TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

January 13, 2026

Ms. Ashwini Khare
Ovivo USA LLC
2300 Grenhill Dr. Suite 100
Round Rock, TX 78664

RE: Cembrane A/S SiC BLOX FX Series Flat Sheet Membranes
Review and Approval of Challenge Testing

Dear Ms. Khare:

On August 26, 2025, the Texas Commission on Environmental Quality (TCEQ) received your submittal providing challenge study data for Cembrane A/S SiC BLOX FX Series Flat Sheet membrane module. We have reviewed the challenge study for this module for compliance with state and federal rules.

Membrane filtration systems installed on, or replaced after, April 1, 2012 for the removal of *Cryptosporidium* and *Giardia* must undergo challenge testing to evaluate the membrane's removal efficiency and for the Texas Commission on Environmental Quality (TCEQ) to establish a challenge test log removal value ($LRV_{C\text{-}Test}$) as required by Title 30 of the Texas Administrative Code (30 TAC) §290.42(g)(3). In addition, these regulations require a membrane manufacturer to provide the non-destructive performance test (NDPT) and associated quality control release value (QCRV) that will be used to verify that all manufactured membrane modules that were not subject to challenge testing will achieve at least the same log removal as those that were challenge tested.

CHALLENGE STUDY FOR CEMBRANE A/S SIC BLOX FX SERIES FLAT SHEET MEMBRANE MODULES
We reviewed the submitted challenge study data for compliance with the *Cryptosporidium* treatment requirements in the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The criteria for compliance are found in Title 40 of the Code of Federal Regulations (40 CFR) §141.719(b)(2). Additional guidance for compliance with these requirements can be found in the United States Environmental Protection Agency (USEPA) Membrane Filtration Guidance Manual (EPA 815-R-06-009). The TCEQ reviewed challenge study data presented in the *Test Report: NSF/ANSI Standard 419-2018: Public Drinking Water Equipment Performance – Filtration* prepared by NSF Laboratories and dated February 24, 2024. Based on our review, we have determined that the challenge study is compliant with LT2ESWTR requirements. Please review the information in the following pages regarding the approved log removal value demonstrated during challenge testing ($LRV_{C\text{-}Test}$) and the NDPT for production membrane modules that did not undergo challenge testing.

TCEQ APPROVED $LRV_{C\text{-}Test}$

For the Cembrane A/S SiC BLOX FX Series flat sheet membrane modules, the TCEQ is approving a **$LRV_{C\text{-}Test}$ of 4.22** for the removal of *Cryptosporidium* for systems operated in deposition mode. The $LRV_{C\text{-}Test}$ approval by the TCEQ does not apply to systems operated in a crossflow mode as this hydraulic configuration was not demonstrated in this challenge test study. The following are the parameters of the approved challenge study:

Full-scale Module Tested	Cembrane A/S SiC BLOX FX Series Flat Sheet Modules
Number of Independent Modules Tested	5
Serial Numbers of Tested Modules	NSF #2 Stack C723 Fire GRS 486, NSF #4 Stack C724 Fire GRS 487, NSF #5 Stack C727 Fire GRS 488, NSF #3 Stack C724 Fire GRS 487, NSF #1 Stack C723 Fire GRS 486
Nondestructive Performance Testing (NDPT) Process	Pressure Decay Test from 10.15 pounds per square-inch (psi)
Quality Control Release Value (QCRV)	0.502 psi per minute
Challenge Particulate	*Bacillus atrophaeus* American Type Culture Collection number 9372 as a surrogate for *Cryptosporidium*
Detection Limit for *B. atrophaeus*	1 Colony Forming Unit (CFU) per 100 milliliter (mL)
Feed Concentration Range for *B. atrophaeus*	1.0×10^6 CFU /100 mL to 1.5×10^6 CFU/100 mL
Challenge Test Flux	249.34 to 249.92 gallons per square-foot per day (gfd)
Mode of Operation	Deposition Mode

LIMITS OF TCEQ APPROVED $LRV_{C\text{-}Test}$

The TCEQ approved $LRV_{C\text{-}Test}$ is only valid for the Cembrane A/S SiC BLOX FX Series flat sheet membrane modules operated under the parameters used for the challenge test and only for modules that have passed the NDPT. From our review of the challenge study, an acceptable Cembrane A/S SiC BLOX FX Series flat sheet membrane module must comply with the following to receive the TCEQ-approved $LRV_{C\text{-}Test}$:

1) Specifications of the approved Cembrane A/S SiC BLOX FX Series flat sheet membrane modules:
   - Constructed of silicon carbide (SiC) ceramic
   - 74.14 ft^2 (6.9 m^2) feed side filtration area per plate
   - Plates per module: 42
   - Nominal pore size: 0.2 micron (µm).
   - Maximum pore size: 0.5 µm.
   - Membrane media symmetry: Asymmetric
   - Plate dimensions: Length 575 millimeters (mm), Width 145/154 mm, Thickness 6/11 mm.
   - Potting depth: 4 – 9 mm
   - Potting material: polyurethane (PU)
   - Module Weight (full/dry): 76 kilograms (kg)/61 kg
   - An outside to inside flow path
   - Deposition mode
   - Maximum design filtrate flux at 20˚ C: 249.90 gallons per square-foot per day (gfd)
   - Temperature tolerance range: 2 to 60˚ C
   - Maximum design transmembrane pressure: -0.5 bar (-7.252 pounds per square-inch).
   - pH Tolerance Range (normal operation): 2 – 12 and

- pH Tolerance Range (cleaning): 1 - 13

2) Prior to shipment to a Texas public water system, each new Cembrane A/S SiC BLOX FX Series flat sheet membrane module must have passed the NDPT, a pressure decay test as discussed by NSF in the *Test Report* and as described below:
   - Ten-minute pressure decay test from 699.82 mbar (10.15 psi).
   - Allowable pressure decay rate (QCRV): 0.502 psi per minute.

3) If the NDPT result for a Cembrane A/S SiC BLOX FX Series flat sheet membrane module exceeds the QCRV (where the measured pressure decay rate was greater than the QCRV), the TCEQ will not allow that Cembrane A/S SiC BLOX FX Series flat sheet membrane module to be installed at any a Texas public water system for microbial contaminant removal credit.

4) The manufacturer, Cembrane A/S (or Ovivo USA), must notify the TCEQ in writing if the Cembrane A/S SiC BLOX FX Series flat sheet membrane modules (as challenge tested by NSF Laboratories) are modified or if the NDPT method is modified in any manner. After receiving written notification, the TCEQ will determine if the modified membrane module shall be required to undergo challenge testing or if the modified NDPT method is acceptable.

5) The manufacturer must record the results of each Cembrane A/S SiC BLOX FX Series flat sheet membrane module's NDPT with the module's assigned unique serial number. The NDPT result for each Cembrane A/S SiC BLOX FX Series flat sheet membrane module delivered to a Texas public water system must be provided upon delivery to the water system. Each Texas public water system must provide the TCEQ with the NDPT result for each module installed for microbial contaminant removal credit.

6) The TCEQ shall grant Texas public water systems using membrane filtration log removal credits for *Giardia* and *Cryptosporidium* that does not exceed the lower of:
   a) The TCEQ approved $LRV_{C\text{-}Test}$ or
   b) The maximum removal efficiency that can be verified through the site-specific direct integrity test (LRV_{DIT}) of the membrane filtration unit.

7) Each Cembrane A/S SiC BLOX FX Series flat sheet membrane module must conform to American National Standards Institute/NSF International (ANSI/NSF) Standard 61 and be certified by a testing organization accredited by ANSI.

8) Please note that the approved $LRV_{C\text{-}Test}$ is for the current Federal and Texas statutes and EPA and TCEQ rules. If any of these statutes or rules are revised, the TCEQ approved $LRV_{C\text{-}Test}$ in this letter may also be revised.

Please provide a copy of this letter to each of your Texas public water system customers and their consulting engineers. This letter is **not** to be construed as:

- A TCEQ granted exception for any Texas public water system to use the Cembrane A/S SiC BLOX FX Series flat sheet membrane modules. Each Texas public water system must request and receive site-specific approval to use membrane filtration in accordance with 30 TAC §290.42(g) and §290.39(l);

- TCEQ approval for a Texas public water system to install Cembrane A/S SiC BLOX FX Series flat sheet membrane modules; or

- TCEQ approval for a Texas public water system's required concentration time (CT) study.

If you have questions concerning this letter, or if we can be of additional assistance, please contact Mr. David Williams, P.E. at david.williams@tceq.texas.gov or (512) 239-4674, or any member of the Technical Review and Oversight Team at PTRS@tceq.texas.gov.

Sincerely,

Chirag Patel, Team Leader
Technical Review and Oversight Team
Plan and Technical Review Section
Water Supply Division
Texas Commission on Environmental Quality

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