

AGENDA
Lower Colorado Regional Water Planning Group
Water Modeling Committee Meeting

Freese and Nichols, 10431 Morado Circle, Building 5, Suite 300,
Conference Room "Capital of Texas", Austin, Texas 78759

September 18, 2023, 1:00 p.m.

Water Modeling Committee Members need to attend meeting in person. The following link is being provided for virtual attendance by non-committee members. Virtual attendees will be able to provide public comment under Agenda Items #3 and #10.

MS Teams virtual link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NjY0OWFIZGUtYTg1NS00ZDI1LTgxOGItZDI1NTI1NjYxNDk3%40tHread.v2/0?context=%7b%22id%22%3a%22191657ea-bcff-4385-9d04-659ef9cee515%22%2c%22oid%22%3a%2249111dd8-74af-4196-906b-20a2cf201a39%22%7d

Committee Meeting:

1. Call to order – Chair Teresa Lutes
2. Welcome and introductions – Chair Lutes
3. Receive public comments on specific issues related to agenda items 4 through 9 – limited to 3 minutes per person
4. Discuss Region K Cutoff Model and assumptions for hydrologic variance request to Texas Water Development Board (TWDB) including:
 - Draft updated Region K Cutoff Modeling Assumptions Regarding Supply and Strategy Analyses for 2026 Regional Plan Development table
 - Draft updated Region K Cutoff Modeling Assumptions Regarding Supply and Strategy Analyses for 2026 Regional Plan Development checklist
5. Take action, as appropriate, on Region K Cutoff Model and assumption recommendations for current planning cycle for hydrologic variance request to TWDB
6. Review and discuss TWDB guidelines related to uncertainty and Drought(s) Worse Than the Drought of Record (DWDOR)
7. Discuss how groundwater modeling and Modeled Available Groundwater (MAG) data feed into groundwater availability/supply estimates (time permitting)
8. Next meeting date – to be determined
9. Future agenda items – to be determined
10. General public comments – limited to 3 minutes per person
11. Adjourn

Meeting Presentation

September 18, 2023

1:00 PM

Region K Water Modeling Committee Meeting



Agenda Item 4: HVR and Model Assumptions

- a. Presentation to address comment from previous Committee meeting (10 minutes)**
- b. Answer questions on comments received on draft HVR checklist and responses (20 minutes)**
- c. Review draft HVR checklist (20 minutes)**
- d. Review updated assumption table (10 minutes)**



Lakes Buchanan and Travis as Water Supply

Lakes Buchanan
and Travis Firm
Supply



Agenda Item 5: Take Action on HVR Recommendations

Take action, as appropriate, on Region K Cutoff Model and assumption recommendations for current planning cycle for hydrologic variance request to TWDB.



Agenda Item 6: Uncertainty and DWDOR

Review and discuss TWDB guidelines related to uncertainty and Drought(s) Worse Than the Drought of Record (DWDOR)



RWP Tasks/Chapters 1 – 8

1. Area Description
 2. Population and Demand
 3. Supplies
 4. Needs
 5. Strategies
 6. Impacts
 7. Drought Response
 8. Stream segments, reservoir sites, policy recommendations
-
- Hydrologic Variance Request to address work required for Tasks 3 and 5
- DWDOR and Uncertainty addressed within new Task 7 item

Task/Chapter 7 – Drought Response Information, Activities, and Recommendations

- 7.1 Drought of record
- 7.2 Uncertainty and drought(s) worse than the drought of record
- 7.3 Description of current preparations for drought
- 7.4 RWPA drought response triggers and actions
- 7.5 Existing and potential emergency interconnects
- 7.6 RWPG drought management WMS
- 7.7 Emergency responses to local drought conditions
- 7.8 Other drought-related considerations and recommendations
- 7.9 Development of Region-Specific Model Drought Contingency Plans

2021 Region K Plan – DWDOR Policy Statement 8.1.14.2

The LCRWPG recommends the following:

- The State should provide funding for a study to:
 - identify the potential incremental impacts to the State’s water resources for a range of DWDR events given the current planning process based on drought of record events,
 - recommend changes to the planning process to facilitate the development of water management strategies by RWPGs to address DWDR events, and
 - recommend methodologies for development of DWDR conditions for RWPGs to including in the planning process.
- Prior to the Sixth Cycle of Regional Water Planning, the TWDB should consider including in the Guidelines to RWPGs additional options and examples of variance requests to address DWDR planning.
- If appropriate, upon completion of the aforementioned study and prior to the Seventh Cycle of Regional Water Planning, the State should consider initiating a rulemaking process to amend TAC Title 31 Chapters 357 and 358 to incorporate planning for DWDR events and the associated water management strategies into the Regional and State Water Plans to improve risk management and the resiliency of future water supplies for the state.

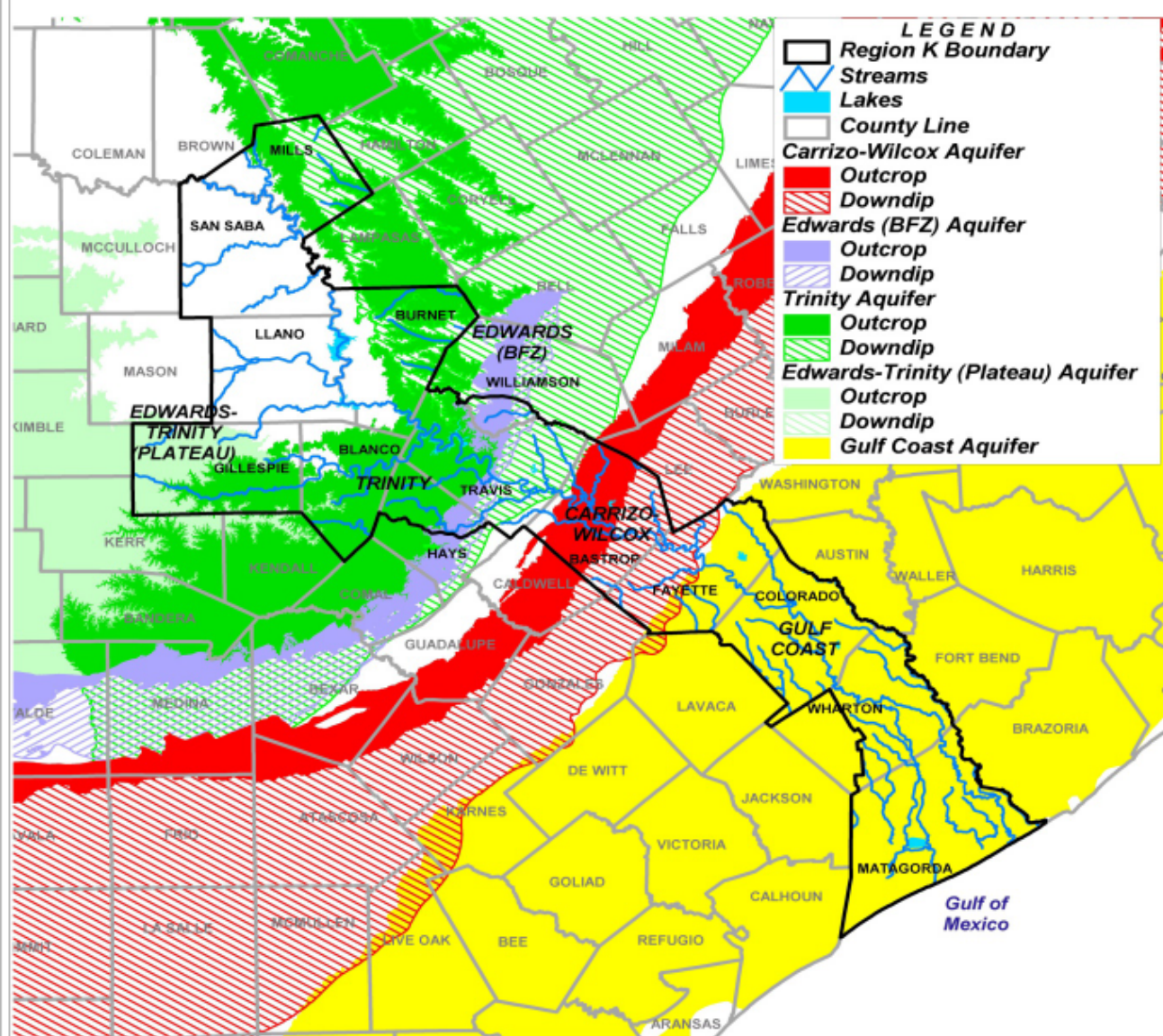
Task/Chapter 7 – TWDB Guidelines

- RWPGs may choose to consider scenarios and/or qualitatively address uncertainty and DWDOR in their region.
- These scenarios or qualitative assessments can be used to more explicitly recognize or acknowledge the relative uncertainties in planning factors (population, demand, supply) and the potential risks without necessarily modifying the plan to mitigate those risks.

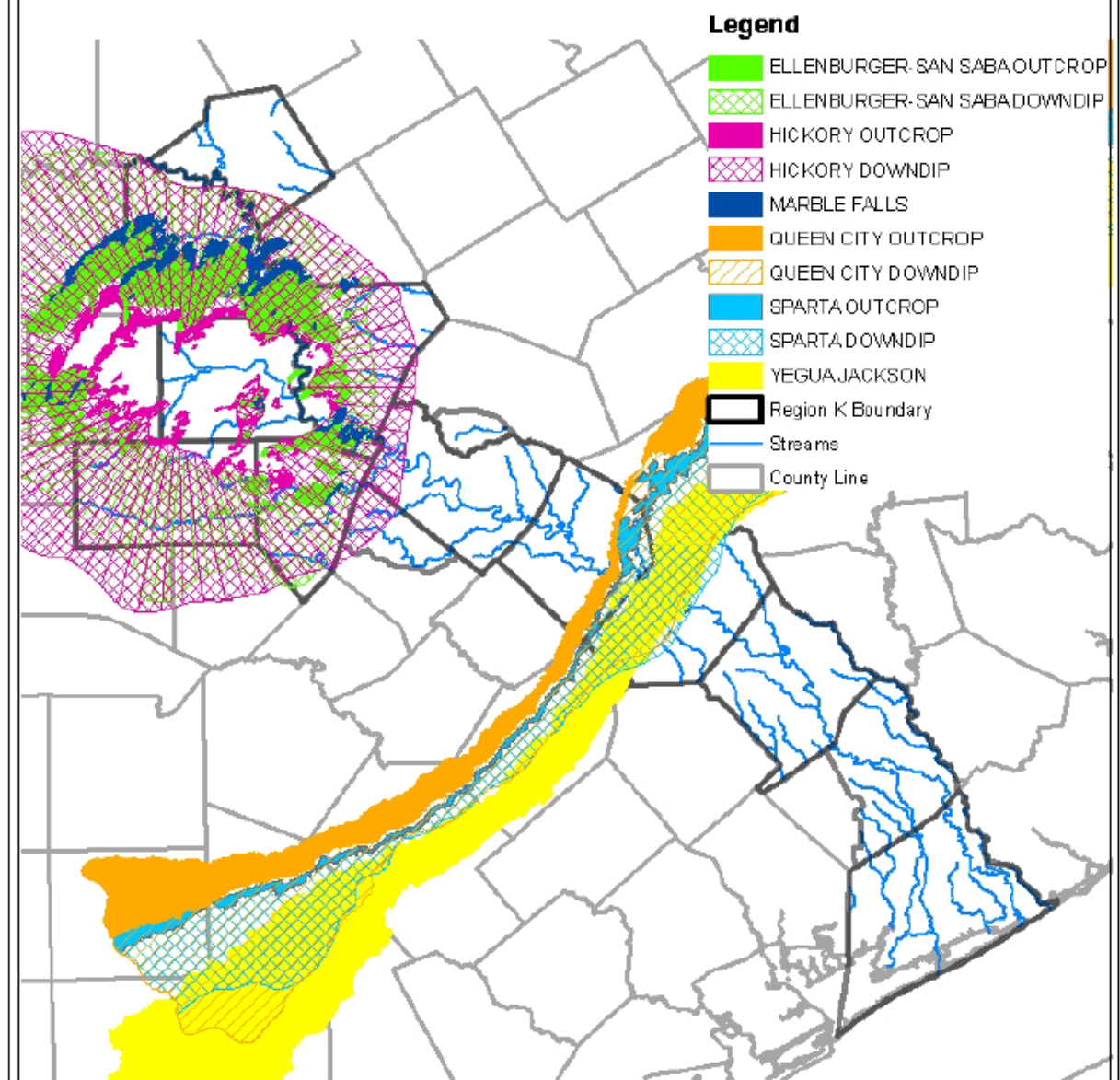
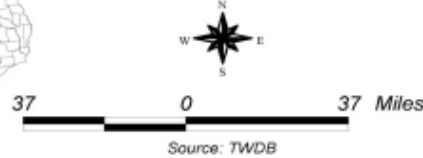
Agenda Item 7: Groundwater Availability

Discuss how groundwater modeling and Modeled Available Groundwater (MAG) data feed into groundwater availability/supply estimates

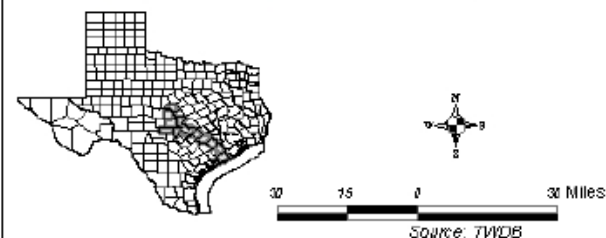




Major Aquifers

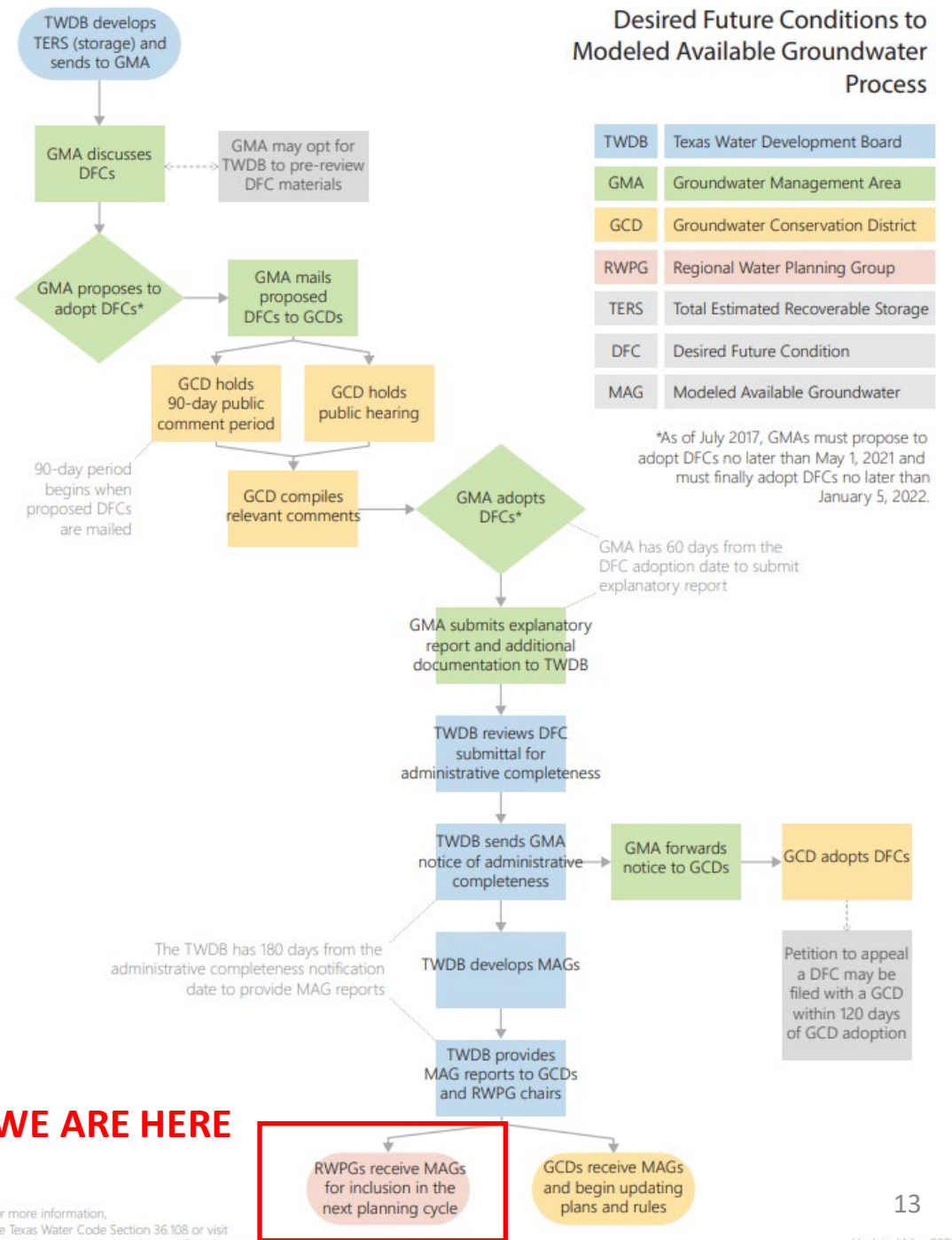


Minor Aquifers



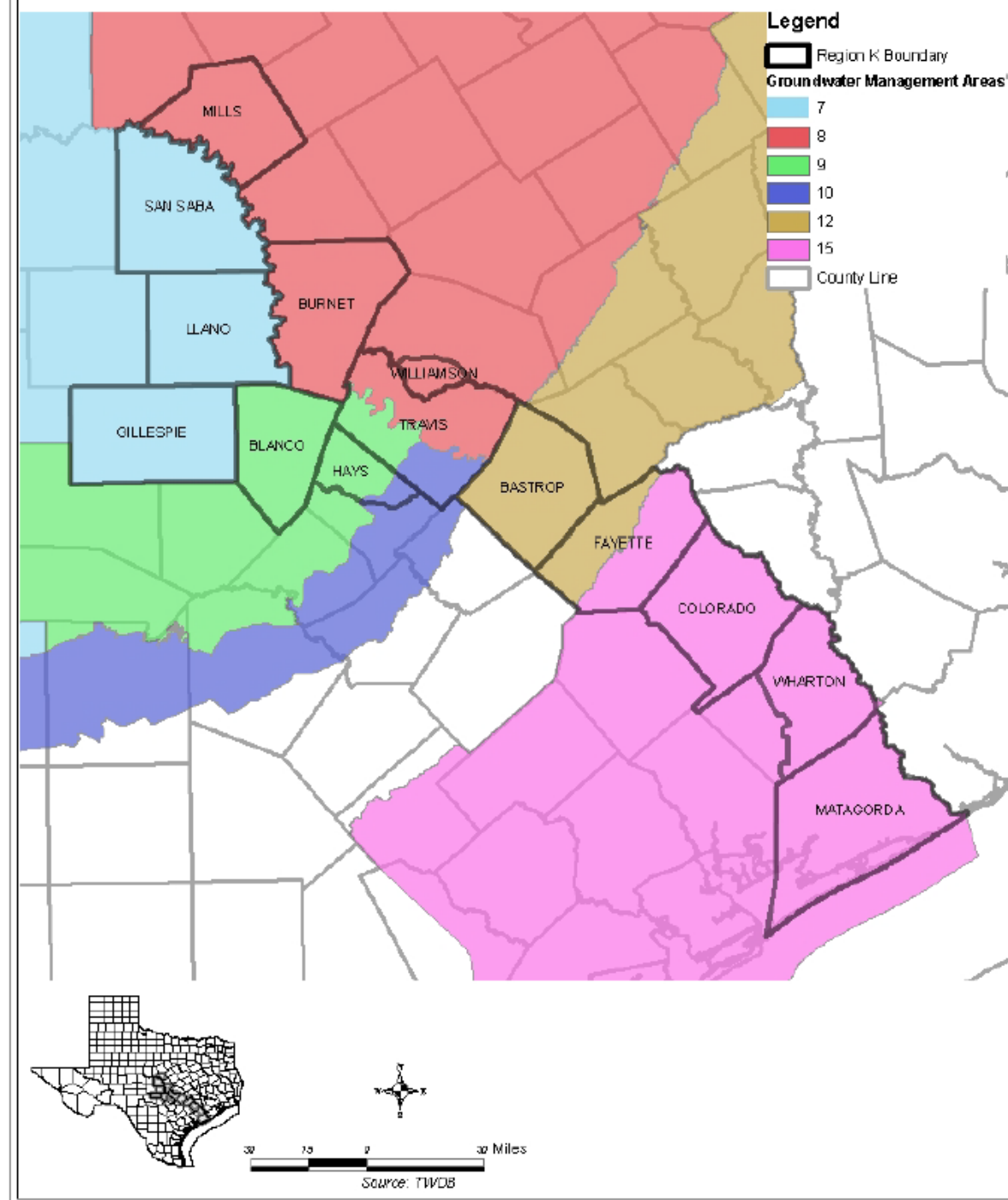
Groundwater Planning

- Groundwater Management Areas (GMAs) set Desired Future Conditions (DFCs) which is a “future state of the aquifer”
- Texas Water Development Board runs groundwater models to determine how much pumping can occur while meeting DFCs
 - This pumping is called “modeled available groundwater” (MAG)
 - MAG values were available early 2023, and finalized/amended in May 2023



GMA's in Region K

- GMA's 7, 8, 9, 10, 12, 15



How are the MAGs Used in Regional Planning?

- If a MAG has been established for a particular aquifer, the TWDB requires that the MAG be considered the maximum amount of groundwater available
- Where a MAG is not established for an aquifer, the local GCD or GMA representative should be consulted regarding an appropriate availability volume
- Some flexibility by decade is available through “MAG peaking factors”



Modeled Available Groundwater (MAG) Peak Factor

Texas Water Code (TWC) §36.1132 requires management of groundwater production on a long-term basis to achieve applicable desired future conditions. In practice, this may include variations in pumping from year to year, for example, in response to relative wet and dry periods. Modeled available groundwater (MAG) is the amount of water that the Texas Water Development Board (TWDB) Executive Administrator determines may be produced on an average annual basis to achieve a desired future condition. Most of the MAG values were developed using groundwater availability models calibrated for long-term average, not drought of record, conditions.

In response to stakeholder concerns during the fourth cycle of regional water planning, the TWDB revised its planning rules to include a MAG Peak Factor that ensures regional water plans have the ability to fully reflect how, under current statute, groundwater conservation districts anticipate managing groundwater production under drought conditions.¹

What is the MAG Peak Factor?

The purpose of the MAG Peak Factor is to

- provide reasonable flexibility and temporary accommodation of increased groundwater pumping above the MAG;
- accommodate anticipated fluctuations in pumping between wet and dry periods, or to account for other shifts in the timing of pumping while remaining consistent with desired future conditions;
- allow regional water planning groups to develop plans that reflect more realistic drought condition groundwater availability and pumping, where appropriate; and
- maintain the integrity of the regional and state water planning process.

The use of proposed MAG Peak Factors requires review and approval by relevant groundwater conservation districts, groundwater management areas, regional water planning groups, and the TWDB Executive Administrator.

Subject to many factors, the MAG Peak Factor might be considered in instances, for example, where

- actual pumping in wetter years is expected to fall below the MAG, thereby allowing intermittent pumping of volumes greater than the MAG during drought; or,

- groundwater pumping in early decades is expected to consistently remain well below the MAG, thereby accommodating pumping volumes somewhat higher than the MAG in later decades—all while achieving the desired future condition.

The MAG is the amount of water that can be produced on an annual average basis, instead of the amount that can be permitted. Groundwater conservation districts must consider MAGs, along with other factors in TWC §36.1132, when issuing permits for groundwater production. Accordingly, the MAG Peak Factor reflects groundwater available for pumping, not permitting, and is utilized for regional water planning purposes only. The MAG Peak Factor is not intended as a limit to permits or as guaranteed approval or pre-approval of any future permit application.

How does the process work?

It is not a mandatory requirement that regional water planning groups utilize MAG Peak Factors in the development of their regional water plans. Rather, it is the decision of each planning group, in concurrence with the relevant groundwater conservation district and groundwater management area, to determine what, if any, MAG Peak Factor is appropriate for planning efforts. A groundwater conservation district may also initiate the use of the MAG Peak Factor. The definition specifies that a MAG Peak Factor would be expressed as a percentage of modeled available groundwater (e.g., greater than 100 percent) and would represent the quantified annual groundwater availability for planning purposes.

Regional water planning groups must request the TWDB Executive Administrator's approval of each MAG Peak Factor. Each planning group request for MAG Peak Factors must

- include written approval from both the relevant groundwater conservation district, if one exists within the particular aquifer-region-county-basin split, and representatives of the groundwater management area;
- include the technical basis for the request in sufficient detail to support groundwater conservation district, groundwater management area, and the Executive Administrator evaluation; and
- document how the MAG Peak Factor will not prevent the associated groundwater conservation district(s) from managing groundwater resources to achieve the desired future condition(s).

MAGs by Aquifer (pivot table from TWDB, filtered to Region K)



RWP27 Aquifer Name	Availability Sum 2030	Availability Sum 2040	Availability Sum 2050	Availability Sum 2060	Availability Sum 2070	Availability Sum 2080
⊗ Carrizo-Wilcox Aquifer	51,818	56,324	60,815	65,571	70,734	70,734
⊗ Cross Timbers Aquifer	-	-	-	-	-	-
⊗ Edwards-BFZ Aquifer	21,417	21,417	21,417	21,417	21,417	21,417
⊗ Edwards-Trinity-Plateau Aquifer	-	-	-	-	-	-
⊗ Edwards-Trinity-Plateau, Pecos Valley, and Trinity Aquifers	4,979	4,979	4,979	4,979	4,979	4,979
⊗ Ellenburger-San Saba Aquifer	27,178	27,181	27,178	27,181	27,178	27,181
⊗ Gulf Coast Aquifer System	222,149	222,438	222,766	223,142	223,415	223,345
⊗ Hickory Aquifer	14,817	14,818	14,817	14,818	14,817	14,818
⊗ Marble Falls Aquifer	7,127	7,139	7,127	7,139	7,127	7,127
⊗ Other Aquifer	14,790	14,790	14,790	14,790	14,790	14,790
⊗ Queen City Aquifer	3,234	3,310	3,393	3,484	3,584	3,584
⊗ Sparta Aquifer	3,216	3,312	3,440	3,616	3,825	3,825
⊗ Trinity Aquifer	30,894	30,882	30,867	30,837	30,837	30,837
⊗ Yegua-Jackson Aquifer	9,984	9,984	9,983	9,983	9,983	9,983
Grand Total	411,603	416,574	421,572	426,957	432,686	432,620

Some MAGs Have Changed from the Previous Cycle (first look, comparison provided by TWDB)



Planning Region	K	
Row Labels	ailabilityDifference2030	ailabilityDifference2070
Carrizo-Wilcox Aquifer	22,119	36,157
Edwards-BFZ Aquifer	7,293	7,293
Edwards-Trinity-Plateau, Pecos Valley, and Trinity Aquifers	-	-
Ellenburger-San Saba Aquifer	8	8
Gulf Coast Aquifer System	2,374	6,986
Hickory Aquifer	2	2
Marble Falls Aquifer	2	2
Queen City Aquifer	(15)	390
Sparta Aquifer	(513)	127
Trinity Aquifer	1,791	1,792
Yegua-Jackson Aquifer	722	722
Grand Total	33,783	53,479

Draft Region K Hydrologic Variance
Request (HVR) Checklist

Clean Copy Version
(Without Track Changes)

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).

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.

Region K uses three variations of the Colorado River WAM:

- *Region K Supply Evaluation Model.* 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:
 - Region K Cutoff assumptions
 - 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.

Click or tap here to enter text.

- 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.

Click or tap here to enter text.

Draft Region K Hydrologic Variance
Request (HVR) Checklist

Track Changes Version
(Same as Clean Copy Version but with
Track Changes)

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).

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.

Region K uses three variations of the Colorado River WAM:

- *Region K Supply Evaluation Model*. 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:
 - Region K Cutoff assumptions
 - 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 Modifications to TCEQ WAM include:
 - Priority order analysis (no cutoff)
 - 2020 LCRA Water Management Plan (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 major 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 when evaluating strategies

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, and 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~~Imposing LCRA's 2020 WMP operation into the supply analysis does not align with the ~~requirement~~directive 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.

~~All the models will include corrections associated with the control point locations for the Twin Buttes/Nasworthy system. Twin Buttes Reservoir is incorrectly located, and the evaporation for Lake Nasworthy is entered at the wrong control point, so no evaporative loss is applied at Lake Nasworthy. 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 changes from request submitted for the ~~2021~~2016 Region K Plan is changing the LCRA WMP cited to be the 2020 WMP ~~and corrections at Twin Buttes/Nasworthy.~~

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 ~~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.

Click or tap here to enter text.

- 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

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.

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

- 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) (“Cutoff Assumptions”)
- 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 ~~indirect use of~~ these flows as a Strategy, No for Supply Analysis)
- Include Other Municipal and Industrial Return Flows (Only when evaluating ~~indirect use of~~ 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 ~~indirect use of~~ the applicable flows as a Strategy, No for Supply Analysis)
- Correct the WAM input DAT file for errors regarding the spatial location and assignment of net evaporation data for Twin Buttes Reservoir and Lake Nasworthy.
 - ~~WR records for Twin Buttes Reservoir to use control point C20330 instead of C20260~~
 - ~~Correct the DAT file CP record for C20260 to replicate evaporation data from C20240~~
 - ~~Correct the DAT file CP record for C20240 to read evaporation data from the EVA file for this control point.~~

These assumptions more accurately reflect the operation of supplies in Region K for supply and strategy evaluations and is therefore more conservative than Run 3. 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~~considered when evaluating strategies.~~

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.

Click or tap here to enter text.

Draft Region K Hydrologic Variance
Request (HVR) Attachment A Table

Clean Copy Version
(Without Track Changes)

DRAFT

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

NO.	ASSUMPTION	(1)	(2)	(3)	Change from 2021 Planning Cycle
		SUPPLY ANALYSIS	STRATEGY ANALYSIS		
		Region K Supply Evaluation	Region K New Appropriations	Region K Strategy Evaluation	
1	Use TCEQ Full-Basin WAM Run 3 Without Modification for New Appropriation Water Supply Strategies Analysis	No	Yes	No	No Change
2	All Rights at and Above Ivie/Brownwood simulated prior to Downstream Rights (maintaining relative date priority in rights upstream)	Yes	No	Yes	No Change
3	Use 1940-2016 Naturalized Flows	Yes	Yes	Yes	Changed Column 2 to “Yes”. Removed “Expanded”.
4	Determine Firm Yield for Buchanan-Travis Reservoir System	Yes	No	No	No Change
5	Use Sediment-Adjusted Future Reservoir Storage by Decade	Yes	No	Yes	No Change
6	Use Lower Colorado River Authority (LCRA) 2020 Water Management Plan Environmental Flow Criteria	No*	Yes	Yes	Changed "2015" to "2020". Added “LCRA”.
7	Set All Water Right Demands at Authorized Diversion Amounts	Yes	Yes	No	No Change
8	Include Provisions of LCRA-STP 2006 Settlement Agreement	Yes	No	Yes	No Change
9	Include Operating Rules for Lakes Buchanan and Travis to Reflect Combined Firm Yield Operation	Yes	Yes	Yes	No change
10	Include Latest Approved Permits and Amendments (as of 2023)	Yes	Yes	Yes	Updated to include latest approved permits and amendments in general, not just LCRA’s and updated date to 2023.
11	Include LCRA 2020 Water Management Plan Highland Lakes Interruptible Water	No	Yes	Yes	Changed "2015" to "2020". Added “LCRA”.
12	Adjust LCRA 2020 Water Management Plan Environmental Flow Triggers (Decadal)	No	No	Yes	Changed "2015" to "2020" Added “LCRA”.
13	Set All Region K Municipal and Industrial Water Right Demands at Projected Future Demand Amounts by Decade	No	No	Yes	No change
14	Modify Curtailment of Highland Lakes Interruptible Water as Necessary to Satisfy LCRA Future Firm Municipal and Industrial Demands	No	No	Yes	No change
15	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”
16	Include LCRA Irrigation Return Flows to the Colorado River	No	No	Only As A Strategy	No Change

DRAFT

17	Include Return Flows from Austin Wastewater Treatment Plants	No	Only As A Strategy	Only As A Strategy	No Change
18	Include Other Municipal and Industrial Return Flows	No	Only As A Strategy	Only As A Strategy	No change
19	Include Reuse Provisions and Environmental Flow Requirements of LCRA Austin 2007 Settlement Agreement	No	Only As A Strategy	Only As A Strategy	No Change

* 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.

Draft Region K Hydrologic Variance
Request (HVR) Attachment A Table

Track Changes Version
(Same as Clean Copy Version but with
Track Changes)

DRAFT

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

NO.	ASSUMPTION	(1)	(2)	(3)	Change from 2021+6 Planning Cycle
		SUPPLY ANALYSIS	STRATEGY ANALYSIS		
		Region K Supply Evaluation Cutoff Model by Decade	TCEQ WAM Run 3 Region K New Appropriations	Region K Strategy Evaluation Cutoff Model by Decade	
1	Use TCEQ Full-Basin WAM Run 3 Without Modification for New Appropriation Water Supply Strategies Analysis	No	Yes	No	No Change
2	All Rights at and Above Ivie/Brownwood simulated prior Senior to Downstream Rights (maintaining relative date priority in rights upstream)	Yes	No	Yes	No Change
3	Use Expanded 1940-2016 Naturalized Flows	Yes	Yes No	Yes	Changed Column 2 to "Yes". Extended hydrology period to 2016. Removed "Expanded".
4	Determine Firm Yield for Buchanan-Travis Reservoir System	Yes	No	No	No Change
5	Use Sediment-Adjusted Future Reservoir Storage by Decade	Yes	No	Yes	No Change
6	Use Lower Colorado River Authority (LCRA) 2015 2020 Water Management Plan Environmental Flow Criteria	No*	Yes	Yes	Changed "2015" to "2020"; Added a footnote for clarification. Added "LCRA".
7	Set All Water Right Demands at Authorized Diversion Amounts	Yes	Yes	No	No Change
8	Include Provisions of LCRA-STP 2006 Settlement Agreement	Yes	No	Yes	No Change
9	Include Operating Rules for Lakes Buchanan and Travis to Reflect Combined Firm Yield Operation	Yes	Yes	Yes	No change Revised "Maintain Consistent Levels of Drawdown in the Lakes" to say "Reflect Combined Firm Yield Operations"
10	Include Latest Approved LCRA Permits and Amendments (as of 2023 December 2017)	Yes	Yes	Yes	Updated to include latest approved permits and amendments in general, not just LCRA's and updated date to 2023. Added "(as of December 2017)"
11	Include LCRA 2020 2015 Water Management Plan Highland Lakes Interruptible Water	No	Yes	Yes	Changed "2015" to "2015". Added "LCRA".
12	Adjust LCRA 2020 2015 Water Management Plan Environmental Flow Triggers (Decadal)	No	No	Yes	Changed "2015" to "2015"; Added "(Decadal)" for clarification. Added "LCRA".
13	Set All Region K Municipal and Industrial Water Right Demands at Projected Future Demand Amounts by Decade	No	No	Yes	No change Expanded "M&I" to "Municipal and Industrial" for clarification
14	Modify Curtailment of Highland Lakes Interruptible Water as Necessary to Satisfy LCRA Future Firm Municipal and Industrial Demands	No	No	Yes	No change Expanded "M&I" to "Municipal and Industrial" for clarification
15	Set LCRA Lower Basin Irrigation Demands Equal to Projected Future Region K Demands by Decade	No	No	Yes	No change Removed "Weather Variable" after the word "Future" Add "Region K" before "Demands by Decade"

DRAFT

16	Include LCRA Irrigation Return Flows to the Colorado River	No	No	Only As A Strategy	No Change
17	Include Return Flows from Austin Wastewater Treatment Plants	No	Only As A Strategy	Only As A Strategy	No Change
18	Include Other Municipal and Industrial Return Flows	No	Only As A Strategy	Only As A Strategy	No changeExpanded "M&I" to "Municipal and Industrial" for clarification
19	Include Reuse Provisions and Environmental Flow Requirements of LCRA_Austin 2007 Settlement Agreement	No	Only As A Strategy	Only As A Strategy	No Change

* The LCRA 2020~~15~~ Water Management Plan states that the amount of firm water allocated for environmental purposes is 33,440 acre-feet per year (~~drought-10-year~~ 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.

Draft Region K Hydrologic Variance
Request (HVR) Checklist
Comments Matrix

Region K 2026 Plan Hydrologic Variance Request (HVR) – Modeling Committee Comment Tracking Matrix

Comments received August 21, 2023 – September 1, 2023

Comments Received Via Region K Technical Consultant Adam Conner at adam.conner@freese.com

ID & Date Comment Received	Name/Affiliation of Commenter	Comment/Question	Response
A - 8/22/23	Carol Olewin / Committee Member	“Thanks for including me in the draft review. As the Public Interest Representative on the [Regional Water Planning Group] RWPG, I found the document very difficult to understand. A lot of industry specific jargon that did not have meaning for me or a lay person. I’d suggest less run on sentences, less adjectives and use Active Voice. It’s hard to tell whether you are drafting the questionnaire or responding to the questionnaire.”	Thank you, we will make the document more approachable for the lay person.
B - 8/26/23	Barbara Johnson / Committee Member	“I have no edits to suggest for the HVR. One question about the drought document: what’s the difference between a one-year yield and a safe yield? Otherwise, that’s it. Thanks.”	Safe yield is a volume of water held in reserve, under drought of record (DOR) conditions, to account for droughts worse than the drought of record. A one-year safe yield would be a volume of water held in reserve that is equal to one year’s worth of demand.
C - 9/1/23	David Lindsay / Committee Member	In the introductory section, Mr. Lindsay recommends including language for the reader that points to the recent drought conditions. An LRE Water analysis shows that the inflows to the Highland Lakes 2019 to date are 1 million acre-feet less than the comparable period in the 2008-2016 Drought of Record.	The introductory section is written by TWDB and is part of the new TWDB-required HVR checklist template, so the recommendation is not to edit the language. However, the current drought conditions can be discussed in Chapter 3 and/or 7 of the 2026 Region K Plan, as was done for the 2016 Region K Plan while the 2010s drought was occurring. As of the time of this HVR, the current drought has not been determined to be worse than the 2010s DOR.
D - 9/1/23	David Lindsay / Committee Member	In the introductory section, Mr. Lindsay suggests that Region K should extend hydrology and furthermore utilize a hybrid/hypothetical hydrology that stacks 2019-2023 one after the other. This request is echoed in comments on Question 4.	As of the time of this HVR, the current drought has not been determined to be worse than the 2010s DOR. It is not feasible to extend hydrology with the time constraints of the regional water planning process.
E - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay recommends that Region K run the “base case” TCEQ WAM to compare to the outputs from the Region K Supply Evaluation Model.	The “base case” TCEQ WAM, unmodified, is not a firm yield model. The assumptions used to create the Region K Supply Evaluation Model are designed to provide a platform for calculating the firm yield of the region’s major water supply reservoirs. It is recommended to continue using the Region K Supply Evaluation Model for this purpose.
F - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay recommends that somewhere in the HVR checklist and in the 2026 Region K Plan itself a description of how the new Arbuckle Reservoir is accounted for in the WAM	The Arbuckle Reservoir is already included in the WAM as a part of the Gulf Coast water right. LCRA’s Garwood water right is also already included in the WAM at its fully authorized amount. As Chapter 3 is

Region K 2026 Plan Hydrologic Variance Request (HVR) – Modeling Committee Comment Tracking Matrix

Comments received August 21, 2023 – September 1, 2023

Comments Received Via Region K Technical Consultant Adam Conner at adam.conner@freese.com

		modeling. Additionally, how is the Garwood Contract included in the WAM modeling?	developed, descriptions of these types of details can be added as appropriate to provide further information about water rights.
G - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay recommends to add “and other major related factors”. Revised sentence would read “LCRA interruptible supplies and environmental flow support. For future decades, we may need to adjust curtailment triggers and other major related factors from the 2020 LCRA WMP modeling to protect firm supplies.”	Agree that there are other factors related to “LCRA interruptible supplies and environmental flow support” that need to be adjusted over the planning decades
H - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay does not concur with the statement, “Imposing LCRA’s 2020 WMP operation into the supply analysis does not align with the directive to use firm yield.” He expressed that the LCRA 2020 WMP should be included with the estimate of firm yield.	Firm yield is defined as the maximum water volume a reservoir can provide each year under a repeat of the drought of record using anticipated sedimentation rates and assuming that all senior water rights will be totally utilized and all applicable permit conditions are met. The LCRA WMP is a near-term operational plan that is not based on the full utilization of senior water rights.
I - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay asked that LCRA clarify the basis for setting aside 33,440 AFY for environmental flows from the firm yield of the Highland Lakes.	The LCRA Board has committed 33,440 acre-feet per year of LCRA’s firm water supply for environmental flows.
J - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay points out that in some recent years, LCRA has released more than 33,440 AF for environmental flows. He recommends that these newer and higher release volumes be included in the Region K Supply Evaluation Model.	LCRA’s 2020 Water Management Plan makes interruptible supply available for agricultural purposes and environmental flows because firm demands from lakes Buchanan and Travis are currently less than the firm supply from those reservoirs and other criteria have been met. As a result of the availability of interruptible supply at this time and the particular environmental flow criteria in the 2020 WMP, the quantity of water released for environmental flows in recent years has been highly variable and may exceed the Board’s commitment of 33,440 acre-feet of firm water for environmental flows. This outcome is consistent with modeling of the 2020 WMP. For long-term supply purposes, the LCRA Board has committed 33,440 acre-feet per year of firm water to be used for environmental flow purposes, which is the appropriate amount of water to include in firm supply models.
K - 9/1/23	David Lindsay / Committee Member	On Question 2, Mr. Lindsay asked for clarification related to Lake Nasworthy and Twin Buttes Reservoir.	We will change the language pertinent to Lake Nasworthy and Twin Buttes Reservoir to simply state “ A modification will be made to the models to correctly assign locations for the Twin Buttes/Nasworthy system. ”.
L - 9/1/23	David Lindsay / Committee Member	On Question 5, Mr. Lindsay recommends switching Region K’s answer to Yes for using Safe Yield, or at	Firm yield analysis used by Region K is in alignment with the method of yield calculation that TCEQ has approved for LCRA’s

Region K 2026 Plan Hydrologic Variance Request (HVR) – Modeling Committee Comment Tracking Matrix

Comments received August 21, 2023 – September 1, 2023

Comments Received Via Region K Technical Consultant Adam Conner at adam.conner@freese.com

		least providing an explanation for why Safe Yield won't be used.	lakes Buchanan and Travis. Region K will use the new Chapter 7 subsection on uncertainty and droughts worse than the drought of record (DWDORs) to advance the region's planning process towards identification of strategies that can be used to address DWDORs.
M - 9/1/23	David Lindsay / Committee Member	On Question 8, Mr. Lindsay recommends changing the assumption to include the Firm Yield of the Buchanan-Travis Reservoir System in the Region K Strategy Model.	For the same reasons that strategies are not included in the Supply Evaluation, the calculation of firm yields are not a part of the Strategy Evaluation.
N - 9/1/23	David Lindsay / Committee Member	On Question 8, Mr. Lindsay recommends changing the assumption to include LCRA lower basin irrigation demands in the Region K Supply Evaluation Model. The suggestion is to have their diversions in the model match their future demands.	Firm yield is defined as the maximum water volume a reservoir can provide each year under a repeat of the drought of record using anticipated sedimentation rates and assuming that all senior water rights will be <u>totally utilized</u> and all applicable permit conditions are met.
O - 9/1/23	David Lindsay / Committee Member	On Question 8 and 9, Mr. Lindsay recommends changing the assumption to include return flows from Austin Wastewater Treatment Plants in the Region K Supply Evaluation Model.	Municipalities and other users are permitted to fully utilize their supplies and are not required to discharge return flows. Many municipalities, including Austin, anticipate using more of their effluent in future decades to meet their demands. Therefore, the assumption of including projected return flow discharge volumes is appropriate only for the Strategy Evaluation Model after the municipality has accounted for effluent reuse strategies.
P - 9/1/23	David Lindsay / Committee Member	On Question 11, Mr. Lindsay asks whether inter basin transfers are taken into account in the Region K WAMs, and whether that needs to be mentioned in the HVR check list.	The inter basin transfers from Region K to neighboring regions are already represented in the TCEQ WAM used by Region K to form the Supply and Strategy Evaluation Models. Thus, these inter basin transfers do not need to be mentioned in the HVR checklist.

Appendix

Draft Surface Water Hydrologic Variance Request Checklist Comments and Questions Received

From: Carol Olewin [REDACTED]
Sent: Tuesday, August 22, 2023 4:51:49 PM
To: Adam Conner [REDACTED]
Subject: Re: Draft Region K Hydrologic Variance Request (HVR) Checklist

Hi Adam, Thanks for including me in the draft review. As the Public Interest Representative on the RWPG, I found the document very difficult to understand. A lot of industry specific jargon that did not have meaning for me or a lay person. I'd suggest less run on sentences, less adjectives and use Active Voice. It's hard to tell whether you are drafting the questionnaire or responding to the questionnaire.

Best Regards,
Carol Olewin

Question received from Barbara Johnson 8/25/2023

From: Barbara Johnson [REDACTED]
Sent: Saturday, August 26, 2023 11:47 AM
To: Adam Conner [REDACTED]
Subject: Re: Draft Region K Hydrologic Variance Request (HVR) Checklist

Hi Adam. I have no edits to suggest for the HDR. One question about the drought document: what's the difference between a one-year yield and a safe yield? Otherwise, that's it. Thanks.

Sent from my iPhone

Surface Water Hydrologic Variance Request Checklist DML Input to Modeling Committee 9/1/2023

Texas Water Development Board (TWDB) rules¹ require that regional water planning groups (RWPGs) use the most current Water Availability Models (WAMs) 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.

Additional relevant background information for potential inclusion the above summary:

In the above summary, it may be helpful to add some additional background information that is very relevant to our current situation and planning in Region K. It is noted above that TWDB rules require using the most current Water Availability Model (WAM), and also notes that an objective is to better prepare for expected drought condition. That point is very relevant now, as we are now experiencing a very serious drought, as noted by Phil Wilson, General Manager of LCRA, during the recent August LCRA Water Operations Committee and Board meetings.

Looking at the actual inflow data, the current drought (which began in 2019,) and very low inflow conditions, has been so serious that our region appears to now be experiencing uncharted territory. As presented during our last Modeling Committee meeting on August 21st, an LRE Water analysis (charts were provided) shows the extremely low 2019 period-to-present cumulative inflow deficit is now over 1 million acre-feet behind the comparable period in the recently established 2008-2016 Drought of Record. This represents only about 50% of the inflows into the Highland Lakes from the comparable period in the recently established 2008-2016 Drought of Record. John Hofmann, Executive Vice President of Water for LCRA, also reported in this month's August LCRA Board meetings that we had only 1 year before we could reach the next Stage 3 Drought threshold of 600,000 acre-feet of combined storage in the lakes, if the severe drought continues. An examination of the LCRA Criteria for Declaring a Drought Worse than the Drought of Record indicates that falling below 600,000 acre-feet of combined storage would trigger that Declaration, as the other 2 criteria regarding a 24-month length and meeting the prescribed drought intensity criteria would also be met. Regarding probability, the evolving opinions on meteorological drivers and

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

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

rainfall projections, are starting to reflect significant concerns that the expected El Nino conditions alone may not bring the hoped for relief, as other large factors are also currently at play, such as the entrenched high-pressure “Heat Dome” over Texas. As such, a new Drought of Record could be declared within our current planning cycle, a situation which would invalidate some important components of the planning process if the new drought of record were not included in the modeling. The current hydrology in the WAM only goes through 2016, and our current hydrology experience is that we are only getting 50% of the WAM-modeled inflows. We cannot assume and expect an El Nino will bring the hoped for relief. Phil Wilson, General Manager of LCRA, stated that we are in a serious drought, that we need everyone’s help, and that we can’t wait to take action. We need LCRA to update the hydrology included in the WAM to incorporate the dire and unprecedented conditions we are now experiencing. As such, it is **proposed that Region K request a Variance to include this hydrology information for the 2017-Present period within the WAM modeling used during this planning cycle (as noted in Item 4).**

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).

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.

Region K uses three variations of the Colorado WAM:

- **Region K Supply Evaluation Model.** This is used for the decadal supply evaluations that will be reported in Chapter 3. This includes the yield of the LCRA system. Modifications to TCEQ WAM include:
 - Region K Cutoff assumptions
 - **No LCRA interruptible supplies or environmental flow support**
 - Sedimentation projections by decade

Recommend running both the base case with current conditions for the Region K Supply Evaluation Model, and also continuing to request Variances for running another case with no LCRA Interruptible supplies or environmental flow support, because both bring value in providing information in a timely fashion that is needed to prepare for expected drought conditions.

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

- **Case for running WAM without Variances for No LCRA interruptible supplies or environmental flow support**

It is recommended that the Region K Supply Evaluation WAM be run without the Variances to learn the predicted water available for Firm customers under the current 2020 WMP requirements, with 2008-2016 hydrology.

The TWDB checklist implies the base case is to run the Supply Evaluation WAM in a manner that incorporate all aspects of LCRA's existing 2020 WMP Permit 5838, which would include the requirements for maximum seasonal interruptible supplies and required releases for environmental sustenance.

Regarding purpose - in simple and practical terms, many people think of Firm Yield as the volume of water that is available for Firm Customers each year through a repeat of the current Drought of Record (2008-2016) conditions. Running the Supply Evaluation WAM without excluding the interruptible and environmental release requirements provides very important information that will let us know how much water is currently available for Firm Customers using the 2008-2016 hydrology and under the current interruptible and environmental release rules included in the LCRA 2020 WMP. Given the severity of the drought we are currently experiencing, this is important information to know as soon as possible so we can make better and more timely water planning decisions. It is expected that running the WAM under with current 2020 WMP stipulations for environmental flows and interruptible releases will show that satisfying these requirements produces a significant reduction in water available for other uses, including for providing to LCRA's current firm customers. Modeling performed by LRE Water shows including all 2020 WMP release provisions results in a reduction of slightly over 100,000 acre-feet of water available for firm customers. As noted above, **it is recommended that the Region K Supply Evaluation WAM be run without the Variances to learn the predicted water available for Firm customers under the current 2020 WMP requirements, with 2008-2016 hydrology.** This appears to support the primary directive that there is sufficient water available to meet the demands of Firm Customers through a "repeat of the drought of record". This approach will provide an assessment of current Firm Demand vs Current Predicted Firm Customer Supply, recognizing that the 2020 WMP effectively prioritizes environmental flows and interruptible releases over providing water to firm customers. Given the previously noted and currently observed adverse changes in inflows/hydrology since the 2008-2016 period, and the dramatic growth being experienced by the region, where Firm Demands in 2022 appear to have already reached the Firm Demands planned for in the 2020 WMP, this is important information to learn and understand, and I am unaware of this information having ever been reported. In terms of relevance of the 2020 WMP to this planning cycle, the potential long timing required to update the 2020 WMP and get TCEQ approval, this current 2020 WMP could well be still in effect and current in 2030.

- **Support Case for running WAM with Variances for No LCRA interruptible supplies or environmental flow support, if also run without variances (above)**

It is understood that Region K has always run the Supply Evaluation Model with TWDB approved Variances to exclude the impacts of the WMPs that require major releases of water

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

for interruptible and environmental requirements. It is further understood that the identification of the maximum amount of water that could be available in the distant future, if and when all currently required interruptible and environmental release requirements are removed, is important to know. This modeling would provide a theoretical maximum of the current water that could be available for all uses if the inflows from 2008-2016 were available and all of the WMP requirements could somehow be removed.

It is recognized that knowledge of this maximum yield resulting from the 2008-2016 hydrology does provide insights and value, but there are concerns as to the practical ability and timing that this would require.

- **Region K New Appropriation Model.** This model is TCEQ's Run 3 with an error correction (see below). This will be used for assessing any strategies that require a new appropriation. Modifications to TCEQ WAM include:
 - Priority order analysis (no cutoff)
 - 2020 LCRA Water Management Plan (WMP)
 - Authorized storage capacities (no adjustments for sedimentation)
 - No external agreements

Regarding authorized storage capacities – I recommend we consider incorporating a section that addresses - Will and how will the new Arbuckle Reservoir be incorporated into the WAM? And – should the Garwood Contract be included as an external agreement? It appears that both of these factors are material and relevant to include.

- **Region K Strategy Evaluation Model.** This model will be used to evaluate strategies that a) do not require a new appropriation (i.e. strategies based on existing water rights), and/or b) for strategies that use a new 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 major related factors”** from the 2020 LCRA WMP modeling to protect firm supplies.
 - Sedimentation for current and future decades
 - Return flows are only considered when evaluating strategies

Regarding inclusion of LCRA interruptible supplies and environmental flow support requirements from the 2020 WMP – It is encouraging to see the recognition of the need to adjust the curtailment triggers for interruptible and environmental release requirements in the 2020 LCRA WMP modeling to protect firm supplies. However, **it is recommended that this language on adjusting curtailment triggers be expanded to reflect other major factors (as included above in bold) that may need to also be adjusted accordingly, such as release caps, and also of inclusion of these large requirements in future decades.** However, **the current and cumulative very low inflow conditions into the Highland Lakes that we are experiencing now may also require considerations of these factors in this current and near-term decades, versus waiting to make actions later out in longer range decades.** In his

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

remarks at the August LCRA Board meetings, Phil Wilson, General Manager of LCRA, stated that we should not wait to take action on increased conservation measures, versus waiting for new drought triggers to occur that mandate them. It seems analogous that Region K may need to find ways to take action sooner and be more proactive and nimbler to respond to changes in our environment that appear to now be happening at a much faster rate and scale. **We support inclusion of the LCRA interruptible supplies and environmental flow requirements in the 2020 WMP in the Strategy Evaluation Model, and also recommend that the current conditions necessitate Region K act more quickly in this cycle, and begin planning earlier in the Supply Evaluation Model Phase. Also - as stated earlier, running the Region K Model without the variances will likely be very insightful and informative in helping to understand the adjustments needed in the 2020 WMP to better protect Firm Customers in the near future.**

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 and current 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, relative to modeled availability without the cutoff assumptions.

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

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

Concur

b). Imposing LCRA's 2020 WMP operation into the supply analysis does not align with the directive to use firm yield.

Do Not Concur - This point b) is confusing and appears to be opposite and not aligned with the need to use the firm yield more broadly (to better understand the impact on Firm customers, as reflected in the 2020 LCRA WMP).

As previously noted, the TWDB rules define Firm Yield as the “maximum water volume a reservoir can provide each year under a repeat of the Drought of Record using anticipated sedimentation and assuming that senior water rights will be totally utilized and all applicable permit conditions met”. 31 Tex Admin Code Section 357.10 (14).

During discussion on this topic during the last Modeling Committee meeting, the Freese and Nichols consultant (Philip Taucer), stated that it was his understanding that the base case should run the WAM models without the variance(s) to see where you stand. This appears to be a good practice and also provides information to make the case for the need for a variance, depending on the results from the run without the variance, versus not knowing where we stand. The case has been made that the base case should run without variances.

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

The Region K Supply Evaluation Model represents the environmental flow support as a 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.

Recommend updating and revising the wording on the environmental support item. It is believed that the 33,400 ac-ft/yr number was established earlier to recognize in-stream flow requirements. **It is requested that LCRA clarify the basis for this number.** The more recent LCRA WMPs now also include potentially very large inflow requirements for Matagorda Bay. Based on the annual LCRA Water Summary Reports, the actual releases for the environment flows have typically been almost double the 33,440 ac-ft referenced commitment, and 2020 LCRA reported releases were above 115,000 ac-ft. **It is recommended that these newer and higher requirements be included in Region K Supply Evaluation Model.**

All the models will include corrections associated with the control point locations for the Twin Buttes/Nasworthy system. Twin Buttes Reservoir is incorrectly located, and the evaporation for Lake Nasworthy is entered at the wrong control point, so no evaporative loss is applied at Lake Nasworthy. These errors have been identified in previous modeling efforts but have not been incorporated into TCEQ's WAM Run 3 at this time.

It is not clear to me what the above paragraph is saying and what is the point?? As I am not familiar with Lake Nasworthy, please include an explanation of it and what is the actual impact on available water of this Variance request.

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 changes from request submitted for the 2016 Region K Plan is changing the LCRA WMP cited to be the 2020 WMP and corrections at Twin Buttes/Nasworthy.

Again - unclear on intent and applicability of Twin Buttes/Nasworthy

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.

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

No

Choose an item.

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

Recommend change to Yes. - it is recommended that a HVR be submitted to TWDB to extend the hydrology from 2017-2023, and the new data be developed by LCRA and included in the Region K WAM modeling.

Given the severity of the current reduction and cumulative deficit in inflows compared to those from the Drought of Record as determined by LCRA reported data it is recommended that the hydrology from 2017-2023 be developed by LCRA and included in the Region K WAM modeling. LRE Water estimates that inflows are running about 1 million acre-feet less than the Drought of Record from 2008-2016, or at approximately 50% of Drought of Record inflows. These new inflow patterns appear to be far different and not representative of those in the recent 2008-2016 Drought of Record. Also, as John Hofmann, Executive Vice President of Water for LCRA, has recently shared, it is possible that the region could reach the 600,000 acre-feet combined storage threshold in about one year, if the current severe drought continues. If so, LCRA would be required to declare a new Drought of Record has commenced, and new hydrology will be needed by Region K in order to fulfill its planning obligations. LCRA has shared that they are already working on this extension of the naturalized flow hydrology, in preparation for updating the 2020 LCRA WMP. It makes sense to ask for the Variance/permission to extend the hydrology to begin preparing for the possibility of officially entering a new Drought of Record period during this planning cycle, if combined storage falls below 600,000 acre-feet.

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.

Recommend shifting to YES, or at a minimum explaining why No has been selected to not consider a Safe Yield, given the severity and length of the current drought. It is very concerning that the Firm Yield calculation approach assumes using all of the water down to empty reservoir lakes, and many of the previous safety factors in the LCRA WMP and Firm Yield calculation have been changed, such as the recent Firm Water Contracts that have reduced the LCRA Board Reserve. Not explaining why a Safe Yield is still NOT appropriate is a concern, given the rapidly changing dynamics in the region that we have

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

been experiencing. Beginning to plan on the need to establish a Safe Yield appears prudent.

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.

Click or tap here to enter text.

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

Recommend a YES, with the following changes, as previously presented in the Comments Existing and Strategy Supply

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

- All rights at and above Ivie/Brownwood are simulated prior to downstream rights (“Cutoff Assumptions”)

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.

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

- Determine Firm Yield for Buchanan-Travis Reservoir System (Yes for Supply Analysis, No for Strategy Analysis)

Recommend changing to YES for Strategy Analysis

I assume this is referring to the LCRA System Yield approach. If so, **it is recommended that the rationale for LCRA's System Yield needs to be included and explained, and why an increase for the "System" is accurate.** This seems very applicable to the Strategy Analysis part of the planning process.

- 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, No for Supply Analysis)**

Recommending change to YES for Supply

- **Set LCRA lower basin irrigation demands equal to projected future demands by decade (Yes for Strategy Analysis, No for Supply Analysis)**

Recommend Yes for Supply Analysis, per previously stated reasons

- Include LCRA Irrigation Return Flows to the Colorado River (Only when evaluating indirect use of these flows as a Strategy)
- **Include Return Flows from Austin Wastewater Treatment Plants (Only when evaluating indirect use of these flows as a Strategy)**

Recommend YES for Supply, but if it is decided to exclude them for Supply - then it is recommended that the exclusion in the Supply Evaluation needs explanation. It also seems like the large Garwood Contract requirements should be included. These two items have a significant impact on operations, and it seems Exclusion of these items in the Supply Evaluation could have a material impact on Supply.

- Include Other Municipal and Industrial Return Flows (Only when evaluating indirect use of these flows as a Strategy)
- Include Reuse Provisions and Environmental Flow Requirements of LCRA-Austin 2007 Settlement Agreement (Only when evaluating indirect use of the applicable flows as a Strategy)
- Correct the DAT file WR records for Twin Buttes Reservoir to use control point C20330 instead of C20260
- Correct the DAT file CP record for C20260 to replicate evaporation data from C20240
- Correct the DAT file CP record for C20240 to read evaporation data from the EVA file for this control point.

These assumptions more accurately reflect the operation of supplies in Region K for supply and strategy evaluations and is therefore more conservative than Run 3.

Mr. Lindsay made his comments in bold text with specific recommendations in underlined bold text
And with yellow highlighting added by Mr. Lindsay for items addressed with comments

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 only considered when evaluating strategies.

Recommend including Austin Return flows and Garwood Contractual Demands, as they have a material impact on Supply and operations.

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.

It is assumed that including reductions in Supply in the Supply and Strategy Analysis sections to meet inter-basin transfer commitments do not require a Hydrologic Variance request, as this is not referenced. If these do require a HVR, it is recommended that this be added to our list of Variance requests, as these commitments are very large.