

# Appendix N

## Hydrologic Variance Request

N-1. Brazos G Memorandum – Hydrologic Variance Request for Surface Water Availability Analyses in Brazos G

N-2. TWDB Letter – Brazos G Regional Water Planning Group (RWPG) request for approval to modify surface water availability modeling assumptions for development of the 2021 Brazos G Regional Water Plan (RWP)

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# Memorandum

Date: Friday, February 23, 2018

Project: 2021 Brazos G Regional Water Plan

To: Jeff Walker, Executive Administrator, Texas Water Development Board

CC: Brazos G RWPG, Thomas Barnett, Stephen Hamlin

From: David D. Dunn, P.E.

Subject: Hydrologic Variance Request for Surface Water Availability Analyses in Brazos G

The Brazos G Regional Water Planning Group (Brazos G) met on February 7, 2018 and discussed the process to determine the amount of surface water available from existing water rights and future water management strategies. During this meeting, Brazos G discussed specific deviations from the standard Texas Water Development Board (TWDB) guidance that will be employed to develop the 2021 Brazos G Regional Water Plan. As you know, the guidance provided by the TWDB in the base scope of work for the Fifth Cycle of Regional Water Planning requires the use of the Run 3 (full authorization) version of the Brazos River Basin and Brazos-San Jacinto Coastal Basin Water Availability Model (Brazos WAM) maintained by the Texas Commission on Environmental Quality (TCEQ). This model is used by the TCEQ for evaluating legal water available to applications for new or amended water rights, and as such, includes some aspects that limit its usefulness for water planning.

Brazos G requests that the TWDB allow specific variations from the base TCEQ Brazos WAM for analyses that determine surface water available to existing rights. These variations will allow a more accurate assessment of supplies available to existing water rights, and will provide consistency with the analyses used to develop the 2006, 2011 and 2016 Brazos G Plans. The resulting WAM containing these necessary modifications to the TCEQ Brazos WAM will be referred to as the “Brazos G WAM.”

1. Utilize naturalized flow and evaporation data developed by the Brazos River Authority (BRA) to extend the period of record through 2015.

The TCEQ Brazos WAM includes a period of record of 1940 – 1997. This period of record does not include the severe drought experienced recently, which in some areas of Texas has replaced the 1950’s drought as the “drought of record.” The BRA, in support of the development of its Water Management Plan for its recently-granted System Operations Permit, has extended the naturalized flow and evaporation datasets through 2015 in order to analyze the impact of the new potential drought of record on the agency’s water supplies. The hydrology has been updated throughout the Brazos Basin. Although developed in response to TCEQ requirements for the BRA’s Management Plan, the TCEQ does not consider these extended flows to be the “official” dataset for analyzing water right appropriations because the flow naturalization process did not include adjust gaged records for water rights with authorized annual diversions less than 1,000 acre-feet, reservoirs with storage less than 5,000 acre-feet, or wastewater effluent discharges less than 1 million gallons per day.. The resulting naturalized flows are somewhat more conservative (smaller) than those that would have been developed with a full flow naturalization process because diversions and water added to storage are added back into the gage flows during the flow naturalization process. The smaller return flows would

make an even smaller difference. Brazos G believes that this is a relatively small limitation in comparison to the opportunity to utilize an extended period of record that encompasses the existing and potentially new “droughts of record” in the Brazos Basin.

Benefit: Improved estimation of flows available to existing water rights considering the likelihood that a new drought of record exists in many parts of the Brazos Basin.

2. Separate individual BRA contractual diversions from cumulative contractual diversions.

The TCEQ Brazos WAM formerly assumed all diversions from storage occur lakeside and did not take into account the multiple BRA contracts located throughout the basin. The more recent TCEQ Brazos WAM now accumulates the BRA’s contracts within various reaches throughout the river basin. Those cumulative contractual diversions will need to be broken out to individual contract holders in the input data set to that water available to specific WUGs and WWP’s can be determined.

Benefits: Improved estimates of water available to WUGs and WWP’s that receive supplies from BRA.

3. Include estimated current and future return flows. (utilized in the 2006, 2011 and 2016 Brazos G Plans)

The Brazos G WAM will include a certain level of current and future return flows (wastewater treatment plant effluent) discharged by entities located throughout the basin that are permitted to discharge in excess of 0.9 million gallons per day (MGD). These return flows are based on historical discharges and projected future discharges assuming an aggressive plan for future reuse of each entity’s effluent. For determining a conservatively low estimate of return flows available to existing water rights, it was assumed that 25% of existing levels of discharge would be directly reused and not continued to be discharged, and 50% of any increases in wastewater plan flows would be reused. These return flow amounts were reviewed and acknowledged by each entity during the development of the 2006 Plan and were used during the development of the 2006, 2011 and 2016 Plans following approval by the TWDB. These return flow amounts will be revisited for the 2021 Plan and will be adjusted for any changes including new discharges, new reuse permits and requests by entities to revise their estimated discharges.

Benefits: Improved estimates of water available to existing water rights; improved estimates of streamflows throughout the Brazos Basin; provide an estimate of wastewater flows potentially available for direct reuse throughout the Brazos Basin.

4. Update reservoir operating rules to work correctly under recent drought conditions.

The reservoir operating rules in the TCEQ Brazos G WAM were developed to allow the BRA’s system of reservoirs to optimize water supply through the drought of the 1950’s. However, these operating rules do not allow the system to operate optimally during the more recent drought. The BRA has developed an alternative set of rules that allow the reservoir system to operate optimally through both the 1950’s and more recent drought, and the Brazos G WAM will incorporate these rules into the model.

5. Include existing subordination agreements in the Brazos G WAM. (utilized in the 2006, 2011 and 2016 Brazos G Plans)

Several agreements exist between parties in the Brazos River Basin whereby one party agrees to not exercise a priority call on the other party's upstream junior water right during times of low flow. This increases water available to the junior water right and decreases water available to the downstream senior water right when insufficient flows exist to satisfy both water rights. Some subordination agreements are included by TCEQ in the TCEQ Brazos WAM, but only those that are identified specifically in the language of the water rights involved. Many others are not included in the language of any water right and therefore are not included in the TCEQ Brazos WAM. The Brazos G WAM will be modified to include additional subordination agreements between entities in the Brazos Basin that are not included in the TCEQ Brazos WAM. Specific agreements currently identified to be added to the Brazos G WAM include:

- Possum Kingdom Reservoir water rights are subordinated to Lake Alan Henry;
- Possum Kingdom Reservoir water rights are subordinated 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.

Some of these may already be incorporated into the TCEQ Brazos WAM. Other subordination agreements will also be incorporated when identified during the planning process.

Benefits: Provides a more realistic determination of water available to existing water rights; improved estimates of streamflows throughout the Brazos Basin.

6. Utilize safe yield analyses for reservoirs upstream of Possum Kingdom Reservoir and for Lake Palo Pinto. (utilized in the 2011 and 2016 Brazos G Plans)

Supplies available from reservoirs will use either a firm or safe yield depending on the location of the reservoir and the preference of the reservoir owner. In the upper Brazos Basin (upstream of Possum Kingdom Reservoir), both 1-year and 2-year safe yields are used by reservoir owners as their preferred basis of supply. These same approaches will be used, as requested by individual reservoir owners to best reflect the operation of their facilities. In addition, the Palo Pinto County Municipal Water District No. 1 has decided to operate on a percent storage reserve basis for Lake Palo Pinto, which is approximately equivalent to a 0.5-year safe yield. The same safe and firm yield assumptions employed in the 2016 Plan will be used in the 2021 Plan, unless a change is specifically requested by a reservoir owner. For reservoirs in which a 0.5-, 1-, or 2-year safe yield is used as the basis for supply, Brazos G will also determine and report the firm yield, as required by TWDB guidance.

Benefits: Provides a more realistic method for determining water supplies in west Texas because it matches that area's preferred approach for managing reservoir water supplies.

7. Utilize the Brazos Mini-WAM to determine supplies in the Clear Fork portion of the Brazos Basin.

During the Phase I studies leading into the 2011 planning cycle, Brazos G developed a subset of the Brazos WAM that extended the period of record through June 2008 for a portion of the upper Brazos Basin (16 primary control points) including the Clear Fork of the Brazos River. This model is referred to as the “Brazos Mini-WAM.” This model was used to determine water available to rights in the applicable portion of the Brazos Basin for the 2011 and 2016 Brazos G Plans. Hydrology for this model has now been updated through 2015 to incorporate the potential new drought of record. Naturalized streamflows for this model were developed using all water rights in the subwatershed and therefore are somewhat more precise than those developed by the BRA for the entire Brazos Basin. Brazos G requests that Brazos G Mini-WAM be used to determine surface water supplies for its applicable portion of the upper Brazos Basin, if it is determined that it provides greater than a 10-percent difference in supply (yield or run-of-river) than results from using the hydrology updated by the BRA.

Benefit: The Brazos G Mini-WAM may provide a better estimate of water available to water rights in the applicable part of the Brazos Basin; provide water supply estimates consistent with recent permitting and management decisions made by the City of Abilene.

8. Utilize the same water supply model for strategy evaluations as is used to determine supplies available to existing water rights.

TWDB guidance requires that evaluations of new water management strategies utilize a strict application of the TCEQ Run 3 WAM. The rationale for this guidance is to ensure that the supply from a water management strategy is consistent with what might actually be permitted by the TCEQ. However, TCEQ takes into account more information than a simple application of the WAM when making water right permitting decisions. Additionally, many water management strategies utilize or are intended to supplement existing supplies, and therefore should be evaluated consistent with the existing supplies they are intended to supplement. The existing supply and the supplementing water management strategy need to be evaluated consistently. Furthermore, the same aspects of the Run 3 WAM that limit its usefulness for determining supplies available to existing rights also limit its ability to determine supplies to new water management strategies. The TCEQ Run 3 WAM is a legal permitting tool that has only limited utility for water supply planning. Brazos G requests that the Brazos G WAM be utilized to evaluate water management strategies instead of the base TCEQ Run 3 WAM.

Benefits: This will provide a consistent basis of evaluation between existing supplies and new water management strategies.

Brazos G thanks the TWDB for considering these alternative technical approaches for determining surface water supplies to existing water rights and new water management strategies. We welcome any questions you may have regarding this hydrologic variance request for surface water supplies. Note that we have coordinated with the technical consultants for Region O and Region H, and they have indicated they intend to utilize the same approaches as outlined above.

Please direct any questions to the Brazos G technical consultant, David Dunn of HDR at [david.dunn@hdrinc.com](mailto:david.dunn@hdrinc.com) or (512) 912-5136.

April 17, 2018

Mr. Wayne Wilson  
Region G Chair  
c/o Wilson Cattle Company  
7026 East OSR  
Bryan, TX 77808

RE: Brazos G Regional Water Planning Group (RWPG) request for approval to modify surface water availability hydrologic assumptions for development of the 2021 Brazos G Regional Water Plan (RWP)

Dear Mr. Wilson:

The Texas Water Development Board (TWDB) has reviewed the request submitted by Mr. David Dunn on behalf of the Brazos G RWPG dated February 23, 2018 for approval of alternative water supply assumptions to be used in determining surface water availability. This letter confirms that the TWDB approves the following requests:

1. Utilize naturalized flow and evaporation data developed by the Brazos River Authority (BRA), which extends the hydrologic record through 2015.
2. Separate BRA individual contractual diversions from cumulative contractual diversions.
3. Include a conservative estimate of current and future return flows.
4. Incorporate updated reservoir system operating rules to more accurately reflect recent conditions.
5. Include existing subordination agreements in the Brazos G Water Availability Model (WAM).
6. Utilize 0.5, 1, or 2-year safe yields for reservoirs upstream of Possum Kingdom Reservoir and for Lake Palo Pinto (to be clearly specified, by reservoir, in the 2021 Brazos G RWP).
7. Utilize the Brazos Mini-WAM to determine supplies in the Clear Fork sub-basin of the Brazos basin.

Region G also requested to use the same water supply assumptions for strategy evaluations as used for existing supply. While the use of these modified conditions may be reasonable for planning purposes, WAM RUN 3 would be utilized by the Texas Commission on Environmental Quality for analyzing permit applications. It is acceptable to use modified conditions for water management strategy supply evaluations only if the yield produced is

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more conservative for surface water appropriations than WAM RUN 3. However, TWDB is of the understanding that the modified conditions will result in greater yields than WAM RUN 3. Therefore, strategy evaluations involving new surface water appropriations must be based on WAM RUN 3. Accounting for subordination agreements and use of future return flows are acceptable modifications for strategy evaluations as outlined in Exhibit C, Section 5.2.1.

Although the TWDB approves the use of safe yields for developing estimates of current water supplies, firm yield for each reservoir must still be reported to TWDB in the online planning database and plan documents.

While the TWDB authorizes these modifications to evaluate existing water supplies for development of the 2021 Brazos G RWP, it is the responsibility of the RWPG to ensure that the resulting estimates of water availability are reasonable for drought planning purposes and will reflect conditions expected in the event of actual drought conditions; and in all other regards will be evaluated in accordance with the contract Exhibit C, *Second Amended General Guidelines for Fifth Cycle of Regional Water Plan Development*.

If you have any questions, please do not hesitate to contact Tom Barnett, project manager for Region G, at 512-463-4209 or via email at [thomas.barnett@twdb.texas.gov](mailto:thomas.barnett@twdb.texas.gov).

Sincerely,



Jeff Walker  
Executive Administrator

c w/o enc: Mr. Stephen Hamlin, Brazos River Authority  
Mr. David Dunn, HDR, Inc.  
Ms. Paula Jo Lemonds, HDR, Inc.  
Ms. Simone Kiel, Freese & Nichols, Inc  
Mr. Tom Barnett, TWDB