

ICR TREATMENT STUDY ANALYSIS

Base Analysis and Data Review Comments

Treatment Study ID	1042
Study Protocol	GAC RSSCT treatment study
Plant ICR Number	215
PWS Name	City of Escondido
City, State, Zip	Escondido, CA 92026

These are general comments that do not need to be responded to directly.

Major comments:

1. Although this study was conducted over four quarters, it was not a typical RSSCT study evaluating seasonal variability. This is due to the fact that the composition of the influent water to the full-scale plant changes daily, and these changes appear to be more important than seasonal variability. With respect to seasonal variability, the SDS incubation temperature was one of the more significant variables – this parameter varied from 18 to 24 °C. With respect to the different blends, the water evaluated during the second quarter was of the poorest quality and most difficult to treat; this water was a 10/90% blend of Lake Dixon and Lake Wohlford. The water evaluated during the fourth quarter was of the highest quality and easiest to treat of the four quarterly batches; this water was a 45/34/21% blend of Lake Dixon, Lake Wohlford, and SDCWA.
2. During the fourth quarter, a 0.1 mg/L free chlorine residual was detected in the influent during sample collection. However, instantaneous DBPs were measured and found to be below detection.

General Comments:

1. In Table 57 of the report, the 50th percentile for SDS-MCAA appears to be incorrect since it is lower than the 25th percentile.

Response: Due to a systematic error, most values reported in Table 57 of the report were incorrect. The values have been corrected, and the updated version of Table 57 has been added to the hard copy and to the electronic version (PDF) of the report.

2. The MRL for UV-254 is reported at 0.009 1/cm, but values as low as 0.001 1/cm are reported in the Data Collection Spreadsheets. The MRL for TOC is reported as 0.5 mg/L, but values

as low as 0.25 are reported in Data Collection Spreadsheets. The MRL for TOX is reported as 25 ug/L, but values as low as 13 ug/L are reported in Data Collection Spreadsheets. It is acceptable to use these measured values below the MRL, but comments should be included that indicate these values are BMRL. Alternatively, the MRL could be revised if it was determined according to acceptable procedures.

3. In the fourth quarter, small levels of SDS-MCAA were observed in the effluent at the beginning of the breakthrough curve (less than 4 ug/L); however, SDS-MCAA was not detected above the MRL of 2.0 ug/L in the previous three quarters.

Response: Although the levels measured were low, the breakthrough of SDS-MCAA in the GAC effluent to levels greater than the influent concentration is unusual. The data was verified.

Outlier Data:

No outliers were removed.

Cell: A1

Comment: 1042_SAS.xls 2/1/00 10:11

All curve fits reviewed and approved. See below for log of refit datasets.

1042_SAS.xls 2/2/00 17:13

Curve fit review updated and approved. See below for log of refit datasets.

Cell: C82

Comment: 1042-10-04 - Run 7 (MCAA) 2/1/00 10:06
Original value (CoefA0) = 2 New value = 2
Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: D82

Comment: 1042-10-04 - Run 7 (MCAA) 2/1/00 10:06
Original value (CoefAf) = 0 New value = 0
Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: E82

Comment: 1042-10-04 - Run 7 (MCAA) 2/1/00 10:06
Original value (CoefB) = 0 New value = 0
Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: F82

Comment: 1042-10-04 - Run 7 (MCAA) 2/1/00 10:06
Original value (CoefD) = 0 New value = 0
Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: J82

Comment: 1042-10-04 - Run 7 (MCAA) 2/1/00 10:06
Original value (S) = 0 New value = 0
Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: K82

Comment: 1042-10-04 - Run 7 (MCAA) 2/1/00 10:06
Original value (t0) = 0 New value = 31.8702
Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: C115

Comment: 1042-20-02 - Run 4 (CHBr3) 2/1/00 10:09
Original value (CoefA0) = 0.1194 New value = -0.679
Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: D115

Comment: 1042-20-02 - Run 4 (CHBr3) 2/1/00 10:09
Original value (CoefAf) = 5.9156 New value = 9.3019

Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: E115

Comment: 1042-20-02 - Run 4 (CHBr3) 2/1/00 10:09

Original value (CoefB) = 97.9562 New value = 20.7472

Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: F115

Comment: 1042-20-02 - Run 4 (CHBr3) 2/1/00 10:09

Original value (CoefD) = 0.1108 New value = 0.0666

Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: J115

Comment: 1042-20-02 - Run 4 (CHBr3) 2/1/00 10:09

Original value (S) = -0.0216 New value = -0.0287

Poor peak curve fit. Data was refit by iterative curve fit procedure.

Cell: C147

Comment: 1042-20-03 - Run 6 (MBAA) 2/2/00 17:10

Original value (CoefA0) = 0 New value = 1.1

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: D147

Comment: 1042-20-03 - Run 6 (MBAA) 2/2/00 17:10

Original value (CoefAf) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: E147

Comment: 1042-20-03 - Run 6 (MBAA) 2/2/00 17:10

Original value (CoefB) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: F147

Comment: 1042-20-03 - Run 6 (MBAA) 2/2/00 17:10

Original value (CoefD) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: J147

Comment: 1042-20-03 - Run 6 (MBAA) 2/2/00 17:10

Original value (S) = 0 New value = 0

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Cell: K147

Comment: 1042-20-03 - Run 6 (MBAA) 2/2/00 17:10

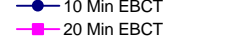
Original value (t0) = 0 New value = 79.1037

Fewer than 6 points above MRL, average above 1/2 MRL. Step function applied.

Design Information

ID / ICR#: CA3710006 / 215	Design TOC: 4.1 mg/L	Full-Scale GAC Size: 12x40 Bituminous
ICR Contact: Timothy Kwak	Col Diameter: 9.0 mm	Bench-Scale GAC Size: 140x230
Phone No.: (760) 741-4855	Min Reynolds#: 0.42	Scaling Factor: 12.57
Period: 3/5/98 - 3/20/98 (15 B-S days)	Full-Scale Temp: 13.0 C	Meas Dry Bed Density: 0.51 g/cm3

Cumulative SDS Conditions

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	3.2	0.0	6	3.1 - 3.2									
pH	7.8	0.0	6	7.8 - 7.8					Temp	15.1	0.1	27	15.0 - 15.6
UV254	0.061	0.000	3	0.061 - 0.061					pH	7.4	0.0	27	7.4 - 7.5
SUVA	1.92	0.02	3	1.90 - 1.94					Time	24.0	0.1	27	23.8 - 24.1
Bromide	69	1	2	68 - 69					Comments: 				
SDS-TOX	201	6	3	195 - 207									
SDS-THM4	58	3	3	55 - 61									
SDS-HAA6	39	1	3	38 - 40									
Effluent	10 Min EBCT (6 B-S days)				20 Min EBCT (15 B-S days)				Chart Legend:				
Effluent pH	8.0	0.0	13	8.0 - 8.1	8.1	0.2	13	7.9 - 8.5					
Effluent Temp	21.7	0.3	13	21.3 - 22.2	21.5	0.3	13	21.0 - 22.3					

TOC

Concentration (mg/L)

Scaled operation time (days)

UV-254

Absorbance (1/cm)

Scaled operation time (days)

SDS-THM4

Concentration (µg/L)

Scaled operation time (days)

SDS-C12 Dose and Residual

Concentration (mg/L)

Scaled operation time (days)

Legend:

- 10 Min EBCT Res
- 20 Min EBCT Res
- Influent Res
- 10 Min EBCT Dose
- 20 Min EBCT Dose
- Influent Dose

SDS-HAA6

Concentration (µg/L)

Scaled operation time (days)

SDS-Chlorination pH

pH

Scaled operation time (days)

SDS-TOX

Concentration (µg Cl₂/L)

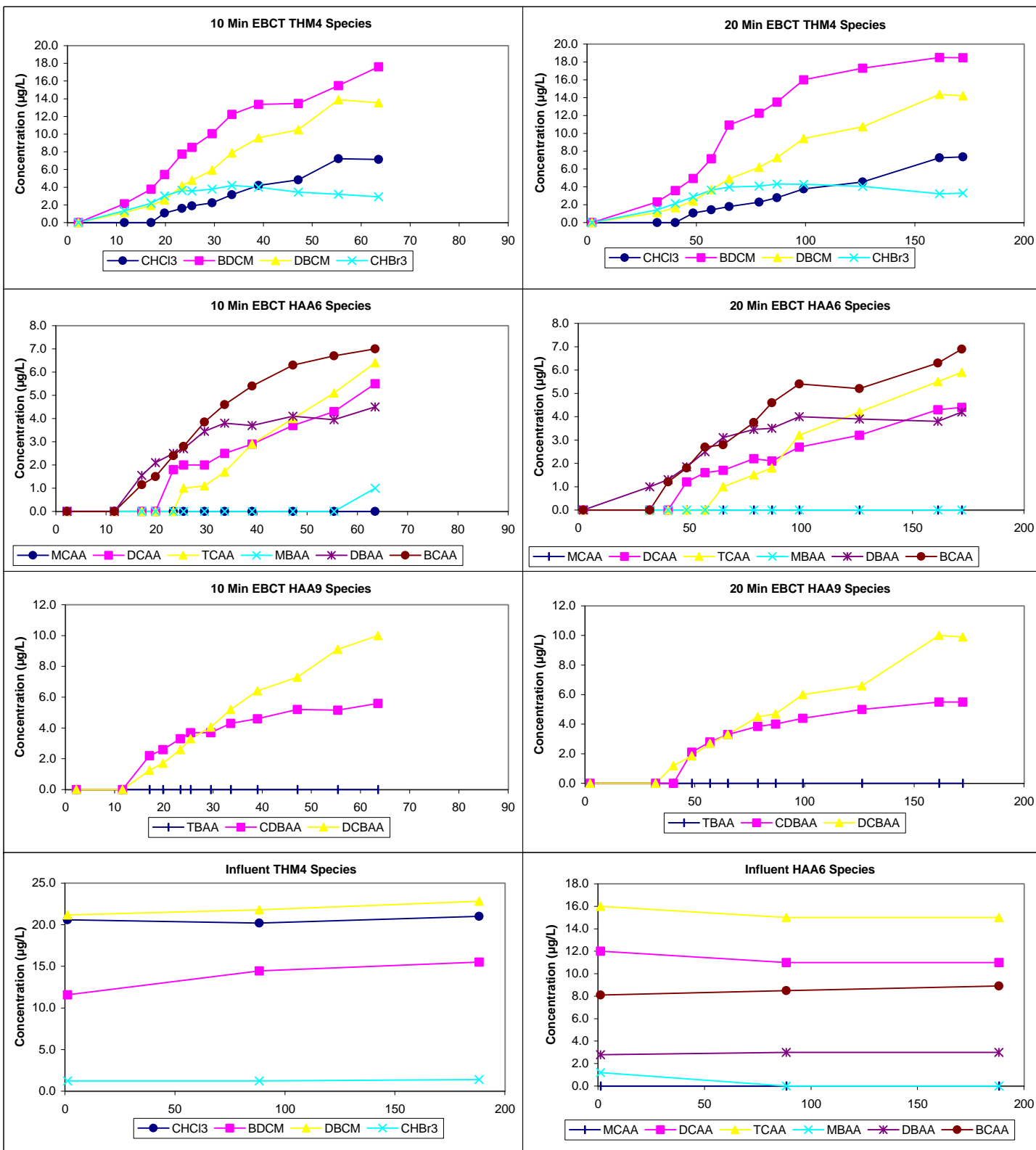
Scaled operation time (days)

SDS-Chlorination Incubation Temperature

Temperature (C)

Scaled operation time (days)

Water Quality Graphs (Continued)



ICR Information

ID / ICR#: CA3710006 / 215
 ICR Contact: Timothy Kwak
 Phone No.: (760) 741-4855
 Period: 6/5/98 - 6/18/98 (12 B-S days)

Design Information

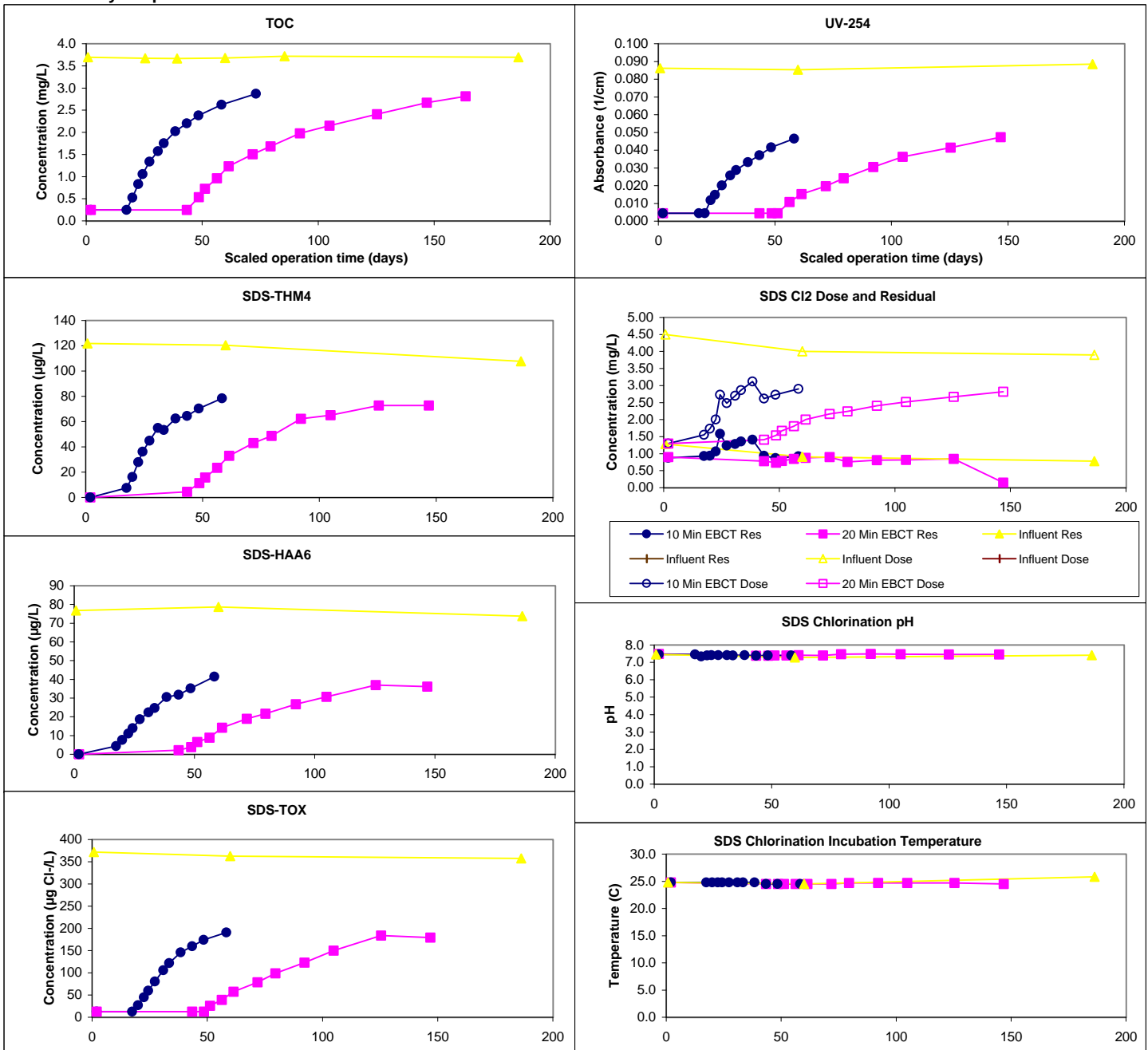
Design TOC: 3.5 mg/L
 Col Diameter: 9.0 mm
 Min Reynolds#: 0.51
 Full-Scale Temp: 17.0 C

Full-Scale GAC Size: 12x40 Bituminous
 Bench-Scale GAC Size: 140x230
 Scaling Factor: 12.57
 Meas Dry Bed Density: 0.52 g/cm3

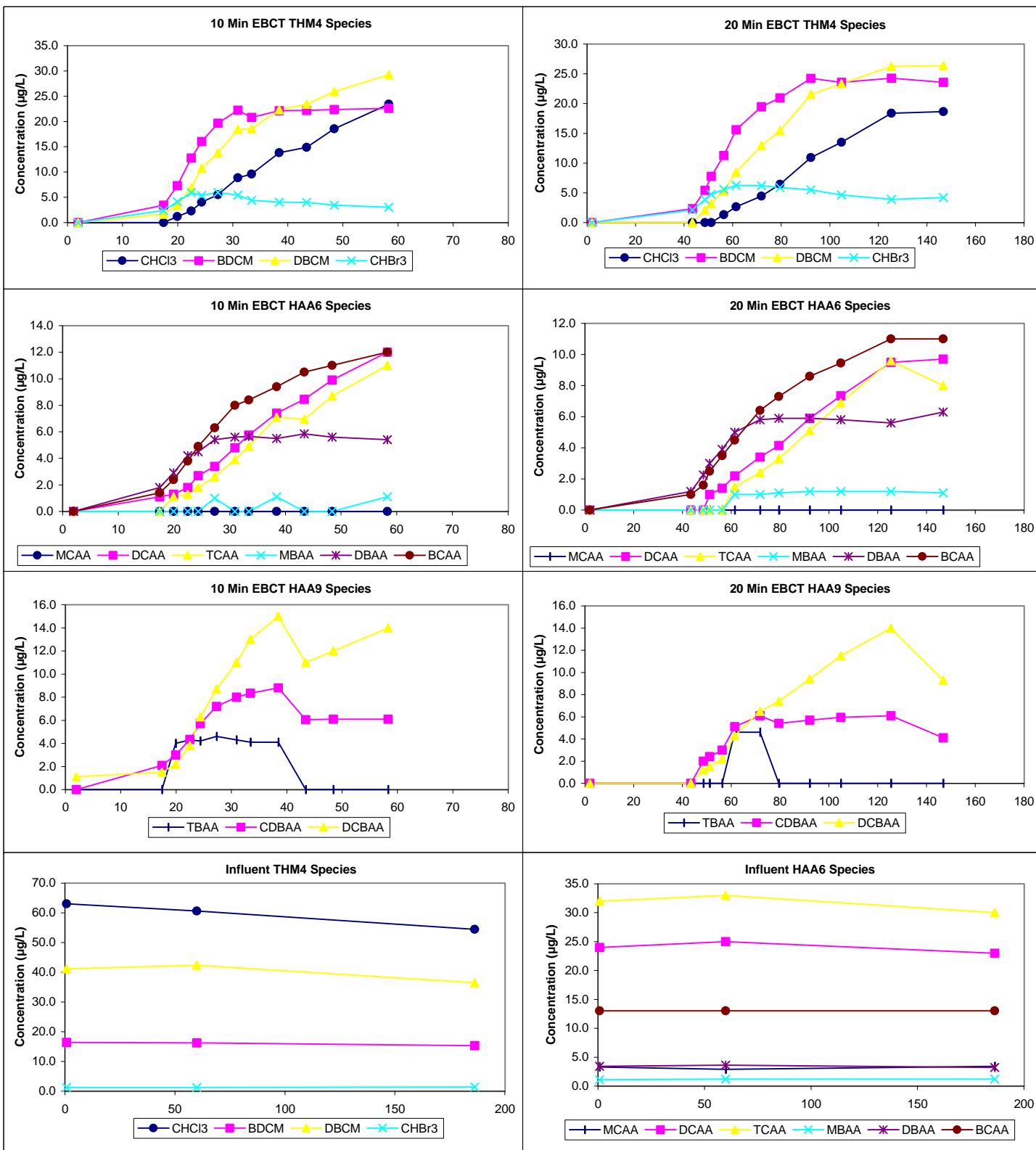
Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	3.7	0.0	6	3.7 - 3.7									
pH	7.2	0.1	3	7.1 - 7.3									
UV254	0.087	0.002	3	0.085 - 0.088									
SUVA	2.35	0.04	3	2.32 - 2.39									
Bromide	84	4	2	82 - 86									
SDS-TOX	364	7	3	358 - 372									
SDS-THM4	117	8	3	108 - 122									
SDS-HAA6	76	2	3	74 - 79									
Effluent	10 Min EBCT (6 B-S days)				20 Min EBCT (13 B-S days)				Chart Legend:				
Effluent pH	7.9	0.1	13	7.8 - 7.9	7.9	0.1	13	7.7 - 8.2		10 Min EBCT	20 Min EBCT	Influent	Influent
Effluent Temp	23.2	1.4	13	20.9 - 27.1	23.6	0.6	13	22.9 - 25.4					

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information

ID / ICR#: CA3710006 / 215
 ICR Contact: Timothy Kwak
 Phone No.: (760) 741-4855
 Period: 8/31/98 - 9/17/98 (16 B-S days)

Design Information

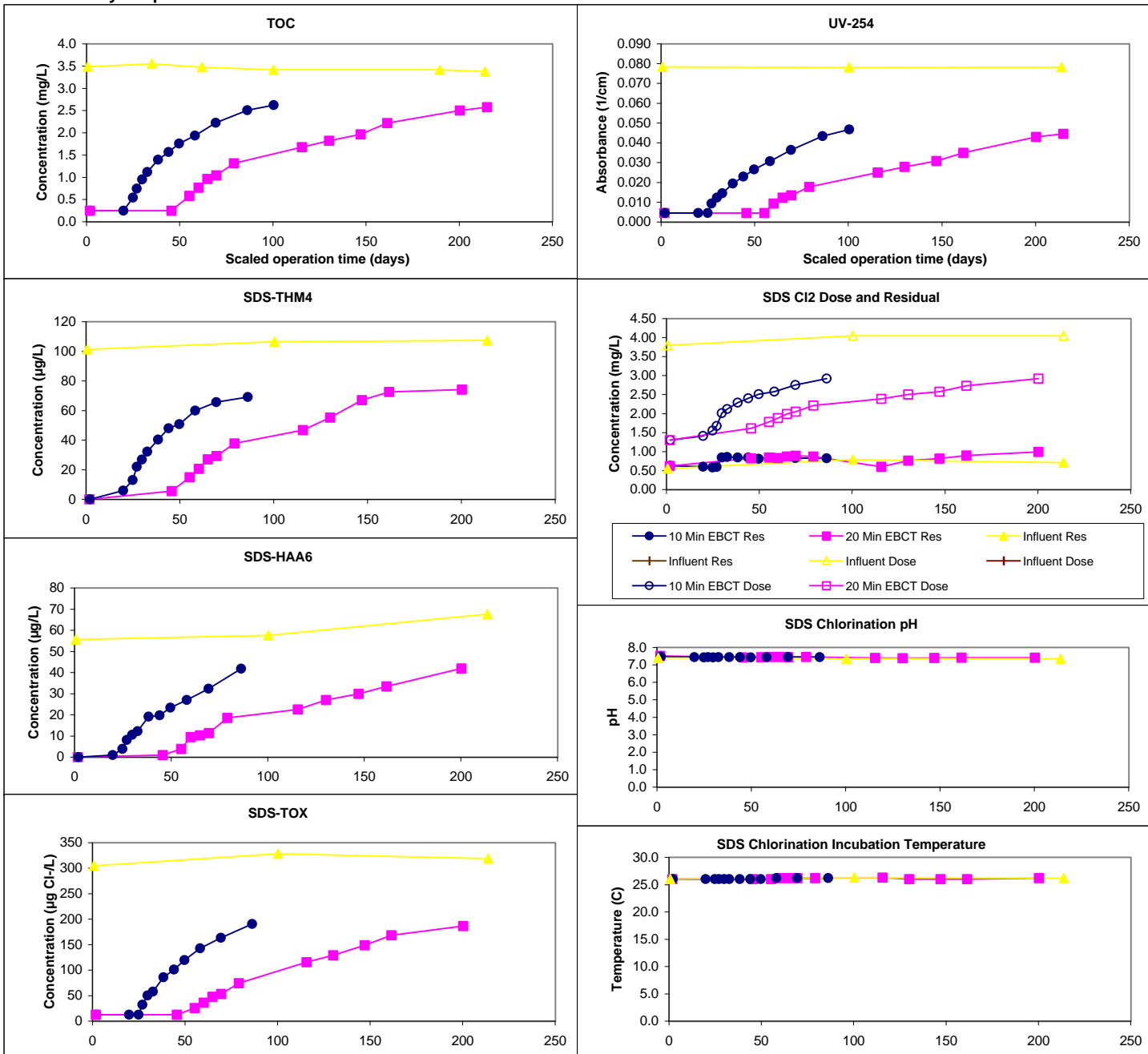
Design TOC: 3.3 mg/L
 Col Diameter: 10.0 mm
 Min Reynolds#: 0.50
 Full-Scale Temp: 27.0 C

Full-Scale GAC Size: 12x40 Bituminous
 Bench-Scale GAC Size: 140x230
 Scaling Factor: 12.57
 Meas Dry Bed Density: 0.45 g/cm3

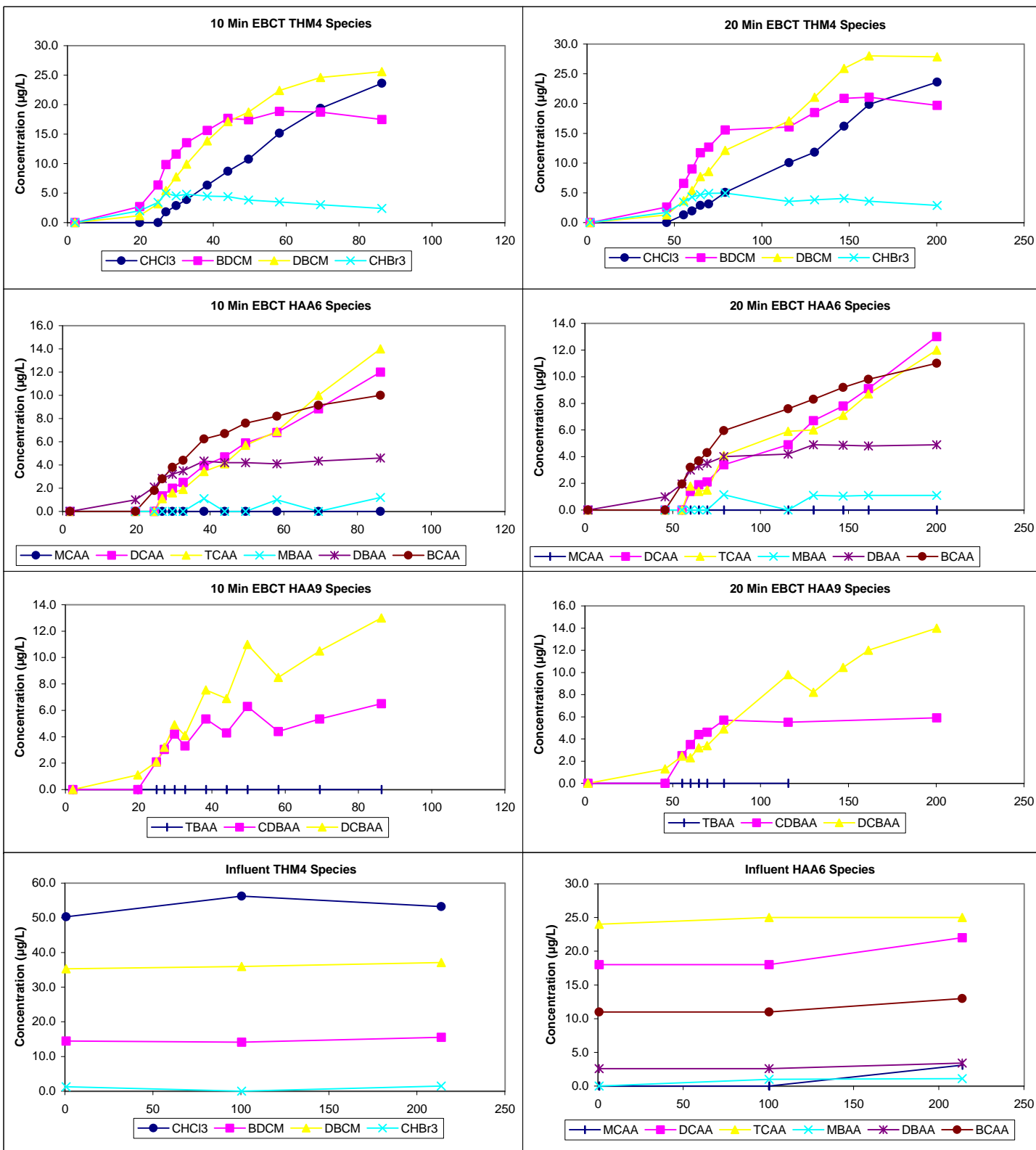
Water Quality Summary

Influent	Influent					Influent				Res (0)	Influent			
	Mean	SD/RD	Count	Min/Max		Mean	SD/RD	Count	Min/Max		Mean	SD	Count	Min/Max
TOC	3.5	0.1	6	3.4 - 3.6						Temp	26.1	0.1	27	26.0 - 26.3
pH	7.6	0.0	6	7.5 - 7.6						pH	7.4	0.0	27	7.3 - 7.5
UV254	0.078	0.000	3	0.078 - 0.078						Time	18.2	0.2	27	17.8 - 18.5
SUVA	2.28	0.04	3	2.25 - 2.32		Comments:								
Bromide	96	0	2	96 - 96										
SDS-TOX	317	12	3	305 - 328		Chart Legend:								
SDS-THM4	105	3	3	101 - 107										
SDS-HAA6	60	6	3	56 - 68		10 Min EBCT 20 Min EBCT Influent Influent								
Effluent	10 Min EBCT (8 B-S days)													
Effluent pH	8.0	0.1	13	8.0 - 8.2	8.1	0.1	13	8.0 - 8.5						
Effluent Temp	21.3	0.6	13	20.4 - 22.3	21.5	0.5	13	20.9 - 22.5						

Water Quality Graphs



Water Quality Graphs (Continued)



ICR Information

ID / ICR#: CA3710006 / 215
 ICR Contact: Timothy Kwak
 Phone No.: (760) 741-4855
 Period: 1/19/99 - 2/11/99 (22 B-S days)

Design Information

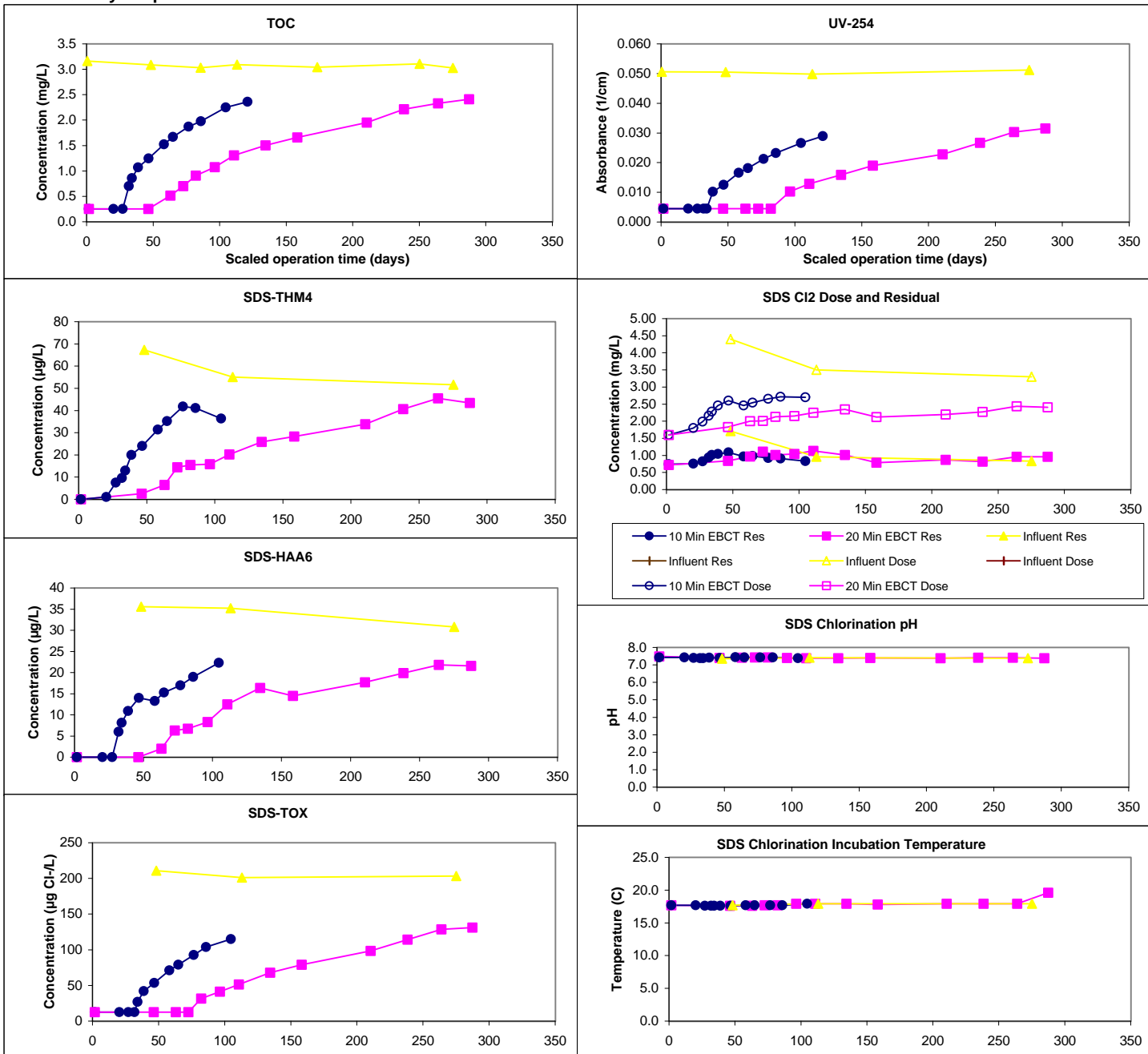
Design TOC: 3.1 mg/L
 Col Diameter: 10.0 mm
 Min Reynolds#: 0.48
 Full-Scale Temp: 18.0 C

Full-Scale GAC Size: 12x40 Bituminous
 Bench-Scale GAC Size: 140x230
 Scaling Factor: 12.57
 Meas Dry Bed Density: 0.47 g/cm3

Water Quality Summary

Influent	Influent				Influent				Res (0)	Mean	SD	Count	Min/Max
	Mean	SD/RD	Count	Min/Max	Mean	SD/RD	Count	Min/Max					
TOC	3.1	0.0	7	3.0 - 3.2									
pH	7.4	0.0	7	7.4 - 7.5									
UV254	0.051	0.001	4	0.050 - 0.051									
SUVA	1.64	0.04	4	1.60 - 1.69									
Bromide	70	0	2	70 - 70									
SDS-TOX	205	5	3	201 - 211									
SDS-THM4	58	8	3	52 - 67									
SDS-HAA6	34	3	3	31 - 36									
Effluent	10 Min EBCT (10 B-S days)				20 Min EBCT (23 B-S days)				Chart Legend:	<div><div></div>10 Min EBCT</div> <div><div></div>20 Min EBCT</div> <div><div></div>Influent</div> <div><div></div>Influent</div>			
	Effluent pH	8.0	0.1	13	7.8 - 8.1	8.0	0.1	13					
Effluent Temp	21.7	0.6	13	21.0 - 23.1	22.0	0.7	13	21.2 - 23.8					

Water Quality Graphs



Water Quality Graphs (Continued)

