

Appendix 3-B

Water Availability Technical Memorandum

The TWDB requires regional water planning groups to use Full Authorization Water Availability Models (WAM Run 3) maintained by the Texas Commission on Environmental Quality (TCEQ) to develop water availability for regional water plans (RWPs). The Region I Consultant Team, on behalf of the East Texas Regional Water Planning Group (Region I), utilized WAMs to calculate surface water availability for the three basins within Region I: the Trinity River, Neches, River, and Sabine River.

For the Trinity River Basin, Region I adopted the updated Trinity Basin WAM developed by the Region C Water Planning Group. Region I also includes part of the Neches-Trinity Coastal Basin. As no changes were proposed by Region I to the Neches-Trinity WAM, surface water supplies in that basin were developed using the unmodified Neches-Trinity Coastal Basin WAM Run 3. This memorandum included as Appendix 3D describes the modifications made to the Neches River and Sabine River WAMs by Region I.



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Summary of WAM Modifications in the Development of Surface Water Supplies for the East Texas 2021 Regional Water Plan

The Texas Water Development Board (TWDB) requires regional water planning groups (RWPG) to use Full Authorization Water Availability Models (WAM Run 3) maintained by the Texas Commission on Environmental Quality (TCEQ) in the development of surface water availability for regional water plans (RWPs). In a letter submitted to TWDB on July 3, 2018, the Region I Consultant Team on behalf of the East Texas Regional Water Planning Group (Region I) requested a hydrologic variance to use modified versions of the Run 3 WAMs for the Trinity River, Neches River, and Sabine River Basins to develop supplies for the Region I 2021 RWP. This hydrologic variance request is still pending approval.

For the Trinity River Basin, Region I adopted the updated Trinity Basin WAM developed by the Region C Water Planning Group. These changes are documented in Region C's hydrologic variance request to the TWDB. Region I also includes part of the Neches-Trinity Coastal Basin. As no changes were proposed by Region I to the Neches-Trinity WAM, surface water supplies in that basin were developed using the unmodified Neches-Trinity Coastal Basin WAM Run 3. This memorandum describes the modifications made to the Neches River and Sabine River WAMs by Region I.

Neches River Basin WAM for the 2021 Region I RWP

Changes to the WAM for the 2021 RWP are based on changes in previous cycles, as well as the inclusion of updated sedimentation of major reservoirs, as specified by Exhibit C ("Second Amended General Guidelines for Fifth Cycle of Regional Water Plan Development"). The following sections describe all changes made to the TCEQ Neches WAM Run 3 (2012) to develop the modified Neches WAM, which will be used to determine existing supplies in the Neches River Basin in the Region I 2021 RWP.

Area-Capacity Relationships

Exhibit C requires RWPGs to include anticipated sedimentation of all major reservoirs (those with a capacity greater than 5,000 ac-ft) in the WAM model runs. There are 12 such permitted reservoirs in the Neches Basin; information related to sedimentation of these reservoirs is shown in Table 1.

Lake Columbia has not yet been constructed, so to be conservative, Lake Columbia's full design capacity and original area-capacity curve was used when evaluating firm yields for all other reservoirs. Conversely, to estimate the yield from Lake Columbia, it was assumed that the reservoir would be built in 2020 and begin collecting sediment at that time.

Table 1. Sedimentation Rates and Projected Storage Capacity of Major Reservoirs in the Neches River Basin

Reservoir	Most Recent Survey		Sediment-Contributing Drainage Area (mi ²)	Sedimentation Rate (ac-ft/yr/mi ²)	Projected 2070 Capacity (ac-ft)
	Year	Conservation Pool Capacity (ac-ft)			
Lake Athens	1998	29,475	22	4.35	22,719
Lake Columbia**	*	195,500	277	0.19	192,910
Lake Jacksonville	2006	25,732	34	2.88	19,508
Lake Kurth	1996	14,769	4	8.57	12,265
Lake Nacogdoches	1994	39,523	89	1.75	27,664
Lake Naconiche	*	9,072	27	0.19	8,750
Lake Palestine	2012	367,310	817	0.76	331,689
Pinkston Lake	*	7,380	14	0.19	7,130
Sam Rayburn Reservoir	2004	2,876,033	3,010	0.18	2,839,698
Lake B. A. Steinhagen	2011	69,259	3,251	0.06	58,731
Lake Striker	1996	22,865	182	0.85	11,561
Lake Tyler	2013	77,284	107	1.00	71,192

* No survey available. Conservation pool capacity reflects design capacity.

** Permitted but not yet constructed. Projected 2070 capacity based on assumption of sedimentation beginning 1/1/2020.

Subordination of Sam Rayburn Reservoir and B. A. Steinhagen Lake

Background

Special conditions 5C and 5D of Certificate of Adjudication 06-4411 require subordination of LNVA’s rights in the Rayburn-Steinhagen system to (a) water rights upstream of the proposed Weches and Ponta Dam sites and (b) intervening municipal rights above Sam Rayburn Reservoir. These conditions were last amended in Amendment H, filed August 14, 2008, and granted July 20, 2010, which limited subordination to rights with priority dates between November 1963 and April 2008.

Several changes were implemented in the WAM related to dual simulation, output, and the refilling of Rayburn and Steinhagen.

- a) Water rights benefiting from subordination were updated to run in both the first and second WRAP simulation.
- b) FNI added additional rights for each water right benefiting from Rayburn/Steinhagen subordination, such that the original right does not have subordination, and the added right applies the subordination and backs up the original without subordination. In doing so, the effects of subordination can be distinguished in the model output.
- c) Subordination rights at Rayburn and Steinhagen to back up other rights were modeled to not refill storage (Type 2 water rights) so that Rayburn and Steinhagen would not be refilling between multiple subordinations.
- d) The 1963 rights for impoundment at Rayburn and Steinhagen were reordered so that Rayburn, the upstream reservoir, would be filled from available streamflow before Steinhagen is refilled.

Reservoir System Operations

UNRMWA – Lake Palestine and Rocky Point Dam

The Upper Neches River Municipal Water Authority operates Lake Palestine in conjunction with its downstream dam on the Neches River in Anderson and Cherokee Counties. The 2012 WAM Run 3 allows rights associated with the downstream dam to draw from both reservoirs, which limits the firm yield of Lake Palestine when it is used to back up the downstream dam. This set of rights was modified so that downstream diversions would first be backed up by the subordination agreement at Steinhagen Lake, and any remaining shortages would be backed up by Lake Palestine.

LNVA – Sam Rayburn Backup of Pine Island Bayou

The modified WAM approved by TWDB for the development of supplies in the 2011 RWP included “operation of LNVA’s water rights [...] as a system by including backup of LNVA’s Pine Island water rights with storage from Sam Rayburn.”

Minimum Elevations – Sam Rayburn and B.A. Steinhagen

WS and OR records were used to set inactive pool capacity for Sam Rayburn Reservoir. The top elevation of inactive pool is 149 ft msl, and the inactive pool capacity was updated each decade based on updated area-capacity-elevation curves. The City of Lufkin has a right to a lakeside diversion of up to 28,000 ac-ft/yr from Sam Rayburn Reservoir; no inactive pool capacity was applied for this right. This diversion is lakeside and does not generate hydropower, so it is not limited by the inlet elevation.

A dead pool capacity was also set for B. A. Steinhagen using an inactive pool elevation of 81 ft msl. Inactive pools were not applied to subordination-related backup rights for either reservoir.

Lake Tyler

For the 2021 Region I WAM, Lake Tyler was modeled as a single reservoir, and associated water rights were adjusted accordingly. This is consistent with the development of the original Neches WAM, which treated this source as one reservoir.

Environmental Flows Standard for Permit 5585

The TCEQ Run 3 WAM included an incorrect target value for the instream flow record at Lake Naconiche (5585A) due to a unit conversion error. The target was corrected to 4744 ac-ft/yr (see IF record at 5585A).

Sabine River Basin WAM for the 2021 Region I RWP

The following sections describe all changes made to the TCEQ Sabine WAM Run 3 (2015) to develop the modified Sabine WAM, which will be used to determine existing supplies from the Sabine River Basin in the Region I 2021 RWP.

Area-Capacity Relationships

Exhibit C requires RWPGs to include anticipated sedimentation of all major reservoirs (those with a capacity greater than 5,000 ac-ft) in the WAM model runs. There are 12 such permitted reservoirs in the Sabine Basin; information related to sedimentation of these reservoirs is shown in Table 2. For each of the 12 reservoirs, sedimentation conditions were estimated based on an average annual sedimentation rate and the number of years since the last survey.

Table 2. Sedimentation Rates and Projected Storage Capacity of Major Reservoirs in the Sabine River Basin

Reservoir	Most Recent Survey		Sediment-Contributing Drainage Area (mi ²)	Sedimentation Rate (ac-ft/yr/mi ²)	Projected 2070 Capacity (ac-ft)
	Year	Conservation Pool Capacity (ac-ft)			
Lake Tawakoni	2009	871,693	756	2.96	736,428
Lake Fork Reservoir	2009	636,504	493	3.83	522,671
Lake Gladewater	2000	4,738	35	1.33	1,480
Lake Cherokee	2015	44,475	158	0.26	42,230
Brandy Branch Reservoir	*	29,513	4	0.24	29,429
Martin Lake	2014	75,726	130	0.37	73,097
Murvaul Lake	1998	38,284	115	1.64	24,873
Toledo Bend Reservoir	*	4,477,000	5,384	0.12	4,410,291
Lake Hawkins	1962	11,890	30	0.24	11,117
Lake Holbrook	*	7,990	15	0.24	7,604
Lake Quitman	*	7,440	31	0.24	6,639
Lake Winnsboro	*	8,100	27	0.24	7,403

* No recent survey available. Conservation pool capacity reflects design capacity.

Firm Yield of Toledo Bend Reservoir

Hydropower operations at Toledo Bend were excluded during the determination of total available supply from the lake. However, hydropower operations were included in the evaluation of supplies for all other reservoirs and run-of-river supplies. The canal water rights owned by Sabine River Authority (SRA) in the lower basin modeled as being subordinate to diversions from Toledo Bend Reservoir for the purposes of determining firm yield. The remainder of the yield of Toledo Bend was evaluated assuming all diversions were taken lakeside. Within the WAM, all diversions from the lake are shared equally between SRA-Texas and SRA-Louisiana, including the additional unpermitted yield.