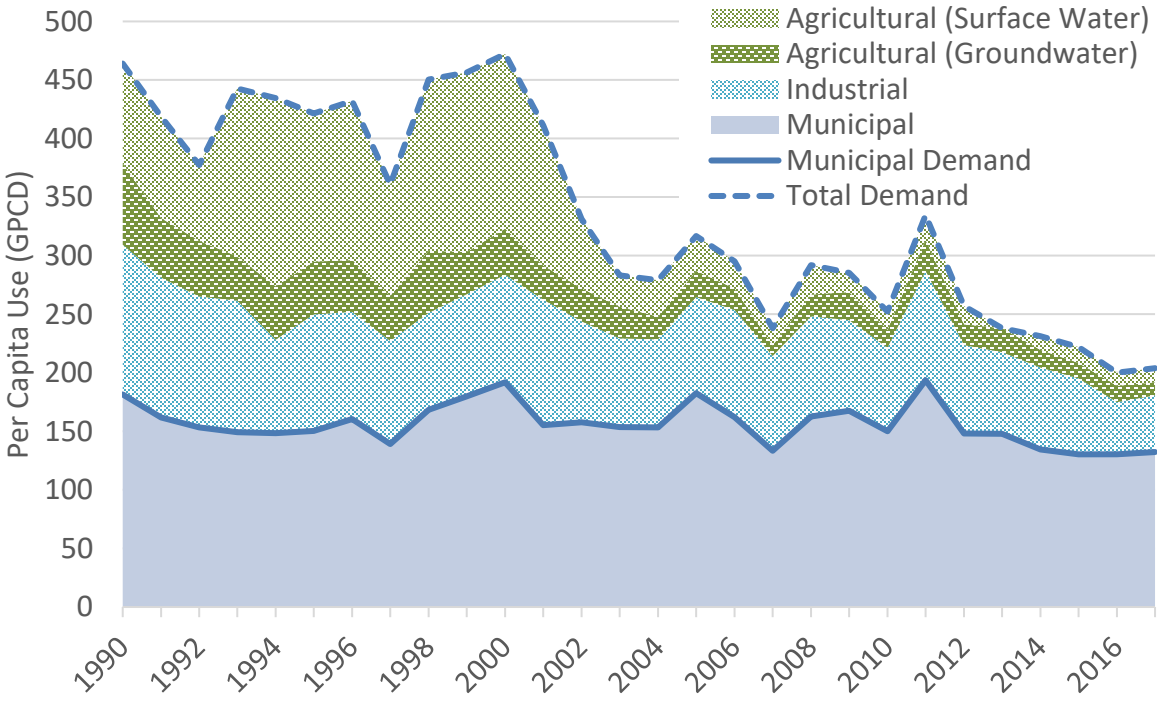


Figure 13. Historical Water Use per Person in Fort Bend County by Use Type

3.4 CHANGES IN HYDROLOGIC CONDITIONS

The RGUP water demand projections were based on the average annual per capita demand from 2000 to 2008 in a given water system. This period of record was selected due to its inclusion of a wide range of hydrologic conditions, as indicated by the Palmer Drought Index (PDI). Thus, the projections were based on the assumption that climatic conditions would repeat over the long-term with a similar frequency to that period. A comparison of the Palmer Modified Drought Index (PMDI) indicates that dry conditions occurred more frequently in the recent evaluation period than in the projection data period (Figure 14), which could explain at least a small increase in per capita demand over the historical average used in the projections.

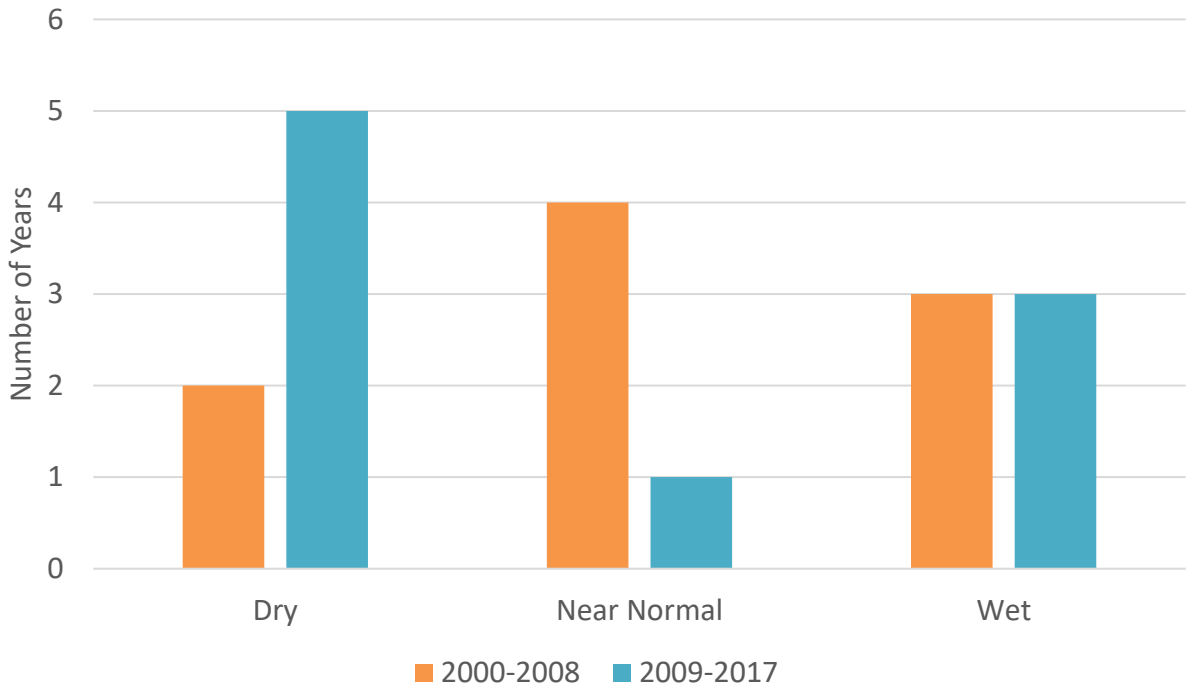


Figure 14. Hydrologic Conditions in Climate Division 8 During Projection Development (2000-2008) and Recent Period (2009-2017)

The PDI at NOAA Gage 414307, which was reported in the RGUP study, is no longer available. The values shown here compare the PMDI for Climatic Division 8, shown in the map in Figure 15.

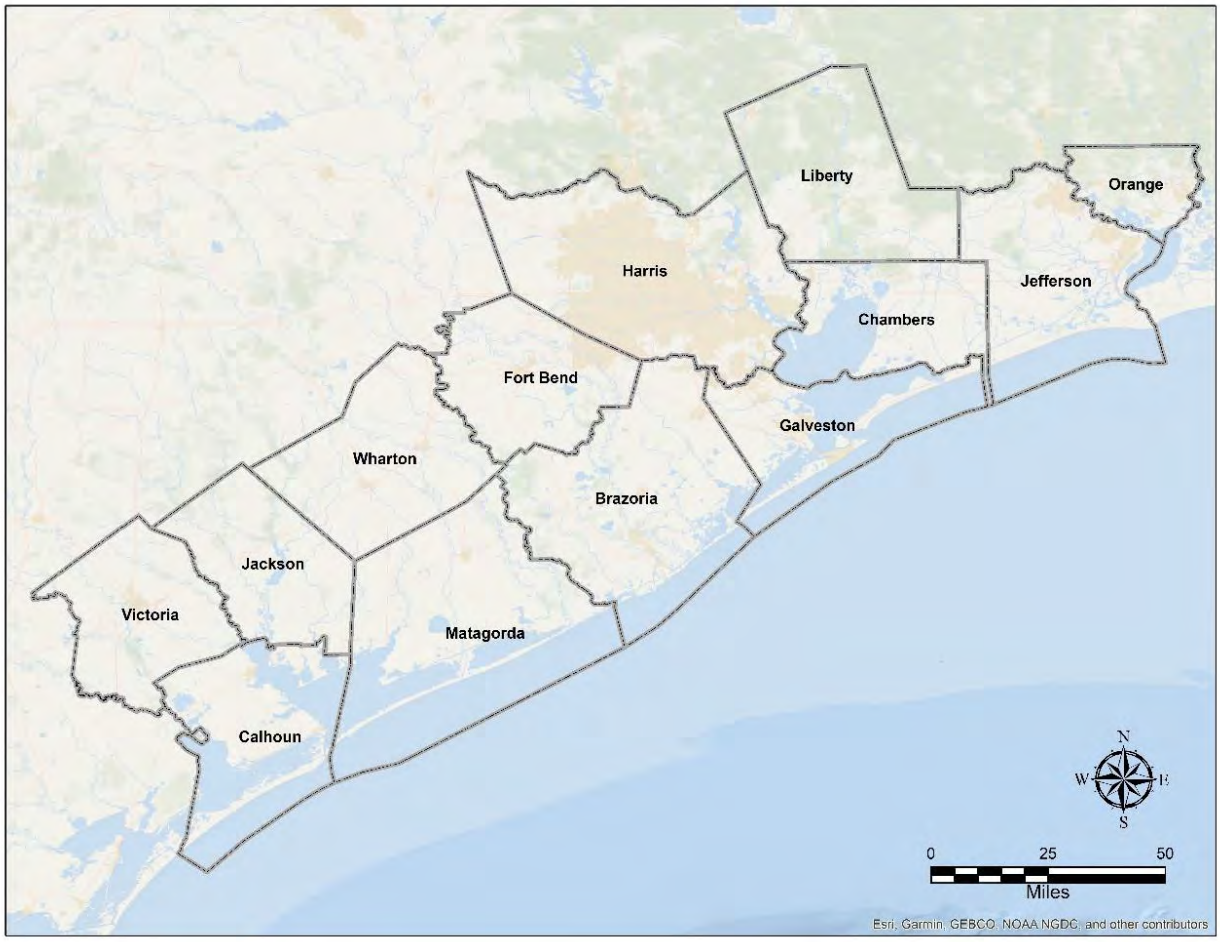


Figure 15. Counties in Climate Division 8: Texas Upper Coast

4.0 MAJOR CENTERS OF POPULATION AND WATER DEMAND IN FORT BEND COUNTY

Larger cities and rapidly growing communities have the potential to have the greatest impact on groundwater levels and subsidence in Fort Bend County. Additional details of the projection evaluation for five such communities are described in the following sections.

4.1 SUGAR LAND

The City of Sugar Land is the most populated municipality that is entirely within Fort Bend County. The City also serves as the public water provider to customers within its city limits. Much of the development in this area has been established for several decades, so that the nature of water demands are not rapidly changing in most of its service area. Two developments – Greatwood and New Territory – were annexed by Sugar Land in December of 2017. RGUP projections for both population and demand were developed separately for Greatwood, New Territory, and Sugar Land prior to annexation. Additionally, the TWDB WUS still reports data separately for these areas, so the evaluation of projections could be completed for each area individually.

The RGUP projections underpredicted average per capita water use in pre-annexation Sugar Land and Greatwood, leading to an underprediction in total water demand (Figure 16 and Figure 17). Demands in New Territory were predicted reasonably well (Figure 18), with errors in average per capita demand of only 6%. Additionally, although the RGUP applied a constant GPCD value to the growing population, resulting in an increasing demand trend, recently observed water use data suggests that conservation may be causing a slight decline in per capita water use in this area. Because much of Sugar Land's service area includes older infrastructure that is slowly being updated with more efficient plumbing fixtures, the RGUP assumption of a constant GPCD may have been inadequate for this particular area.

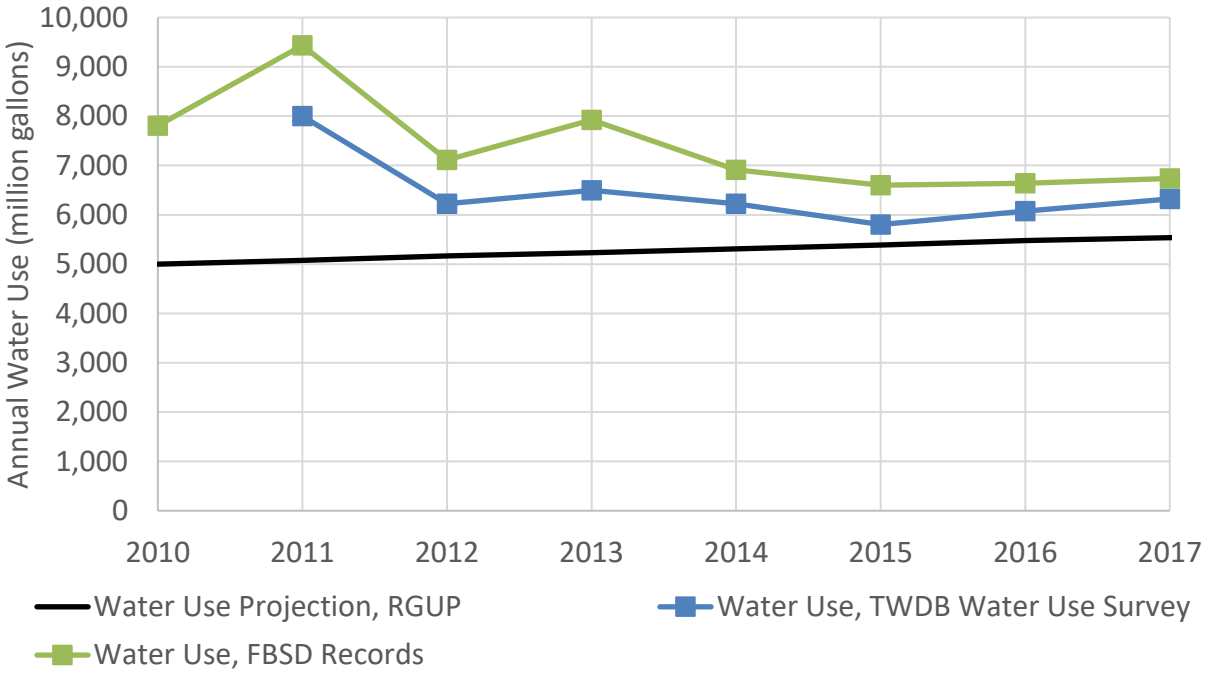


Figure 16. Water Use in City of Sugar Land (excluding Greatwood and New Territory)

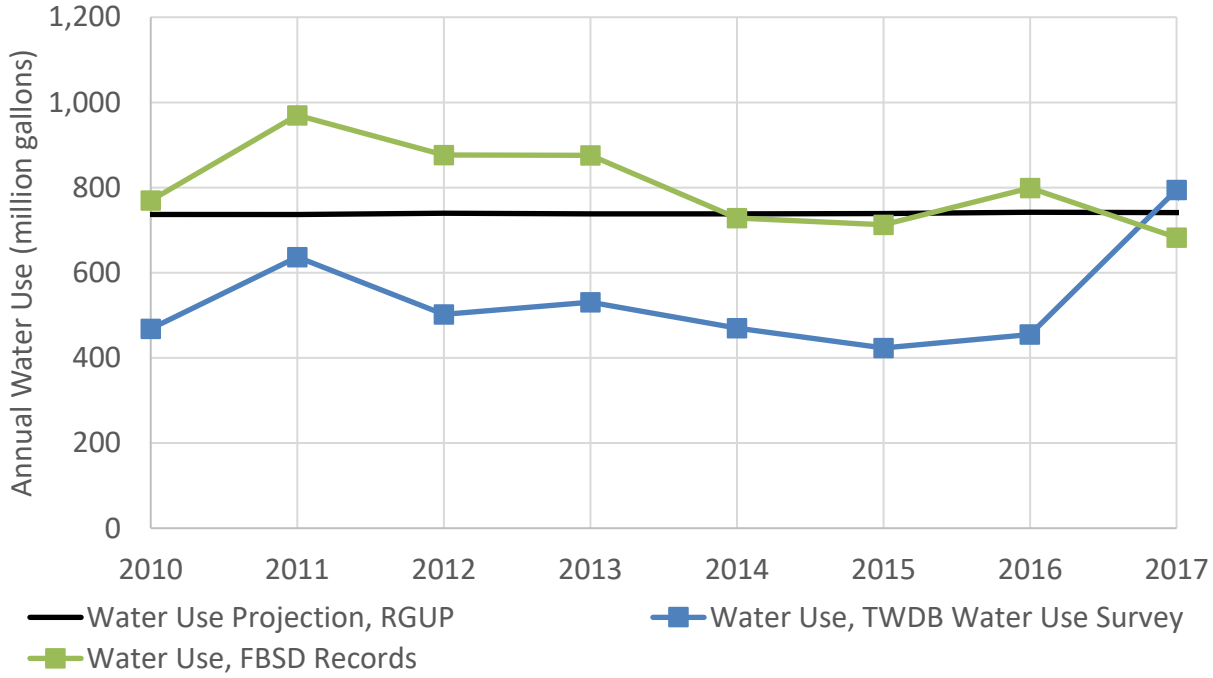


Figure 17. Water Use in Greatwood

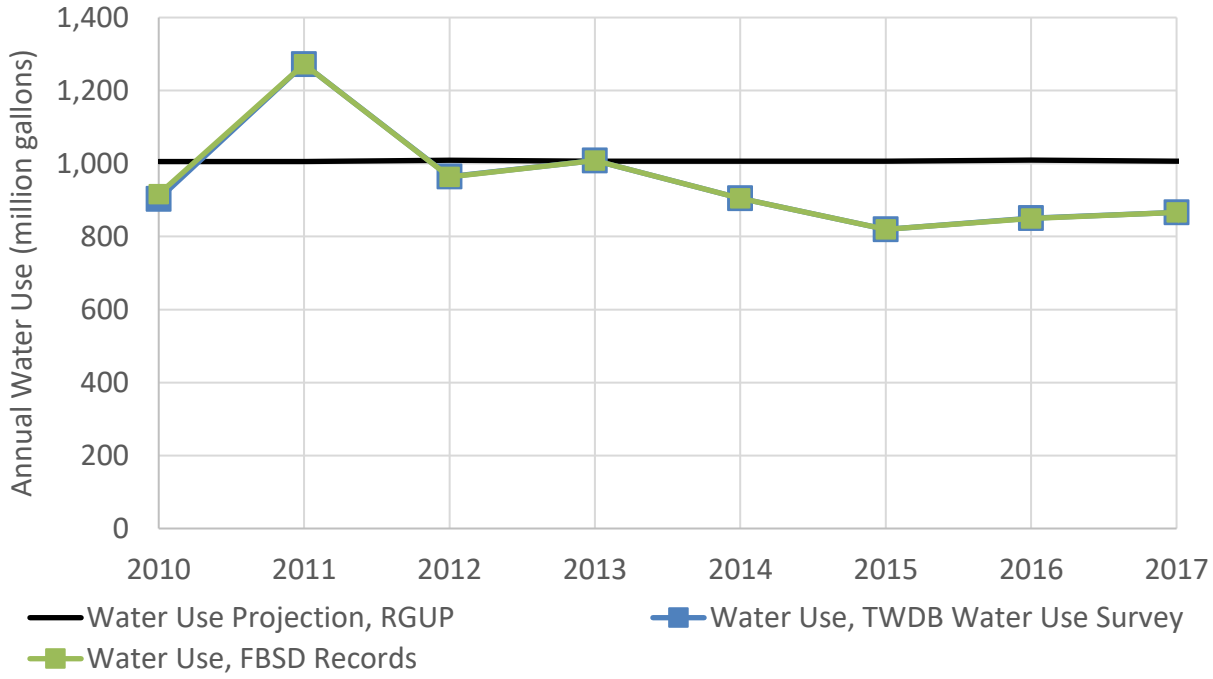


Figure 18. Water Use in New Territory

4.2 RICHMOND AND ROSENBERG

Located in the center of Fort Bend County, the Richmond/Rosenberg area is another significant hub of development. As illustrated in Figure 3, the RGUP projected populations for these cities was fairly reasonable, as the projections were smaller than TDC estimates but larger than HGAC estimates in 2015. Average per capita water demands were underestimated for both cities; however, the deviation in per capita use was only -7.4% for Rosenberg (based on FBSD data), and on a year-to-year basis, the projected demand for Rosenberg was relatively similar to observed water use (Figure 19). The deviations were larger in Richmond, with a difference of -39% in average per capita use (based on FBSD data). A year-to-year comparison is shown in Figure 20.

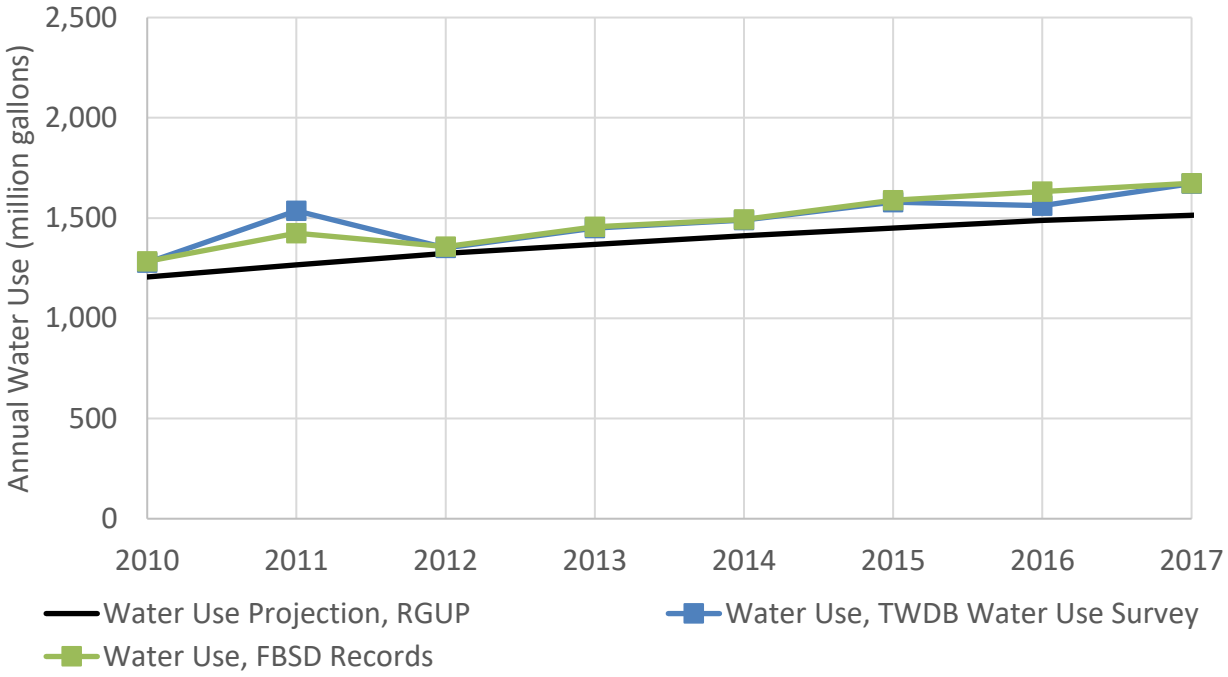


Figure 19. Water Use in Rosenberg

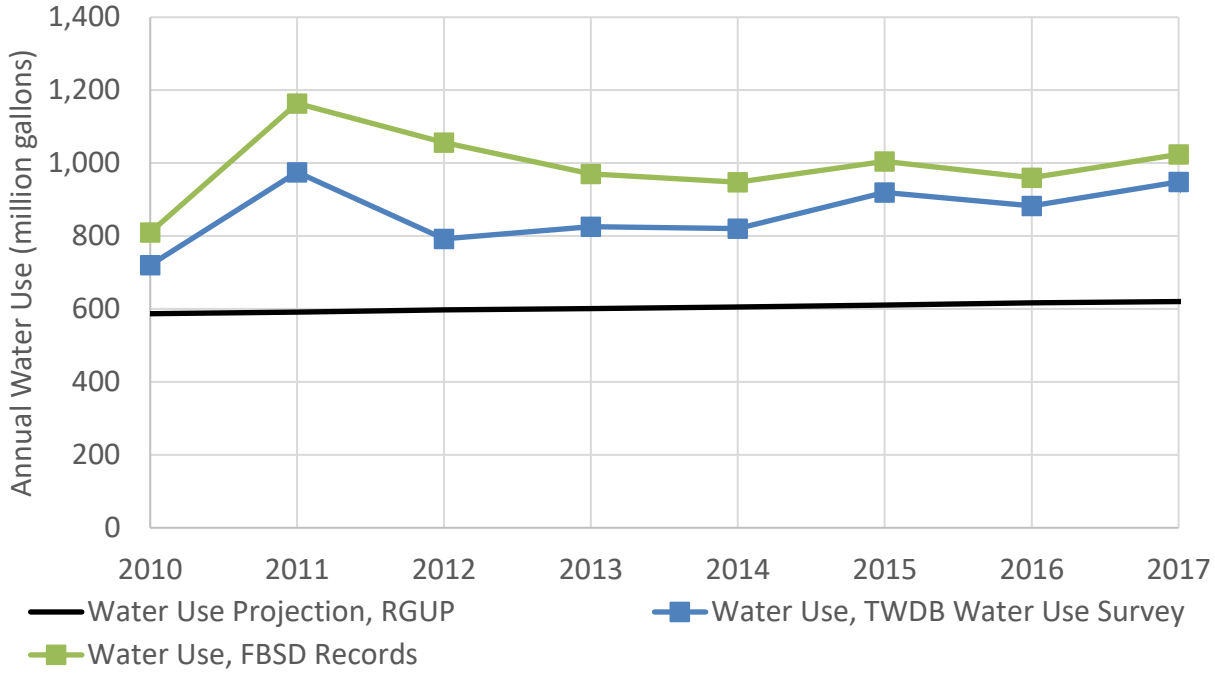


Figure 20. Water Use in Richmond

4.3 FULSHEAR

The City of Fulshear is a rapidly growing municipality in the northern part of Fort Bend County. The projections developed as part of the RGUP significantly overpredicted both population and per capita water demand in the City of Fulshear, which is both a CDP and a PWS. The overprediction may be partly explained by the method used to interpolate between decadal RGUP projections. The spline interpolation method was applied to the RGUP projections between 2010 and 2020 based on the non-linearity of long-term growth projections for Fulshear (Figure 21). However, this method tends to generate much higher population mid-decade than a linear method would, exacerbating the deviation between projected and estimated population around 2015. Although the RGUP incorrectly predicted the timing of near-term growth, by 2030, the RGUP projections are in line with projections from HGAC for Fort Bend County census tract 6732. However, as shown in Figure 22, planned developments in Fulshear within tract 6732 are expected to build out at the population projected by HGAC for the entire tract. These developments are limited to the Fulshear area, suggesting that the HGAC projection methodology does not anticipate much growth within this census tract outside of Fulshear. (The location of census tract 6732 and Fulshear are shown in Figure 23). The RGUP projection, on the other hand, may have underpredicted growth within the Fulshear developments while overpredicting growth elsewhere in tract 6732. Altogether, while the various projections seem to be in agreement on a long-term basis, near-term growth in Fulshear will require a closer look in future updates to projections. In particular, progress on specific planned developments and revised estimates of build-out for new communities should be considered in determining the timing of population growth.

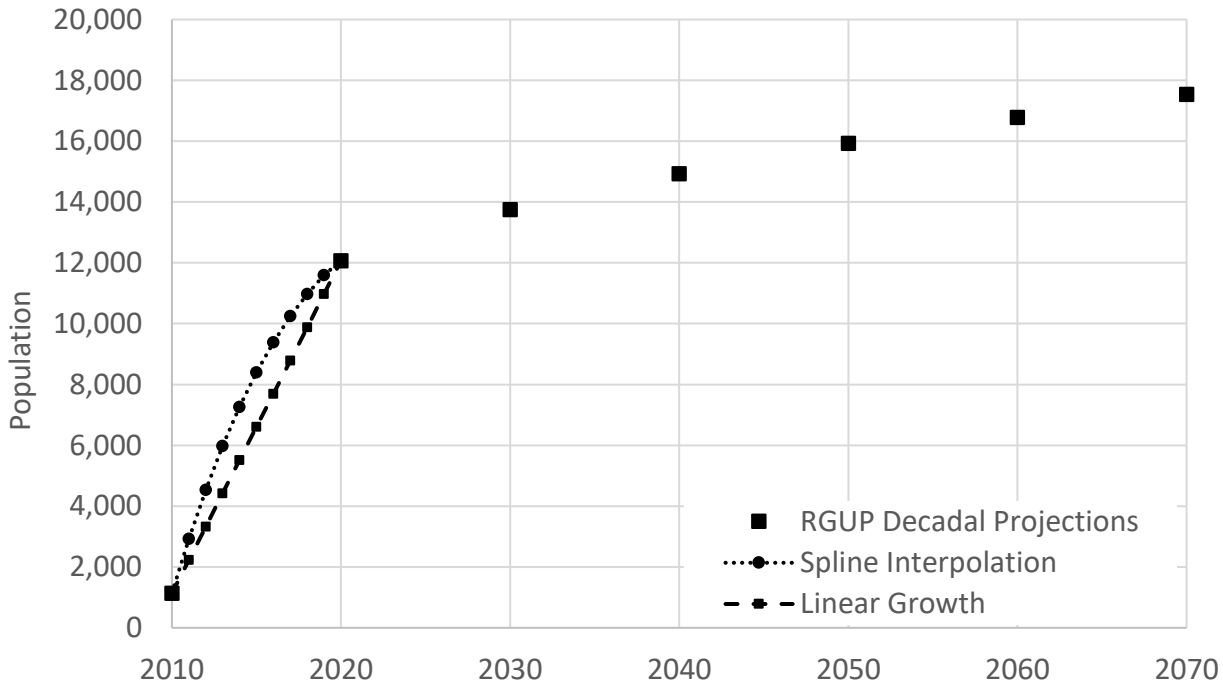


Figure 21. Long-term RGUP Population Projection for City of Fulshear

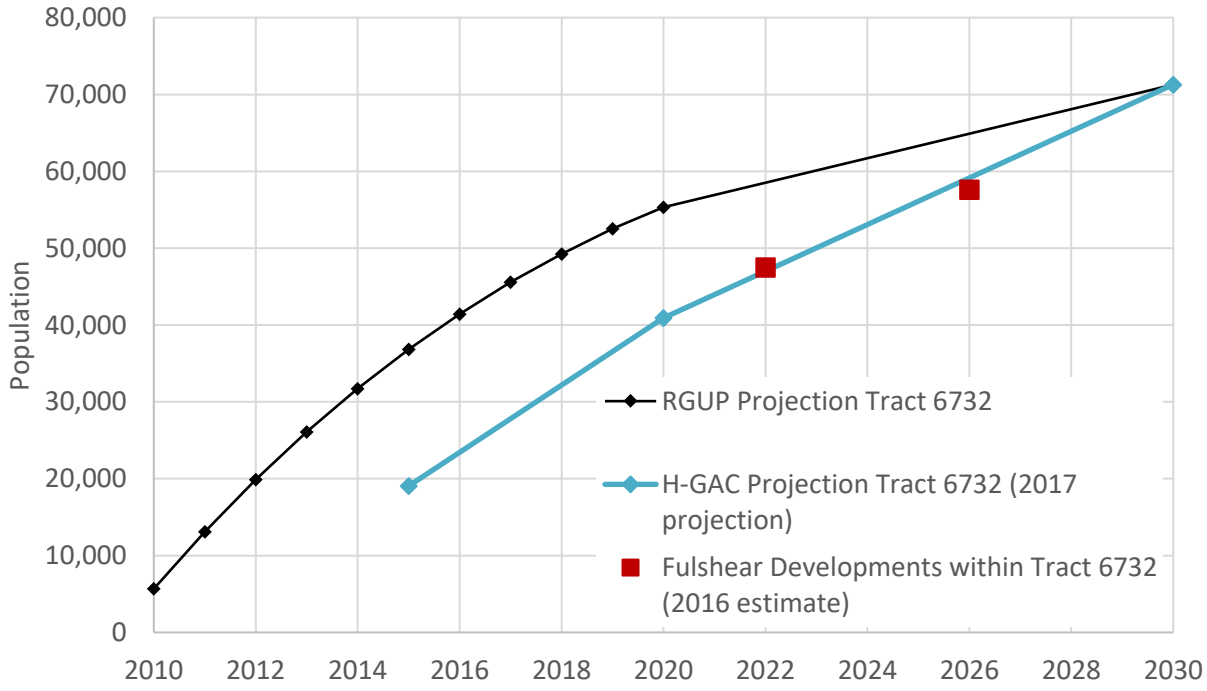


Figure 22. Near-term Population Projection for Census Tract 6732

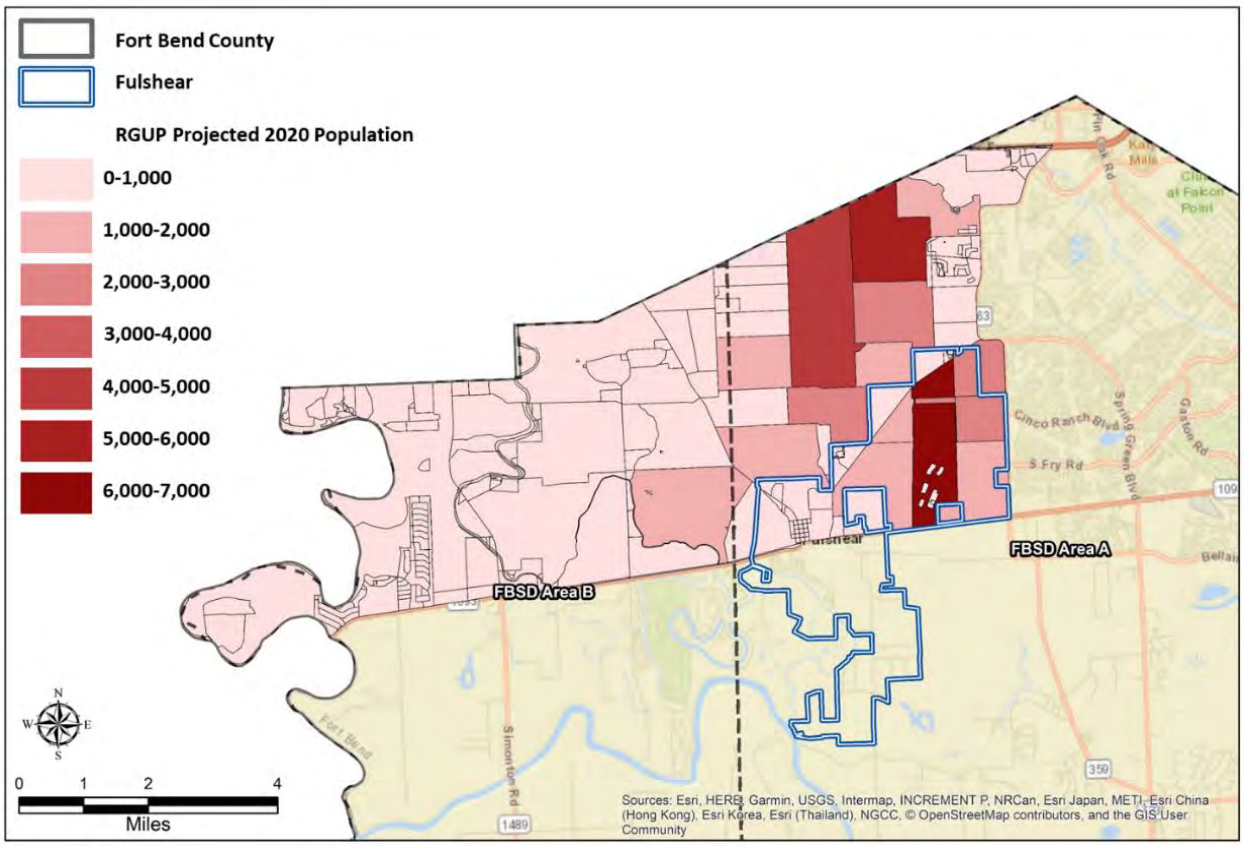


Figure 23. Fort Bend County Census Tract 6732

A delay in anticipated development may be one of the contributing factors to the deviation in projected per capita demand. The older parts of Fulshear have historically had a fairly low GPCD. The average GPCD from 2000 to 2008 in the TWDB WUS, when adjusted for outliers, was 73 GPCD. As new master-planned communities are developed and annexed by the city, the city's water system has had to meet demands for additional amenities and increased per-person residential irrigation. The RGUP projected that future use would be better indicated by more recent data, and the projected demand was set to 202 GPCD based on data from the North Fort Bend Water Authority (NFBWA). This value is the average of 2007-2010 demand for the City of Fulshear, Fulshear MUD 1, and five MUDs (FBC MUDs 169, 170, 171, 172, and 173), all of which are within the city limits. Compared to 2010-2017 water use data from FBSD, this projection overpredicted average per capita demand in Fulshear by 20.5%. Additionally, the new Water and Wastewater Master Plan for the City of Fulshear (2018) anticipates average daily demands of around 130 GPCD during the planning period of 2017 through 2036, based on demands seen in nearby communities similar to the new developments in and around Fulshear.

In summary, long-term population projections for Fulshear seem to be in line with anticipated growth, but the timing of development over the next decade will require a close review when projections are revised. Recent development in and around Fulshear has transformed the area from a small rural community to a suburban hub of master-planned communities. This shift in the type of development (such as the water demands related to amenities that are constructed as part of the new communities) and the water demands associated with development itself (such as the water required for construction and irrigation prior to the arrival of residents) generates different levels of per capita water demand than historical records prior to new development would indicate. As a result, revised short-term demand projections may need to consider the requirements of developers. Updates to projections for Fulshear will be able to incorporate recent water use records from the newer master-planned communities to better predict demand trends for the increasingly suburban Fulshear community. Additionally, coordination with Fulshear, NFBWA, and FBSD will be necessary to eliminate discrepancies between water use records.

4.4 FORT BEND COUNTY WATER CONTROL AND IMPROVEMENT DISTRICT 2

The Fort Bend County Water Control and Improvement District 2 (WCID 2) provides water to a large area in northeast Fort Bend County, encompassing the City of Stafford, part of the City of Missouri City, and small areas (less than 200 acres total) within the City of Houston, the City of Sugar Land, and unincorporated Fort Bend County. In 2008, WCID 2 developed a Groundwater Reduction Plan (GRP) to define a cooperative effort between itself, the City of Meadows Place, Harris County MUD 122, and Fifth Street Water Supply Corporation to reduce total groundwater use by supporting new surface water supplies. Under this plan, WCID 2 would convert part of its water supply to surface water from the GCWA A System Canal (also known as the American Canal), while the remaining GRP participants would continue to use groundwater to meet current and future demands.

As with many PWS, the population reported by WCID 2 in the TWDB WUS was significantly higher than the Census population in 2010. However, the growth in population as projected by the RGUP tracked along with the reported population, so that the deviation of the projection from the WUS report in 2017 (-23.9%) was not much different than that of the 2010 Census from the WUS report (-23%). The City of Stafford comprises 73.9% of the WCID 2 service area. Using TDC estimates for population of the City of Stafford, the RGUP slightly underpredicted population, with the deviation from TDC estimates increasing each year from -3.6% (651 people) in 2011 to -7.2% (1,376 people) in 2017. Finally, the HGAC estimates

for 2015 population at the census tract level suggest that the RGUP actually overpredicted population in most of the WCID 2 service area, except for small areas in the northwest and northeast corners. Considering these various sources, there is no definitive evidence that the RGUP projection for total population in the FBC WCID 2 service area was not appropriate.

On the other hand, the demand projections were likely too high based on recently observed data. The RGUP demand projections for WCID 2 were based on a projected per capita demand of 261 GPCD. The RGUP projection overpredicted average per capita use by 32% based on the TWDB WUS and by 45% based on FBSD data. Figure 24 shows the RGUP projection and the TWDB WUS reported total water use for WCID 2 since 2010. The difficulty in projecting per capita demand for this water system may be partially attributed to its segmented service area. Use of census populations at the census block level is recommended in determining the exact population serviced by this PWS for the development of revised projections.

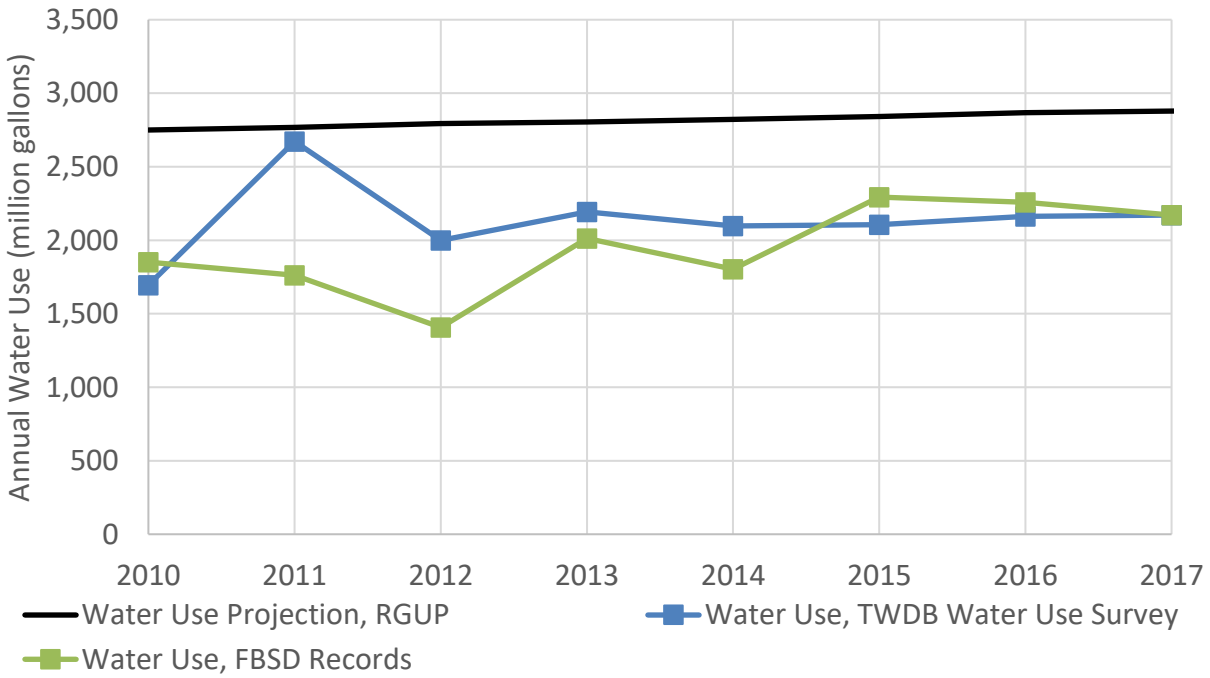


Figure 24. Water Use in Fort Bend County WCID 2

5.0 SUMMARY AND CONCLUSIONS

The evaluation of population projections at various scales suggested that the projections utilized in the 2013 DRP may have underpredicted growth in some developed areas although overall county populations were overpredicted by about 5%. Additionally, water demands projections for the county as a whole were fairly consistent with recent records, but projections frequently underpredicted demand for individual utilities. As expected, most population growth and municipal water use between 2008 and 2017 has been confined to Regulatory Area A. Performance of the projections from the 2013 RGUP varies depending on the specific location. However, at the county level, this evaluation indicates that there has been no significant departure from the projected development upon which the current DRP was based. The next regional groundwater update project will take a forward-looking view at development in Fort Bend County and should consider the conclusions of this evaluation to improve upon the 2013 projection methodology. At the same time, any required changes to the regulatory boundaries may be considered based on anticipated, long-term growth patterns that may extend beyond Regulatory Area A.

5.1 RECOMMENDATIONS

As part of the next regional groundwater update project, the following recommendations identify focus areas for improved projection performance:

1. Further refine the methodology for predicting increases in population density within developed areas.
2. Reassess development timelines in Fulshear and the nearby census tract 6732, as well as in census tract 6755.
3. Coordinate with water providers to clarify the boundaries of utility service areas in order to match water demands to the appropriate population and better estimate future expansion of water systems.
4. Consider what type of growth (single-family, multi-family, and/or commercial) is occurring within high-growth areas and how that growth drives changes in per capita water demand.
5. Consider the possibly opposing future impacts of conservation and climate on per capita water demand.
6. Reassess non-municipal water demands based on the latest available data.

APPENDIX A

METHODOLOGY FOR REMOVAL OF OUTLIERS

Methodology for Removal of Outliers

When calculating the annual GPCD values from a given dataset, any values lower than 40 GPCD were assumed to be unrealistic and were discarded from the analysis dataset. Larger per capita values of more than 1,000 GPCD were also seen for a few PWS. These were also considered unreasonable, but the application of an arbitrary cut-off value risked excluding accurate data for high-use systems. Instead, a maximum GPCD value based on the climate conditions in a given year was applied to all PWS. This method combines the use of a typical box-and-whisker plot with the assumption that dry years will cause water demands to increase.

First, for each year (2009-2017), a box-and-whisker plot is developed using the GPCD values of all PWS. Typically, values outside the "whiskers" of such a plot are considered to be outliers. The formula used by Excel to develop these whiskers was applied to determine the high-value whisker, or "upper fence" in that year (Equation 1).

$$Upper\ Fence = Q_3 + 1.5 * IQR \qquad \text{Equation 1}$$

where Q_3 is the 3rd quartile (75th percentile) and IQR is the interquartile range (third quartile less first quartile).

Second, the data-based Upper Fence values for each year were plotted against the Palmer Modified Drought Index (PMDI) for that year. PMDI values were those reported by NOAA for Climate Division 8. A simple linear regression was applied to model a predicted GPCD cutoff value for any given PMDI (Figure A-1). This model, the "PMDI-predicted upper fence," is intended to adjust estimated GPCD values based on measured climate conditions. Based on this model, a PWS with reported per capita use of 500 GPCD in a very wet year with PMDI = 3 is assumed to be an outlier, and that value will be reduced to the modeled cutoff of 392 GPCD. However, an estimate of 500 GPCD in a drought year like 2011 is considered to be valid and is not adjusted. The result of this cutoff process is illustrated in Figure A-2.

This process was repeated separately when analyzing the FBSD data and the TWDB data, so that the GPCD "cap" was dependent only upon the current dataset.

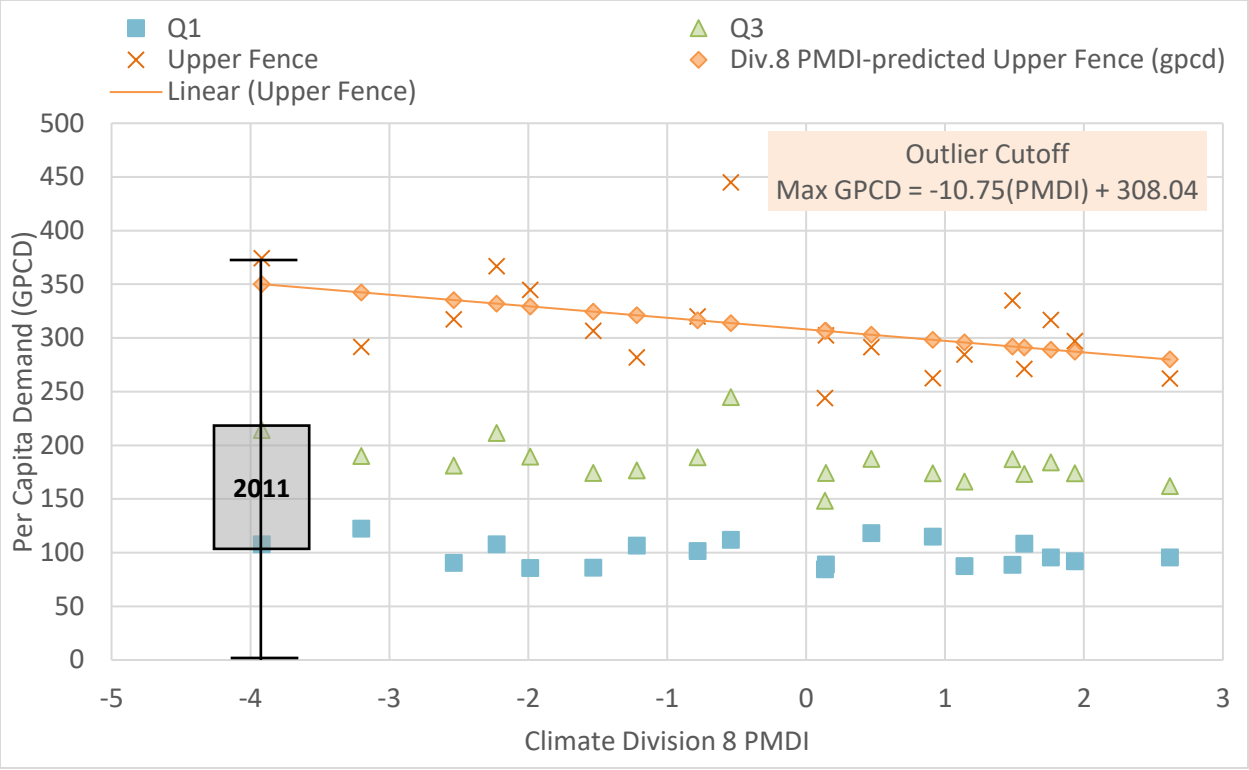


Figure A-1. Development of Maximum GPCD Cutoff Value based on Palmer Modified Drought Index

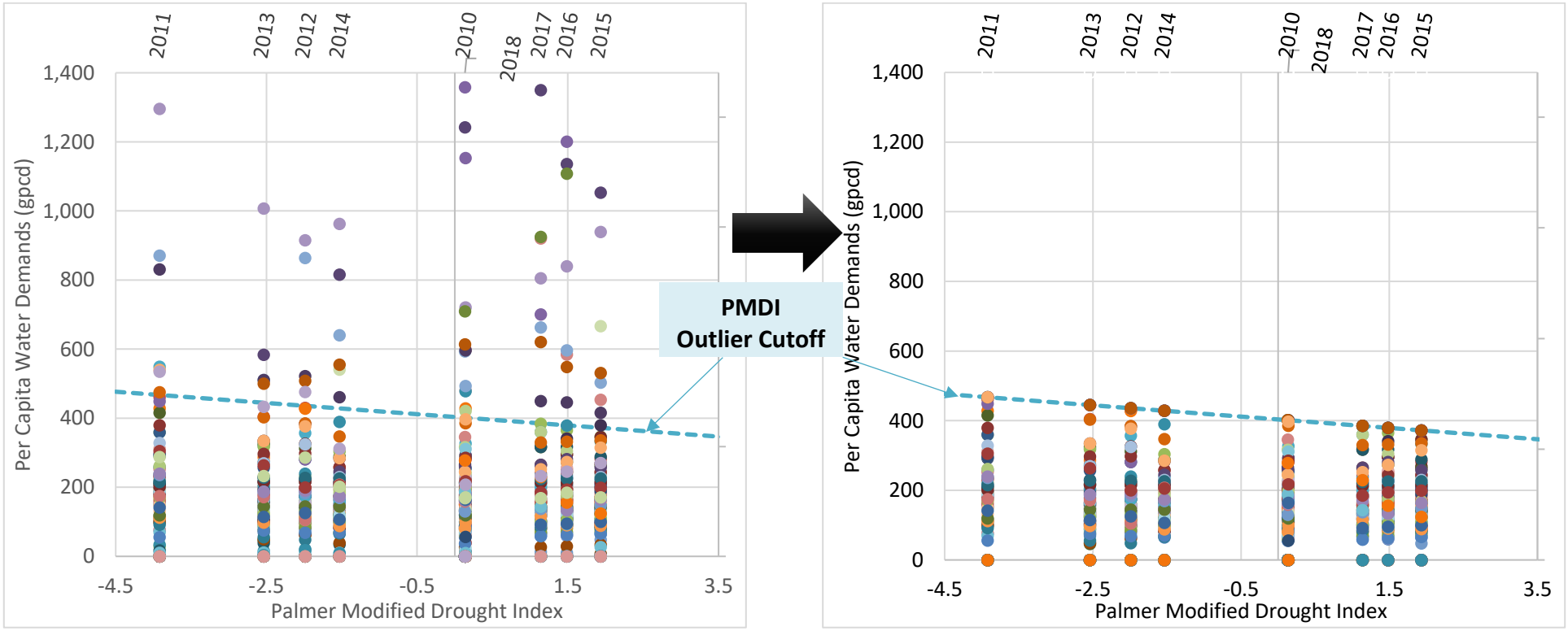
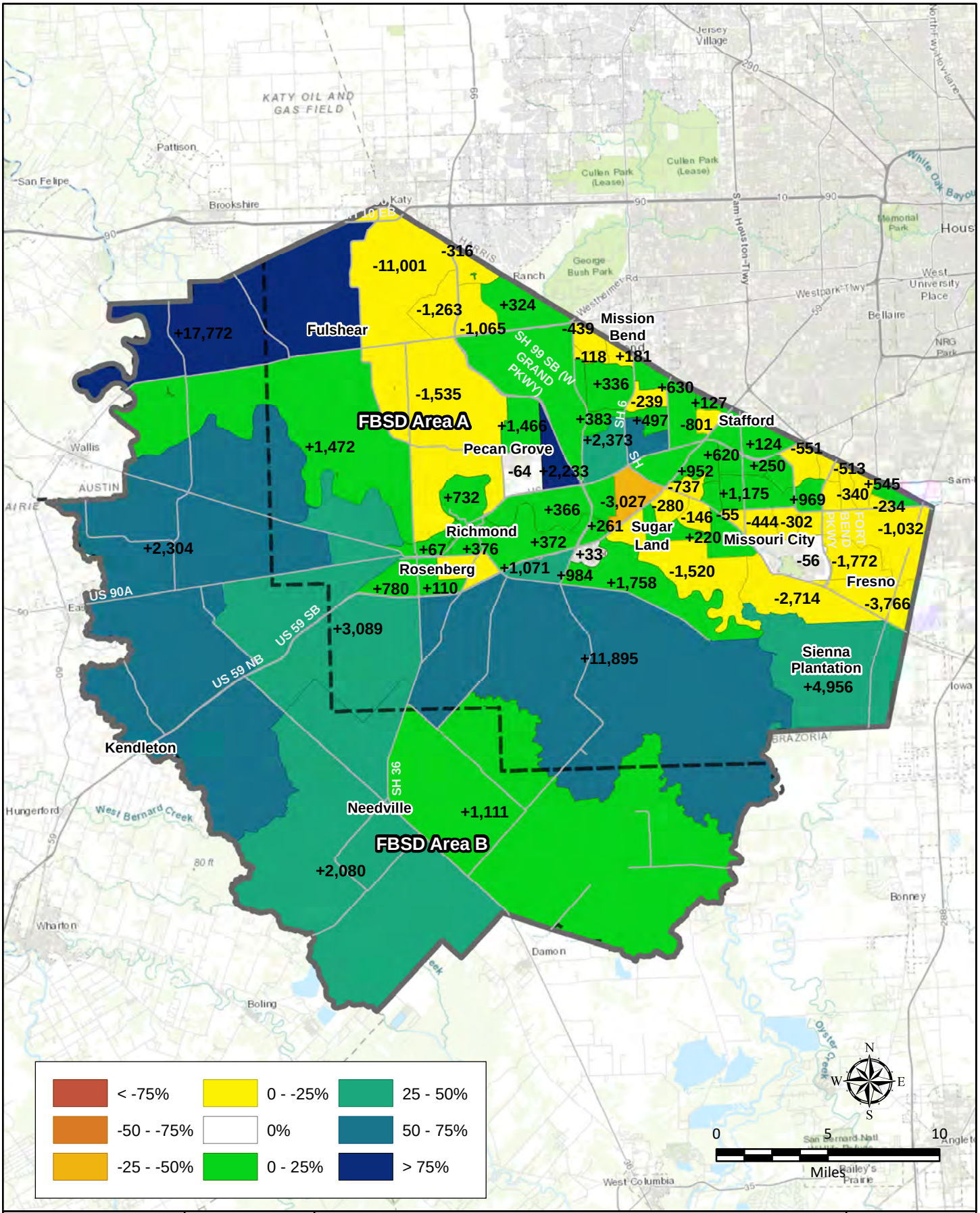


Figure A-2. Adjustment of Large GPCD Values Using PMDI-based Maximum GPCD

APPENDIX B

EXHIBITS



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PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
HGAC 2017 Regional Growth Forecast

2015 Percent Deviation in Population

FIGURE
2-A

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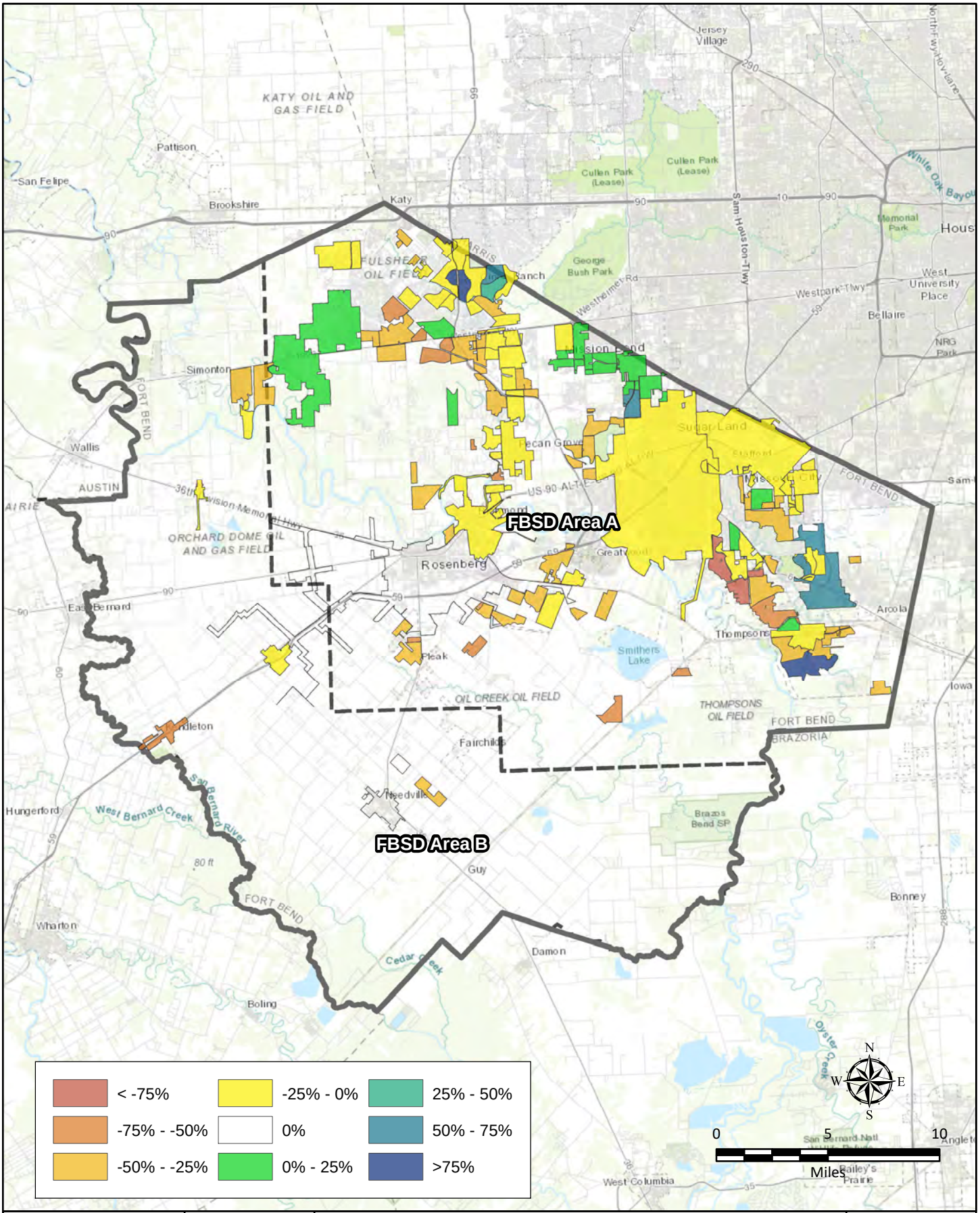

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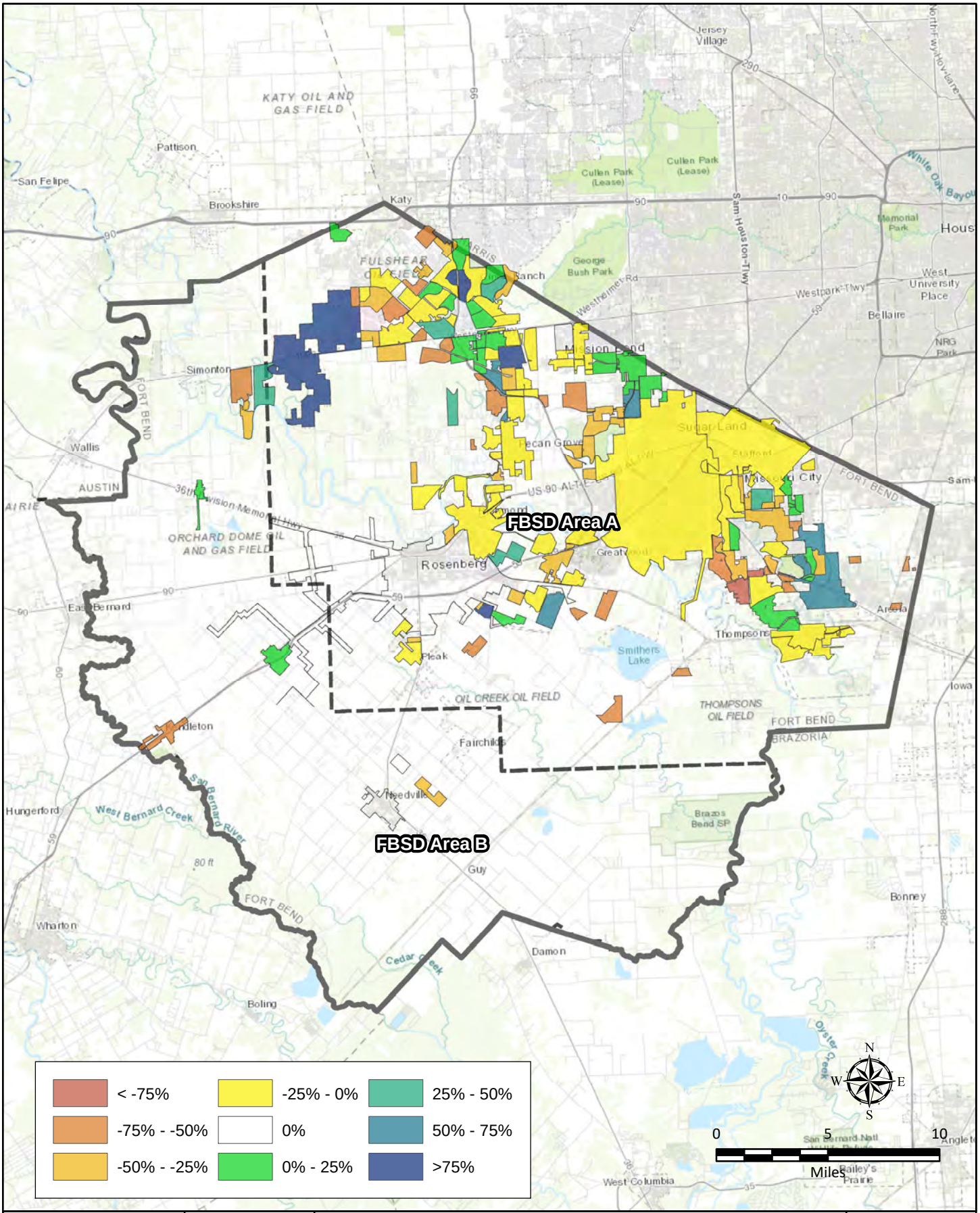
PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
TWDB Water Use Survey

2010 Percent Difference in Population Water Use Survey and U.S. Census

FIGURE
4-A



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PREPARED BY	CMC

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10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
TWDB Water Use Survey

2015 Percent Deviation in Population

FIGURE
5-A

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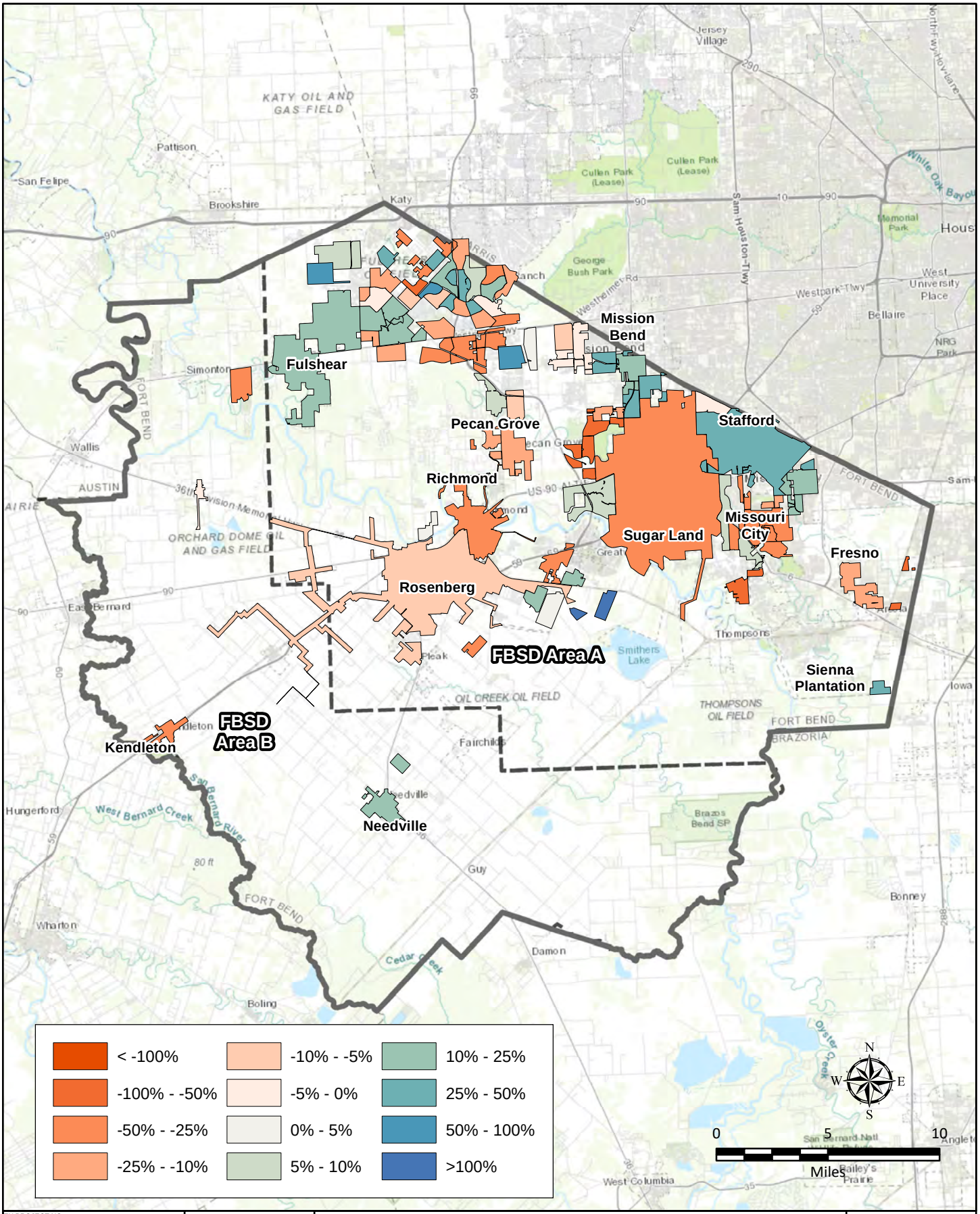

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PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
Fort Bend Subsidence District

Percent Deviation in Average Per Capita Demand

FIGURE
7-A

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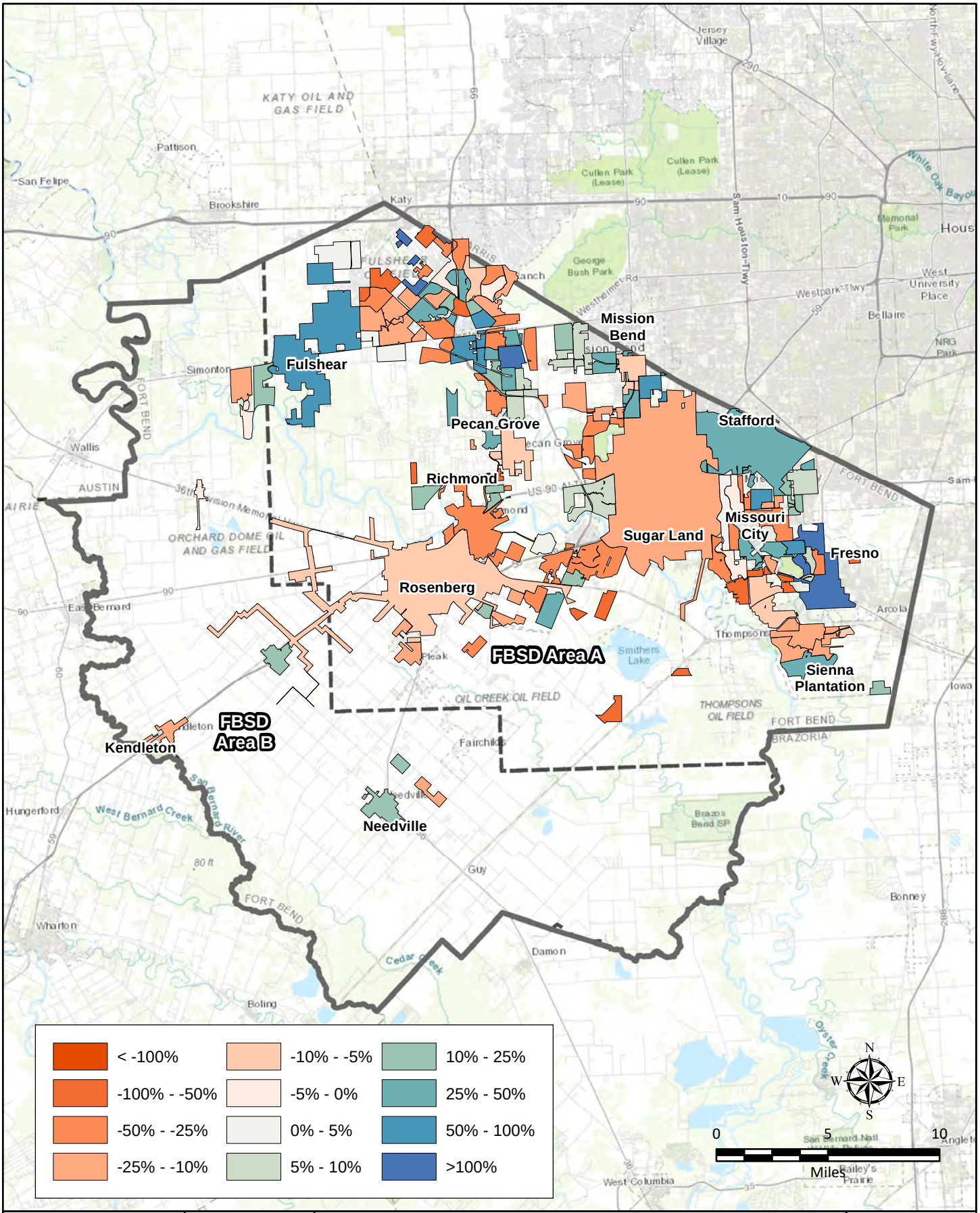

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PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
TWDB Water Use Survey

Percent Deviation in Average Per Capita Demand

FIGURE
8-A

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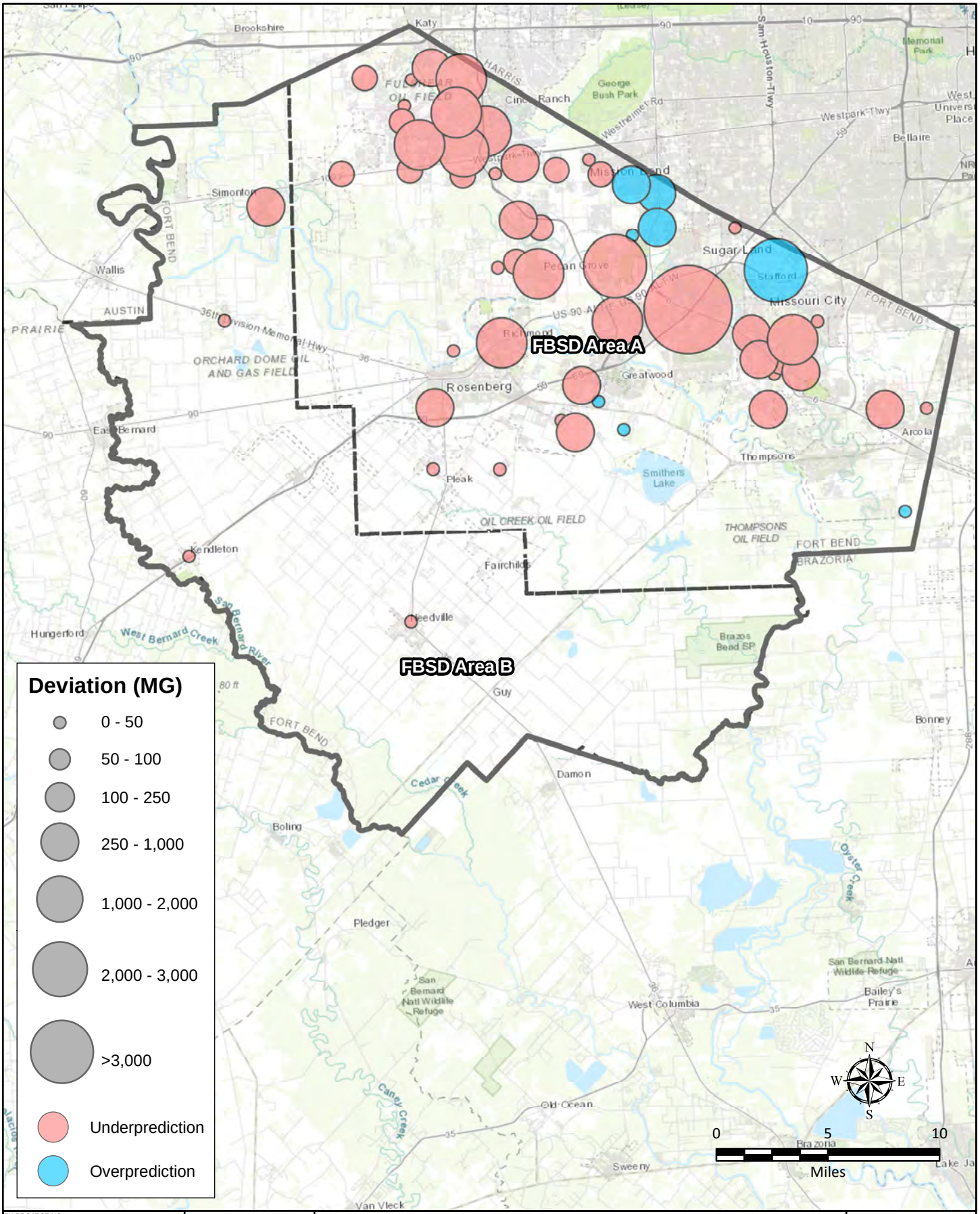

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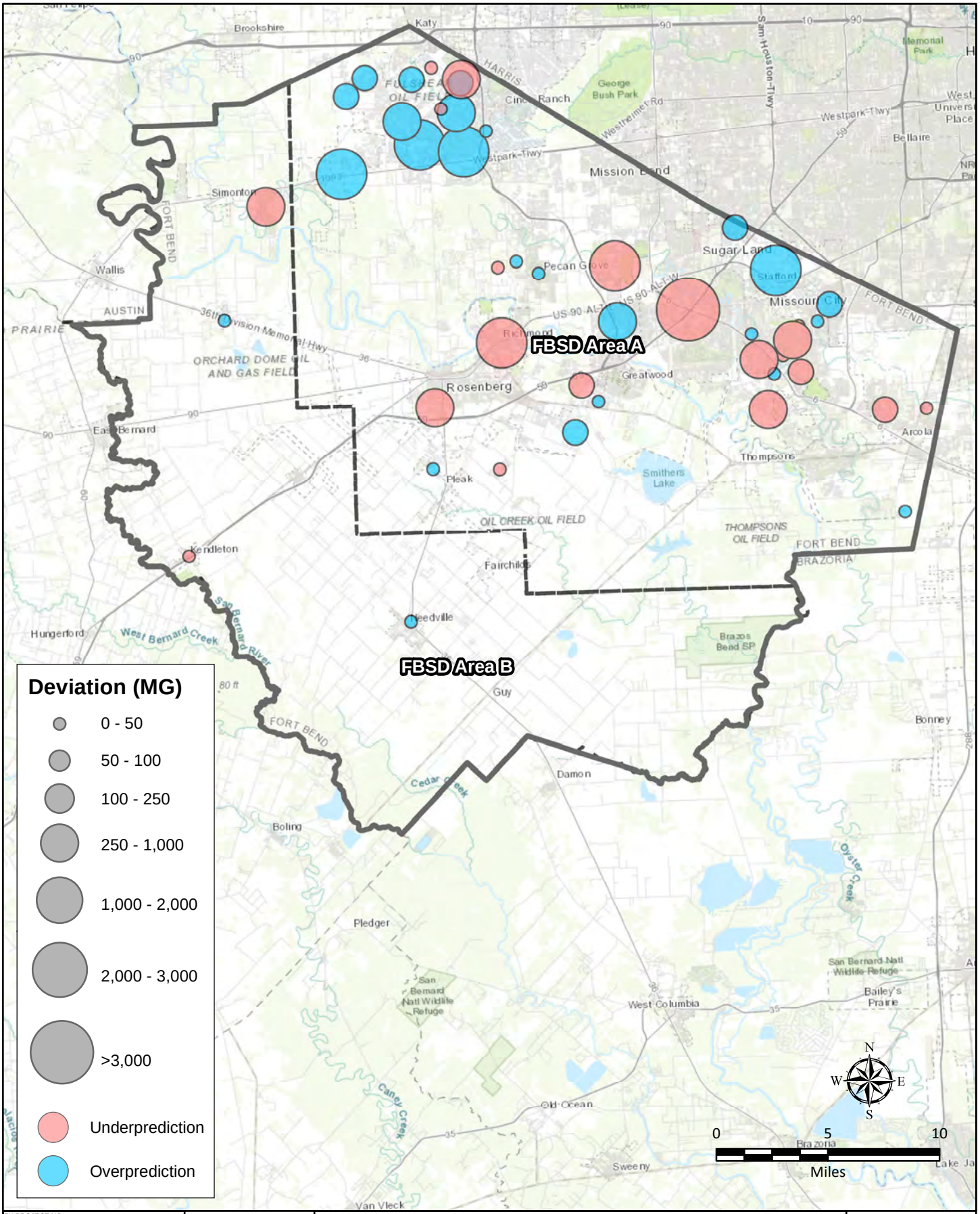
PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
Fort Bend Subsidence District

2011 Deviation in Total Water Use (millions of gallons)

FIGURE
10a-A



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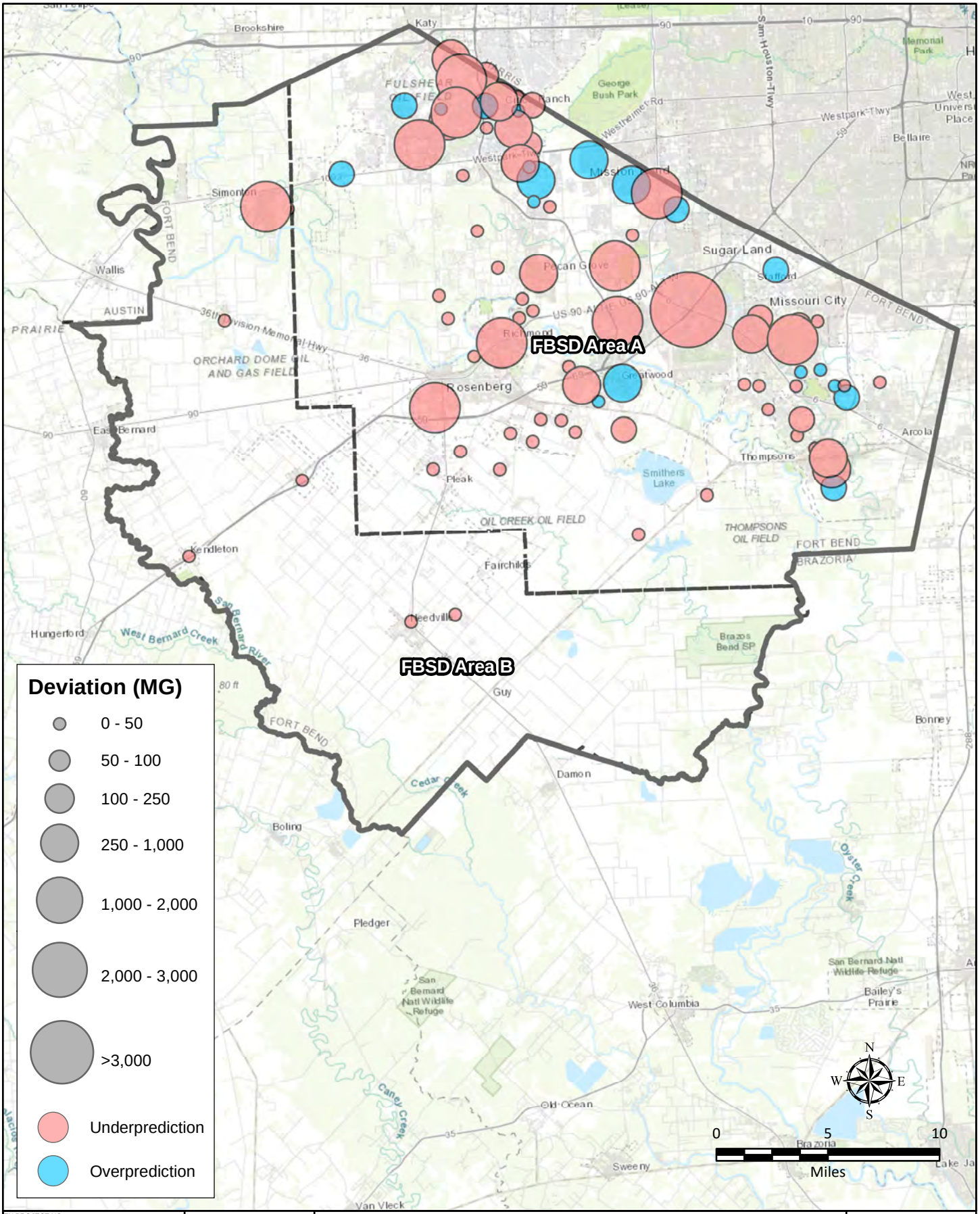
PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
Fort Bend Subsidence District

2015 Deviation in Total Water Use (millions of gallons)

FIGURE
10b-A



FN PROJECT NO.	FSD18733
DATE CREATED	Date: 6/28/2019
DATUM & COORDINATE SYSTEM	NAD83 State Plane (feet) Texas South Central
FILE NAME	Name: Fig_11a-A_Total_Use_2011_TWDB
PREPARED BY	CMC

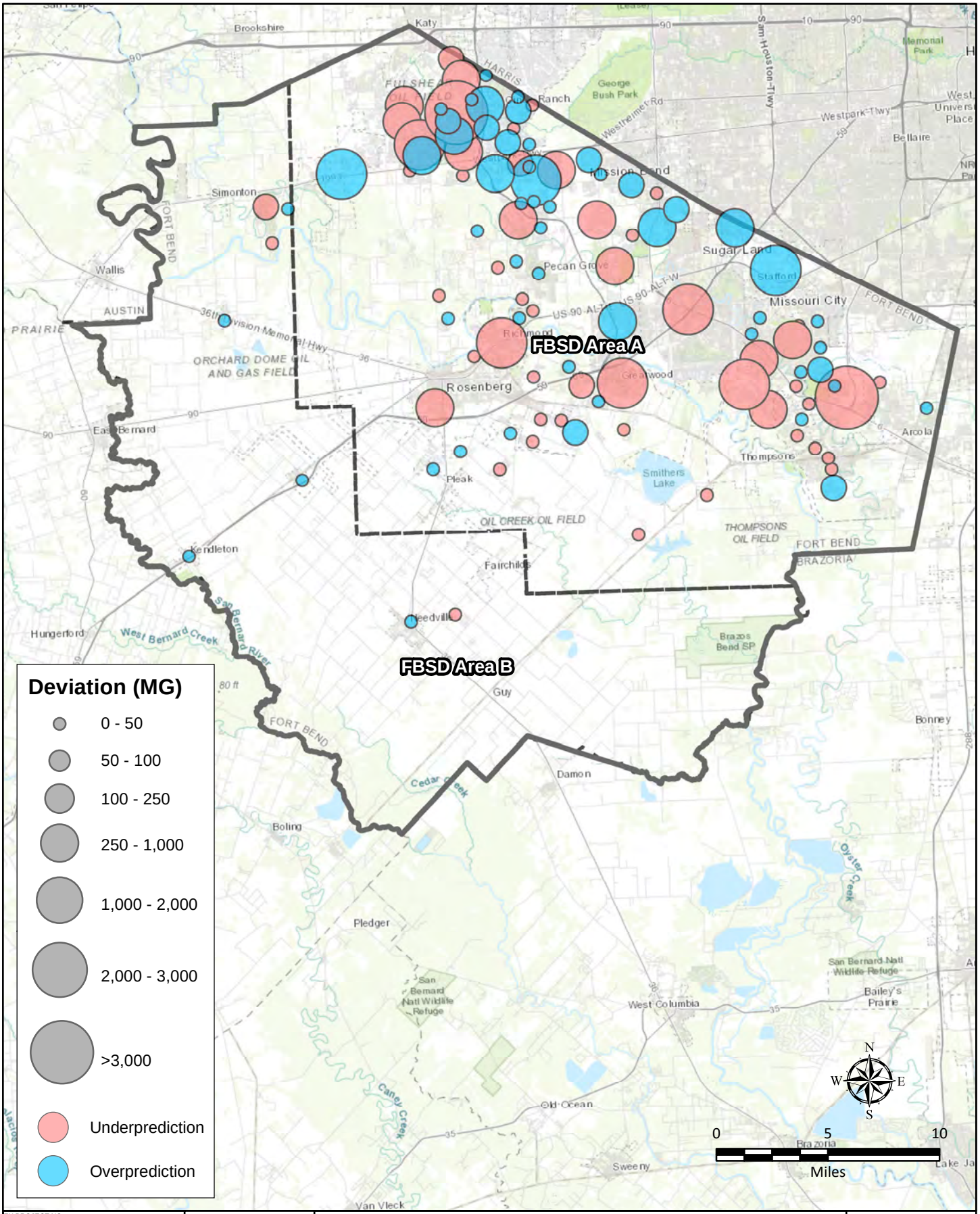
FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
TWDB Water Use Survey

2011 Deviation in Total Water Use (millions of gallons)

FIGURE
11a-A

Date Saved: 6/28/2019 12:22:56 PM Path: H:\WR_PLANNING\Working\Report\Exhibits_Revised\Fig_11a-A_Total_Use_2011_TWDB.mxd



FN PROJECT NO.	FSD18733
DATE CREATED	Date: 6/28/2019
DATUM & COORDINATE SYSTEM	NAD83 State Plane (feet) Texas South Central
FILE NAME	Name: Fig_11b-A_Total_Use_2015_TWDB
PREPARED BY	CMC

FREESE AND NICHOLS, INC.
10497 TOWN AND COUNTRY WAY, SUITE 600
HOUSTON, TEXAS 77024
OFFICE: 713-600-6800
FAX: 713-600-6801

Data Source
TWDB Water Use Survey

2015 Deviation in Total Water Use (millions of gallons)

FIGURE
11b-A

APPENDIX C

ANALYSIS RESULTS TABLES

Table C-1. Population of Census-Designated Places
Comparison of RGUP Projection and HGAC 2017 Regional Growth Forecast

Census Place	Interpolation Method	RGUP Population Projection		HGAC Regional Growth Forecast 2017		Deviation in Population (compared to HGAC RGF)		Percent Deviation in Population (compared to HGAC RGF)	
		2015	2020	2015	2020	2015	2020	2015	2020
Rosenberg	spline	36,954	40,232	32,115	39,496	4,839	736	15.1%	1.9%
Missouri City	linear	74,408	81,379	74,045	77,201	363	4,178	0.5%	5.4%
Sugar Land	linear	84,529	90,158	81,473	79,190	3,056	10,968	3.8%	13.9%
Stafford	linear	17,568	17,730	16,529	15,163	1,039	2,567	6.3%	16.9%
Fulshear	spline	8,397	12,070	3,698	9,954	4,699	2,116	127.1%	21.3%
Richmond	linear	12,020	12,339	10,801	12,652	1,219	(313)	11.3%	(2.5%)
Meadows Place	linear	4,664	4,668	4,743	4,829	(79)	(161)	(1.7%)	(3.3%)

Table C-2a. Population of Census-Designated Places
RGUP Projection and Texas Demographic Center Estimates

Census Place	Interpolation Method	RGUP Population Projection							TDC Population Estimates						
		2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017*
Kendleton	linear	380	380	380	380	380	380	380	392	394	379	391	400	405	408
Rosenberg	spline	32,167	33,568	34,828	35,954	36,954	37,837	38,609	31,710	32,587	32,635	34,127	38,635	39,873	40,484
Missouri City	linear	68,760	70,158	71,568	72,960	74,408	75,777	77,180	69,177	70,473	69,297	71,922	74,776	76,367	77,101
Sienna Plantation	linear	14,189	14,660	15,127	15,594	16,075	16,535	17,004	14,196	14,515	14,757	15,063	16,159	16,636	16,868
Needville	linear	2,824	2,825	2,826	2,827	2,830	2,831	2,832	2,885	2,931	2,964	3,083	3,225	3,314	3,357
Beasley	linear	641	642	643	643	645	645	645	661	663	657	678	744	754	759
Pleak	linear	1,072	1,103	1,132	1,160	1,194	1,221	1,250	1,063	1,065	1,116	1,200	1,316	1,397	1,439
Fairchilds	linear	765	766	768	769	773	773	775	784	794	826	854	942	981	1,012
Thompsons	linear	249	251	253	254	262	264	266	253	256	264	275	294	303	308
Greatwood	linear	11,597	11,658	11,717	11,778	11,837	11,896	11,957	11,896	12,123	12,156	11,638	13,850	14,756	15,226
Sugar Land	linear	79,948	81,082	82,227	83,350	84,529	85,625	86,764	81,043	82,523	82,258	86,696	92,249	94,936	96,180
Fresno	linear	19,447	19,830	20,214	20,591	20,991	21,358	21,739	19,673	20,082	20,269	20,726	22,233	23,024	23,411
Arcola	linear	1,664	1,684	1,707	1,728	1,753	1,771	1,793	1,696	1,729	1,639	1,672	1,889	2,144	2,285
Orchard	linear	352	352	352	352	352	352	352	355	371	364	362	372	375	376
Simonton	linear	818	824	833	836	846	850	853	834	846	821	848	929	952	963
Stafford	linear	17,426	17,458	17,492	17,522	17,568	17,598	17,631	18,077	18,340	18,073	18,676	18,702	18,905	19,007
Fulshear	spline	2,924	4,537	5,980	7,264	8,397	9,387	10,244	1,287	1,601	2,573	3,393	5,529	7,583	8,983
Four Corners	linear	12,392	12,405	12,415	12,427	12,439	12,449	12,461	12,768	13,060	13,287	13,483	14,518	14,947	15,153
Cumings	spline	1,272	1,532	1,764	1,968	2,146	2,300	2,433	1,021	1,052	1,064	1,088	1,181	1,278	1,330
Weston Lakes	linear	2,495	2,509	2,523	2,536	2,551	2,561	2,574	2,529	2,609	2,508	2,664	2,742	2,787	2,807
Richmond	linear	11,743	11,807	11,877	11,942	12,020	12,076	12,144	11,967	12,184	11,654	11,944	12,987	13,257	13,401
Cinco Ranch	linear	18,299	18,320	18,349	18,370	18,400	18,416	18,440	18,641	18,862	18,814	18,306	20,340	22,800	24,176
Mission Bend	linear	36,590	36,683	36,774	36,862	36,960	37,040	37,130	37,213	37,672	37,817	36,811	39,775	40,683	41,119
Pecan Grove	spline	17,046	18,009	18,857	19,597	20,236	20,780	21,235	16,312	16,516	16,540	16,179	17,169	17,410	17,519
New Territory	linear	15,186	15,186	15,186	15,186	15,186	15,186	15,186	15,465	15,568	15,527	15,133	15,849	15,981	16,035
Meadows Place	linear	4,661	4,662	4,662	4,663	4,664	4,665	4,666	4,734	4,755	4,706	4,761	5,028	5,107	5,143
Fifth Street	linear	2,518	2,549	2,582	2,614	2,649	2,679	2,712	2,573	2,639	2,661	2,697	3,003	3,110	3,163

Table C-2b. Population of Census-Designated Places
Comparison of RGUP Projection and Texas Demographic Center Estimates

Census Place	Deviation in Population (compared to TDC)							Percent Deviation in Population (compared to TDC)						
	2011	2012	2013	2014	2015	2016	2017	2011	2012	2013	2014	2015	2016	2017*
Kendleton	(12)	(14)	1	(11)	(20)	(25)	(28)	(3.1%)	(3.6%)	0.3%	(2.8%)	(5.0%)	(6.2%)	(6.9%)
Rosenberg	457	981	2,193	1,827	(1,681)	(2,036)	(1,875)	1.4%	3.0%	6.7%	5.4%	(4.4%)	(5.1%)	(4.6%)
Missouri City	(417)	(315)	2,271	1,038	(368)	(590)	79	(0.6%)	(0.4%)	3.3%	1.4%	(0.5%)	(0.8%)	0.1%
Sienna Plantation	(7)	145	370	531	(84)	(101)	136	(0.0%)	1.0%	2.5%	3.5%	(0.5%)	(0.6%)	0.8%
Needville	(61)	(106)	(138)	(256)	(395)	(483)	(525)	(2.1%)	(3.6%)	(4.7%)	(8.3%)	(12.2%)	(14.6%)	(15.6%)
Beasley	(20)	(21)	(14)	(35)	(99)	(109)	(114)	(3.0%)	(3.2%)	(2.1%)	(5.2%)	(13.3%)	(14.5%)	(15.0%)
Pleak	9	38	16	(40)	(122)	(176)	(189)	0.8%	3.6%	1.4%	(3.3%)	(9.3%)	(12.6%)	(13.1%)
Fairchilds	(19)	(28)	(58)	(85)	(169)	(208)	(237)	(2.4%)	(3.5%)	(7.0%)	(10.0%)	(17.9%)	(21.2%)	(23.4%)
Thompsons	(4)	(5)	(11)	(21)	(32)	(39)	(42)	(1.6%)	(2.0%)	(4.2%)	(7.6%)	(10.9%)	(12.9%)	(13.6%)
Greatwood	(299)	(465)	(439)	140	(2,013)	(2,860)	(3,269)	(2.5%)	(3.8%)	(3.6%)	1.2%	(14.5%)	(19.4%)	(21.5%)
Sugar Land	(1,095)	(1,441)	(31)	(3,346)	(7,720)	(9,311)	(9,416)	(1.4%)	(1.7%)	(0.0%)	(3.9%)	(8.4%)	(9.8%)	(9.8%)
Fresno	(226)	(252)	(55)	(135)	(1,242)	(1,666)	(1,672)	(1.1%)	(1.3%)	(0.3%)	(0.7%)	(5.6%)	(7.2%)	(7.1%)
Arcola	(32)	(45)	68	56	(136)	(373)	(492)	(1.9%)	(2.6%)	4.1%	3.3%	(7.2%)	(17.4%)	(21.5%)
Orchard	(3)	(19)	(12)	(10)	(20)	(23)	(24)	(0.8%)	(5.1%)	(3.3%)	(2.8%)	(5.4%)	(6.1%)	(6.4%)
Simonton	(16)	(22)	12	(12)	(83)	(102)	(110)	(1.9%)	(2.6%)	1.5%	(1.4%)	(8.9%)	(10.7%)	(11.4%)
Stafford	(651)	(882)	(581)	(1,154)	(1,134)	(1,307)	(1,376)	(3.6%)	(4.8%)	(3.2%)	(6.2%)	(6.1%)	(6.9%)	(7.2%)
Fulshear	1,637	2,936	3,407	3,871	2,868	1,804	1,261	127.2%	183.4%	132.4%	114.1%	51.9%	23.8%	14.0%
Four Corners	(376)	(655)	(872)	(1,056)	(2,079)	(2,498)	(2,692)	(2.9%)	(5.0%)	(6.6%)	(7.8%)	(14.3%)	(16.7%)	(17.8%)
Cumings	251	480	700	880	965	1,022	1,103	24.6%	45.7%	65.8%	80.8%	81.7%	80.0%	82.9%
Weston Lakes	(34)	(100)	15	(128)	(191)	(226)	(233)	(1.3%)	(3.8%)	0.6%	(4.8%)	(7.0%)	(8.1%)	(8.3%)
Richmond	(224)	(377)	223	(2)	(967)	(1,181)	(1,257)	(1.9%)	(3.1%)	1.9%	(0.0%)	(7.4%)	(8.9%)	(9.4%)
Cinco Ranch	(342)	(542)	(465)	64	(1,940)	(4,384)	(5,736)	(1.8%)	(2.9%)	(2.5%)	0.3%	(9.5%)	(19.2%)	(23.7%)
Mission Bend	(623)	(989)	(1,043)	51	(2,815)	(3,643)	(3,989)	(1.7%)	(2.6%)	(2.8%)	0.1%	(7.1%)	(9.0%)	(9.7%)
Pecan Grove	734	1,493	2,317	3,418	3,067	3,370	3,716	4.5%	9.0%	14.0%	21.1%	17.9%	19.4%	21.2%
New Territory	(279)	(382)	(341)	53	(663)	(795)	(849)	(1.8%)	(2.5%)	(2.2%)	0.4%	(4.2%)	(5.0%)	(5.3%)
Meadows Place	(73)	(93)	(44)	(98)	(364)	(442)	(477)	(1.5%)	(2.0%)	(0.9%)	(2.1%)	(7.2%)	(8.7%)	(9.3%)
Fifth Street	(55)	(90)	(79)	(83)	(354)	(431)	(451)	(2.1%)	(3.4%)	(3.0%)	(3.1%)	(11.8%)	(13.9%)	(14.3%)

Table C-3. Population of Public Water Systems
Comparison of RGUP Projections, TWDB Water Use Survey, and TCEQ Texas Drinking Water Watch

Water System Name	Interpolation Method	2010 Census (RGUP Baseline)	RGUP Projection		TWDB Water Use Survey		Texas Drinking Water Watch	Percent Deviation from Baseline Data (TWDB or TCEQ)		
		2010	2015	2018	2010	2015	2018	2010	2015	2018
5TH STREET WATER SYSTEM	spline	1,805	1,924	2,053	1,512	1,512	1,593	19.4%	27.2%	28.9%
723 UTILITY	linear	92	128	149	147	210	180	-37.4%	-39.1%	-17.1%
BIG OAKS MUD	linear	6,074	6,250	6,356	6,207	6,294	6,450	-2.1%	-0.7%	-1.5%
BLUE RIDGE WEST MUD	linear	6,899	6,918	6,927	7,365	0	7,428	-6.3%	#N/A	-6.7%
BRAZOS LAKES WATER SUPPLY	spline	78	145	195	246	324	324	-68.5%	-55.3%	-39.9%
BRIDLEWOOD ESTATES WATER SYSTEM	spline	935	1,820	2,115	978	1,173	1,116	-4.4%	55.1%	89.6%
CINCO MUD 1	spline	815	949	1,077	0	936	1,050	#N/A	1.3%	2.6%
CINCO MUD 10	linear	2,619	2,703	2,753	2,826	2,823	2,826	-7.3%	-4.3%	-2.6%
CINCO MUD 12	spline	2,438	2,446	2,454	963	1,151	1,668	153.1%	112.5%	47.1%
CINCO MUD 14	spline	5,049	5,074	5,107	6,561	6,171	6,558	-23.0%	-17.8%	-22.1%
CINCO MUD 2	linear	3,833	3,833	3,833	4,488	4,482	5,163	-14.6%	-14.5%	-25.8%
CINCO MUD 3	spline	2,850	2,847	2,849	1,647	2,361	2,601	73.1%	20.6%	9.5%
CINCO MUD 5	spline	2,359	2,389	2,408	1,776	1,875	2,601	32.8%	27.4%	-7.4%
CINCO MUD 6	spline	2,017	2,033	2,052	2,409	2,904	3,219	-16.3%	-30.0%	-36.3%
CINCO MUD 7	spline	2,957	3,110	3,172	3,972	3,660	4,521	-25.5%	-15.0%	-29.8%
CINCO MUD 8	spline	3,043	3,243	3,307	3,108	3,597	4,632	-2.1%	-9.8%	-28.6%
CINCO MUD 9	linear	3,869	3,869	3,869	4,029	3,783	4,029	-4.0%	2.3%	-4.0%
CINCO SOUTHWEST MUD 1	linear	154	493	697	0	132	102	#N/A	273.8%	583.5%
CINCO SOUTHWEST MUD 2	spline	3,550	4,473	5,452	4,863	5,403	5,733	-27.0%	-17.2%	-4.9%
CINCO SOUTHWEST MUD 3 DAYCARE	linear	941	2,983	4,207	0	0	5,355	#N/A	#N/A	-21.4%
CINCO SOUTHWEST MUD 4	spline	1,133	2,108	3,047	3,231	5,301	6,042	-64.9%	-60.2%	-49.6%
CITY OF BEASLEY	linear	642	646	647	747	630	732	-14.1%	2.5%	-11.6%
CITY OF FULSHEAR	spline	1,200	12,791	16,834	1,128	5,113	6,003	6.3%	150.2%	180.4%
CITY OF KENDLETON	linear	260	260	260	597	717	714	-56.5%	-63.8%	-63.6%
CITY OF MEADOWS PLACE	linear	4,698	4,702	4,704	0	4,660	5,286	#N/A	0.9%	-11.0%
CITY OF MISSOURI CITY MUSTANG BAYOU WATE	linear	3,090	4,799	5,815	1,947	2,757	2,745	58.7%	74.1%	111.8%
CITY OF NEEDVILLE	linear	2,828	2,836	2,839	2,823	2,835	2,823	0.2%	0.0%	0.6%
CITY OF ORCHARD	linear	352	352	352	408	300	468	-13.7%	17.4%	-24.7%
CITY OF RICHMOND	linear	12,239	12,739	13,026	13,131	14,328	14,328	-6.8%	-11.1%	-9.1%
CITY OF ROSENBERG	spline	30,504	36,678	38,936	30,618	36,861	35,838	-0.4%	-0.5%	8.6%
CITY OF SUGAR LAND	linear	73,997	79,740	83,121	84,511	83,372	83,886	-12.4%	-4.4%	-0.9%
CITY OF SUGAR LAND - GREATWOOD	spline	11,541	11,578	11,620	0	0	13,077	#N/A	#N/A	-11.1%
CITY OF SUGAR LAND - NEW TERRITORY	linear	14,897	14,912	14,920	0	0	15,966	#N/A	#N/A	-6.5%
CITY OF SUGAR LAND RIVER PARK	linear	3,421	3,422	3,422	0	3,600	3,777	#N/A	-5.0%	-9.4%
FIRST COLONY MUD 9	linear	6,956	6,980	6,995	0	7,348	8,055	#N/A	-5.0%	-13.2%
FORT BEND COUNTY FWSD 1	linear	617	662	685	0	1,601	1,719	#N/A	-58.6%	-60.2%
FORT BEND COUNTY FWSD 2	spline	349	468	509	0	0	2,109	#N/A	#N/A	-75.8%
FORT BEND COUNTY MUD 115 RIVERSTONE	spline	1,504	1,581	1,608	1,314	1,470	1,434	14.4%	7.5%	12.2%
FORT BEND COUNTY MUD 116 CANYON GATE	linear	2,301	2,404	2,466	3,936	4,752	4,083	-41.5%	-49.4%	-39.6%
FORT BEND COUNTY MUD 118	linear	3,717	3,771	3,802	3,918	4,138	3,960	-5.1%	-8.9%	-4.0%

Water System Name	Interpolation Method	2010 Census (RGUP Baseline)	RGUP Projection		TWDB Water Use Survey		Texas Drinking Water Watch	Percent Deviation from Baseline Data (TWDB or TCEQ)		
		2010	2015	2018	2010	2015	2018	2010	2015	2018
FORT BEND COUNTY MUD 119	spline	5,463	5,466	5,467	3,408	3,417	5,289	60.3%	60.0%	3.4%
FORT BEND COUNTY MUD 121	linear	2,735	2,987	3,138	0	3,336	4,923	#N/A	-10.5%	-36.3%
FORT BEND COUNTY MUD 122	spline	2,828	3,231	3,354	3,134	3,127	3,354	-9.8%	3.3%	0.0%
FORT BEND COUNTY MUD 123	spline	2,568	3,550	3,845	2,970	3,831	4,128	-13.6%	-7.3%	-6.9%
FORT BEND COUNTY MUD 124	linear	2,431	2,510	2,558	0	0	2,532	#N/A	#N/A	1.0%
FORT BEND COUNTY MUD 128	linear	301	862	1,192	1,401	1,749	2,049	-78.5%	-50.7%	-41.8%
FORT BEND COUNTY MUD 129	linear	2,557	2,791	2,927	2,865	4,044	3,492	-10.7%	-31.0%	-16.2%
FORT BEND COUNTY MUD 130	linear	1,574	1,597	1,611	0	0	2,616	#N/A	#N/A	-38.4%
FORT BEND COUNTY MUD 131	linear	427	706	872	684	0	792	-37.6%	#N/A	10.1%
FORT BEND COUNTY MUD 133	spline	278	1,728	2,212	864	4,015	2,757	-67.8%	-57.0%	-19.8%
FORT BEND COUNTY MUD 134C	linear	338	1,338	1,929	0	4,781	4,740	#N/A	-72.0%	-59.3%
FORT BEND COUNTY MUD 134D	linear	1	49	77	0	0	105	#N/A	#N/A	-26.5%
FORT BEND COUNTY MUD 140 RIVERS EDGE	spline	1,260	1,549	1,637	1,416	1,899	1,992	-11.0%	-18.4%	-17.8%
FORT BEND COUNTY MUD 142	linear	4,075	4,957	5,472	6,141	8,830	8,184	-33.6%	-43.9%	-33.1%
FORT BEND COUNTY MUD 143 WATER VIEW ESTA	spline	1,327	2,544	2,909	2,088	3,213	3,366	-36.4%	-20.8%	-13.6%
FORT BEND COUNTY MUD 145 RIO VISTA	spline	292	585	678	669	1,086	951	-56.3%	-46.2%	-28.7%
FORT BEND COUNTY MUD 146	spline	2,091	2,796	3,020	3,057	5,786	3,555	-31.6%	-51.7%	-15.1%
FORT BEND COUNTY MUD 149	linear	50	447	683	1,260	2,903	2,103	-96.0%	-84.6%	-67.5%
FORT BEND COUNTY MUD 151	spline	2,757	6,615	8,242	3,672	0	7,398	-24.9%	#N/A	11.4%
FORT BEND COUNTY MUD 152	spline	301	866	1,061	522	801	801	-42.4%	8.1%	32.5%
FORT BEND COUNTY MUD 155	spline	928	1,923	2,253	1,560	2,397	2,097	-40.5%	-19.8%	7.5%
FORT BEND COUNTY MUD 156	linear	0	547	874	0	1,659	1,053	#N/A	-67.1%	-17.0%
FORT BEND COUNTY MUD 158	spline	561	1,150	1,338	864	1,971	1,380	-35.0%	-41.6%	-3.0%
FORT BEND COUNTY MUD 162	spline	888	1,270	1,417	1,800	2,919	2,466	-50.7%	-56.5%	-42.6%
FORT BEND COUNTY MUD 165	spline	844	2,123	2,530	1,062	2,874	2,667	-20.5%	-26.1%	-5.1%
FORT BEND COUNTY MUD 182	spline	17	1,775	2,480	0	0	816	#N/A	#N/A	203.9%
FORT BEND COUNTY MUD 185	linear	635	1,005	1,227	0	2,116	1,761	#N/A	-52.5%	-30.3%
FORT BEND COUNTY MUD 187	spline	71	1,619	2,212	0	1,139	777	#N/A	42.1%	184.7%
FORT BEND COUNTY MUD 19	linear	354	363	366	543	543	552	-34.9%	-33.2%	-33.6%
FORT BEND COUNTY MUD 194	linear	80	1,351	2,112	0	776	776	#N/A	74.0%	172.2%
FORT BEND COUNTY MUD 2	linear	6,889	6,904	6,912	6,600	6,212	6,747	4.4%	11.1%	2.4%
FORT BEND COUNTY MUD 23	linear	10,304	11,013	11,437	0	0	12,297	#N/A	#N/A	-7.0%
FORT BEND COUNTY MUD 24	linear	461	631	733	888	1,837	1,443	-48.1%	-65.6%	-49.2%
FORT BEND COUNTY MUD 25	linear	9,544	9,929	10,157	13,790	15,589	13,530	-30.8%	-36.3%	-24.9%
FORT BEND COUNTY MUD 26 QUAIL GREEN WEST	linear	4,360	4,601	4,743	4,452	4,503	4,506	-2.1%	2.2%	5.3%
FORT BEND COUNTY MUD 30	linear	9,269	10,057	10,516	9,117	10,827	9,780	1.7%	-7.1%	7.5%
FORT BEND COUNTY MUD 34	linear	3,434	4,221	4,681	2,823	3,144	3,756	21.6%	34.2%	24.6%
FORT BEND COUNTY MUD 35	linear	5,872	6,102	6,227	0	6,606	6,609	#N/A	-7.6%	-5.8%
FORT BEND COUNTY MUD 37	linear	1,223	1,252	1,270	1,704	0	1,830	-28.3%	#N/A	-30.6%
FORT BEND COUNTY MUD 41	linear	2,632	2,651	2,660	0	4,131	4,167	#N/A	-35.8%	-36.2%
FORT BEND COUNTY MUD 42 WAT PLAT	linear	3,580	3,737	3,830	0	4,452	4,050	#N/A	-16.1%	-5.4%
FORT BEND COUNTY MUD 46	linear	1,687	1,805	1,875	1,860	0	2,004	-9.3%	#N/A	-6.4%
FORT BEND COUNTY MUD 47	spline	1,171	1,557	1,717	1,263	1,287	1,332	-7.3%	21.0%	28.9%

Water System Name	Interpolation Method	2010 Census (RGUP Baseline)	RGUP Projection		TWDB Water Use Survey		Texas Drinking Water Watch	Percent Deviation from Baseline Data (TWDB or TCEQ)		
		2010	2015	2018	2010	2015	2018	2010	2015	2018
FORT BEND COUNTY MUD 48	linear	1,518	1,662	1,748	1,962	3,195	3,363	-22.6%	-48.0%	-48.0%
FORT BEND COUNTY MUD 49	linear	725	781	814	1,020	1,045	1,041	-28.9%	-25.2%	-21.9%
FORT BEND COUNTY MUD 5	spline	288	1,484	1,886	540	1,560	1,182	-46.6%	-4.9%	59.5%
FORT BEND COUNTY MUD 50	spline	2,478	4,317	4,833	3,567	4,021	4,218	-30.5%	7.4%	14.6%
FORT BEND COUNTY MUD 57	linear	1,314	3,030	4,054	0	5,535	5,226	#N/A	-45.3%	-22.4%
FORT BEND COUNTY MUD 58	linear	1,181	3,495	4,880	0	4,488	4,488	#N/A	-22.1%	8.7%
FORT BEND COUNTY MUD 66	spline	313	1,033	1,275	483	492	495	-35.2%	110.0%	157.6%
FORT BEND COUNTY MUD 81 WESTON LAKES	linear	1,496	1,539	1,562	2,748	3,315	3,264	-45.6%	-53.6%	-52.2%
FORT BEND COUNTY WCID 2	linear	28,864	29,835	30,396	37,500	38,475	40,506	-23.0%	-22.5%	-25.0%
FORT BEND COUNTY WCID 3	linear	496	504	508	603	633	633	-17.7%	-20.4%	-19.8%
FORT BEND COUNTY WCID 8	linear	35	36	36	105	117	108	-66.6%	-69.4%	-66.7%
FULBROOK SUBDIVISION WATER PLANT	spline	371	827	991	588	660	660	-36.9%	25.3%	50.2%
GOLDENROD ESTATES HOMEOWNERS ASSN	linear	78	78	78	0	0	85	#N/A	#N/A	-7.8%
GRAND LAKES MUD 1	linear	3,598	3,599	3,599	0	3,063	3,204	#N/A	17.5%	12.3%
GRAND LAKES MUD 2	linear	2,102	2,127	2,142	2,271	2,065	2,070	-7.4%	3.0%	3.5%
GRAND LAKES MUD 4	linear	1,202	1,209	1,213	0	0	2,985	#N/A	#N/A	-59.4%
GRAND MISSION MUD 1	spline	4,119	5,221	5,559	0	5,557	5,928	#N/A	-6.0%	-6.2%
GRAND MISSION MUD 2	spline	923	3,657	4,528	966	1,878	1,593	-4.5%	94.7%	184.2%
HARRIS FORT BEND COUNTIES MUD 5	linear	2,503	2,715	2,841	3,159	3,803	3,894	-20.8%	-28.6%	-27.0%
HARRIS-FORT BEND COUNTIES MUD1	spline	1,757	1,841	1,876	0	3,744	3,762	#N/A	-50.8%	-50.1%
KINGDOM HEIGHTS WATER SYSTEM	spline	491	1,233	1,499	708	1,407	1,167	-30.6%	-12.4%	28.4%
KINGSBRIDGE MUD	linear	8,934	8,960	8,975	7,902	8,118	8,113	13.1%	10.4%	10.6%
LAKES OF MISSION GROVE	linear	144	196	226	135	135	138	6.6%	45.2%	63.8%
MEADOWCREEK MUD	linear	1,630	1,674	1,700	2,664	2,682	2,670	-38.8%	-37.6%	-36.3%
NIAGRA PUBLIC WATER SUPPLY	linear	176	177	177	0	0	165	#N/A	#N/A	7.3%
NORTH MISSION GLEN MUD	linear	9,400	9,429	9,444	8,658	8,697	8,685	8.6%	8.4%	8.7%
PALMER PLANTATION MUD 1	spline	1,488	1,677	1,731	0	1,977	1,956	#N/A	-15.2%	-11.5%
PALMER PLANTATION MUD 2	linear	2,448	2,488	2,510	0	2,478	2,463	#N/A	0.4%	1.9%
PARK PLACE SOUTHWEST	spline	20	107	136	0	0	26	#N/A	#N/A	422.3%
PECAN GROVE MUD	spline	11,413	11,526	11,565	13,713	14,925	14,913	-16.8%	-22.8%	-22.5%
PLANTATION MUD	spline	3,948	3,948	3,948	4,293	4,527	4,383	-8.0%	-12.8%	-9.9%
QUAIL VALLEY UTILITY DISTRICT	linear	8,524	8,821	8,995	13,239	13,794	13,317	-35.6%	-36.0%	-32.5%
RIVERWOOD FOREST	linear	486	493	496	510	678	678	-4.6%	-27.3%	-26.9%
ROSEMEADOWS III	linear	240	240	240	456	435	435	-47.4%	-44.8%	-44.8%
ROYAL LAKES ESTATES	linear	394	439	463	708	970	852	-44.4%	-54.8%	-45.6%
SHADOW GROVE ESTATES	linear	103	105	107	114	111	111	-9.3%	-5.0%	-3.9%
SIENNA PLANTATION MANAGEMENT DISTRICT	linear	201	340	422	0	996	996	#N/A	-65.8%	-57.6%
SIENNA PLANTATION MUD 10	spline	2,371	4,669	5,431	3,966	5,820	4,992	-40.2%	-19.8%	8.8%
SIENNA PLANTATION MUD 12	spline	686	3,274	4,090	2,589	2,910	2,589	-73.5%	12.5%	58.0%
SIENNA PLANTATION MUD 2	linear	4,067	4,179	4,244	4,776	4,788	4,785	-14.9%	-12.7%	-11.3%
SIENNA PLANTATION MUD 3	linear	5,114	5,366	5,514	6,879	7,065	7,029	-25.7%	-24.1%	-21.6%
SIENNA PLANTATION MUD 4	linear	1,712	2,065	2,277	474	474	474	261.2%	335.7%	380.4%
SIENNA PLANTATION THE WOODS	spline	359	400	412	306	324	342	17.4%	23.5%	20.4%

Water System Name	Interpolation Method	2010 Census (RGUP Baseline)	RGUP Projection		TWDB Water Use Survey		Texas Drinking Water Watch	Percent Deviation from Baseline Data (TWDB or TCEQ)		
		2010	2015	2018	2010	2015	2018	2010	2015	2018
SOUTHWEST ENVIRONMENTAL RESOURCES	spline	193	316	358	495	495	492	-61.0%	-36.1%	-27.3%
SUN RANCH WATER SYSTEM	spline	17	38	46	42	85	75	-59.1%	-55.1%	-38.1%
TDCJ JESTER 1 UNIT	linear	1,610	1,611	1,612	0	0	3,365	#N/A	#N/A	-52.1%
THUNDERBIRD UTILITY DISTRICT 1	linear	3,106	3,141	3,160	0	0	4,047	#N/A	#N/A	-21.9%
THUNDERBIRD UTILITY DISTRICT SYSTEM 2	linear	773	773	773	0	1,779	1,815	#N/A	-56.5%	-57.4%
WILLOW POINT MUD	spline	106	459	564	0	444	216	#N/A	3.4%	161.3%

Table C-4. Population of Census Tracts in Fort Bend County
Comparison of RGUP Projection and HGAC 2017 Regional Growth Forecast

Census Tract	Interpolation Method	RGUP Population Projection		HGAC Regional Growth Forecast 2017		Deviation in Population (compared to HGAC RGF)		Percent Deviation in Population (compared to HGAC RGF)	
		2015	2020	2015	2020	2015	2020	2015	2020
670,101	linear	6,885	6,966	6,340	6,049	545	917	8.6%	15.2%
670,102	linear	3,383	3,383	3,617	3,582	(234)	(199)	(6.5%)	(5.6%)
670200	linear	8,324	8,324	8,664	8,376	(340)	(52)	(3.9%)	(0.6%)
670300	linear	3,844	3,885	4,357	4,075	(513)	(190)	(11.8%)	(4.7%)
670400	linear	5,117	5,173	6,078	5,628	(961)	(455)	(15.8%)	(8.1%)
670500	linear	4,903	5,694	5,454	5,433	(551)	261	(10.1%)	4.8%
670601	linear	9,201	9,425	8,232	8,549	969	876	11.8%	10.2%
670602	linear	1,920	1,931	2,344	2,436	(424)	(505)	(18.1%)	(20.7%)
670700	linear	7,122	10,837	8,154	12,246	(1,032)	(1,409)	(12.7%)	(11.5%)
670800	linear	15,454	16,535	19,220	19,719	(3,766)	(3,184)	(19.6%)	(16.1%)
670901	linear	11,670	13,106	11,726	12,972	(56)	134	(0.5%)	1.0%
670902	linear	6,621	8,210	8,393	10,871	(1,772)	(2,661)	(21.1%)	(24.5%)
671001	linear	5,502	5,587	5,946	6,161	(444)	(574)	(7.5%)	(9.3%)
671002	linear	6,710	6,957	7,012	7,181	(302)	(224)	(4.3%)	(3.1%)
671100	linear	9,220	10,256	8,045	8,197	1,175	2,059	14.6%	25.1%
671200	linear	6,190	6,223	5,868	5,799	322	424	5.5%	7.3%
671300	linear	3,835	3,835	3,585	3,160	250	675	7.0%	21.4%
671400	linear	8,909	8,939	8,289	7,087	620	1,852	7.5%	26.1%
671501	linear	8,093	8,400	7,826	7,416	267	984	3.4%	13.3%
671502	linear	1,682	1,682	1,737	1,736	(55)	(54)	(3.2%)	(3.1%)
671601	linear	6,641	6,645	7,378	6,942	(737)	(297)	(10.0%)	(4.3%)
671602	linear	3,596	3,596	3,378	3,189	218	407	6.5%	12.8%
671700	linear	5,103	5,103	4,151	3,956	952	1,147	22.9%	29.0%
671800	linear	3,226	3,428	3,102	2,984	124	444	4.0%	14.9%
671900	linear	4,130	4,130	4,003	4,099	127	31	3.2%	0.8%
672001	linear	8,686	8,821	8,056	7,742	630	1,079	7.8%	13.9%
672002	linear	6,327	6,371	7,128	6,275	(801)	96	(11.2%)	1.5%
672100	linear	4,748	5,097	3,968	3,860	780	1,237	19.7%	32.0%
672200	linear	6,021	8,988	3,904	5,378	2,117	3,610	54.2%	67.1%
672301	linear	7,849	7,901	8,088	7,663	(239)	238	(3.0%)	3.1%
672302	linear	9,242	9,257	8,745	8,294	497	963	5.7%	11.6%
672400	linear	8,751	8,751	8,570	8,178	181	573	2.1%	7.0%
672500	linear	7,488	7,515	7,828	7,679	(340)	(164)	(4.3%)	(2.1%)
672601	linear	10,280	10,300	10,719	10,295	(439)	5	(4.1%)	0.0%
672602	linear	6,332	6,332	6,450	6,418	(118)	(86)	(1.8%)	(1.3%)
672701	linear	14,155	14,229	13,819	13,907	336	322	2.4%	2.3%
672702	linear	6,984	7,022	6,601	6,570	383	452	5.8%	6.9%
672800	linear	8,145	8,214	5,772	6,100	2,373	2,114	41.1%	34.7%
672900	spline	50,803	64,603	48,823	62,747	1,980	1,856	4.1%	3.0%
673001	linear	8,459	8,459	8,775	9,271	(316)	(812)	(3.6%)	(8.8%)
673002	spline	9,125	10,157	8,801	8,194	324	1,963	3.7%	24.0%
673003	linear	12,971	13,021	14,036	13,735	(1,065)	(714)	(7.6%)	(5.2%)
673101	linear	52,425	71,546	63,426	70,869	(11,001)	677	(17.3%)	1.0%
673102	linear	16,547	17,711	17,810	17,566	(1,263)	145	(7.1%)	0.8%
673200	spline	36,833	55,305	19,061	40,909	17,772	14,396	93.2%	35.2%
673300	linear	8,807	12,871	7,335	10,988	1,472	1,883	20.1%	17.1%
673400	spline	24,983	32,351	26,518	36,603	(1,535)	(4,252)	(5.8%)	(11.6%)
673500	spline	10,626	11,534	9,160	11,695	1,466	(161)	16.0%	(1.4%)
673600	linear	7,051	7,128	7,115	7,957	(64)	(829)	(0.9%)	(10.4%)
673700	linear	2,291	2,370	58	638	2,233	1,732	3850.0%	271.5%
673800	linear	9,371	9,395	9,005	9,280	366	115	4.1%	1.2%
673901	linear	8,763	8,763	8,502	8,408	261	355	3.1%	4.2%

Census Tract	Interpolation Method	RGUP Population Projection		HGAC Regional Growth Forecast 2017		Deviation in Population (compared to HGAC RGF)		Percent Deviation in Population (compared to HGAC RGF)	
		2015	2020	2015	2020	2015	2020	2015	2020
673902	linear	7,015	8,334	10,042	9,460	(3,027)	(1,126)	(30.1%)	(11.9%)
674000	linear	7,995	8,016	8,275	8,123	(280)	(107)	(3.4%)	(1.3%)
674100	linear	6,922	6,922	7,068	6,612	(146)	310	(2.1%)	4.7%
674200	linear	5,600	5,600	5,380	5,174	220	426	4.1%	8.2%
674300	linear	8,985	9,171	8,648	9,564	337	(393)	3.9%	(4.1%)
674400	linear	16,230	22,359	17,750	22,068	(1,520)	291	(8.6%)	1.3%
674501	linear	11,794	16,952	14,508	16,127	(2,714)	825	(18.7%)	5.1%
674502	linear	24,462	32,109	19,506	25,308	4,956	6,801	25.4%	26.9%
674601	linear	3,762	3,762	3,729	3,709	33	53	0.9%	1.4%
674602	linear	8,912	10,173	7,154	7,946	1,758	2,227	24.6%	28.0%
674603	linear	5,999	5,999	5,015	5,059	984	940	19.6%	18.6%
674604	linear	5,197	5,781	4,126	6,321	1,071	(540)	26.0%	(8.5%)
674700	linear	14,596	18,011	14,224	20,469	372	(2,458)	2.6%	(12.0%)
674800	linear	5,805	5,957	5,429	5,057	376	900	6.9%	17.8%
674900	linear	5,642	5,739	4,910	5,077	732	662	14.9%	13.0%
675000	linear	3,240	3,252	3,173	3,909	67	(657)	2.1%	(16.8%)
675100	linear	9,503	9,895	11,004	14,103	(1,501)	(4,208)	(13.6%)	(29.8%)
675200	linear	5,712	5,794	5,602	6,313	110	(519)	2.0%	(8.2%)
675300	linear	6,757	6,826	5,977	5,883	780	943	13.1%	16.0%
675400	spline	11,722	15,444	8,633	10,333	3,089	5,111	35.8%	49.5%
675500	spline	28,023	41,326	16,128	30,096	11,895	11,230	73.8%	37.3%
675600	linear	7,817	9,780	6,706	7,387	1,111	2,393	16.6%	32.4%
675700	linear	9,394	11,937	7,314	7,451	2,080	4,486	28.4%	60.2%
675800	spline	6,560	8,801	4,256	4,558	2,304	4,243	54.1%	93.1%

Table C-5. Average Per Capita Water Demands
Comparison of RGUP Projection and Fort Bend Subsidence District Records

Water System Name	GPCD (2010-2017) *Observed Total Use (FBSD) / RGUP Population Projection*				RGUP Projected GPCD	Deviation in Average GPCD (adjusted)
	Average GPCD	Max GPCD	Average GPCD (adjusted)	Max GPCD (adjusted)		
BIG OAKS MUD	26.6	131.9	131.9	131.9	125	(5.3%)
BLUE RIDGE WEST MUD	94.1	137.0	106.4	137.0	122.5	15.1%
BRIDLEWOOD ESTATES WATER SYSTEM	168.8	638.7	181.9	566.8	183.6	0.9%
CINCO MUD 1	183.7	246.8	183.7	246.8	291	58.4%
CINCO SOUTHWEST MUD 1	214.6	465.7	214.6	465.7	246	14.6%
CITY OF FULSHEAR	167.7	382.7	167.7	382.7	202	20.5%
CITY OF KENDLETON	375.6	908.1	321.7	479.4	210.7	(34.5%)
CITY OF MEADOWS PLACE	145.4	367.9	145.4	367.9	140.9	(3.1%)
CITY OF NEEDVILLE	92.4	107.4	92.4	107.4	107	15.8%
CITY OF ORCHARD	138.9	198.2	138.9	198.2	135.9	(2.2%)
CITY OF RICHMOND	215.9	258.5	215.9	258.5	131.4	(39.1%)
CITY OF ROSENBERG	116.9	121.9	116.9	121.9	108.3	(7.4%)
CITY OF SUGAR LAND	260.7	344.0	260.7	344.0	185.1	(29.0%)
FIRST COLONY MUD 9	130.6	189.7	130.6	189.7	138.4	6.0%
FORT BEND COUNTY FWSD 1	200.3	446.0	200.3	446.0	62	(69.0%)
FORT BEND COUNTY FWSD 2	88.0	118.9	88.0	118.9	90	2.3%
FORT BEND COUNTY MUD 112	174.5	233.9	174.5	233.9	184.9	6.0%
FORT BEND COUNTY MUD 115 RIVERSTONE	392.4	656.6	427.3	566.8	238	(44.3%)
FORT BEND COUNTY MUD 116 CANYON GATE	224.0	344.5	224.0	344.5	130	(42.0%)
FORT BEND COUNTY MUD 118	75.7	217.3	171.0	217.3	156	(8.8%)
FORT BEND COUNTY MUD 119	37.1	144.5	118.1	144.5	160	35.4%
FORT BEND COUNTY MUD 122	106.4	359.5	232.9	359.5	135	(42.0%)
FORT BEND COUNTY MUD 124	131.8	203.7	131.8	203.7	173	31.3%
FORT BEND COUNTY MUD 130	239.1	336.3	239.1	336.3	304	27.1%
FORT BEND COUNTY MUD 131	109.5	154.2	109.5	154.2	158	44.3%
FORT BEND COUNTY MUD 133	197.8	480.7	254.5	479.4	167	(34.4%)
FORT BEND COUNTY MUD 142	91.9	221.2	178.7	221.2	158	(11.6%)
FORT BEND COUNTY MUD 146	140.4	357.2	212.4	357.2	233	9.7%
FORT BEND COUNTY MUD 149	2090.9	5762.5	445.3	566.8	154	(65.4%)
FORT BEND COUNTY MUD 151	187.9	253.2	187.9	253.2	203	8.1%
FORT BEND COUNTY MUD 155	40.6	129.0	87.4	129.0	107	22.4%
FORT BEND COUNTY MUD 162	149.3	182.6	149.3	182.6	89	(40.4%)
FORT BEND COUNTY MUD 182	79.7	131.6	106.1	131.6	203	91.4%
FORT BEND COUNTY MUD 185	260.7	298.8	260.7	298.8	113	(56.7%)
FORT BEND COUNTY MUD 2	14.4	82.1	82.1	82.1	105.1	28.0%
FORT BEND COUNTY MUD 23	111.1	128.3	111.1	128.3	90.8	(18.3%)
FORT BEND COUNTY MUD 25	330.1	536.8	330.1	536.8	110.8	(66.4%)
FORT BEND COUNTY MUD 26 QUAIL GREEN WEST	84.7	134.8	84.7	134.8	94.7	11.9%
FORT BEND COUNTY MUD 30	34.4	121.2	105.1	121.2	102.4	(2.6%)
FORT BEND COUNTY MUD 34	307.1	623.9	299.9	566.8	232	(22.7%)
FORT BEND COUNTY MUD 37	340.9	487.9	340.9	487.9	253	(25.8%)
FORT BEND COUNTY MUD 41	36.4	159.9	125.1	159.9	109.1	(12.8%)
FORT BEND COUNTY MUD 46	168.2	259.4	191.7	259.4	208.8	8.9%
FORT BEND COUNTY MUD 5	119.5	224.9	119.5	224.9	108	(9.7%)
FORT BEND COUNTY MUD 50	156.6	696.3	264.8	525.2	194	(26.7%)
FORT BEND COUNTY MUD 57	184.0	304.7	184.0	304.7	179	(2.7%)
FORT BEND COUNTY MUD 58	114.8	212.3	170.2	212.3	134	(21.3%)
FORT BEND COUNTY MUD 81 WESTON LAKES	562.3	693.1	494.5	566.8	358.6	(27.5%)
FORT BEND COUNTY WCID 2	180.0	210.6	180.0	210.6	261	45.0%
FORT BEND COUNTY WCID 3	477.7	801.8	443.8	566.8	355	(20.0%)
FORT BEND COUNTY WCID 8	865.6	1508.2	496.6	566.8	355	(28.5%)
GRAND LAKES MUD 4	210.6	340.9	236.0	340.9	181	(23.3%)
GRAND MISSION MUD 1	68.6	238.1	158.6	238.1	161	1.5%
HARRIS FORT BEND COUNTIES MUD 5	369.8	475.3	369.8	475.3	195	(47.3%)

Water System Name	GPCD (2010-2017) *Observed Total Use (FBSD) / RGUP Population Projection*				RGUP Projected GPCD	Deviation in Average GPCD (adjusted)
	Average GPCD	Max GPCD	Average GPCD (adjusted)	Max GPCD (adjusted)		
KINGSBRIDGE MUD	33.2	135.6	96.1	135.6	117	21.8%
MEADOWCREEK MUD	136.3	180.2	136.3	180.2	103.3	(24.2%)
NORTH MISSION GLEN MUD	19.2	82.4	61.6	82.4	87.1	41.4%
PALMER PLANTATION MUD 1	409.7	602.1	405.3	566.8	244.9	(39.6%)
PECAN GROVE MUD	215.7	300.7	215.7	300.7	173.2	(19.7%)
PLANTATION MUD	98.4	115.8	98.4	115.8	118	19.9%
QUAIL VALLEY UTILITY DISTRICT	195.4	289.7	195.4	289.7	122.3	(37.4%)
ROYAL LAKES ESTATES	27.3	114.8	84.9	114.8	184	116.6%
THUNDERBIRD UTILITY DISTRICT 1	231.7	298.3	231.7	298.3	170	(26.6%)

Table C-6. Average Per Capita Water Demands
Comparison of RGUP Projection and TWDB Water Use Survey Data

Water System Name	GPCD (2010-2017) *Observed Total Use (TWDB) / RGUP Population Projection*				RGUP Projected GPCD	Deviation in Average GPCD (adjusted)
	Average GPCD	Max GPCD	Average GPCD (adjusted)	Max GPCD (adjusted)		
5TH STREET WATER SYSTEM	58.5	58.5	58.5	58.5	103	76.1%
723 UTILITY	326.0	461.3	322.7	443.9	131	(59.4%)
BIG OAKS MUD	95.4	174.5	104.9	174.5	125	19.2%
BLUE RIDGE WEST MUD	115.4	115.4	115.4	115.4	122.5	6.2%
BRAZOS LAKES WATER SUPPLY	312.8	549.3	299.6	443.9	103.3	(65.5%)
BRIDLEWOOD ESTATES WATER SYSTEM	127.8	237.3	127.8	237.3	183.6	43.7%
CINCO MUD 1	212.9	287.9	212.9	287.9	291	36.7%
CINCO MUD 10	212.9	287.9	212.9	287.9	205	(3.7%)
CINCO MUD 12	212.9	287.9	212.9	287.9	275	29.2%
CINCO MUD 14	212.9	287.9	212.9	287.9	174	(18.3%)
CINCO MUD 2	212.9	287.9	212.9	287.9	195	(8.4%)
CINCO MUD 3	212.9	287.9	212.9	287.9	137	(35.7%)
CINCO MUD 5	212.9	287.9	212.9	287.9	208	(2.3%)
CINCO MUD 6	212.9	287.9	212.9	287.9	161	(24.4%)
CINCO MUD 7	212.9	287.9	212.9	287.9	177	(16.9%)
CINCO MUD 8	212.9	287.9	212.9	287.9	119.8	(43.7%)
CINCO MUD 9	212.9	287.9	212.9	287.9	154	(27.7%)
CINCO SOUTHWEST MUD 1	338.9	534.6	319.9	443.9	246	(23.1%)
CINCO SOUTHWEST MUD 2	338.9	534.6	319.9	443.9	246	(23.1%)
CINCO SOUTHWEST MUD 3 DAYCARE	338.9	534.6	319.9	443.9	246	(23.1%)
CINCO SOUTHWEST MUD 4	338.9	534.6	319.9	443.9	246	(23.1%)
CITY OF BEASLEY	93.1	116.8	93.1	116.8	112.8	21.2%
CITY OF FULSHEAR	115.7	290.1	130.1	290.1	202	55.3%
CITY OF KENDLETON	268.6	428.8	263.6	428.8	210.7	(20.1%)
CITY OF MISSOURI CITY MUSTANG BAYOU WATE	69.7	77.2	69.7	77.2	143.5	105.9%
CITY OF NEEDVILLE	92.6	107.4	92.6	107.4	107	15.6%
CITY OF ORCHARD	139.8	197.4	139.8	197.4	135.9	(2.8%)
CITY OF RICHMOND	187.2	216.6	187.2	216.6	131.4	(29.8%)
CITY OF ROSENBERG	117.1	131.4	117.1	131.4	108.3	(7.5%)
CITY OF SUGAR LAND	199.0	291.7	225.4	291.7	185.1	(17.9%)
CITY OF SUGAR LAND - GREATWOOD	244.8	334.1	244.8	334.1	174.9	(28.6%)
CITY OF SUGAR LAND - NEW TERRITORY	174.2	233.9	174.2	233.9	184.9	6.1%
FIRST COLONY MUD 9	133.0	190.1	133.0	190.1	138.4	4.1%
FORT BEND COUNTY MUD 115 RIVERSTONE	638.8	920.3	382.8	395.2	238	(37.8%)
FORT BEND COUNTY MUD 116 CANYON GATE	256.2	359.0	256.2	359.0	130	(49.3%)
FORT BEND COUNTY MUD 118	142.2	149.7	142.2	149.7	156	9.7%
FORT BEND COUNTY MUD 119	113.4	144.2	113.4	144.2	160	41.1%
FORT BEND COUNTY MUD 121	129.2	168.0	129.2	168.0	131	1.4%
FORT BEND COUNTY MUD 122	244.0	359.5	244.0	359.5	135	(44.7%)
FORT BEND COUNTY MUD 123	99.4	112.0	99.4	112.0	127	27.8%
FORT BEND COUNTY MUD 128	728.7	1349.5	358.8	427.4	207	(42.3%)
FORT BEND COUNTY MUD 129	216.5	258.1	216.5	258.1	207	(4.4%)
FORT BEND COUNTY MUD 131	143.3	143.3	143.3	143.3	158	10.3%
FORT BEND COUNTY MUD 133	284.5	480.7	273.8	395.2	167	(39.0%)
FORT BEND COUNTY MUD 134C	603.9	666.9	394.5	415.3	324	(17.9%)
FORT BEND COUNTY MUD 140 RIVERS EDGE	118.4	152.4	118.4	152.4	131	10.6%
FORT BEND COUNTY MUD 142	154.8	185.4	154.8	185.4	158	2.1%
FORT BEND COUNTY MUD 143 WATER VIEW ESTA	138.2	192.9	138.2	192.9	151	9.3%
FORT BEND COUNTY MUD 145 RIO VISTA	124.1	160.7	124.1	160.7	28	(77.4%)
FORT BEND COUNTY MUD 146	324.7	383.8	324.6	383.2	233	(28.2%)
FORT BEND COUNTY MUD 149	1122.5	2175.5	387.4	443.9	154	(60.2%)
FORT BEND COUNTY MUD 151	201.9	204.7	201.9	204.7	203	0.5%
FORT BEND COUNTY MUD 152	152.8	222.2	152.8	222.2	129	(15.6%)
FORT BEND COUNTY MUD 155	145.5	195.3	145.5	195.3	107	(26.5%)

Water System Name	GPCD (2010-2017) *Observed Total Use (TWDB) / RGUP Population Projection*				RGUP Projected GPCD	Deviation in Average GPCD (adjusted)
	Average GPCD	Max GPCD	Average GPCD (adjusted)	Max GPCD (adjusted)		
FORT BEND COUNTY MUD 158	141.1	209.6	141.1	209.6	125	(11.4%)
FORT BEND COUNTY MUD 162	149.6	184.6	149.6	184.6	89	(40.5%)
FORT BEND COUNTY MUD 165	118.7	136.6	118.7	136.6	156	31.4%
FORT BEND COUNTY MUD 182	131.6	131.6	131.6	131.6	203	54.3%
FORT BEND COUNTY MUD 185	16.1	47.8	47.8	47.8	113	136.4%
FORT BEND COUNTY MUD 187	161.0	182.7	161.0	182.7	108	(32.9%)
FORT BEND COUNTY MUD 19	95.6	116.6	95.6	116.6	63.3	(33.8%)
FORT BEND COUNTY MUD 194	141.8	163.3	141.8	163.3	161	13.5%
FORT BEND COUNTY MUD 2	61.1	81.2	69.9	81.2	105.1	50.4%
FORT BEND COUNTY MUD 24	189.3	228.2	189.3	228.2	79	(58.3%)
FORT BEND COUNTY MUD 25	170.0	232.5	188.8	232.5	110.8	(41.3%)
FORT BEND COUNTY MUD 26 QUAIL GREEN WEST	70.3	110.3	79.3	110.3	94.7	19.4%
FORT BEND COUNTY MUD 30	96.1	110.2	96.1	110.2	102.4	6.6%
FORT BEND COUNTY MUD 34	350.0	478.5	338.1	395.2	232	(31.4%)
FORT BEND COUNTY MUD 35	160.2	164.3	160.2	164.3	223	39.2%
FORT BEND COUNTY MUD 37	70.6	70.6	70.6	70.6	253	258.4%
FORT BEND COUNTY MUD 41	133.6	158.2	133.6	158.2	109.1	(18.3%)
FORT BEND COUNTY MUD 42 WAT PLAT	150.8	193.9	150.8	193.9	147.4	(2.3%)
FORT BEND COUNTY MUD 46	157.6	224.0	157.6	224.0	208.8	32.5%
FORT BEND COUNTY MUD 47	112.2	129.5	112.2	129.5	121.5	8.3%
FORT BEND COUNTY MUD 48	138.9	164.5	138.9	164.5	103	(25.8%)
FORT BEND COUNTY MUD 49	157.9	208.4	157.9	208.4	138	(12.6%)
FORT BEND COUNTY MUD 5	124.7	225.0	124.7	225.0	108	(13.4%)
FORT BEND COUNTY MUD 50	99.2	197.7	115.8	197.7	194	67.5%
FORT BEND COUNTY MUD 57	316.0	379.2	314.7	373.7	179	(43.1%)
FORT BEND COUNTY MUD 58	144.8	317.3	307.6	317.3	134	(56.4%)
FORT BEND COUNTY MUD 66	56.3	111.5	80.2	111.5	94	17.2%
FORT BEND COUNTY MUD 81 WESTON LAKES	642.6	870.6	404.8	443.9	358.6	(11.4%)
FORT BEND COUNTY WCID 2	198.1	252.0	198.1	252.0	261	31.8%
FORT BEND COUNTY WCID 3	264.6	420.8	260.9	395.2	355	36.1%
FORT BEND COUNTY WCID 8	935.6	1295.3	404.8	443.9	355	(12.3%)
FULBROOK SUBDIVISION WATER PLANT	178.7	311.2	178.7	311.2	202	13.0%
GRAND LAKES MUD 1	128.4	132.9	128.4	132.9	200	55.8%
GRAND LAKES MUD 2	279.3	379.5	279.3	379.5	336	20.3%
GRAND LAKES MUD 4	1016.5	1107.9	381.2	383.2	181	(52.5%)
GRAND MISSION MUD 1	240.0	281.4	240.0	281.4	161	(32.9%)
GRAND MISSION MUD 2	79.4	116.4	79.4	116.4	281	253.9%
HARRIS FORT BEND COUNTIES MUD 5	374.1	475.3	370.2	443.9	195	(47.3%)
HARRIS-FORT BEND COUNTIES MUD1	260.8	328.6	260.8	328.6	109	(58.2%)
KINGDOM HEIGHTS WATER SYSTEM	117.2	191.7	117.2	191.7	131	11.8%
KINGSBRIDGE MUD	124.0	193.7	124.0	193.7	117	(5.6%)
LAKES OF MISSION GROVE	168.1	295.6	168.1	295.6	233	38.6%
MEADOWCREEK MUD	120.7	187.2	134.7	187.2	103.3	(23.3%)
NORTH MISSION GLEN MUD	67.3	82.4	67.3	82.4	87.1	29.4%
PALMER PLANTATION MUD 1	176.8	231.9	176.8	231.9	244.9	38.5%
PALMER PLANTATION MUD 2	120.4	171.0	120.4	171.0	197.5	64.0%
PECAN GROVE MUD	183.1	219.8	183.1	219.8	173.2	(5.4%)
PLANTATION MUD	100.4	115.9	100.4	115.9	118	17.5%
QUAIL VALLEY UTILITY DISTRICT	191.0	295.3	191.0	295.3	122.3	(36.0%)
RIVERWOOD FOREST	211.1	215.3	211.1	215.3	202	(4.3%)
ROSEMEADOWS III	138.2	144.8	138.2	144.8	107	(22.6%)
ROYAL LAKES ESTATES	529.0	830.4	404.8	443.9	184	(54.5%)
SHADOW GROVE ESTATES	223.4	228.2	223.4	228.2	131	(41.4%)
SIENNA PLANTATION MANAGEMENT DISTRICT	543.9	620.8	399.9	427.4	158	(60.5%)
SIENNA PLANTATION MUD 10	172.5	235.5	172.5	235.5	158	(8.4%)
SIENNA PLANTATION MUD 12	175.0	218.3	175.0	218.3	158	(9.7%)
SIENNA PLANTATION MUD 2	197.6	261.4	197.6	261.4	158	(20.0%)

Water System Name	GPCD (2010-2017) *Observed Total Use (TWDB) / RGUP Population Projection*				RGUP Projected GPCD	Deviation in Average GPCD (adjusted)
	Average GPCD	Max GPCD	Average GPCD (adjusted)	Max GPCD (adjusted)		
SIENNA PLANTATION MUD 3	180.1	239.3	180.1	239.3	158	(12.3%)
SIENNA PLANTATION MUD 4	39.5	143.5	118.6	143.5	158	33.2%
SIENNA PLANTATION THE WOODS	346.7	539.7	334.5	443.9	294	(12.1%)
SOUTHWEST ENVIRONMENTAL RESOURCES	117.4	164.4	117.4	164.4	108	(8.0%)
SUN RANCH WATER SYSTEM	221.1	305.3	221.1	305.3	103	(53.4%)