

Summary of 2021 RWP Draft Non-Municipal Water Demand Projection Methodologies (Irrigation, Manufacturing, Steam-Electric Power, Livestock and Mining) and Supporting Data

This document provides a brief summary of the methodologies and data sources used in developing the draft water demand projections for irrigation, manufacturing, steam-electric power and livestock to be included in the 2021 regional water plans and the 2022 State Water Plan. More complete descriptions and detailed examples can be found in [Methodologies for Developing Draft Irrigation, Manufacturing, and Steam-Electric Power Water Demand Projections \(February 2017\)](#).

The proposed criteria for requesting changes to the draft projections are described in the Texas Water Development Board (TWDB) regional water planning contract, Section 2 of [First Amended General Guidelines for Fifth Cycle of Regional Water Plan Development \(Exhibit C\)](#).

1 Historical Water Use Estimates

Historical water use data collected by the TWDB provides the foundation for each non-municipal water use category. The TWDB conducts an annual Water Use Survey (WUS) that is sent to municipal entities and industrial facilities within the state of Texas. The historical water use estimates for 2010-2014 include annual WUS information as well as additional water use estimates developed by the TWDB. These estimates are broken down by groundwater, surface water, and reuse, but they do not include brackish water. Table 1-1 below shows the 6-digit North American Industry Classification System (NAICS) codes included in each water use category.

Table 1-1 NAICS Codes within each water use category

Water Use Category	NAICS Codes
Manufacturing	115110 – 115210, 221119 – 400000, 486110 – 486991
Steam-electric power	220000 – 221119
Mining	211111 – 213116
Livestock	112111 – 112991

More information on the historical basis for each water use category is provided below:

- a. **Irrigation** water use estimates are developed annually by the TWDB Conservation Division and are based on crops, acreage, climatic conditions, observations by local agricultural representatives, and data provided by irrigation and groundwater districts.
- b. **Manufacturing** water use estimates are the summation of water use for manufacturing facilities reporting to the TWDB annual WUS and non-surveyed manufacturing use volumes reported by surveyed municipal water sellers.
- c. **Steam-electric power** water use estimates include volumes reported to the TWDB annual WUS by large power generation plants that sell power on the open market, but generally do not

include cogeneration plants that generate power for manufacturing or mining processes. Non-surveyed steam-electric power use volumes reported by surveyed municipal water sellers are also included in these estimates.

- d. **Livestock** water use estimates are a combination of annual WUS information and additional estimates provided by the TWDB based on livestock inventory data from the National Agricultural Statistical Service (NASS) and the Texas Department of Agriculture and per head water use consumptions by animal class. Table 1-2 displays livestock category and per head daily water use information.

Table 1-2 Estimated per head daily water use

TWDB Category	NASS Data Type	Per Head Daily Water Use (in gallons)
Cattle	Milk	75
	Fed & Other	15
Poultry	Hens	86* (per 1,000 head)
	Broilers	77* (per 1,000 head)
Horses	Horses, Ponies, & Burros	12
Hogs	Hogs	11
Sheep	Sheep	2
Goats	Milk, Meat, Angora	0.5

*Source: "How Much Water Does a Broiler House Use?", (<https://www.poultryventilation.com/sites/default/files/tips/2009/vol21n5.pdf>); "Water Consumption Rates for Chickens", (<http://www.poultryhub.org/nutrition/nutrient-requirements/water-consumption-rates-for-chickens/>).

- e. **Mining** water use is a combination of reported water use to the TWDB annual WUS and additional oil and gas water use estimates provided by the TWDB using the FracFocus database. Oil and gas water use estimates are then broken down by water source based on a TWDB-contracted study, [Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report](#), with the Bureau of Economic Geology (BEG) summarized in Table 1-3 below.

Table 1-3 Estimated percentages of reuse and brackish water use in hydraulic fracturing areas

Play	Fresh Water	Reuse / Recycle	Brackish
Permian Farwest	20%	0%	80%
Permian Midland	68%	2%	30%
Anadarko Basin	50%	20%	30%
Barnett Shale	92%	5%	3%
Eagle Ford Shale	80%	0%	20%
East Texas Basin	95%	5%	0%

2 Summary of Methodologies

2.1 Draft Irrigation Water Demand Projections Methodology Summary

Data Sources

- TWDB historical water use estimates by region and county (2010-2014), including reuse
- Projected total groundwater availability volumes including modeled available groundwater (MAG) volumes from the 2017 State Water Plan (SWP)
- Updated MAG volumes for Groundwater Management Areas (GMAs) 1, 2, 9, 14, and 15 as of May 17, 2017

The baseline methodology for draft irrigation water demand projections is the average of the most recent five-years (2010-2014) of water use estimates held constant between 2020 and 2070. In counties where the total groundwater availability over the planning period is projected to be less than the groundwater-portion of the baseline water demand projections, the draft irrigation water demand projections will begin to decline in 2030 or later, commensurate with the groundwater availability. This approach to groundwater-constrained areas is incorporated in 36 counties (see Table 2-1).

The default total groundwater availability in each county is based on the 2017 SWP. However, recently approved MAG volumes are incorporated for counties located in GMAs 1, 2, 9, 14, and 15 since they became available at the time of development of the draft projections. *If the regional water planning groups (RWPGs) feel that the draft irrigation water demand projections should be based on the updated MAG volumes as new MAG volumes become available for other GMAs during the revision process, please contact your project manager to request a re-run of the draft projections.*

Table 2-1 lists counties whose draft water demand projections will be constrained by groundwater resources based on the new irrigation projections methodology.

Table 2-1 Counties with draft irrigation demand projections constrained by groundwater resource.

Region	County	Projected groundwater availability total 2020-2070 (in acre-feet)	Projected groundwater portion of irrigation demand total 2020-2070 (in acre-feet)
O	Bailey	2,747,159	4,489,173
O	Briscoe	957,642	1,347,267
O	Castro	5,392,173	19,373,013
O	Cochran	3,303,619	5,071,899
O	Crosby	4,291,399	5,450,931
A	Dallam	11,335,969	21,677,448
O	Dawson	5,086,677	5,392,587
O	Deaf Smith	5,023,156	10,710,816
L	Dimmit	171,309	279,378
G	Eastland	240,720	251,634
O	Floyd	4,522,482	6,570,687
O	Gaines	9,399,036	18,486,582
O	Hale	4,122,717	15,829,329
A	Hall	1,216,210	1,794,792
B	Hardeman	289,613	637,398
A	Hartley	13,522,427	21,909,192
G	Haskell	2,224,460	2,968,302
O	Hockley	4,393,160	6,704,460
G	Knox	1,715,258	2,242,776
D	Lamar	278,970	287,436
O	Lamb	4,352,744	13,222,719
O	Lubbock	5,641,470	7,111,338
L	Medina	1,453,143	2,332,893
A	Moore	7,059,141	11,176,752
G	Nolan	333,693	581,451
G	Palo Pinto	612	41,871
O	Parmer	3,524,744	12,194,049
G	Robertson	2,705,916	3,883,446
F	Scurry	82,365	367,251
A	Sherman	12,879,019	16,947,708
O	Swisher	2,664,096	6,905,196
O	Terry	5,718,313	8,804,487
L	Uvalde	2,444,802	3,159,552
O	Yoakum	3,741,448	8,240,223
L	Zavala	1,801,208	2,345,031

2.2 Draft Manufacturing Water Demand Projections Methodology Summary

Data Source

- TWDB historical water use estimates by region and county (2010-2014), including reuse
- TWDB historical water use estimates by individual manufacturing facility (2010-2014), including reuse
- Texas Work Force Commission (TWC) employment projections for 2014-2024 by 3-digit NAICS code for the 28 TWC workforce development areas (WDAs)

The 2020 draft water demand projections for each county are based on the highest county-aggregated manufacturing water use in the most recent five years. The most recent 10-year projections for employment growth from the TWC are used as proxy for growth by manufacturing sectors between 2020 and 2030. The water use within each NAICS category is multiplied by the employment growth rate. In cases where the employment is projected to decrease for a 3-digit NAICS sector, the water demand projections will be held constant. After 2030, the draft manufacturing water demand are held constant through 2070.

For those counties with no reported water use between 2010 and 2014, a single year of data (2015), if available, is used for the 2020 projection. It is important to note that the manufacturing water use category does not include the water use by all firms. In collecting manufacturing water use data, the TWDB staff focuses on facilities that use large volumes of water (more than 10 million gallons), relative to the area of the state and/or are self-supplied by groundwater or surface water. Smaller-use facilities are generally supplied by public utilities as commercial accounts, and thus, part of the municipal water demands. TWDB staff conducted additional reviews of Texas Commission on Environmental Quality industrial water right usage reports and contacted wholesale water providers and groundwater conservation districts who are not otherwise surveyed to ensure that all large-water use manufacturing facilities are included in the historical estimates. This information will be available to the RWPGs by June 30, 2017.

2.3 Draft Steam-Electric Power Water Demand Projections Methodology Summary

Data Source

- TWDB historical water use estimates by region and county (2010-2014), including reuse
- TWDB historical water use estimates by individual steam-electric power plant (2010-2014), including reuse
- U.S. Energy Information Administration - Form EIA_860 data (2015)
(<https://www.eia.gov/electricity/data/eia860/>)

The 2020 draft water demand projections for each county are based on the highest county-aggregated historical steam-electric power water use in the most recent five years (2010-2014). The anticipated water use of future facilities listed in state and federal reports is added to the demand projections from the anticipated operation date to 2070. The reported water use of facilities scheduled for retirement in the state and federal reports is subtracted from the demand projections. Subsequent demand projections after 2020 are held constant throughout the planning period.

However, there were no power plants scheduled to be retired, only individual generator(s) within active plants. Individual generator(s) scheduled to be retired were left in the baseline water use if the plant is still active.

If any known power generation facility has been missed in the TWDB's annual WUS, that facility's water use is estimated using average water use per kilowatt-hour output for the associated fuel-type and added to the historical highest water use for that county.

Landfill gas, wood waste biomass, and battery power plants, as well as any power generating facilities using renewable energy sources, are not included in the draft water demand projections.

2.4 Draft Livestock Water Demand Projections Methodology Summary

Data Source

- TWDB historical water use estimates by region and county (2010-2014), including reuse

The 2020 draft water demand projections for each county are based on the average of the most recent five-years (2010-2014) of water use estimates. The same growth trend from the 2017 State Water Plan is applied to project livestock water demand for 2030-2070.

In 2017, the TWDB updated livestock water use estimates for 2010-2014 using new per head daily water use for chickens (Table 1-2), these updated estimates were used in developing the draft livestock water demand projections.

2.5 Draft Mining Water Demand Projections Methodology Summary

Data Source

- TWDB historical water use estimates by region and county (2010-2014), including reuse
- 2017 State Water Plan mining water demand projections

Draft mining water demand projections have already been provided to the RWPGs (December 2016), which are carried forward from the 2017 SWP and based largely on a TWDB-contracted study, [Oil & Gas Water Use in Texas: Update to the 2011 Mining Water Use Report](#), with the BEG. The BEG estimated recent mining water use and projected that use across the planning horizon using data collected from trade organizations, government agencies, and other industry representatives. County-level projections were compiled as the sum of individual projections for four sub-sector mining categories: oil and gas, aggregates, coal and lignite, and other.