



October 20, 2023

Mr. Lann Bookout  
Region G Project Manager  
Texas Water Development Board  
P.O. Box 12321  
Austin Texas 78711

This document is released for the purpose of information exchange review and planning only under the authority of Tony L. Smith, P.E., September 21, 2023, TX PE#92620.

Subject: Hydrologic Variance Request for the Determination of Water Availability and Water Supplies for the 2026 Brazos G Regional Water Plan (Region G)

Dear Mr. Bookout:

The Brazos G Regional Water Planning Group (Brazos G RWPG) met on October 20, 2023, to discuss the process for determining the amount of surface water available from existing surface water sources and future water management strategies using the guidance provided by the Texas Water Development Board (TWDB) in the scope of work for the present cycle of Regional Water Planning. During this meeting, the Brazos G RWPG discussed the approach for determining water availability within the region, noting where specific variances from the standard TWDB guidance will be employed towards development of the 2026 Brazos G Regional Water Plan.

The Brazos G RWPG approved submittal of this letter and the accompanying attachments, requesting that the TWDB allow the Brazos G RWPG to use the approaches detailed herein throughout the regional planning process for analyses that determine surface water availability to existing rights and for analyses to determine the potential supplies available from new water management strategies and water management strategy projects.

### Surface Water Supplies

The Brazos G planning area is located primarily within the Brazos River Basin. Small areas of the region are in the Colorado, Red, and Trinity River Basins. Surface waters in each of these river basins serve as a source of water to Brazos G. In its guidelines for Regional Water Planning, the TWDB requires that water availability be based on results derived from the official Texas Commission on Environmental Quality (TCEQ) Water Availability Models (WAMs), unless a hydrologic variance request is submitted.

The TCEQ WAMs, which have been developed for all river basins in Texas, simulate the management, operation, and use of streamflow and reservoirs over a historical period of record, adhering to the prior appropriation doctrine that governs Texas' water right priority system. The TCEQ WAMs are the fundamental tools used to determine surface water availability for water rights permitting and contain information about water rights in each respective river basin.

There are several versions of each of these WAMs. TWDB guidance stipulates that regional water planning groups use the Full Authorization version that TCEQ employs to analyze applications for perpetual water rights. This scenario is often referred to as WAM "Run 3." The assumptions in the TCEQ WAM Run 3 are conservatively modeled for permitting purposes, allowing for consideration of water supply availability under drought-of-record conditions to ensure water demands can be met under critical circumstances.

Page 2

For the purposes of the development of the 2026 Brazos G Water Plan, the “Run 3” WAMs for the Brazos River Basin will be updated to determine surface water availabilities in the region. To reflect the current and future conditions of the region, the following hydrologic variances are summarized below. The hydrologic variance request form provided by the TWDB has been completed for the Brazos River Basin, and is included in Attachment A.

### **Firm Yield**

“Firm Yield” is defined in the Texas Administrative Code 31 TAC §357.10 (14) as the:

“Maximum amount of water that is physically and legally accessible from existing sources for immediate use by a Water User Group under a repeat of Drought of Record conditions.”

In accordance with regional water planning rules and guidance, firm yields for existing reservoirs and water management strategies contemplating a reservoir within Region G will be reported within the 2026 Brazos G Plan based on the modeled results from the applicable WAM for the basin in which the reservoir is located.

### **Drought Worse than the Drought of Record**

Per TWDB guidance, regional water plans must address water supply needs during a repeat of the drought of record. The generated values of supplies, demands, and population all have associated ranges of uncertainty. Although the limited regional planning resources may not support evaluating a range of or multiple scenarios and although assessments of the likelihood of droughts potentially worse than the drought of record (DWDOR) are not required, RWPGs may choose to consider scenarios and/or qualitatively address uncertainty and DWDOR in their region. Such assessments can be used to more explicitly recognize or acknowledge the relative uncertainties in the planning process and the potential risks without necessarily modifying the plan to mitigate those risks.

If evaluations performed by water providers within Brazos G include considerations of potential impacts of a DWDOR, these evaluations will be documented within Chapter 8 of the 2026 Brazos G Plan and considered for informing upon legislative and regional policy recommendations of the Brazos G RWPG within that chapter.

### **General Hydrologic Assumptions**

The Brazos G RWPG will assess surface water availability in a manner that accurately reflects water supplies that are available for use. The Brazos G RWPG requests that the TWDB approve the following assumptions for use in representing existing supplies and potential future surface water supplies in the 2026 Brazos G Water Plan. The WAMs containing the necessary modifications to the TCEQ WAM that incorporate these assumptions will be referred to as the “Region G WAMs.” A general summary of the models and assumptions to be employed for the evaluation of existing water supply and water management strategies (WMS’s) is provided below.



Assumption	Use for Existing Supplies	Use for Water Management Strategies
<b>General</b>		
Use most recent available versions of the TCEQ WAMs.	X	X
WAM Run 3 - full consumption of existing water rights with no (zero) return flows) used as basis for specific identified modifications.	X	X
Incorporation of return flows (most recent available 5-year minimums) for permitted discharges greater than 0.9 MGD.	X	
Modeling of reuse to include consideration of minimum and permitted return flows associated with WUG in a manner consistent with TCEQ evaluations of reuse applications.		X
Channel losses based on factors employed within official TCEQ WAMs.	X	X
ASR evaluations will consider surface water availability as determined by the WAM compared to demand, with the firm supply being the maximum demand that could be met assuming a repetition of the period of record drought.		X
Adopted environmental flow standards will be used as incorporated into the applicable official TCEQ WAMs	X	X
Subordination of water rights will be modeled in a manner consistent with method of modeling of subordination within the official TCEQ WAMs.	X	X



Assumption	Use for Existing Supplies	Use for Water Management Strategies
The Brazos River Authority's (BRA) System Operations permit will be modeled and analyzed in a manner consistent with the terms of the water right.	X	X
<p>For municipal and industrial users:</p> <p>Run of the river rights will be determined in accordance with TWDB guidelines which state that the use-appropriate monthly percentage of the annual firm diversion must be satisfied in each and every month of the simulation period for all surface water diversions.</p> <p>Reservoirs will use firm yield unless a change is specifically requested by a reservoir owner and approved by the RWPG and TWDB, as appropriate per TWDB guidelines.</p> <p>The calculated source availabilities will be compared against existing legal and infrastructure constraints (water treatment plants, pipelines, intakes, etc.) and will be constrained if the existing infrastructure or legal capability is not sufficient to facilitate full utilization of the source. The most constrained amount will be used as the firm supply.</p>	X	X
For irrigation users, water supply will be determined using firm reliability (100%). In the absence of any supply information or justification of reliable supplies available in a drought of record, supply values will be set equal to zero.	X	X
For livestock, in the absence of any supply information or justification of reliable supplies available in a drought of record, supply values will be set to zero.	X	X
Water supply contracts will be assumed to automatically renew, unless specifically identified as otherwise by a WWP or WUG.		X



### **Brazos River Basin WAM**

For the Brazos River Basin, the most recently available official TCEQ WAM Run 3 (ver. October 1, 2023) will be employed for all availability analyses in the basin using the modeled hydrologic period of 1940-2018.

The current WAM Run 3 accumulates the BRA's contracts within various reaches throughout the river basin. Those cumulative contractual diversions will be disaggregated to the individual contract holders representing the specific WUGs and WWP. Allocation of individual contract supplies will be based on the supply available in the reach in which the contract diversion is located.

The WAM Run 3 will be modified to include available data on current and future wastewater treatment plant effluent (return flows) discharged by entities located throughout the basin that are permitted to discharge in excess of 0.9 million gallons per day (MGD) in order to evaluate existing supplies. For a conservative estimation, the magnitude of return flows added to the model will reflect the minimum wastewater discharged from the most recent 5 years of available historical discharge data. Brazos G requests this modification to improve the estimates of water available to existing water rights; improved estimates of streamflow throughout the Brazos River Basin; and to provide an estimate of wastewater flows potentially available for direct reuse throughout the Brazos River Basin. Use of return flows in the WAM will be limited to determination of existing supplies and only return flows specific to a reuse water management strategy will be added to the WAM when evaluating future strategies.

Additionally, there are agreements within the Brazos River Basin where one party agrees not to exercise a priority call on the other party's upstream junior water right during low flow periods. This increases water available to the junior water right and decreases water available to the downstream senior water right where there is insufficient flow for both water rights. While the TCEQ WAM contains several such subordination agreements, it contains only those subordination agreements which are included as a part of the legal water right. There are other subordination agreements which are not included in the language of the water right permits and therefore are not included in the WAM. The Brazos G WAM will be modified to include the following currently identified agreements:

- Possum Kingdom Reservoir water rights are subordinate to Lake Alan Henry;
- Possum Kingdom Reservoir water rights are subordinate to the City of Stamford's California Creek pump-back operation into Lake Stamford;
- Lake Waco is subordinated to the City of Clifton's 1996 priority date water right;
- Possum Kingdom Reservoir water rights are subordinated to rights held by the West Central Texas Municipal Water District in Hubbard Creek Reservoir; and
- Possum Kingdom Reservoir water rights are subordinated to rights held by the City of Abilene to divert flows from the Clear Fork of the Brazos River into Lake Fort Phantom Hill.

Other subordination agreements will also be incorporated when identified during the planning process.



For modeling of the BRA's water sources, the BRA's Little River reservoirs' (i.e., Belton, Georgetown, Granger, Proctor, and Stillhouse) modeled source availabilities will be aggregated and reported as the "Brazos River Authority Little River System." Additionally, the BRA's main stem reservoirs' (i.e., Granbury, Limestone, Possum Kingdom, Somerville, and Whitney) modeled source availabilities will be aggregated and reported as the "Brazos River Authority Main Stem System." Lastly, Aquilla Lake will be modeled and reported as the "Brazos River Authority Aquilla System."

Modeling of the BRA System Operations permit will be reported as the "BRA System Operations Permit Supply." Source availabilities will be modeled and analyzed in a manner consistent with the terms of the water right for both existing supplies and potential water management strategies.

The BRA's reservoir operating rules in WAM Run 3 are implemented in the model such that BRA's system of reservoirs operates optimally during the drought of the 1950's. However, these operating rules do not allow the system to operate optimally during more recent drought conditions. The BRA has developed more recent operational rules allowing the reservoir system to operate optimally through both the 1950's and more recent drought conditions. WAM Run 3 will be modified to incorporate these more recent rules from BRA into the model to more accurately reflect expected conditions and operations for existing supplies and potential future water management strategies.

Within the upper portion of the Brazos River Basin, reservoir owners tend to use safe yield instead of firm yield for the determination of source availability. To reflect the planning of those reservoir owners, the Brazos G RWPG requests to evaluate the available source supply from reservoirs using a firm yield or safe yield determination, depending upon the location of the reservoir and the preference of the reservoir owner. Safe yield approaches used by reservoir owners will be utilized to best reflect the operation of the reservoirs when determining reservoir supply, and are identified below.

1. Upstream of Possum Kingdom Reservoir (in the upper Brazos River Basin):
  - a. 2-year Safe Yield:
    - i. Fort Phantom Hill;
    - ii. Hubbard Creek.
  - b. 1-year Safe Yield:
    - i. Abilene;
    - ii. Cisco;
    - iii. Daniel;
    - iv. Graham-Eddleman;
    - v. Kirby;
    - vi. Stamford;
    - vii. Sweetwater;
    - viii. Sweetwater\_Trammel\_RC4128;

- ix. Lytle Lake;
- x. City of Hamlin Lake;
- xi. Anson North;
- xii. Woodson;
- xiii. Baird;
- xiv. McCarty;
- xv. Moran;
- xvi. Bryson; and
- xvii. Millers Creek Reservoir.

2. Palo Pinto County Municipal Water District No. 1 operates Lake Palo Pinto on a percent storage reserve basis, which is approximately equivalent to a 0.5-year safe yield.

For reservoirs in which a safe yield is utilized as the basis for supply, Brazos G will also determine and report the firm yield, as required by TWDB guidance.

Brazos G will utilize a modified WAM to evaluate water management strategies similar to the WAM used for determination of existing available supplies. The Modified WAM for strategy evaluation will include all of the requested variances except for:

- The addition of return flows, unless evaluating a reuse strategy.
- Loss of reservoir storage due to sedimentation.

If existing or future supplies utilize ASR, the supply evaluation will consider surface water availability as determined by the WAM compared to demand for the WUG/WWP, with the firm supply being the maximum demand that could be met assuming a repetition of the period of record drought.

These changes are requested to the WAM Run 3 for the Brazos G RWPG's modeling of the Brazos River Basin for existing sources, supplies, and future water management strategies, and other corrections noted during review of the model. As noted previously, these requested variances are also presented in the required, completed hydrologic variance form provided in Attachment A.

### **Other WAMs**

For the purposes of the 2026 Brazos G Water Plan, for the Colorado River Basin the Brazos G RWPG requests use of the Colorado WAM model as modified by the Region F and Region K RWPGs as approved by the TWDB for all availability analyses in the basin. For the Red River Basin, the Brazos G RWPG requests use of the Red River Basin WAM model as modified by the Region B RWPG and approved by the TWDB for all availability analyses in the basin. For the Trinity River Basin, the Brazos G RWPG requests use of the Trinity WAM model as modified by the Region C RWPG and approved by the TWDB for all availability analyses in the basin.



Mr. Lann Bookout  
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October 20, 2023

Page 8

### **Sedimentation**

For reservoirs with available volumetric survey information, annual sediment rate will be calculated, and loadings calculated for Year 2030 and Year 2080. Sediment distribution will be calculated through evaluation of the best-fit (based on Root Mean Squared Error) of the trapezoidal, conical, or Empirical Area Reduction Method (EARM). The 2030 and 2080 area-capacity curves will then be developed and employed within WAM. Intervening decadal yields will be linearly interpolated, unless reservoir owners request specific decadal projections utilizing the approved WAM, which will be documented consistent with TWDB guidance.

The most recent volumetric survey information will be utilized. For reservoirs lacking volumetric surveys, original area-capacity relations within TCEQ WAM Run 3 will be assumed constant.

This sedimentation process would be employed for both existing and water management strategy reservoir firm/safe yields.

If you have any questions regarding this request, please contact me at your convenience. We appreciate the TWDB's consideration of this request.

Sincerely,  
CAROLLO ENGINEERS, INC.

Tony L. Smith, P.E.  
Project Manager

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Enclosures: Attachments A - Checklist

cc: Mr. Wayne Wilson, Chair, Brazos G RWPG  
Ms. Pam Hanneman, Administrator, Brazos G RWPG





## Surface Water Hydrologic Variance Request Checklist

Texas Water Development Board (TWDB) rules<sup>1</sup> require that regional water planning groups (RWPG) use most current Water Availability Models (WAM) from the Texas Commission on Environmental Quality (TCEQ) and assume full utilization of existing water rights and no return flows for surface water supply analysis. Additionally, evaluation of existing stored surface water available during Drought of Record conditions must be based on Firm Yield using anticipated sedimentation rates. However, the TWDB rules also allow, and **we encourage**, RWPGs to use more representative, water availability modeling assumptions; better site-specific information; or justified operational procedures other than Firm Yield with written approval (via a Hydrologic Variance) from the Executive Administrator in order to better represent and therefore prepare for expected drought conditions.

RWPGs must use this checklist, which is intended to save time and reduce effort, to request a Hydrologic Variance for estimating the availability of surface water sources. For Questions 4 – 10, please indicate whether the requested variance is for determining Existing Supply, Strategy Supply, or both. Please complete a separate checklist for each river basin in which variances are being requested.

**Water Planning Region:** G

1. Which major river basin does the request apply to? Please specify if the request only applies part of the basin or only to certain reservoirs.

Brazos River Basin

2. Please give a brief, bulleted, description of the requested hydrologic variances including how the alternative availability assumptions vary from rule requirements, how the modifications will affect the associated annual availability volume(s) in the regional water plan, and why the variance is necessary or provides a better basis for planning. You must provide more-detailed descriptions in the subsequent checklist questions. Attach any available documentation supporting the request.
  - Requested variance to separate individual BRA contractual diversions from cumulative contractual diversions. The current WAM Run 3 accumulates the BRA's contracts within various reaches throughout the river basin. This modification will allocate individual contract supplies based on the modeled supply available in the reach in which the contract diversion is located. It does not affect the associated annual availability volume, only how the modeled volume is allocated to individual contract holders. This variance provides a more accurate depiction of the allocation of legally available water to each WUG/WWP, and thus provides a better basis for planning.
  - Requested variance for the addition of return flows. This is a variance from the rule requirements as WAM Run 3 contains no return flows, and would thus increase associated annual availability volumes. This requested variance is to utilize wastewater treatment plant effluent (return flows) discharged by entities located throughout the

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<sup>1</sup> 31 Texas Administrative Code (TAC) §§ 357.10(14) and 357.32(c)

- basin that are permitted to discharge in excess of 0.9 million gallons per day (MGD) in order to evaluate existing and future supplies. For a conservative estimation, the magnitude of return flows added to the model is proposed to reflect the minimum wastewater discharged from the most recent five (5) years of available historical discharge data. This variance is requested to conservatively improve the estimates of water available to existing water rights; improve estimates of streamflow throughout the Brazos Basin; and to provide a conservative estimate of wastewater flows potentially available for reuse throughout the Brazos Basin.
- Requested variance to add existing contractual subordination agreements. WAM Run 3 contains only those subordination agreements which are included as part of a water right/permit. There exist contractual subordination agreements (not presently included in WAM Run 3) within the Brazos River Basin where one party agrees not to exercise a priority call on the other party's upstream junior water right during low flow periods. This increases water available to the junior water right and decreases water available to the downstream senior water right where there is insufficient flow for both water rights. This variance results in more accuracy of the legal availability of existing supply to WUGs and WWP in the Brazos G region, and thus provides an improved basis for planning.
  - Requested variance to model and report availabilities for the Brazos River Authority (BRA) by system. For modeling of these BRA water sources, the BRA's Little River reservoirs' (i.e., Belton, Georgetown, Granger, Proctor, and Stillhouse) modeled source availabilities will be aggregated and reported as the "Brazos River Authority Little River Lake/Reservoir System." The BRA's main stem reservoirs' (i.e., Granbury, Limestone, Possum Kingdom, Somerville, and Whitney) modeled source availabilities will be aggregated and reported as the "Brazos River Authority Main Stem Lake/Reservoir System." Lastly, Aquilla Lake will be modeled and reported as the "Brazos River Authority Aquilla Lake/Reservoir System." This variance does not increase the associated annual availability volumes, but allows for more accurate allocation of supplies to WUGs and WWPs, and thus provides an improved basis for planning.
  - Requested variance to accurately reflect implementation of the BRA's System Operations permit. Modeling of the BRA System Operations permit will be reported as the "BRA System Operations Permit Supply." Annual source availability volumes will be modeled and analyzed in a manner consistent with the terms of the water right for both existing supplies and potential water management strategies. This variance allows for modeling the complexity of the BRA System Operations Permit in a manner that more accurately represents availability from this source to WWPs and WUGs, and thus provides a better basis for planning.
  - Requested variance to update reservoir operating rules to address more recent drought conditions. Updating WAM Run 3 inputs to be consistent with updated BRA operations addressing both the 1950's and more recent drought conditions will allow for a more accurate depiction of source availabilities under drought conditions, whereby annual source availability volumes may be more limited where more extreme drought conditions have affected reservoir firm yields and diversion capabilities. This increased accuracy provides an improved basis for planning during drought conditions.
  - Requested variance for use of safe yields for specific reservoirs. The use of safe yield is proposed for the purposes of the 2026 Brazos G Regional Water Plan for the

- determination of source availabilities for specific reservoirs where owners have adopted defined safe yield amounts for their operations. The safe yield amount is lower than the firm yield, thus affecting annual availability. The use of these defined safe yields for the characterization of source availability for specific reservoirs provides greater consistency with the owners' use of the source, and thus provides a more accurate depiction of availability for WUGs and WWPs, serving as a better basis for planning.
- Other corrections to the WAM that may be identified during review of the model.
  - Utilize a modified WAM for strategy evaluations similar to the WAM used for determination of existing available supplies. The Modified WAM for strategy evaluation will include all of the requested variances *except*:
    - The addition of return flows, unless evaluating a reuse strategy.
    - Loss of reservoir storage due to sedimentation.

The evaluation of a strategy will exclude these variances to ensure the more conservative estimation of water availability is determined in a manner consistent with TWDB guidelines, and thus serves as a better basis for planning strategies for WUGs and WWPs.

- ASR evaluations will consider surface water availability as determined by the WAM compared to demand for the WUG/WWP, with the firm supply being the maximum demand that could be met assuming a repetition of the period of record drought.

3. Was this request submitted in a previous planning cycle? If yes, please indicate which cycle and note how it is different, if at all, from the previous request?

Yes

- For the purposes of the 2021 Plan, the representation of individual BRA contractual diversions were added to the model as WR records to track individual supply availabilities for each contract in the reach of the applicable diversion. The present request differs from the request from the previous planning cycle, whereby for the purposes of the 2026 Plan the modeling in the WAM remains as a diversion from a reach as represented in WAM Run 3. Existing contract information will be used to allocate the available supply modeled from the diversion for each reach.
- Addition of return flows were used during the development of the 2006, 2011, 2016, and 2021 Plans following approval by the TWDB. Return flow amounts will be modified to reflect more recent discharge information.
- Inclusion of existing contractual subordination agreements were utilized in the development of the 2006, 2011, 2016, and 2021 Plans. The request is no different from the previous request.
- The reporting of BRA systems was not explicitly identified and submitted as a variance request in the previous planning cycle. However, this request is consistent with the methodology and reporting used for the purposes of the 2021 Plan, and is submitted this cycle for completeness.
- Modeling and reporting of the BRA System Operations Permit was not explicitly identified and submitted as a variance request in the previous planning cycle. However,

this request is consistent with the methodology and reporting used for the purposes of the 2021 Plan, and is submitted this cycle for completeness.

- An update of reservoir operating rules (along with inclusion of an updated, more recent hydrologic period) to more accurately reflect operations under recent drought conditions was requested and approved for the purposes of the 2021 regional water plan. With a more recently updated WAM Run 3 including an extended hydrologic period of record is now available, the portion of the request to extend the hydrologic period is no longer necessary; however, updating the reservoir operation rules is consistent with the request and approved methodology used for the purposes of the 2021 Plan.
- The use of safe yield analyses for reservoirs upstream of Possum Kingdom Reservoir and for Lake Palo Pinto were utilized in the development of the 2011, 2016, and 2021 Plans. The request is no different from the previous request.
- Corrections to the model for errors that may be identified was not submitted in the previous planning cycle.
- Utilization of the same model for strategy evaluations as is used for determination of existing available supplies was utilized in the development of the 2021 plan. The request is no different from the previous request.
- The inclusion of ASR evaluations was not explicitly identified and submitted as a variance request in the previous planning cycle.

4. Are you requesting to extend the period of record beyond the current applicable WAM hydrologic period? If yes, please describe the proposed methodology. Indicate whether you believe there is a new drought of record in the basin.

No

Choose an item.

[Click or tap here to enter text.](#)

5. Are you requesting to use a reservoir safe yield? If yes, please describe in detail how the safe yield would be calculated and defined, which reservoir(s) it would apply to, and why the modification is needed or preferable for drought planning purposes.

Yes

Existing and Strategy Supply

Reservoir owners upstream of Possum Kingdom Reservoir (in the upper Brazos Basin) utilize 1-year and 2-year safe yields, which are used as the preferred basis for determining supply. Additionally, the Palo Pinto County Municipal Water District No. 1 operates Lake Palo Pinto on a percent storage reserve basis, which is approximately equivalent to a 0.5-year safe yield. These safe yield assumptions are used to best reflect the operation of the reservoirs.

Safe Yield Reservoirs are:

0.5-year Safe Yield: Palo Pinto.

2-year Safe Yield: Fort Phantom Hill, Hubbard Creek.

1-year Safe Yield: Abilene, Cisco, Daniel, Graham-Eddleman, Kirby, Stamford, Sweetwater, Sweetwater\_Trammel\_RC4128, Lytle Lake, City of Hamlin Lake, Anson North, Woodson, Baird, McCarty, Moran, Bryson, and Millers Creek Reservoir.

6. Are you requesting to use a reservoir yield other than firm yield or safe yield? If yes, please describe, in a bulleted list, each modification requested including how the alternative yield was calculated, which reservoir(s) it applies to, and why the modification is needed or preferable for drought planning purposes. Examples of alternative reservoir yield analyses may include using an alternative reservoir level, conditional reliability, or other special reservoir operations.

No

Choose an item.

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7. Are you requesting to use a different model (such as a RiverWare or Excel-based models) than RUN 3 of the applicable TCEQ WAM? If yes, please describe the model being considered including how it incorporates water rights and prior appropriation and how it is more conservative than RUN 3 of the applicable TCEQ WAM.

No

Choose an item.

[Click or tap here to enter text.](#)

8. Are you requesting to use a modified TCEQ WAM? If yes, please describe in a bulleted list all modifications in detail including all specific changes to the WAM and whether the modified WAM is more conservative than the TCEQ WAM RUN 3. Examples of WAM modifications may include adding subordination agreements, contracts, updated water rights, modified spring flows, updated lake evaporation, updated sedimentation<sup>2</sup>, system or reservoir operations, or special operational procedures into the WAM.

Yes

Existing and Strategy Supply

- Requested variance to separate individual BRA contractual diversions from cumulative contractual diversions. The current WAM Run 3 accumulates the BRA's contracts within

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<sup>2</sup> Updating anticipated sedimentation rates does not require a hydrologic variance under 31 TAC § 357.10(14). The Technical Memorandum will require providing details regarding the sedimentation methodology utilized. Please consider providing that information with this request.

- various reaches throughout the river basin. Those cumulative contractual diversions will be calculated in the WAM, then disaggregated to the individual contract holders representing specific WUGs and WWPs utilizing contract information and supply availabilities. Allocation of individual contract supplies will be based on the modeled supply available in the reach in which the contract diversion is located. This variance provides a more accurate depiction of the allocation of legally available water to each WUG/WWP, and thus provides a better basis for planning.
- Addition of return flows for permitted wastewater treatment plant effluent in excess of 0.9 MGD, the magnitudes of which will be based on the minimum discharge from the most recent five (5) years of available historical discharge data. Return flows will be modeled in the WAM through the use of CI records which adds flow to the model at the beginning of the priority loop, making these amounts available to all water rights. This is consistent with TCEQ modeling of return flows when evaluating permits dependent upon return flows. Use of return flows in the WAM will be limited to the determination of existing supplies and only return flows specific to a reuse water management strategy will be added to the WAM when evaluating future strategies.
  - Additionally, there are agreements within the Brazos River Basin where one party agrees not to exercise a priority call on the other party's upstream junior water right during low flow periods. This increases water available to the junior water right and decreases water available to the downstream senior water right where there is insufficient flow for both water rights. While the TCEQ WAM contains several such subordination agreements, it contains only those subordination agreements which are included as a part of the legal water right. There are other subordination agreements which are not included in the language of the water right permits and therefore are not included in the WAM. The Brazos G WAM will be modified to include the following currently identified agreements:
    - Possum Kingdom Reservoir water rights are subordinate to Lake Alan Henry;
    - Possum Kingdom Reservoir water rights are subordinate to the City of Stamford's California Creek pump-back operation into Lake Stamford;
    - Lake Waco is subordinated to the City of Clifton's 1996 priority date water right;
    - Possum Kingdom Reservoir water rights are subordinated to rights held by the West Central Texas Municipal Water District in Hubbard Creek Reservoir; and
    - Possum Kingdom Reservoir water rights are subordinated to rights held by the City of Abilene to divert flows from the Clear Fork of the Brazos River into Lake Fort Phantom Hill.

Other subordination agreements will also be incorporated when identified during the planning process.

The addition of subordination agreements not described in water right permits will be modeled in the WAM by modifying the diversion made senior to the subject reservoirs with a PX 1 record and with a PX 2 with an option enabled to disregard the subordinated reservoir and downstream reservoirs when determining available streamflow for depletion.

- Annual source availability volumes of BRA’s System Operations permit will be modeled and analyzed in a manner consistent with the terms of the water right for both existing supplies and potential water management strategies. Modifications to the WAM will entail modification of records of type PX, OR, TO, WR, and WS to distribute diversions in a manner consistent with the permit while reflecting supply operations as operated by BRA.
  - Update reservoir operating rules to work correctly under recent drought conditions. The revised operating rules involve releases from additional reservoirs within BRA’s system. Modifications to the WAM will utilize additional WR, WS, and OR records to model the updated operation rules.
  - Reservoir firm yields will be modeled using the FY card. Reservoir safe yield will be modeled as a diversion wherein the minimum annual storage volume is equal to the diversion target times the number of years the safe yield represents.
  - Update the WAM storage area curve data for major reservoirs to represent sedimentation effects for the planning decades. New storage area curves will be developed for each planning decade. Sedimentation effects will be estimated using the methodology proffered by the TWDB.
  - Other corrections of errors if noted during application of the models.
  - Evaluate ASR strategy supplies by modeling the firm yield of the surface water supply used for ASR. The maximum demand that could be met by the ASR strategy, assuming a repetition of the period of record drought, would be the firm yield identified in the WAM.
9. Are you requesting to include return flows in the modeling? If yes, are you doing so to model an indirect reuse water management strategy (WMS)? Please provide complete details regarding the proposed methodology for determining reuse WMS availability.

Yes

#### Existing and Strategy Supply

For the determination of existing supplies, for wastewater treatment plant discharges permitted for more than 0.9 MGD, the magnitudes of the return flows added to the WAM are to be the minimum discharge from the most recent five (5) years of available historical discharge data.

For evaluation of indirect reuse WMSs, a conservatively low estimate of return flows available to the strategy will be utilized. It will be assumed that 25% of existing discharges would be directly reused and not continued to be discharged, and 50% of increases in wastewater plant discharges would be directly reused.

10. Are any of the requested Hydrologic Variances also planned to be used by another region for the same basin? If yes, please indicate the other Region. Please indicate if unknown.

Yes

Coordination between Region G and other regional water planning groups has, and will continue to be performed, to ensure consistency in the representations of existing supplies and strategies between regions in a manner ascribing to the TWDB's guidelines and statutory requirements.

11. Please describe any other variance requests not captured on this checklist or add any other information regarding the variance requests on this checklist.

No additional variance requests.