MEMORANDUM

TO: SRBA

CC:

PROJECT: SBG15591 – CY 2016 Support Services

FROM: Keeley Kirksey

SUBJECT: Demand Scenarios Based on 2016 East Texas (D) Regional Water Plan

DATE: October 31, 2016

INTRODUCTION

The Scope of Work for CY 2016 Support Services between the Sulphur River Basin Authority (SRBA) and the Sulphur Basin Group (SBG) under Task 1.2 requires SBG to:

> "Review information regarding future water supply needed for local use in the Sulphur Basin from previous phases of the Feasibility Study, state and regional water plans and other sources. Determine the most likely point of diversion of those needs. Develop up to three potential scenarios to meet future needs."

These scenarios augment prior assumptions for operational modeling of a possible Sulphur Basin Project comprised of two components – reallocated storage at Wright Patman Lake in combination with new storage upstream, generally at the Marvin Nichols 1A site. The purpose of this exercise is to test the thesis that the geographic distribution of in basin needs has the potential to affect the definition of efficient system operations of the two components.

Scenarios developed in response to the Scope requirement should not be construed to be definitive projections. They are merely illustrative of a set of reasonable future scenarios for water demand and needs in order to provide context for modeling. The purpose of this planning-level exercise is to compare various operational configurations for future projects.

BASIS OF DEMAND PROJECTIONS

The most current and comprehensive assessment of future water needs in and proximate to the Sulphur Basin can be found in the 2016 Region D Water Plan. Accordingly, this source was chosen as the primary basis for developing a scenario depicting possible future water demands and needs. In this analysis, the term "needs" is defined in accordance with the definition used by the Texas Water Development Board (TWDB) in the regional planning process as projected demands less current supplies. (That is, these are the needs prior to the implementation of water management strategies.)

Based on information contained in the Region D Plan, two possible scenarios were developed – one which is limited strictly to needs within the approximate boundary of the Sulphur River Basin and an expanded scenario

which includes needs within Region D located in counties that are adjacent to the Sulphur River Basin and/or the general route of a proposed high-volume pipeline (Bowie, Cass, Delta, Franklin, Hopkins, Hunt, Lamar, Morris, Red River, and Titus Counties) which would be developed to transmit water from the Sulphur Basin Project to users west of the Sulphur Basin.

The Region D needs by county and use type were obtained from the Texas Water Development Board (TWDB) website[1] and reflect data from the 2016 Plan. As part of the regional planning process, data from the regional water plans is entered into an online database (DB17). For scenario 2, the total county needs were obtained directly from DB17. In order to develop scenario 1, it was necessary to apportion some of the county needs by basin. This information is not available online, and was obtained from TWDB staff, who ran a query on the database and provided those results to us. As defined by TWDB through the regional planning process, needs are considered to be projected demands less currently-available supplies. That is, these are the needs prior to the implementation of new water management strategies.

The Region D plan considers the "current" supplies as available sources limited by current treatment and raw water infrastructure or other relevant factors. In the case of Wright Patman Lake as a current water supply in the Region D plan, availability to meet municipal needs is primarily limited by the capacity of the Texarkana treatment infrastructure which is 18 MGD (20,163 acre-feet per year) until 2070 when it is reduced to approximately 14.3 MGD (16,000 acre-feet per year) due to reservoir sedimentation. In addition, the Region D plan assumes that Wright Patman will continue to provide 120,000 acre-feet per year towards industrial needs in Cass County over the entire planning horizon. Accordingly, the available supply considered to be potentially available (assuming maintenance of existing infrastructure) from Wright Patman Lake for purposes of estimating Region D needs is 140,163 acre-feet per year through 2060 (20,163 for municipal use and 120,000 for industrial).

Some, but not all, of the needs shown in the tables below could be met by strategies identified in the Region D plan. The scenario developed herein does not purport to suggest that the Sulphur Basin Project would be a superior strategy to those options, only that there are needs for water in these locations which might realistically be met by the in-basin portion of the Sulphur Basin Project yield if it were to be developed. However, there are some needs identified in the Region D plan for which the recommended strategy is additional water from Region C suppliers. In order to develop a straightforward analysis, those needs are included in this scenario development, however, they would presumably be met by the non-local portion (80%) of the Sulphur Basin Project's yield. The only county where the needs would be slightly different if this had been considered is Hunt County.

The desired yield of the Sulphur Basin Project is 604,000 acre-feet per year. Based on the current contract between the JCPD and SRBA, 20 percent (120,800 acre-feet per year) would be available for the benefit of Sulphur Basin users. The proposed Scenario 1 (Sulphur Basin Only) below, depicts a reasonable distribution of use for that supply based on the Region D plan as discussed above. Scenario 2, (Expanded Demand Scenario) considers use of the Sulphur Basin Project supply in both Sulphur Basin and proximate counties. The general geographic distribution of the needs shown in each scenario will be used in the basinwide Riverware model to assess system operations considerations for a project comprised of both Wright Patman and Marvin Nichols storage locations as described in the Scope of Work.

SCENARIO 1 – SULPHUR BASIN ONLY

[1] Texas Water Development Board: *2017 Interactive Texas State Water Plan*, [ONLINE], Available URL: https://2017.texasstatewaterplan.org/region/D, July 2016.

The needs from the Region D Water Plan by basin were obtained from Texas Water Development Board staff and are summarized in the tables below. Table 1 shows that in 2070, approximately 33 percent of the total demand for the counties listed in the section above, is located within the Sulphur Basin. Table 2 shows the Sulphur Basin needs by county and use type. The information in Table 2 is also presented geographically on Figure 1.

Table 1. Sulphur Basin Needs by Use Type (Acre-Feet per Year)

Use Type	Total Need by Use Type For Counties in the Sulphur Basin						Sulphur Basin Needs Only						Percent of Total Needs in Sulphur Basin					
	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
Municipal	22,176	24,699	28,717	30,654	36,319	47,023	15,372	15,595	16,332	16,594	17,138	17,922	69%	63%	57%	54%	47%	38%
Manufacturing	5,827	7,295	13,459	18,906	28,758	74,241	2,100	3,445	9,488	14,703	23,870	65,871	36%	47%	70%	78%	83%	89%
Irrigation	30,200	30,133	29,916	29,458	29,026	28,839	10,034	10,052	9,916	9,774	9,534	9,491	33%	33%	33%	33%	33%	33%
Mining	300	347	395	463	540	639	179	214	255	306	359	422	60%	62%	65%	66%	66%	66%
Steam Electric Power	32,643	45,291	61,115	80,352	102,973	130,336	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Total	**91,146**	**107,765**	**133,602**	**159,833**	**197,616**	**281,078**	**27,685**	**29,306**	**35,991**	**41,377**	**50,901**	**93,706**	**30%**	**27%**	**27%**	**26%**	**26%**	**33%**

Table 2. Sulphur Basin Needs by County and Use Type (Acre-Feet per Year) [a]

County	Use Type	Sulphur Basin Needs Only						Percent of Total Needs in Sulphur Basin					
		2020	2030	2040	2050	2060	2070	2020	2030	2040	2050	2060	2070
Bowie	Municipal	14,873	15,054	15,016	14,934	14,916	14,915	87%	87%	87%	87%	87%	87%
Bowie	Manufacturing	1,535	1,669	1,799	1,909	2,066	2,235	99%	99%	99%	99%	99%	99%
Bowie	Irrigation	2,305	2,305	2,243	2,088	1,943	1,881	44%	44%	44%	45%	45%	45%
Cass	Manufacturing	0	1,184	7,062	12,145	21,111	62,676	0%	91%	98%	99%	99%	100%
Hopkins	Municipal	0	1	2	4	41	88	0%	8%	8%	10%	31%	35%
Hopkins	Irrigation	2,126	2,126	2,126	2,126	2,126	2,126	100%	100%	100%	100%	100%	100%
Hopkins	Mining	149	187	237	293	352	422	66%	66%	66%	66%	66%	66%
Hunt	Municipal	0	0	131	407	860	1,520	0%	0%	1%	4%	5%	6%
Hunt	Irrigation	33	33	33	33	33	33	23%	23%	23%	23%	23%	23%
Hunt	Steam Electric Power	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Hunt	Mining	30	27	18	13	7	0	41%	42%	51%	68%	100%	0%
Lamar	Municipal	21	20	22	31	38	45	31%	25%	27%	32%	36%	39%
Lamar	Manufacturing	565	592	620	642	685	951	100%	100%	100%	100%	100%	100%
Lamar	Steam Electric Power	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Lamar	Irrigation	2,300	2,367	2,331	2,381	2,325	2,360	13%	13%	13%	13%	13%	13%
Morris	Municipal	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Morris	Manufacturing	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Red River	Municipal	0	0	593	592	591	591	0%	0%	100%	100%	100%	100%
Red River	Manufacturing	0	0	7	7	8	9	0%	0%	100%	100%	100%	100%
Red River	Irrigation	3,270	3,221	3,183	3,146	3,107	3,091	75%	75%	75%	75%	75%	75%
Titus	Municipal	478	520	568	626	692	763	34%	34%	34%	34%	34%	34%
Titus	Manufacturing	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Titus	Steam Electric Power	0	0	0	0	0	0	0%	0%	0%	0%	0%	0%
Total		**27,685**	**29,306**	**35,991**	**41,377**	**50,901**	**93,706**						

[a] There are no needs in Delta and Franklin Counties.

As shown in Table 3, all of the needs in the Sulphur Basin, as presented in the 2016 Region D Water Plan, could be met with water from the Sulphur Basin Project and there would still be excess supply available. This assessment does not consider the implementation date of the Sulphur Basin Project.

Table 3. Sulphur Basin Needs by Use Type that Could be Met with Water from the Sulphur Basin Project (Acre-Feet per Year)

Scenario	2020	2030	2040	2050	2060	2070
Supply Remaining from 20% After Municipal Needs are Met	105,428	105,205	104,468	104,206	103,662	102,878
Supply Remaining from 20% After Municipal & Manufacturing Needs are Met	103,328	101,760	94,980	89,503	79,792	37,007
Supply Remaining from 20% After Municipal, Manufacturing, & Irrigation Needs are Met	93,294	91,708	85,064	79,729	70,258	27,516
Supply Remaining from 20% After All Needs are Met	93,115	91,494	84,809	79,423	69,899	27,094

FIGURE 1

NEEDS ANALYSIS (SULPHUR BASIN ONLY)

2070 NEEDS BY COUNTY PER THE 2016 REGION D WATER PLAN IN THE SULPHUR RIVER BASIN (ACRE-FEET PER YEAR)

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Lamar County
Municipal = 45
Manufacturing = 951
Irrigation = 2,360

Red River County
Municipal = 591
Manufacturing = 9
Irrigation = 3,091

Bowie County
Municipal = 14,915
Manufacturing = 2,235
Irrigation = 1,881

Delta County
No Unmet Needs

Hunt County
Municipal = 1,520
Irrigation = 33

Hopkins County
Municipal = 88
Irrigation = 2,126
Mining = 422

Titus County
Municipal = 763

Cass County
Manufacturing = 62,676

Franklin County
No Unmet Needs

Morris County
No unmet needs in Sulphur Basin

Ray Roberts
Trinity River
NWTP TSR
Ralph Hall
Marvin Nichols
MN LPS
Chapman
Chapman LPS
Wright Patman - Maximum Reallocation
WP LPS
Bridgeport
Lewisville
NTMWD Outfall
Wylie WTP

Carter County
Jefferson County
Love County
Marshall County
Bryan County
Choctaw County
Howard County
Sevier County
McCurtain County
Little River County
Montague County
Cooke County
Grayson County
Fannin County
Lamar County
Red River County
Bowie County
Delta County
Hopkins County
Franklin County
Titus County
Morris County
Camp County
Cass County
Wise County
Denton County
Collin County
Hunt County
Rockwall County
Rains County
Wood County
Upshur County
Marion County
Parker County
Tarrant County
Dallas County
Kaufman County
Van Zandt County
Harrison County
Gregg County
Smith County
Ellis County
Henderson County
Rusk County
Panola County
Hill County
Navarro County
Cherokee County
Anderson County
Freestone County
Shelby County

Pump Stations
Delivery Locations

Pipelines
- Base Route
- Bridgeport
- Chapman Outfall
- Marvin Nichols
- NWTP
- Patman
- Ray Roberts
- Wylie WTP
- Existing Chapman

River Basins
Region D Water Planning Area

0 7.5 15 30 Miles

FNI PROJECT	UFH12387
FILE	H:\WR_PLANNING\FINAL_EXHIBITS\Demand_Scenarios.mxd
DATUM & COORDINATE SYSTEM	NAD 1983 StatePlane Texas North Central FIPS 4202 Feet
DATE	July, 2016
PREPARED BY	JJR

SCENARIO 2 – EXPANDED DEMAND SCENARIO

For the expanded scenario, Figure 2 shows the 10 Region D counties along or near the proposed pipeline - Bowie, Cass, Delta, Franklin, Hopkins, Hunt, Lamar, Morris, Red River, and Titus Counties.
Table 4 summarizes the needs by use type. Table 5 summaries the needs by use type and county. The needs by entity, as well as the Water Management Strategies proposed to meet the needs in the most recent Region D plan, are included in Attachment A.

Table 4. Region D Needs (for the Counties Considered) by Use Type (Acre-Feet per Year)

Use Type	2020	2030	2040	2050	2060	2070
Municipal	22,176	24,699	28,717	30,654	36,319	47,023
Manufacturing	5,827	7,295	13,459	18,906	28,758	74,241
Irrigation	30,200	30,133	29,916	29,458	29,026	28,839
Mining	300	347	395	463	540	639
Steam Electric Power	32,643	45,291	61,115	80,352	102,973	130,336
Total	**91,146**	**107,765**	**133,602**	**159,833**	**197,616**	**281,078**

Table 5. Region D Needs by County and Use Type (Acre-Feet per Year)[a]

County	Use Type	2020	2030	2040	2050	2060	2070
Bowie	Municipal	17,187	17,387	17,334	17,237	17,217	17,216
Bowie	Manufacturing	1,544	1,679	1,810	1,922	2,080	2,251
Bowie	Irrigation	5,240	5,240	5,079	4,676	4,300	4,140
Cass	Manufacturing	115	1,305	7,189	12,277	21,252	62,827
Hopkins	Municipal	0	12	25	42	131	255
Hopkins	Irrigation	2,126	2,126	2,126	2,126	2,126	2,126
Hopkins	Mining	227	283	360	444	533	639
Hunt	Municipal	3,362	5,538	8,863	10,696	16,086	26,446
Hunt	Irrigation	146	146	146	146	146	146
Hunt	Steam Electric Power	12,085	14,188	16,751	19,877	23,687	28,213
Hunt	Mining	73	64	35	19	7	0
Lamar	Municipal	67	81	83	96	107	116
Lamar	Manufacturing	565	592	620	642	685	951
Lamar	Steam Electric Power	0	980	2,733	4,870	7,474	10,568
Lamar	Irrigation	18,312	18,308	18,305	18,302	18,299	18,302
Morris	Municipal	164	161	160	163	166	170
Morris	Manufacturing	0	0	0	0	0	2,763
Red River	Municipal	0	0	593	592	591	591
Red River	Manufacturing	0	0	7	7	8	9
Red River	Irrigation	4,376	4,313	4,260	4,208	4,155	4,125
Titus	Municipal	1,396	1,520	1,659	1,828	2,021	2,229
Titus	Manufacturing	3,603	3,719	3,833	4,058	4,733	5,440
Titus	Steam Electric Power	20,558	30,123	41,631	55,605	71,812	91,555
Total		**91,146**	**107,765**	**133,602**	**159,833**	**197,616**	**281,078**

[a] There are no needs in Delta and Franklin Counties.

FIGURE 2

2070 NEEDS BY COUNTY PER THE 2016 REGION D WATER PLAN (ACRE-FEET PER YEAR)

NEEDS ANALYSIS

Lamar County
Municipal = 116
Manufacturing = 951
SEP = 10,568
Irrigation = 18,302

Red River County
Municipal = 591
Manufacturing = 9
Irrigation = 4,125

Bowie County
Municipal = 17,216
Manufacturing = 2,251
Irrigation = 4,140

Delta County
No Unmet Needs

Hunt County
Municipal = 26,446
SEP = 28,213
Irrigation = 146

Hopkins County
Municipal = 255
Irrigation = 2,126
Mining = 639

Titus County
Municipal = 2,229
Manufacturing = 5,440
SEP = 91,555

Cass County
Manufacturing = 62,827

Franklin County
No Unmet Needs

Morris County
Municipal = 170
Manufacturing = 2,763

Pump Stations
Delivery Locations
Pipelines
Base Route
Bridgeport
Chapman Outfall
Marvin Nichols
NWTP
Patman
Ray Roberts
Wylie WTP
Existing Chapman
River Basins
Region D Water Planning Area

0 7.5 15 30 Miles

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FILE H:\WR_PLANNING\FINAL_EXHIBITS\Demand_Scenarios.mxd
DATUM & COORDINATE SYSTEM NAD 1983 StatePlane Texas North Central FIPS 4202 Feet
DATE July, 2016
PREPARED BY JJR

Not considering the implementation date of the Sulphur Basin Project, all of the municipal needs in the counties considered could be met with water available from the Sulphur Basin Project from 2020 through 2070. All of the manufacturing needs could be met through 2060 and a portion of the steam electric power (SEP) demands could be met through 2040. This information is summarized in Table 6.

Table 6. Needs by Use Type that Could be Met with Water from the Sulphur Basin Project (Acre-Feet per Year)

Scenario	2020	2030	2040	2050	2060	2070
Supply Remaining from 20% After Municipal Needs are Met	98,624	96,101	92,083	90,146	84,481	73,777
Supply Remaining from 20% After Municipal & Manufacturing Needs are Met	92,797	88,806	78,624	71,240	55,723	0
Supply Remaining from 20% After Municipal, Manufacturing, & SEP Needs are Met	60,154	43,515	17,509	0	0	0
Supply Remaining from 20% After Municipal, Manufacturing, SEP, & Irrigation Needs are Met	29,954	13,382	0	0	0	0
Supply Remaining from 20% After All Needs are Met	29,654	13,035	0	0	0	0