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October 11, 2023

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TO: Mr. Jeff Walker, Executive Administrator
Texas Water Development Board (TWDB)
P.O. Box 13231
1700 North Congress Avenue
Austin, Texas 78711-3231

FROM: **David Van Dresar, Lower Colorado Regional Water Planning Group (Region K) Chair**

SUBJECT: **Surface Water Hydrologic Variance Request**

On October 4, 2023, the Lower Colorado Regional Water Planning Group (Region K) authorized submitting this surface water hydrologic variance request to Texas Water Development Board (TWDB) for approval. Region K is requesting approval to use the Region K Cutoff Model (Cutoff Model) in determining availability of surface water resources and analyzing water management strategies for development of the 2026 Region K Regional Water Plan (RWP). Attached are the completed Surface Water Hydrologic Variance Request Checklist and a table for additional detail.

In the development of the 2011 Region K RWP, Region K determined that the standard Texas Commission on Environmental Quality (TCEQ) Full Authorization Water Availability Model (WAM) did not adequately reflect the historical operation of water rights and existing contractual commitments in the Colorado River Basin. Region K subsequently requested and received TWDB's approval to use a modified version of the TCEQ Full Authorization WAM, known as the Cutoff Model, in determining surface water availability and water management strategy analysis for the 2011 RWP.

Region K again requested to use the Cutoff Model for the 2016 Region K RWP, after making some updates that reflected new data and changed conditions within the basin. That request was also approved by TWDB, with limitations identified for water management strategy analysis. The Cutoff Model used for the 2021 RWP used the same assumptions as approved previously by TWDB plus some limited revisions.

Region K is requesting to use the same basic Cutoff Model assumptions with limited revisions to the assumptions used in the 2021 RWP. The attached **Surface Water Hydrologic Variance Request Checklist** provides detail on TWDB's standardized set of questions for each river basin. The attached **Table A – Summary of Region K Modeling Assumptions** outlines all of the major assumptions and identifies where a change to an assumption has been made since the 2021 RWP. It also indicates which section of TWDB's HVR Checklist correlates to each assumptions (if applicable).

There are two basic purposes for applying a Water Availability Model (WAM) in the context of regional water planning. One is to establish the available firm supply of surface water under drought of record conditions for each individual existing surface water right and for each decade of the planning period. The second is to analyze potential water management strategies for meeting projected future water demand by decade, including

strategies that potentially involve new appropriations of state water. When the Cutoff Model is applied for these specific purposes, Region K has adopted the nomenclature of “**Region K Supply Evaluation Model**” and “**Region K Strategy Evaluation Model**” to differentiate between the selections of Cutoff Model assumptions as shown in Table A. The unmodified TCEQ Full Authorization WAM is used in addition to the Strategy Evaluation Model if a water management strategy involves a new appropriation of state water.

REGION K SUPPLY EVALUATION MODEL

Region K requests to perform water supply availability analyses using the Supply Evaluation Model. This model reflects historical and current water management operations in the basin with regard to existing water rights, and as such, it provides the best informed representation of available water supplies during drought of record conditions for water rights within the Region K planning area. The basic assumptions that differ from those included in the standard TCEQ Colorado WAM Full Authorization WAM are outlined in **Table A – Summary of Region K Modeling Assumptions**.

REGION K NEW APPROPRIATION MODEL

The analysis of potential surface water-based water management strategies can involve different WAM modeling approaches depending on the nature of a particular strategy and the purpose for which the analysis is being made. For a strategy that requires a new appropriation of surface water from TCEQ, the amount of water that the strategy is capable of producing under drought of record conditions is first determined under the same permitting assumptions used by TCEQ. This means that the strategy should be analyzed using TCEQ's standard Full Authorization WAM as it currently exists with all existing water rights in the entire Colorado River Basin fully exercised in accordance with their authorized impoundment and diversion amounts and with no return flows. The basic assumptions of this Region K “New Appropriation Model” are outlined in the attached **Table A Column 2**.

REGION K STRATEGY EVALUATION MODEL

The Region K “Strategy Evaluation Model” is used for surface water-based water management strategy evaluation. This includes both surface water-based strategies that require a new appropriation and those that rely on an existing water right. Once included in the Strategy Evaluation Model, these new sources of supply then would be available to meet the projected demands for specific water users at different decades in the future. The basic assumptions for the Strategy Evaluation Model for these types of strategy planning simulations are listed in the attached **Table A Column 3**.

RECOGNITION OF IMPACTS OF CURRENT DROUGHT

At the time of this Hydrologic Variance Request (HVR), Region K is experiencing an extraordinary multi-year drought. Inflows to the Highland Lakes, on a monthly and calendar year basis, have recently been the lowest in the period of record back to 1942. However, the current drought has still not been determined to be worse than the 2010s drought which is recognized by Region K as the drought of record for planning purposes. Region K has discussed including information about current drought conditions in Chapters 3 and 7 of the plan report. As the region's naturalized flows are updated and additional hydrological information becomes available, Region K will plan to update its models to reflect this information for future planning rounds.

For this round of planning, Region K intends to use the regional water planning Drought Task (Task/Chapter 7), including Section 7.2 regarding Uncertainty and Drought(s) Worse than the Drought of Record, to advance the plan's scope in this critical arena. Region K intends to request additional TWDB funding for a study to be completed prior to the next round of planning to assess methods of quantification of uncertainty and drought(s) worse than the Drought of Record, including safe yield and other approaches. Through the Region K Policy Committee process, the planning group will consider expanding upon its 2021 RWP policy statement on Planning for Droughts Worse than the Drought of Record. This may include requesting that the Legislature increase funding for planning for uncertainty and droughts worse than the drought of record in a quantified manner.

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CONCLUSION

We believe that the WAM modeling approach outlined above is consistent with directives from TWDB regarding regional water planning and meets the requirements of TCEQ with regard to how strategies involving potential new appropriations of surface water are analyzed and represented in the regional planning process. Furthermore, we believe that this approach will provide the best-informed estimates of future available surface water supplies that reflect historical water management operations in the basin with regard to existing water rights.

We appreciate your consideration of this submittal. If you have any questions about this request, please contact me as shown below.

Respectfully submitted,



David Van Dresar
Region K Chairman
david@fayettecountygroundwater.com

Enclosures: Table A - Summary of Region K Cutoff Model Modeling Assumptions
Surface Water Hydrologic Variance Checklist

Cc: Lann Bookout, TWDB
Teresa Lutes, Region K Water Modeling Committee Chair
Neil Deeds, INTERA

TABLE A
SUMMARY OF REGION K MODELING ASSUMPTIONS
REGARDING SUPPLY AND STRATEGY ANALYSES
FOR 2026 REGIONAL PLAN DEVELOPMENT

ITEM	ASSUMPTION	(1)	(2)	(3)	Change from 2021 Planning Cycle	Pertinent HVR Checklist Question No.
		SUPPLY ANALYSIS	STRATEGY ANALYSIS			
		Region K Supply Evaluation	Region K New Appropriations	Region K Strategy Evaluation		
A	Use TCEQ Full-Basin WAM Run 3 Without Modification for New Appropriation Water Supply Strategies Analysis	No	Yes	No	No Change	2, 8
B	All Rights at and Above Ivie/Brownwood simulated prior to Downstream Rights (maintaining relative date priority in rights upstream)	Yes	No	Yes	No Change	2, 8
C	Use 1940-2016 Naturalized Flows	Yes	Yes	Yes	Changed Column 2 to "Yes". Removed "Expanded".	2, 4, 8
D	Determine Firm Yield for Buchanan-Travis Reservoir System	Yes	No	No	No Change	2, 6, 8
E	Use Sediment-Adjusted Future Reservoir Storage by Decade	Yes	No	Yes	No Change	2, 8
F	Use Lower Colorado River Authority (LCRA) 2020 Water Management Plan Environmental Flow Criteria	No*	Yes	Yes	Changed "2015" to "2020". Added "LCRA".	2, 8
G	Set All Water Right Demands at Authorized Diversion Amounts	Yes	Yes	No	No Change	2, 8
H	Include Provisions of LCRA-STP 2006 Settlement Agreement	Yes	No	Yes	No Change	2, 8
I	Include Operating Rules for Lakes Buchanan and Travis to Reflect Combined Firm Yield Operation	Yes	Yes	Yes	No change	2, 8
J	Include Latest Approved Permits and Amendments (as of 2023)	Yes	Yes	Yes	Updated to include latest approved permits and amendments in general, not LCRA's and updated date to 2023.	2, 8
K	Include LCRA 2020 Water Management Plan Highland Lakes Interruptible Water	No	Yes	Yes	Changed "2015" to "2020". Added "LCRA".	2, 8
L	Adjust LCRA 2020 Water Management Plan Environmental Flow Triggers (Decadal)	No	No	Yes	Changed "2015" to "2020" Added "LCRA".	2, 8

M	Set All Region K Municipal and Industrial Water Right Demands at Projected Future Demand Amounts by Decade	No	No	Yes	No change	2, 8
N	Modify Curtailment of Highland Lakes Interruptible Water as Necessary to Satisfy LCRA Future Firm Municipal and Industrial Demands	No	No	Yes	No change	2, 8
O	Set LCRA Lower Basin Irrigation Demands Equal to Projected Future Region K Demands by Decade	No	No	Yes	Add "Region K" before "Demands by Decade"	2, 8
P	Include LCRA Irrigation Return Flows to the Colorado River	No	No	Only As A Strategy	No Change	2, 8
Q	Include Return Flows from Austin Wastewater Treatment Plants	No	Only As A Strategy	Only As A Strategy	No Change	2, 8, 9
R	Include Other Municipal and Industrial Return Flows	No	Only As A Strategy	Only As A Strategy	No change	2, 8, 9
S	Include Reuse Provisions and Environmental Flow Requirements of LCRA Austin 2007 Settlement Agreement	No	Only As A Strategy	Only As A Strategy	No Change	2, 8

* The LCRA 2020 Water Management Plan states that the amount of firm water allocated for environmental purposes is 33,440 acre-feet per year (drought average). This amount is a commitment from the firm yield of the Highland Lakes.

Note: TCEQ SB-3 requirements will be taken into consideration in strategies involving a new appropriation of water.

Surface Water Hydrologic Variance Request Checklist

Texas Water Development Board (TWDB) rules¹ 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:

K

- 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.

Lower Colorado Basin (downstream of O.H. Ivie Reservoir and Lake Brownwood).
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- 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.

<p>Region K uses three variations of the Colorado River WAM:</p> <ul style="list-style-type: none">• <i>Region K Supply Evaluation Model.</i> This is used for the decadal supply evaluations that will be reported in Chapter 3. This includes the yield of the Lower Colorado River Authority (LCRA) system. Modifications to TCEQ WAM include:<ul style="list-style-type: none">○ Region K Cutoff assumptions<ul style="list-style-type: none">▪ This modification to the TCEQ WAM essentially creates two separate systems within the same WAM: one for upstream of O.H. Ivie Reservoir and Lake Brownwood, and another for downstream. The system above Ivie and Brownwood executes first before the downstream system, which prevents

¹ 31 Texas Administrative Code (TAC) §§ 357.10(14) and 357.32(c)the

senior rights in the lower basin from making priority calls on the upstream system. This assumption is consistent with existing agreements among water right holders and reflects the actual operation of the basin.

- No LCRA interruptible supplies or environmental flow support
 - Both of these items are part of the 2020 LCRA Water Management Plan (WMP) which is included in the Strategy Evaluation Model only.
- Sedimentation projections by decade
 - This modification to the TCEQ WAM utilizes the most recent sedimentation surveys for projecting changes to reservoir storage as storage is reduced over time due to sediment accumulation.
- *Region K New Appropriation Model.* This model is TCEQ’s Run 3 with an error correction (see below). This will be used for any strategies that require a new water right appropriation. Key features of the Region K New Appropriation Model include:
 - Priority order analysis (no cutoff)
 - 2020 LCRA WMP
 - Authorized storage capacities (no adjustments for sedimentation)
 - No external agreements
- *Region K Strategy Evaluation Model.* This model will be used to evaluate strategies that a) do not require a new water right appropriation (i.e. strategies based on existing water rights), and/or b) for strategies that use a new water right appropriation evaluated with the New Appropriation Model to meet a specific need. Modifications to TCEQ WAM include:
 - Region K Cutoff assumptions
 - LCRA interruptible supplies and environmental flow support. For future decades, we may need to adjust curtailment triggers and other related factors from the 2020 LCRA WMP modeling to protect firm supplies.
 - Sedimentation for current and future decades
 - Wastewater effluent (herein referred to as “return flows”) are only considered as a strategy

The Region K Cutoff assumptions modify the priority assumptions in Run 3 and are included in the Supply Evaluation and Strategy Evaluation models. These models assume that all water rights at and above Lakes O.H. Ivie and Brownwood are simulated prior to downstream water rights while maintaining relative date priority in rights upstream. This assumption reflects historical, current, and expected future water management operational practices between the upper and lower Colorado Basin, and is therefore a better basis for planning. The cutoff models show increased water availability upstream of Lakes O.H. Ivie and Brownwood in Region F and decreased availability downstream in Region K.

The Region K Supply Evaluation Model does not include interruptible supplies because:

- a). TWDB Regional Planning Rules require (and Region K agrees) that supply estimates be made for firm yield conditions with all water rights fully utilized.

b). Including LCRA's 2020 WMP operation into the supply analysis does not align with the requirement to use firm yield. The LCRA WMP is a near-term operational plan that is not based on the full utilization of senior water rights.

The Region K Supply Evaluation Model represents the environmental flow support as an LCRA commitment of 33,440 ac-ft/year from the firm yield of the Highland Lakes. This is consistent with how LCRA represents its commitment to environmental flows from the firm yield of the system.

The projected conditions within the Region K Strategy Evaluation does include both interruptible supplies and environmental flow support from the 2020 LCRA WMP. The curtailment triggers from the 2020 WMP may need to be modified to protect firm supplies as demand increases.

More details on these modifications may be found in the summary table in Attachment A.

A modification will be made to the models to correctly assign locations for the Twin Buttes/Nasworthy system. These location errors have been identified in previous modeling efforts but have not been incorporated into TCEQ's WAM Run 3 at this time.

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

Only substantive change from request submitted for the 2021 Region K Plan is changing the LCRA WMP cited to be the 2020 WMP.

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.

No request is being made to extend the period of record beyond the Colorado WAM hydrologic period which covers 1940-2016. The basin is currently experiencing drought conditions. However, no determination of a new drought of record has been made at the time of this variance request.

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.

No

Choose an item.

Region K will use the new Chapter 7 subsection on uncertainty and droughts worse than the drought of record (DWDOR) to advance the region's planning process towards identification of strategies that can be used to address DWDORs.

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 sedimentation², system or reservoir operations, or special operational procedures into the WAM.

Yes

Existing and Strategy Supply

The following assumptions are also summarized in the table in Attachment A.

² 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.

- All rights at and above Ivie/Brownwood are simulated prior to downstream rights, also referred to as “Region K Cutoff” (Yes for Region K Supply Evaluation Model and Region K Strategy Evaluation Model, No for Region K New Appropriation Model)
- Determine Firm Yield for Buchanan-Travis Reservoir System (Yes for Supply Analysis, No for Strategy Analysis)
- Use reservoir storage with adjustment for sedimentation projections by decade
- Include provisions of LCRA-STP 2006 Settlement Agreement
- Include operating rules for Lakes Buchanan and Travis to reflect combined Firm Yield operation
- Include any permits and amendments (as of 2023)
- Modify curtailment of Highland Lakes interruptible water as necessary to satisfy future LCRA Firm Municipal and Industrial Demands (Yes for Strategy Analysis, NA for Supply Analysis)
- Set LCRA lower basin irrigation demands equal to projected future demands by decade (Yes for Strategy Analysis, NA for Supply Analysis)
- Include LCRA Irrigation Return Flows to the Colorado River (Only when evaluating indirect use of these flows as a Strategy, No for Supply Analysis)
- Include Return Flows from Austin Wastewater Treatment Plants (Only when evaluating these flows as a Strategy, No for Supply Analysis)
- Include Other Municipal and Industrial Return Flows (Only when evaluating these flows as a Strategy, No for Supply Analysis)
- Include Reuse Provisions and Environmental Flow Requirements of LCRA-Austin 2007 Settlement Agreement (Only when evaluating the applicable flows as a Strategy, No for Supply Analysis)
- Correct the WAM input file for errors regarding the spatial location and assignment of net evaporation data for Twin Buttes Reservoir and Lake Nasworthy.

○

The common assumption used for Supply and Strategy Evaluations is the Region K cutoff assumption. This assumption differs from Run 3 in that the order of simulation is changed to allow upper basin water rights to be simulated prior to the lower basin rights. This assumption is more conservation than Run 3.

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

Strategy Supply

Return flows are not used in evaluating supplies. Return flows are only included in the strategy evaluation modeling as a water management strategy.

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

Many of these changes will be included in Region F.

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

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