

Supplementary material

**Removal of bacteria and organic carbon by an Integrated Ultrafiltration -
Nanofiltration Desalination Pilot Plant**

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Category: Original research paper

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Figure S1: Location of Dow nanofiltration pilot plant

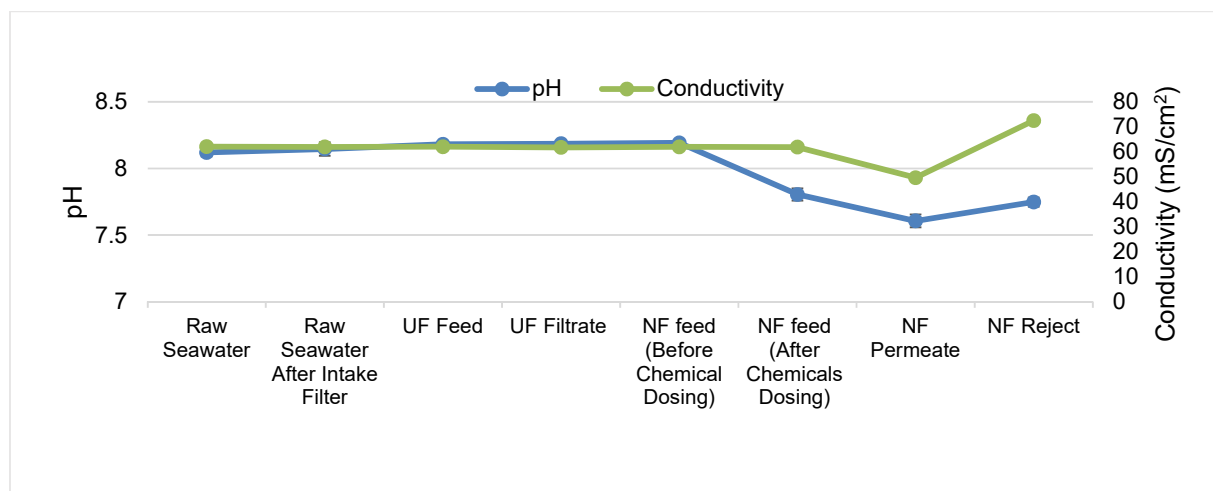


Figure S2: Physical parameters of seawater in the UF-NF treatment train. The pH and conductivity are given along the Y-axis, while the sampling location is along the X-axis. The values are averages of five measurements over three weeks. Error bars represent standard deviation.

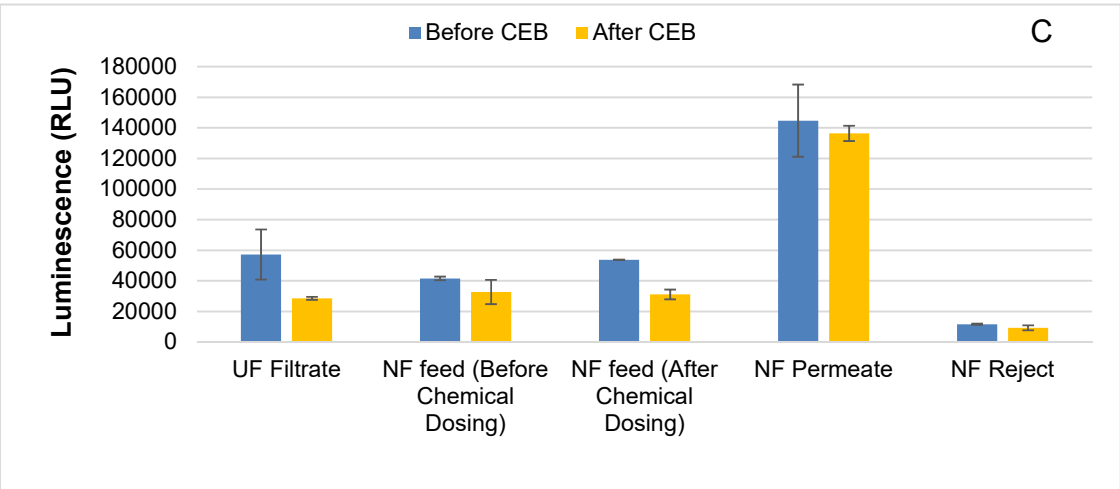
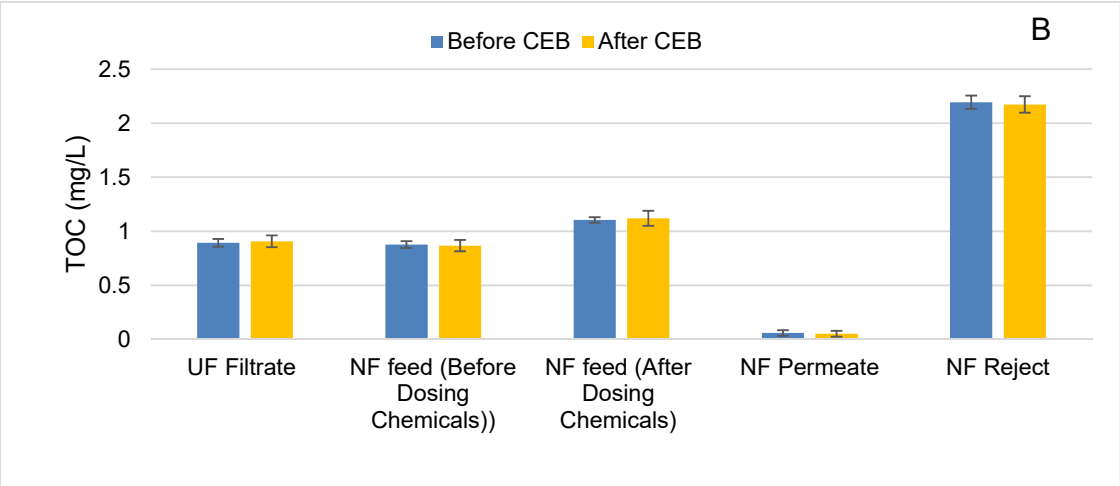
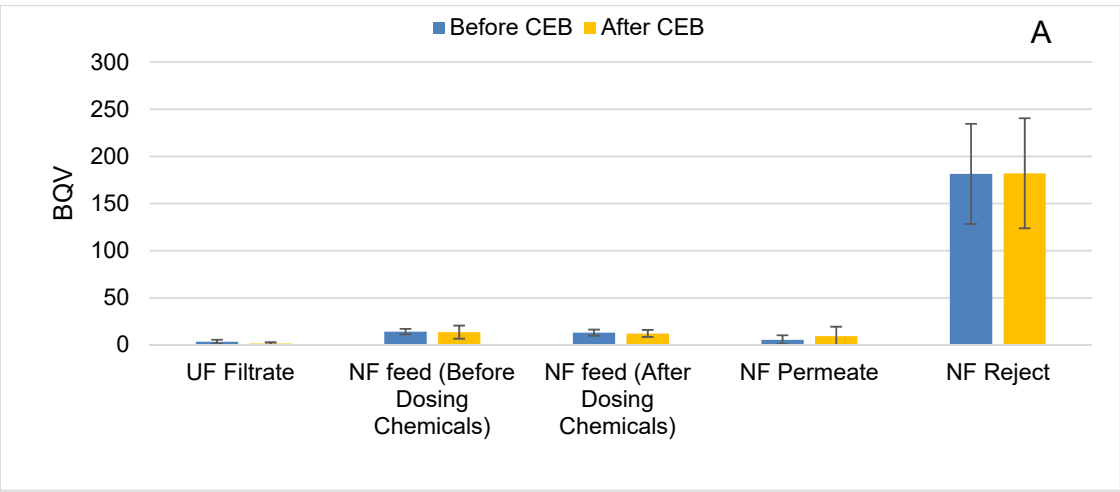
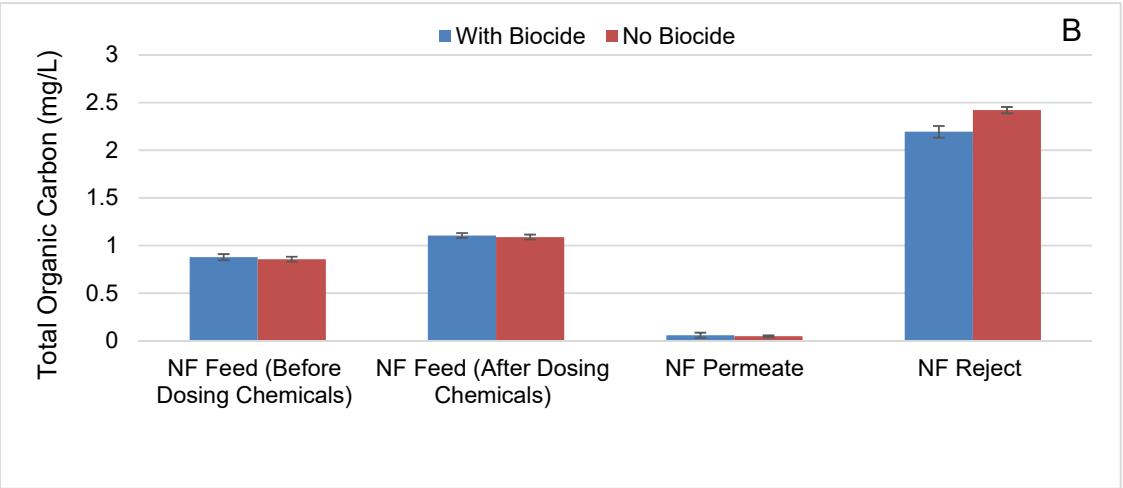
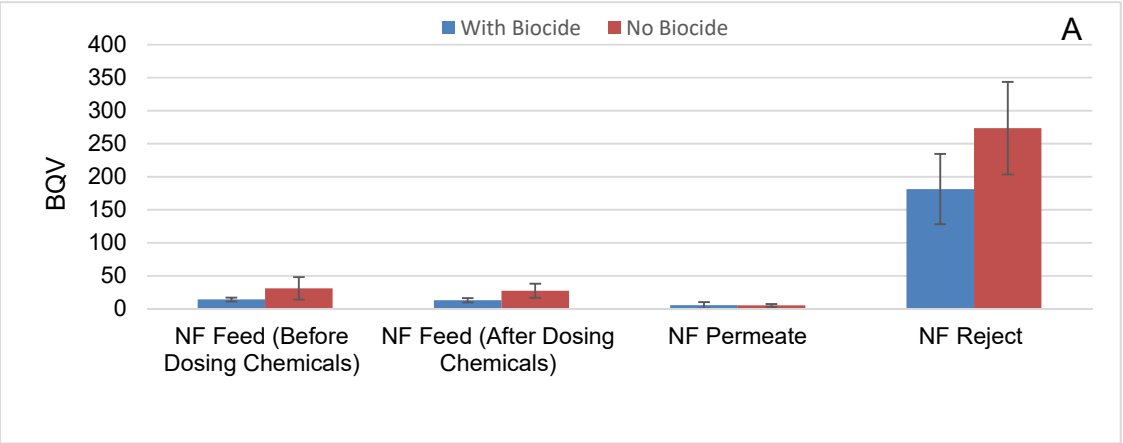


Figure S3: Effect of CEB on bacteria, TOC, and AOC at stages downstream of UF. The results shown are the average of five independent samples collected over three weeks. Error bars represent standard deviation. Table S1: Sample collection points and rationale.



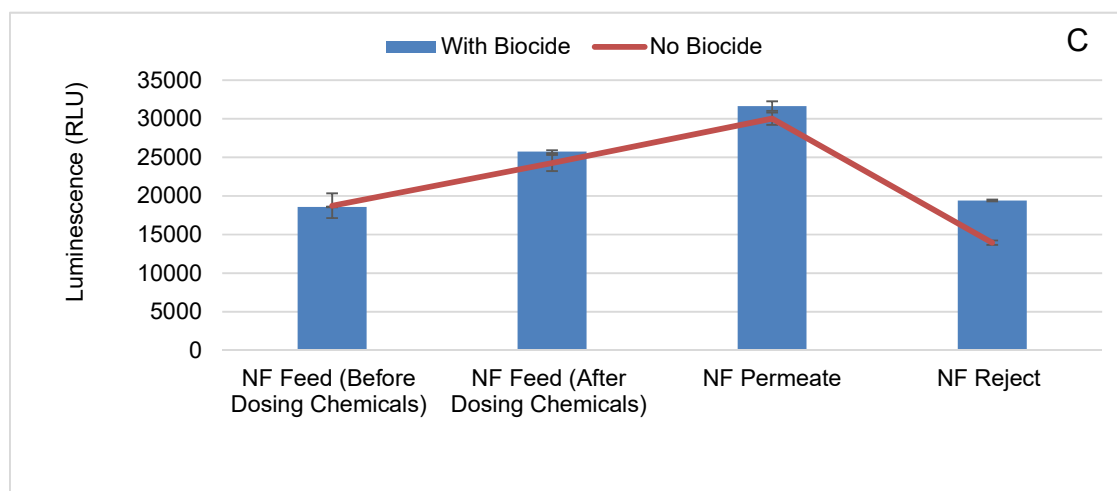


Figure S4. Effect of biocide (DBNPA) on bacteria (A), TOC (B) and AOC (C) removal by NF. The results here show the average of two sampling runs. Error bars represent standard deviation.

Table S1. Sample collection points and rational.

#	Time of collection	Sample ID	Collection Rational
1	Before CEB	Raw Seawater	To check the seawater characteristics before any treatment or filtration
2		Raw Seawater After Intake Filter	To test the effect of the intake filter
3		UF-B Feed	To test the specific feed for UF-B
4	Before CEB	UF-B Filtrate	To check the efficiency of UF-B filtration
5		NF Feed (Before Chemical Dosing)	To test the merged UF filtrate from UF B and UF A before dosing any chemicals
6		NF Feed (After Chemical Dosing)	To check how dosing the biocide, antiscalant, and SMBS effect the NF feed
7		NF Permeate	To check the efficiency of NF
8		NF Reject	To check the organic composition of the NF reject
9	After CEB	UF-B Filtrate	To test how CEB can affect the UF filtrate quality and the downstream desalination processes *Only in phase 1
10		NF Feed (Before Chemical Dosing)	
11		NF Feed (After Chemicals Dosing)	
12		NF Permeate	
13		NF Reject	

Figure S5. Flowchart showing sample processing after collection.

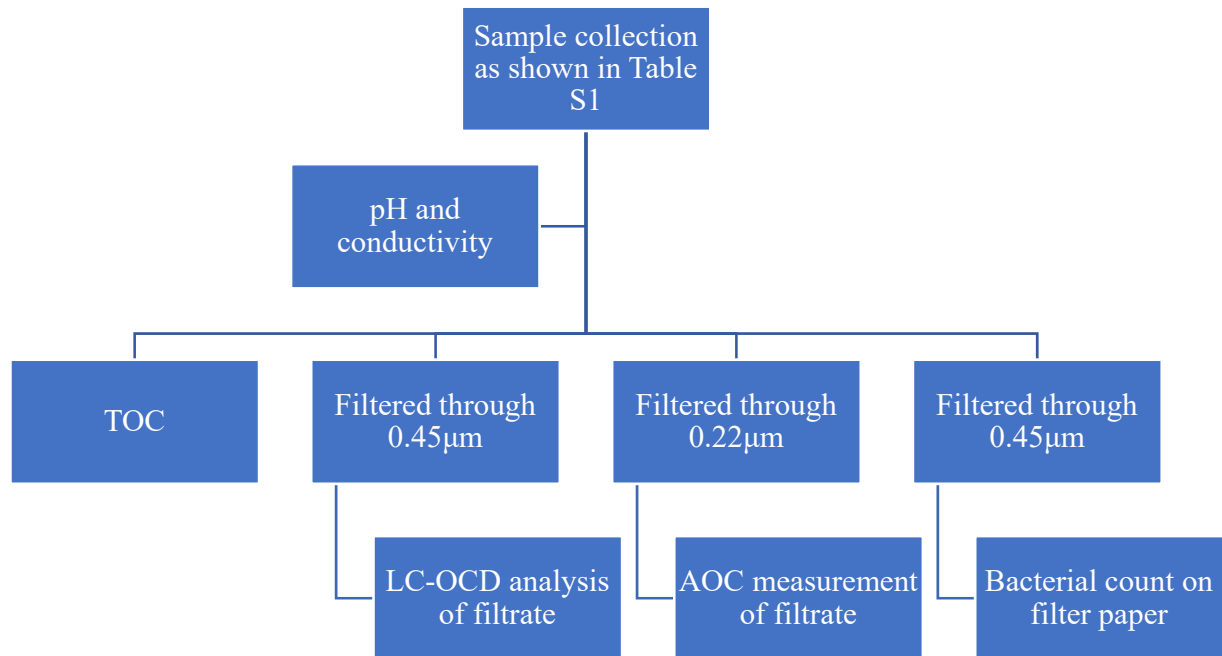


Table S2: Steps followed during chemically enhanced backwashing of the UF.

ID	Step	Duration (s)	Notes
1	Air scour	20	
2	Draining	20	
3	Hydraulic cleaning	60	
4	Chemical cleaning	120	NaOCl dosed at 350 mg/L
5	Soaking	600	
6	Forward flush	300	
7	Normal Backwash	160	

Table S3: Steps followed during cleaning for the NF membrane.

Steps	Day 1: CIP alkali (1000 mg/L NaOH) pH: 11	Day 2: CIP acid (2000 mg/L HCl) pH:2.5
1	Low flow recirculation	Low flow recirculation
2	Recycle	Recycle
3	Soaking	Soaking
4	High flow recirculation	High flow recirculation
5	NF Flush out	NF Flush out