Characterizing the Efficacies of Various Treatment Modalities for the Recycling of Produced Oilfield Waste

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Inform Environmental, LLC

The Collaborative Laboratories for Environmental Analysis and Remediation at UT-Arlington

CHALLENGER WATER SOLUTIONS

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Killing Two Birds with One Stone

- Reduce the reliance on fresh water
  - Highly localized withdrawals of groundwater in arid regions
- Reduce the occurrence of induced seismicity
  - Underground injections wells
  - Such a prevalent issue that it has triggered the state government to finance the TEXNET program

- Unfortunately produced water recycling has been hindered by two key factors:
  - Economics
  - Effectiveness under field conditions

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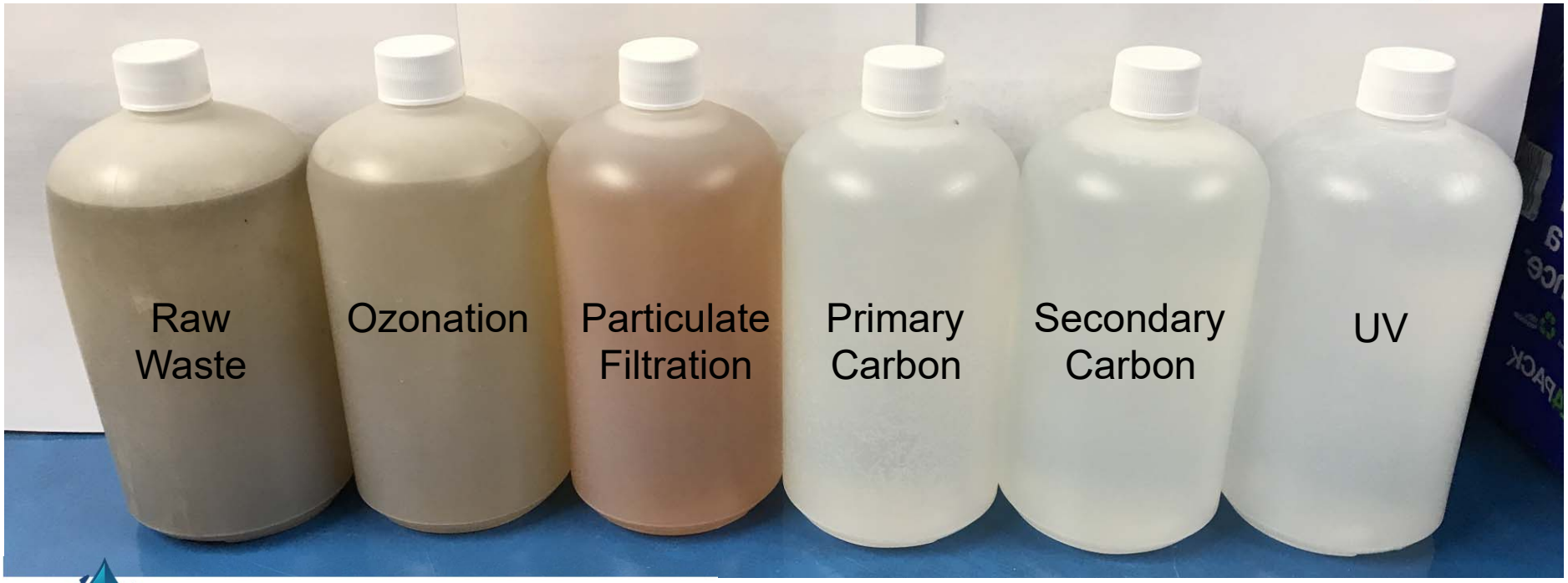
Biogeochemistry

Produced water treatment for reuse



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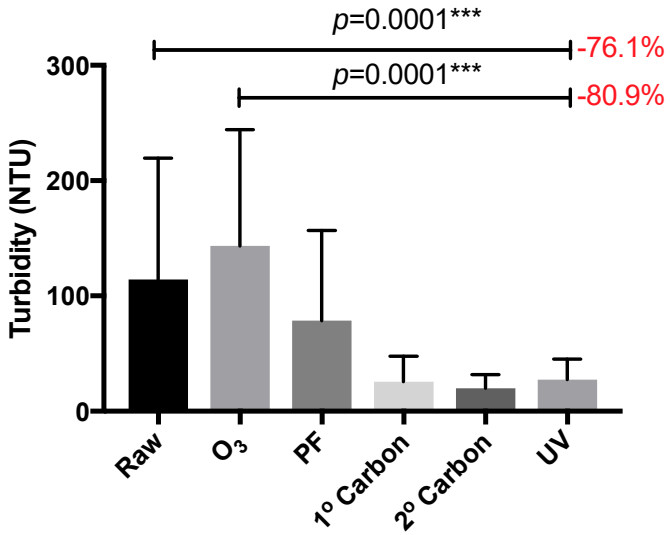
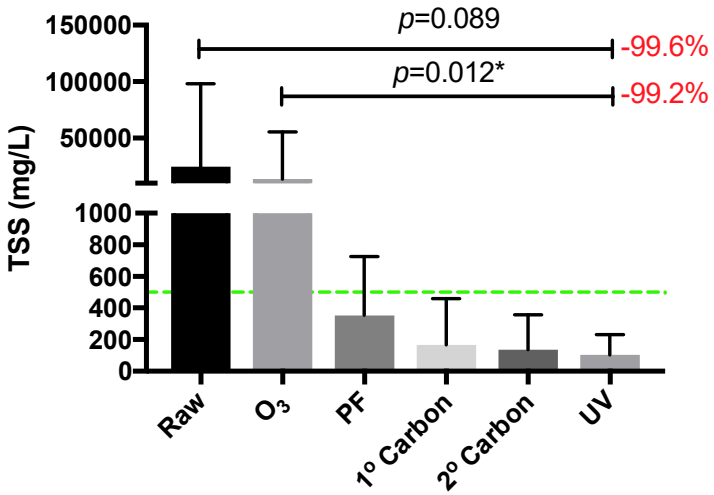
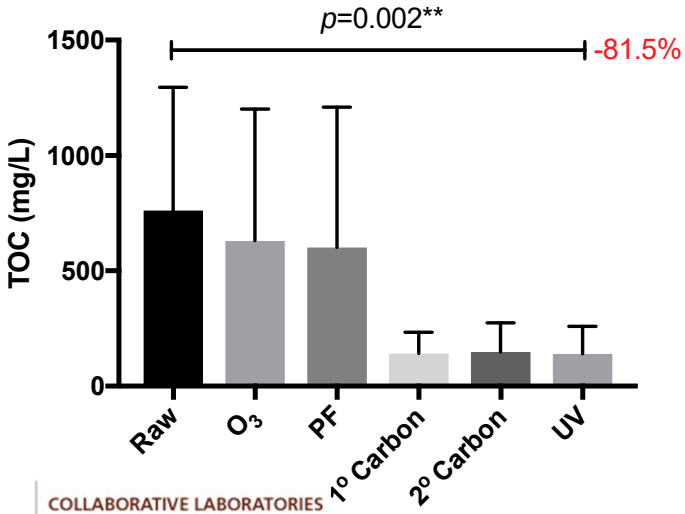
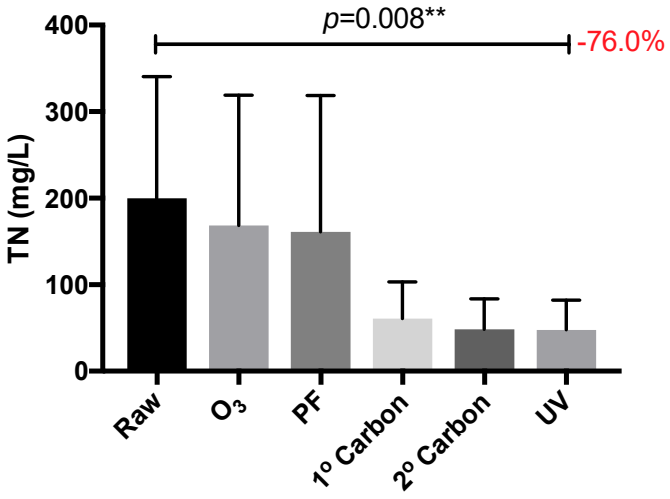
Hildenbrand et al., 2018 (*in review*)

Bulk Measurements









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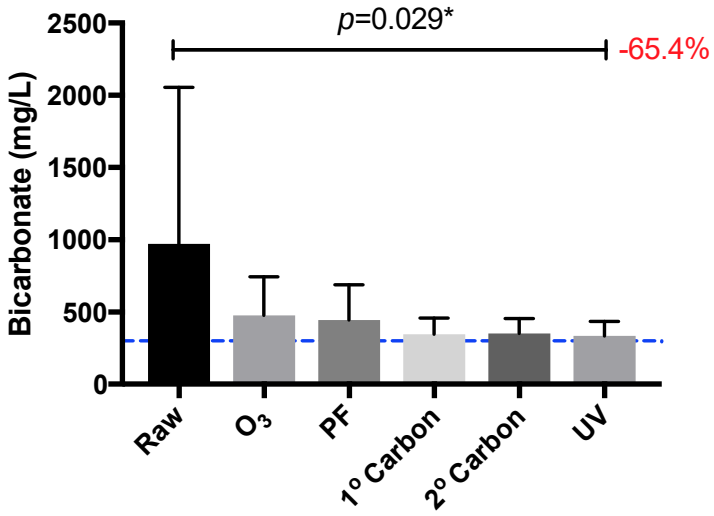

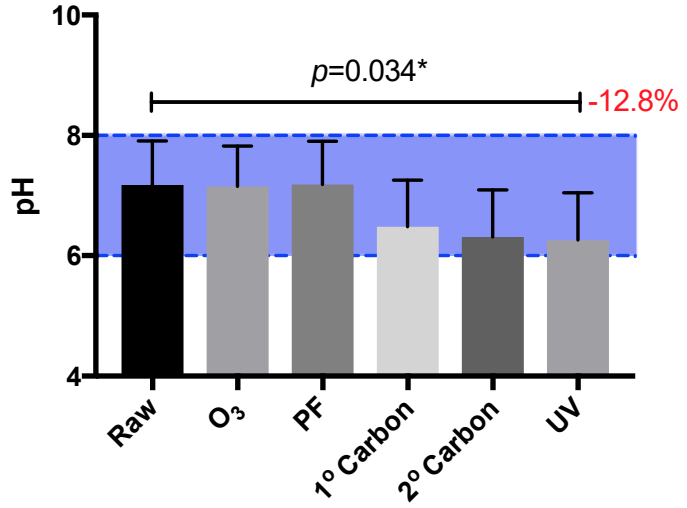

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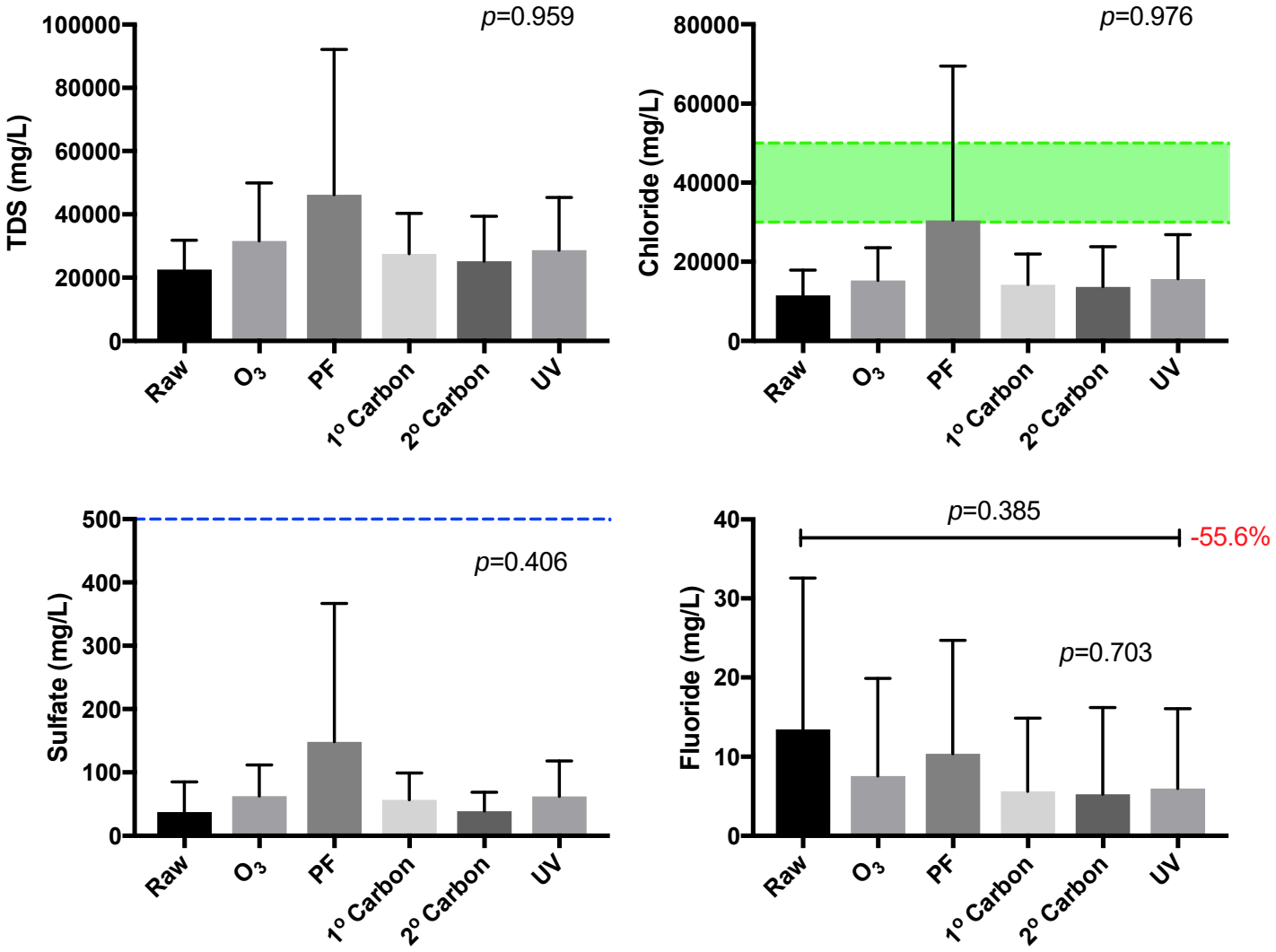
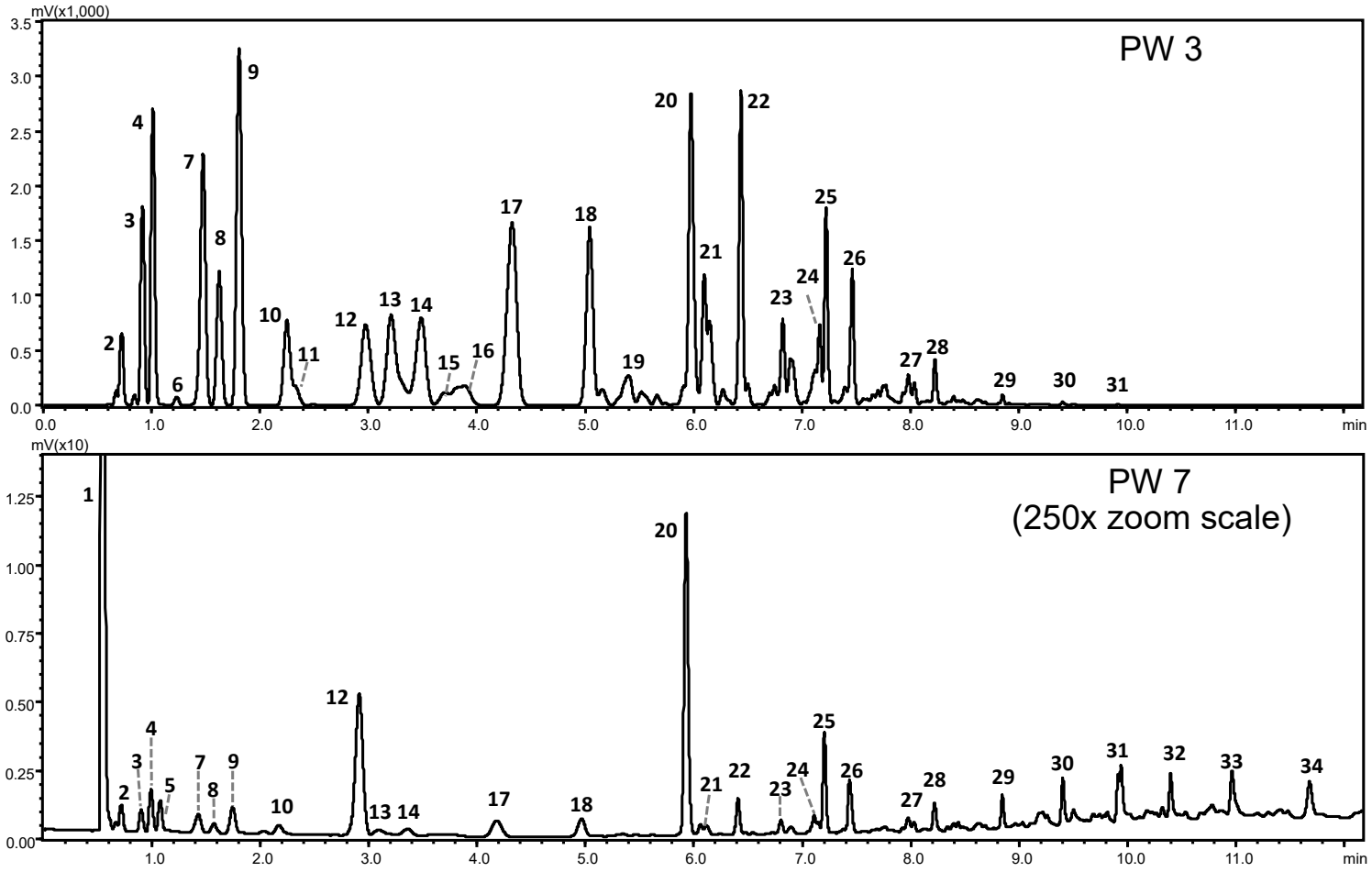


Hildenbrand et al., 2018 (*in review*)

Organic Contaminants



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Hildenbrand et al., 2018 (*in review*)

Organic Contaminants

#	Compound	#	Compound	#	Compound	#	Compound	#	Compound	#	Compound
1	Hydrogen sulfide	7	Methylene chloride	13	Ethylene chloride	19	Methyl-cyclohexane	25	m- + p-Xylene		
2	Methanol	8	Methyl acetate	14	3-Hexanol	20	Toluene	26	Nonane + o-Xylene		
3	Methanethiol	9	n-Propanol	15	Cyclo-hexane	21	C8 aliphatic + C8 cyclic HC	27	Alkyl aromatics	31	Tridecane
4	Ethanol	10	Hexane	16	Benzene	22	Octane	28	Decane	32	Tetradecane
5	iso-Pentane	11	2-butanol	17	3-methyl hexane	23	C9 aliphatic HC	29	Undecane	33	Pentadecane
6	Pentane	12	Ethyl acetate	18	Heptane	24	Cyclohexanoe + Ethyl Benzene	30	Dodecane	34	Hexadecane

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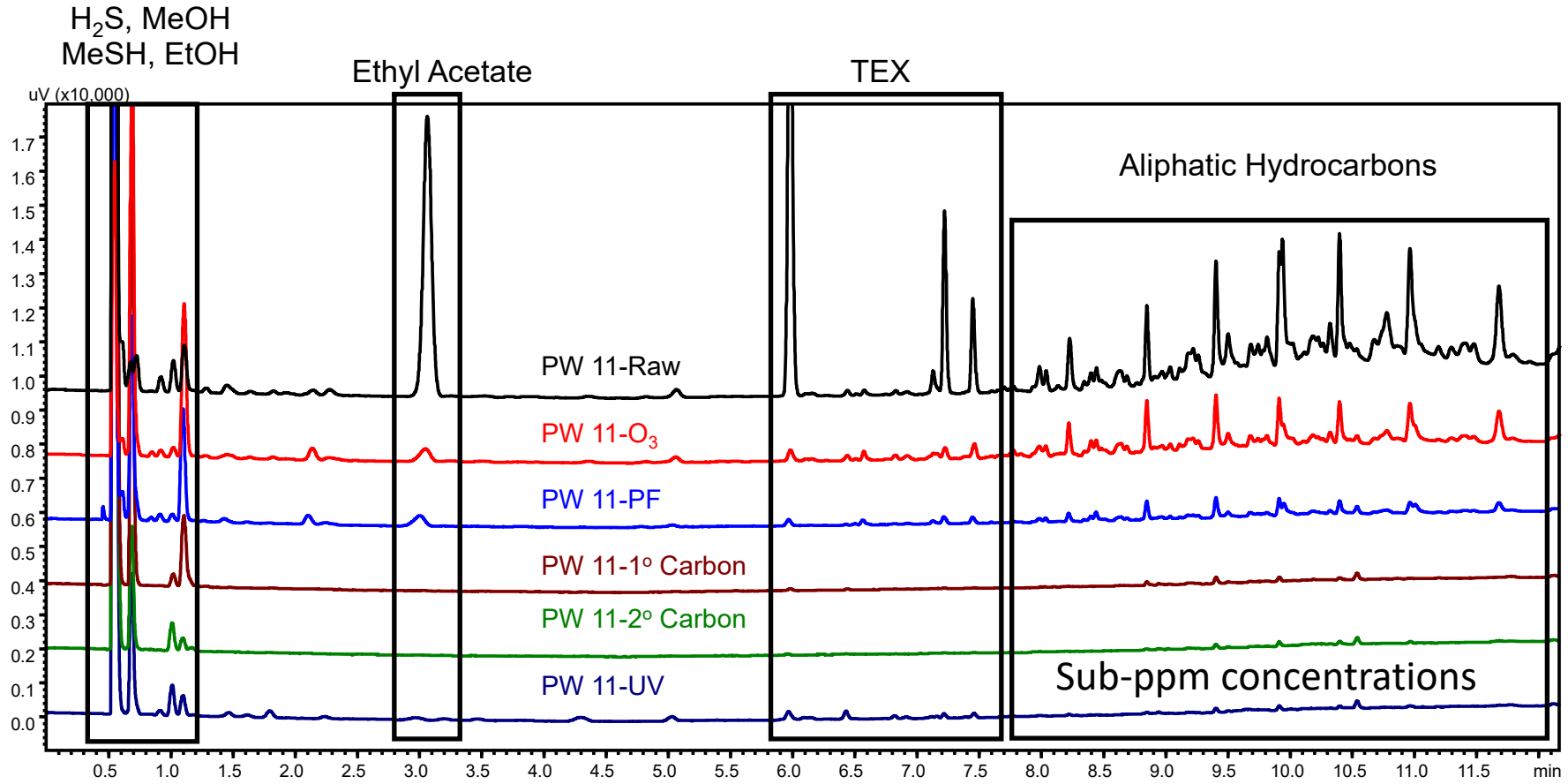
Organic Contaminants



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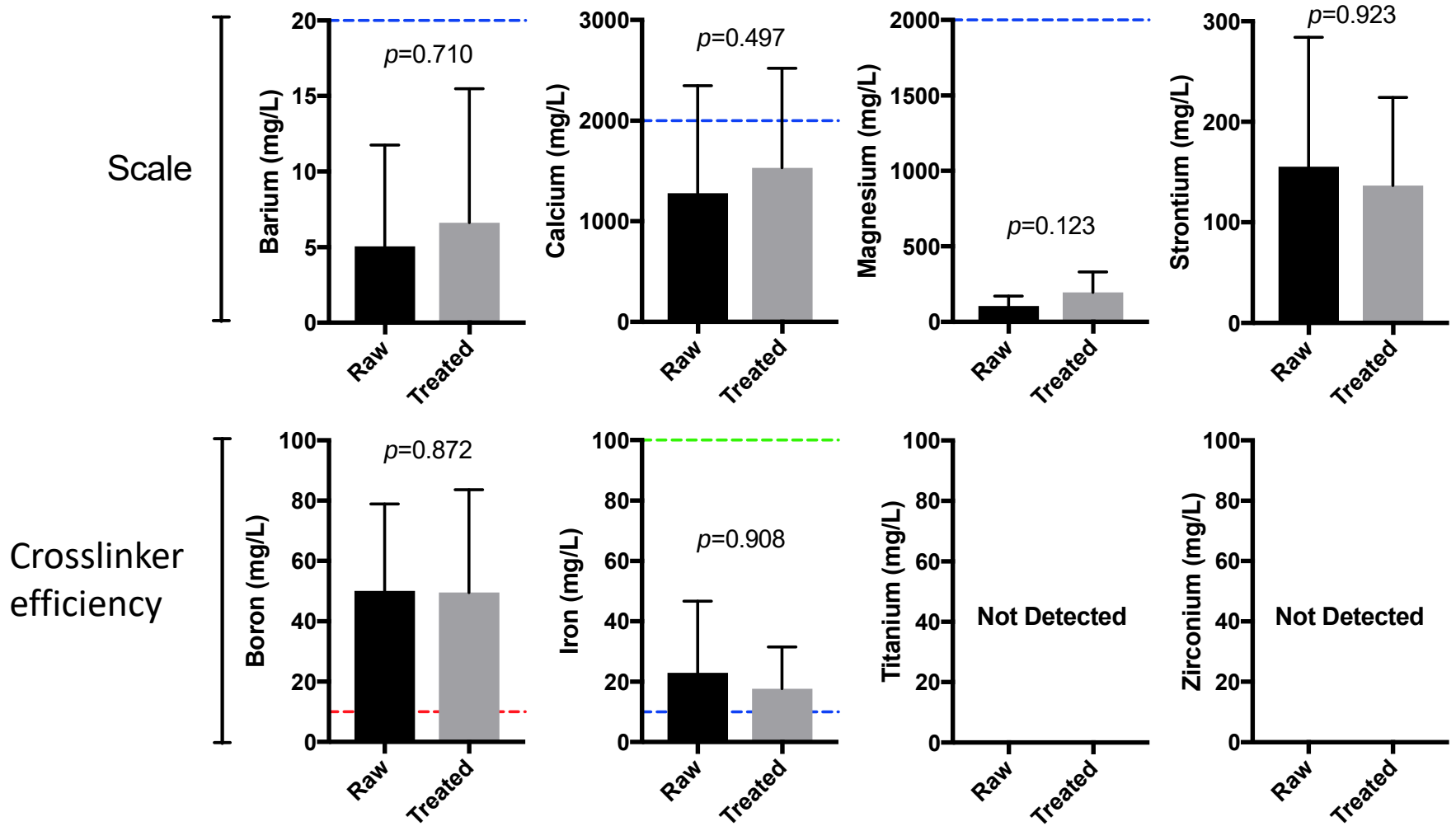
Inorganic Constituents



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Hildenbrand et al., 2018 (*in review*)

Biological Contaminants

Sample	Microorganism ID	CFUs	Sample volume
PW8 Raw	*E. aurantiacum (98.1%)*	100	25 mL
	A. Baumannii (77.4%)	25,000	25 mL
	A. punctata (82.6%)	100	25 mL
	S. epidermidis (96.6%)	100	25 mL
	Planomicrobium sp. (99.9%)	100	25 mL
	Pseudomonas sp. (99.9%)	1	25 mL
	Paracoccus sp. (99.9%)	100	25 mL
PW8 0_3	*Pseudomonas sp. (99.9%)*	100	25 mL
	Paracoccus sp. (99.9%)	100	25 mL
	Rhizobium sp. (76.8%)	100	25 mL
PW8 PF	*Paracoccus sp. (93.6%)*	100	25 mL
PW8 PC	*C. perfringens (93.6%)*	100	25 mL
	R. ornithinolytica (82.9%)	100	25 mL
	Paracoccus sp. (89.7%)	100	25 mL
PW8 SC	*S. putrefaciens (75%)*	12,500	25 mL
PW8 UV	*Paracoccus sp. (81.9%)*	1,000	25 mL
	S. epidermidis (99%)	1,000	25 mL

Sample	Microorganism ID	CFUs	Sample volume
PW 9 Raw	*S. putrefaciens (99.9%)*	4	25 mL
	B. cereus group (96.9%)	100	25 mL
	Paracoccus sp. (85.8%)	4	25 mL
PW9 0_3	*S. hominis (88.1%)*	50	25 mL
	S. maltophilia (96%)	1,750	25 mL
PW9 PF	*B. cereus group (87.4%)*	100	25 mL
PW9 PC	*S. putrefaciens (84.4%)*	-	25 mL
	S. algae (96.8%)	-	25 mL
	K. pneumoniae (81.2%)	7	25 mL
	P. chlororaphis (76.1%)	25,000	25 mL
PW9 SC	*Paracoccus sp. (75%)*	100	25 mL
	K. pneumoniae (87%)	7	25 mL
PW9 UV	*B. stabilis (87%)*	5	25 mL

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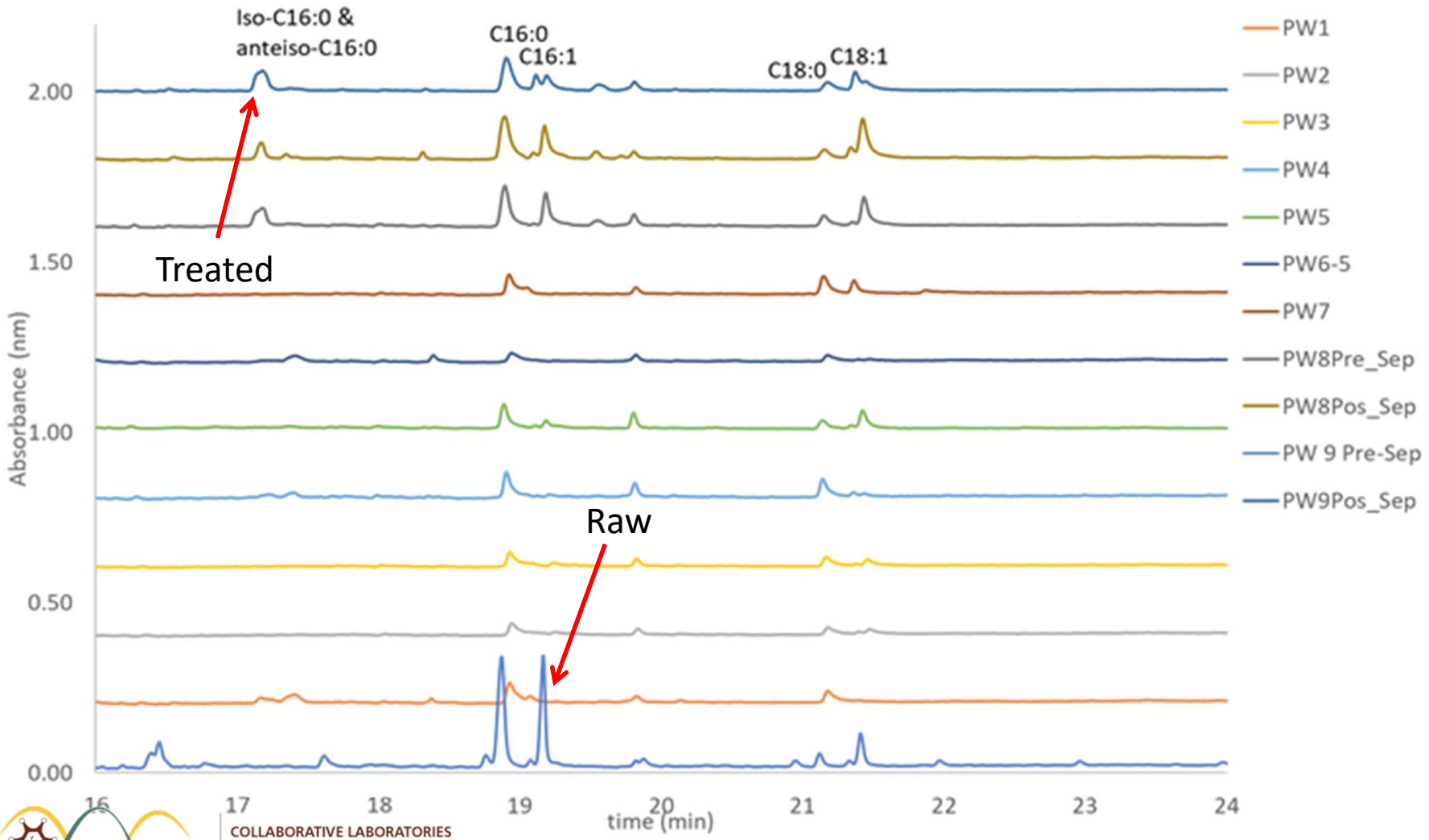
Hildenbrand et al., 2018 (*in review*)

Future Directions-Targeted Treatment



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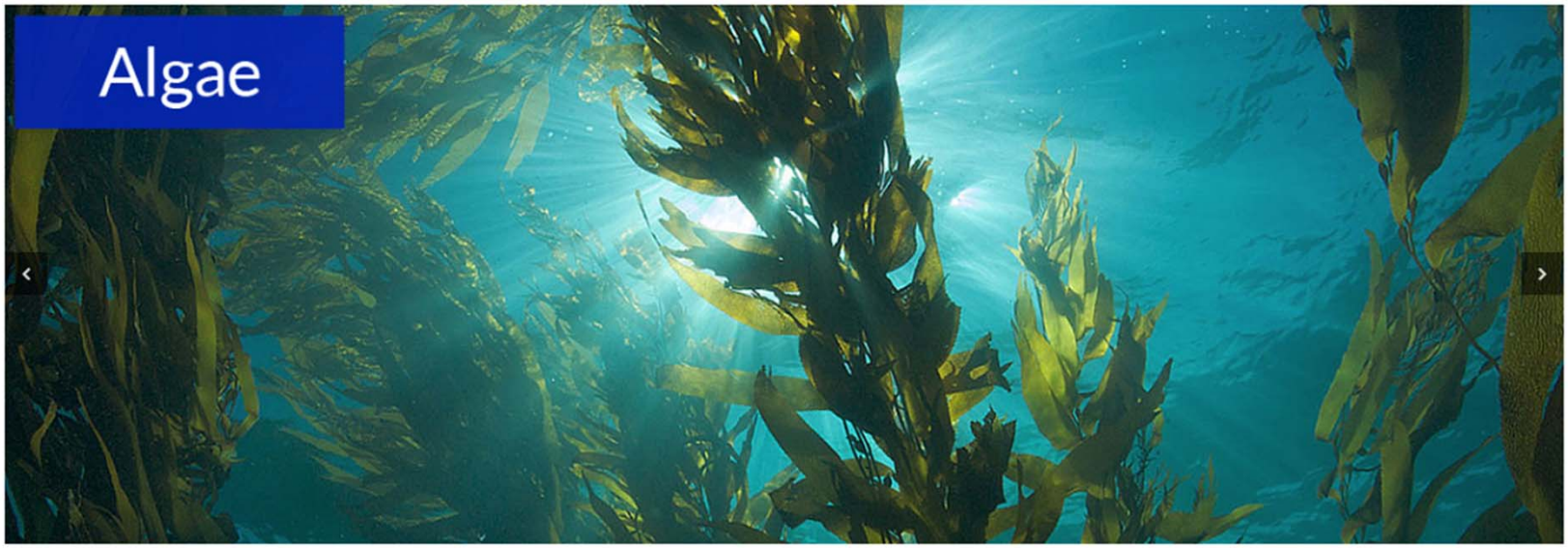
Santos et al., 2018 (*in preparation*)

Future Directions- Potable Water



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SOBRAGUA

TECQ™ has introduced a scaled-up version of its proprietary solar still, Which offers a green alternative to more expensive reverse osmosis desalination plants.

Special Thanks to:

- Challenger Water Solutions
  - Clint Layman
  - Joel Warner

CHALLENGER
WATER SOLUTIONS

- CLEAR @ UT-Arlington
  - Dr. Kevin Schug
  - Dr. Ines Santos
  - Dr. Doug Carlton
  - Manny Varona-Torres
  - Tiffany Liden

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Questions?

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